Building the PRIMA MAINS 3

WIRELESS INVENTIONS THAT ARE WANTED
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- FLUID-LIGHT TUNING
- SHORT-WAVE SECTION
- BEGINNER'S SUPPLEMENT
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All-Electric Superhet

PORTABLE FLUID-LIGHT SIX

This is the new "His Master's Voice" Mains Portable. It works off the mains electricity supply. Earth and aerial are self-contained. It is the answer to all who have waited for "mains reception" in a portable set. Its selectivity is so acute that it is fitted with Fluid-light tuning — the sensational new device that ensures accurate tuning always. In this model this device takes the form of two illuminated arrows that gradually approach each other until they show the exact point of perfect reception. So that by sight alone, unassisted by ear, you can tell when this set is tuned, as it were, to concert pitch!


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MODEL 447. Superhet Table Model (five valves including rectifier). Fluid-light tuning in central window. Automatic volume control. A.C. only.

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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. Cricklitt, 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. It was decided 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 its quality. Ambrose and his band did yeoman service by providing listeners with Saturday night dance music over a number of years, and it is hoped that no interference will result, 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 Molchanov, 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.

Another Wavelength Change

Another attempt on the stratosphere 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 Molchanov, 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, 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).
Rounded the World of Wireless

Adelheid Armhold, Parry Jones, Arthur Cramner, Harold Williams, and the B.B.C. Chorus. On May 9th, in addition to the winning Overture in a London network competition, the first broadcast of Bar'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.

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 1986 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," as he is a farmer's son and worked on his father's farm until he was twenty.

Marie Hall Recital

MARIE HALL, who broadcast a national broadcast in the National programme, has toured fourteen countries since she made her debut 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 Seckov in Vienna. The Strad of May 8th, in 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 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.

The Variety profession is to collaborate with the B.B.C.

Hospital Ward as Studio

WARD of the Great Ormond Street Hospital for Sick Children will serve as a broadcasting studio on May 10th, when the Dauntrey 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 Storin, xylophone soloist.

"The Musician at the Gramophone"

LESLIE HEWARD, conductor of the City of Birmingham Orchestra, has an interesting subject for his "Scrapbook" No. 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 to have "Scrap-book" No. 10th shall remain a closed book until the night of the broadcast, but remembering the "Scrap-books" for 1913 and 1960, 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 of gathering praise of the young 1909, listeners may anticipate, but remembering the "Scrap-book" series spotlight a recital on the variety profession is to collaborate 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 J.F. valve in the output stage. He used a 506-volt H.T. battery and employed a good balanced-armature loud-speaker. After reading several advertisements and becoming excited 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 as good as with the previous arrangement. Why? Three books will be awarded for the first three correct solutions opened. Address your enquiries to "The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, W.C.2.

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 overstated 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. 84 and books have accordingly been forwarded to them:

C. R. Arons, 34, Cress Street, Rugby, Warwickshire.
J. Jardine, 59, Lorneburn Street, Dumfries.
A. Fisher, 106, Tunworth Lane, Mitcham, Surrey.

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

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

New HMV PORTABLE

Flesh 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 Unauflhörliche," with

Patent of the Variety

Page dimensions: 595.2x844.8

[Image 0x0 to 595x845]
[55x89]
Interesting to examine some of the circuits reaction, the signals on gradually be built up to a value of one valve. However, it is exciting to examine some of the circuits principle, which aimed at obtaining the utmost amplification from one valve. While 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. The Armstrong 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 resistance can be equal to the negative resistance; 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 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.

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 oscillograph 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
LI 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, the dual 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 .0008 mfd., where a .00015 mfd. instrument would ordinarily be used, or .0006 mfd. if a .0008 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.

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 retracing circuit 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. 6-8. It employs a pentode output valve acting as a power-grid detector, and is particularly suitable for local-station reception on the loudspeaker. Owing to the absence of inter-valve couplings, low-frequency oscillation, cross-modulation, 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 the one-valver this set is particularly easy to operate. The only controls are the tuning and reaction condensers, and the on and wavechange switches, although there is also a variable selec-

(Continued on page 224)
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 the 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 very distressing to have to remove a 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.

Protective Switches

Devices of the above type are quite cheap and simple to fit, but many listeners prefer 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 week 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. 29. 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.

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Battery Condition
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 perfection, 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. Of course, it is possible, 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-speak.er.

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 effect 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 pre-determined 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.

Preventing Atmospheric Interference

Another invention which is urgently needed is one by means of which atmospheres 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. Atmospheres 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 atmospheres have a comparatively unlimited field outside which the aerial must 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 supposed that, if 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 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 windings 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 with 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 24 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 portion of the total. What is required, then, is a valve which is more economical.

(Continued on page 221)
An Efficient Lead-in Device

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

A lead-in made from two stand-off insulators, is shown in the sketch. I first drilled a 

\[ \text{in} \] diameter 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. A wing-nut on each end clamps the insulators tightly 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.

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

A two-ratio microphone transformer.

The case of the L.F. transformer is removed, leaving the bobbin with the windings and the stallory laminated core. The four leads from the bobbin to the terminals 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.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 the 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 60 : 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.
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. DOCH (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 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. RAVENDES (Bedminster).

Preventing Vibration in a Car Radio

TWO or three old cycle inner tubes will do excellent service, acting as shock absorbents 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, E7).

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. 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 least, 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).
ACCURACY

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H.F. Pentode.
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COSSOR 41 M.P.G.
A.C. Variable-mu Pentagrid.
Heater volts 4, amps 1; Mod. Anode volts (max.) 250; Mod. Screen volts (max.) 100; Mod. Grid volts (Variable) 1.5 to 20; Osc. Anode volts (max.) 100. 20/-

COSSOR 42 MP/PEN
A.C. High Slope Power Pentode.
Heater volts 4; amps. 2; Max. Anode volts 250; Max. Screen volts 250; Mutual Cond. at Vd. 100, Vag. 100, Vg. O = 7.0 m.a./v. 18/6

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don't be puzzled
find out why

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INSIST ON A PIFCO AND SAVE TROUBLE.
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. For this reason the Det.-L.F. type of receiver was developed to a great extent.

An illustration some time ago, is a typical example of a distinctly modern Det.-L.F. set and it was discovered 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.

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-
PRACTICAL WIRELESS

May 5th, 1934

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

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.

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.

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 cut-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, intercalre transformers, and other components.

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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

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 "Practical 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, and, consequently, when a bright 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 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 developed by the designers of this system, the restrictio7n 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 Transmission

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 in 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 to 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.
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.

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 loud-speaker 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.
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 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. Feet-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.

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.

Slotted 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)
Construcational Details of Our Latest Three Valver, which is Both Simple to Construct and Efficient in Performance

A

s we explained last week, this receiver has been designed to incorporate all the advantages of the mains-driven wireless set, without the risks which might arise when handling apparatus intended for subsequent connection to a 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 cost 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 soon put the wiring into the place, and with a little patience it could also photographically assemble the components which are included in the receiver in such a manner that it requires a definite scheme to be followed in order that various components will not have to be reversed in order to get some results in an assembly.

Therefore, provided the receiver is carefully put together, the under-surface of the chassis can always be seen, and is the best guide in this respect as to the correct order of assembly. The components are designated by numbers, and the positions of various parts are shown by little arrows, which are designated as red or blue, the first being on the opposite page of this article, the second on overleaf.

The majority of parts are made ready to the person who is engaged on the assembly, and this is Type AM, made by Mains Power Radio, Ltd. An examination of the specifications of this unit will show that it is designed to deliver a maximum output of only approximately 150 volts, and not 250 volts as may be at first thought. The majority of the valves of the present day are made for 250 volts, but 250 volts are not always employed in the assembly of this unit, and the plug should be fitted with the positive plug in the positive socket instead of the negative plug, and the other plug should be fitted with the negative plug in the negative socket and the C.R. 12 volt battery. Small wattage is employed throughout, and the负 Load of this receiver is not at all heavy.

A

T.

he Prima Mains Three, we have said, is a very powerful three-valver, made with a ready-made mains unit and this is Type AM, made by Mains Power Radio, Ltd. An examination of the specifications of this unit will show that it is designed to deliver a maximum output of only approximately 150 volts, and not 250 volts as may be at first thought. The majority of the valves of the present day are designed for 250 volts, but 250 volts are not always employed in the assembly of this unit, and the plug should be fitted with the positive plug in the positive socket instead of the negative plug, and the other plug should be fitted with the negative plug in the negative socket and the C.R. 12 volt battery. Small wattage is employed throughout, and the 负 Load of this receiver is not at all heavy.

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

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 must inevitably attend wireless sets when handling apparatus intended for subsequent conversion to household 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 extra cost of converting to mains supply is also very low. There are only nine components to be included in this mains unit, before him.

The mains unit is made by 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 the valve and component connections are designed for gramophone reproduction simply by plugging the bias plug No. 1 into the 1.5 volt socket and connecting the pick-up to the appropriate terminals on the rear of the chassis. The mains unit is made by Ready-Made Mains Unit...

A Powerful Three-Valver, with a Ready-Made Mains Unit

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 the valve and component connections are designed for gramophone reproduction simply by plugging the bias plug No. 1 into the 1.5 volt socket and connecting the pick-up to the appropriate terminals on the rear of the chassis. The mains unit is made by Ready-Made Mains Unit...
THE PRIMA MAINS THREE

P.T. 425 is just under 1 watt and this, 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 Id. 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.166 (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.—Ormond (C3 & C7).
One .0005 mfd. Fixed Condenser—Graham Farish (C4).
One .001 mfd. Grid Leak—Graham Farish (R5).
One 1:1 I.F. Transformer—Ormond.
One pair Grid Bias Battery Clips—Bulgin No. 1.
One packet Terminal Insulating Washers—Belling Lee.
One Safety Anode Connector—Clix.
Seven Wander Plugs—Clix.
Four Spade Terminals—Clix.
One Packet Terminal Insulating Washers—Belling Lee.
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
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.

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. 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.
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 (L1) tuned by a variable condenser (C1) and that the designer has adopted that familiar device for obtaining a high degree of selectivity—a series condenser (C2) 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 (V2) via a fixed condenser (C3), while the grid leak (R2) is connected between the grid of V1 and the positive side of the detector filament.

Further Analyses

Now examine the group of symbols representing the pieces of apparatus between the detector and the output valve (V1). 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 (C4) by means of which the amount of high-frequency energy fed back to the reaction coil (L4) can be controlled.

Finally, the high-frequency choke a connection is taken to one side of the primary winding of the low-frequency transformer (L5), while the other end is connected to a terminal marked H.T.+1.

It is not usual, in a circuit diagram, to indicate all the intermediate connections. Those 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 connected, there is another terminal 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 placed 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 (V3) and to a terminal marked G.B.—. Furthermore, a negative grid-bias is applied to the valve.

Finally, the anode is connected directly 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.

**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 used, one may, as a matter of fact, use the holder best suited to one's own discretion. Of course, if the selection is very poor and the item is of non-quality, the selection is not due to 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 wire 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 holder best suited to that particular condition, thus taking advantage of the experience gained by the designer of the circuit. The meaning is based upon the knowledge that the one he mentions has the desired accuracy.—K.
The Pilot Kit SERVICE was founded in 1919.

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Assemble this amazing Unit yourself in less than half an hour. Gives seven times the volume with mains current alone. Guaranteed by Peto-Scott. Postage-paid. Suitable for all B.C. sets. Complete with Speaker Cabinet and Peto-Scott Walnut Consolette Cabinet.

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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 proportion of the higher frequencies (commonly called "top") fed into the speaker, with the result that the output of the set, that is, across the loud-speaker, will be reduced and a fuller, richer tone will be heard, but with certain types of loud-speaker there is a tendency to "booming" 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 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.

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

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

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.

It is not often that complaints of excessive bass are heard, but with certain types of loud-speaker there is a tendency to "booming" 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 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.

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-
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 transformer cuts "top" without introducing 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.

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 offering a considerable bass cut.

**To be concluded**

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Wire wound type supplied in 5,000, 10,000 and 50,000 ohms. Perfectly silent in operation. Special types of building heavy mains current (1 amp.). Robust construction. Moulded in all brown bakelite. One hole fixing. Moulded as a variable condenser in all circuits.

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**Daddy what a shave!**

A close shave, one you can be proud of, is possible with the toughest beard if you use Parke-Davis Shaving Cream. The creamy lather softens the bristles and makes the razor edge feel like a finger. The antiseptic in Parke-Davis Shaving Cream ensures skin comfort and safeguards against infection. If you would like to know how it feels to be really ‘clean’ shaven send for a free sample tube of Parke-Davis Shaving Cream. It will last a week — afterwards, you can buy large tubes for 1/6d. from your chemist.

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(Upper block letters please)
New Radio - gramophone Robot

FOR the first time in the 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 record.

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-adiagram," in which an automatic mechanism weighing only 29 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 45 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 engineering 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 connexion with this type, the use of a screened pentode, hitherto associated in this country with high-frequency amplification only.

The diode, 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 KT13 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.

WORKING IN EBONITE.

MESSRS. BURNE JONES have specialized for many years 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.

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 bracket along until the first mark is in position under the file, and tighten the bracket. Hold the former on the tube with the marked rib 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. Each 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 work 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 its 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**

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 balancing 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 in the middle of the control, the receiver will tend to become non-sensitive, i.e., the bias on the R.F. tube will reduce and by means of the A.V.C. device the bias on the R.F. amplifier will be controlled and the volume afterwards turned up to the required setting. Inter-station noises, of course, are thereby avoided.

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 of "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 space a narrow glass tube is seen, not unlike a very small thermometer. When the receiver is switched on this tube glows a bright green colour and gives the appearance of a tube of green liquid. As the tuning control is turned the height of this liquid appears to vary, the effect actually being controlled by means of a shadow cast upon the upper rear portion of the escutcheon. The optimum setting for a particular station is that which shows the highest column of "liquid" or, looked at another way, the ends of the arrows vary and the optimum setting is indicated by the longest arrow (or, again, the narrowest shadow).

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

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

The H.M.V. Device was first detailed to the Public for the first time in April.
IT is an indisputable fact that the majority of troubles
encountered in the use of microphones are due to
improper handling of the instrument. The majority of
these troubles can be traced to one cause—
poor maintenance of the microphone, or the non-use of
suitable stands or microphone tripods. It has been
proved time and time again that the use of a
convenient and adjustable microphone stand not only
prevents misuse of microphones but makes them
more effective in the hands of the user. This is
shown by a study of the work of some of the
larger broadcasting stations in the United States.

We have before us one of our readers who
wrote us some time ago that he had discovered
a convenient and adjustable microphone stand
which he found extremely useful. This stand
is known as the Metaplex, and is manufactured
by the British Radio Gramophone Co., of
Northampton. We have had the opportunity of
examining this stand and are pleased to say that it
is very useful and convenient. It is adjustable,
and can be used either as a tripod or as a
stand. The stand is very rigid and
strong, and is capable of supporting
a very heavy microphone. It is
also very portable, and can be
folded up in a very small space.

The stand is very easy to use,
and can be adjusted to suit the needs of
the user. It is very light in weight,
and can be carried easily. It is
also very strong, and can support
a very heavy microphone. It is
also very portable, and can be
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also very portable, and can be
folded up in a very small space.
The B.B.C. Symphony Orchestra

Suit No. 3 in D Major (Bach) and Prelude from Violin Sonata No. 6 in Eb (Bach). H.M.V. DB1786, recorded by the B.B.C. Symphony Orchestra (conducted by Adrian Boult), is an outstanding success. Each had a greater output than any other composer. He must have written more than a thousand compositions, so 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 indicative of his genius.

I Passed by Your Window and There is a Flower that Bloomed, sung by Walter G. Winfield, was recorded on Oct. 30, 1940, We believe there is every possibility that this well-known concert-hall artist will accept a role in an important West End production in the near future. His excellent recording of these two songs was among the most popular sales of the ballad record.

His Dog and Warbler’s Serenade, played by London Palladium Orchestra, H.M.V. B9804, is rather a novel record with the larking dog, duck, bat and bird trills, although so realistically recorded, are really from the mouth of Imoto, the well-known animal impersonator.

The Street’s Ballet Suite, recorded by the London Symphony Orchestra under the baton of Sir Adrian Boult, on H.M.V. C2615, played by Marek Janowski, is a most interesting and well-recorded piece. It is remarkable when Bach had a greater interest in the seemingly unmusical sounds of the mystery world. The whistling, dog bark and bird trills, although so realistically recorded, are really from the mouth of Imoto, the well-known animal impersonator.

It is recorded that the song was composed by Mendelssohn, H.M.V. C2615, played by Sir Adrian Boult, in 1896, and was recorded by Sir Adrian Boult, in 1940, on H.M.V. B9804. The song is a medley of the songs which have made him famous. While the whole record is highly entertaining, there will be few people who cannot be thrilled by his stirring voice singing Of Man River at the end. A comparatively new orchestra, to the “His Master’s Voice” list, is one led by Alfredo, who makes a specialty 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. B9809 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 Ray and Josephine’s Jazz. These titles were originally orchestrated by Ray Noble for a 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. B9421. The vocal refrain of this title is by another author, Leslie Sarony, and certain words and the accompanying music have been left out purposely in order that listeners can supply them. The other tune when the band was to be hired by H. H. H. to be heard in the applause of the crowd. Some will protest, but their protests are not likely to be heard in the applause of the crowd.

It might be well to find out if the Vicar of Blakely Church, who is likely to be heard on Sunday Service—Stories—an entirely vocal affair by Billy Cotton and his Band on Regal Z10020. The exploits of the old Biblical heroes are re-told in a gossamer and the conception. Some will protest, but their protests are not likely to be heard in the applause of the crowd. Better hear it and judge for yourselves.

Enter for our 20-guinea Bifocal Competition now.

PRACTICAL WIRELESS

PRACTICAL WIRELESS

Reply to Broadcast Queries

EDITOR’S NOTE: Queries must limit their queries to three per letter.

PRACTICAL WIRELESS

May 5th, 1934

LIST OF COMPONENTS FOR THE PENTODE ONE-VALVER

1. Ormond mini, 0.005 mfd. variable condenser, No. 4
2. Telson dual-range aerial coil, No. 76
3. Telson 3-point wave-change switch
4. 4100 fixed condenser with grid leak clips, 0.001 mfd.
5. Telson grid-leak, 1 megohm
6. Dubilier electrolytic condensers, high voltage type
7. Dubilier electrolytic condensers, high voltage type
8. 0.002 mfd. variable condenser type 9200, 2 mfd.
9. Dubilier electrolytic condensers, 1 watt type
10. Graham Farish 0.003 mfd. differential condenser
11. 0.0005 mfd. variable condenser
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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 “Qued” 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 very 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. A. D. CRANT, Hon. Sec. Inter-national Short-Wave Club (Leicester).

An Appreciation from the East Indies

Sir,—I have received the tool kit, “Encyclopaedia of Popular Mechanics,” and Newnes’ “Wireless Constructions.” I am deeply indebted to you for this, and must thank you for your wonderful service and kindness. Both the Encyclopaedias are the envy of my friends. They contain so many useful tips for the wireless enthusiast. —Roy H. ROWLANDS (Pemang, Straits Settlements).

A South African Reader’s Thanks

Sir,—I thank you for the gifts recently received. The tool kit is just what is required, and the “Popular Mechanics Encyclopaedia” is very interesting. I have now had six gifts altogether for which I also thank you, forgetting the many interesting columns in PRACTICAL WIRELESS.—A. F. POULOC (Windhoek, S.W. Africa).

B.B.C. Television Transmissions

Sir,—I find with regret that the B.B.C. transmission of “Everyman’s Wireless Book” has 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 televisions 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. BORIAM (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. B. WATSON (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 consider a series of “Leader” designs, starting with a simple receiver, say, of the detector and L.F. type, and then adding stages by stages enlarging it by easy stages, each stage incorporating in it the components of the previous one, as far as is possible. By having a battle 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 experiments and work.—PHILLIP 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).

PRACTICAL WIRELESS

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 duplex 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 utilise the paraphase 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 between 200 and 250 metres there are only 400 kilocycles.
—THAT the above facts account for the difficulty of tuning on short-waves when using large-capacity condensers with 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 unauthorised work, every effort will be made to return copies of manuscripts forwarded on application. All correspondence intended for the Editor should be addressed to: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 81-84, Southampton Street, Strand, W.C.2.

The Editor welcomes your suggestions and contributions to the magazine. After careful consideration, some may be published. Readers are requested to state their name and address on all communications. Contributions are read at the Editor’s discretion. The Editor reserves the right to make any alteration in the substance which he may consider advisable. Full credit will be given to the authors of all contributions published.

NEW FERRANTI ELECTROSTATIC VOLTMETERS

TWO new electrostatic voltmeters have recently been introduced by Ferranti Limited. One is a 150 V. instrument, spring mounted in a cast-iron case, and enclosed for measurements to be taken with the dial in a horizontal position. The other model is a 25 V. instrument, with an upright case, and is fitted in a polished wood case. A footrest (W. 52/5) gives further particulars of these meters, and also details regarding a new 25m. 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 of the operation of a switch at the top of the instrument. The full scale readings are 2 V. A.C. and 0-05 V. D.C. Both these ranges have a resistance of 1,000 ohms for a volt, the ordinary incinerator being a full 1000 ohms.

WATMEL VOLUME CONTROLLERS

A DEEPER range of volumes and variable resistances is shown in a list recently issued by Watmels Waring & Gillow and Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, W.1. Receivers to the competition, and entry form, are given in a folder, and also a totally enclosed potentiometer with compound stator. The two new components consist of totally enclosed metal-clad vacuum control and volume controllers, which are obtainable in any value up to 200,000 ohms. One is fitted with a single control, and the other is rated to carry 3 amps at 250 volts. Various types of dial controllers, and a new heavy-duty variable resistance are also listed. The latter component, which is specially designed for the control of power for television and for laboratory use, has the elements wound on a 6-in. mica transformer, and is obtainable by rotation of a contact slider which spans the four resistance forms. The two controllers are priced at 15s. 6d. each. The address is Imperial Works, High Street, Edgware, London, W.7.

AVO MINOR COMPETITION

An interesting competition in which £100 in prizes is offered is announced by The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, W.1. Entrants to the competition have to use an AVO Minor testing instrument, and write down a comprehensive list of tests which it is judged to perform most accurately. Alternatively, competitors may write down as few words as possible to describe the experience of the Avo Minor when used at a given frequency, the alternative or surprising result for defective equipment. The prize money will be distributed as follows: a first prize of £10, a second prize of 25s., and a third prize of 10s. a week for a year, a third prize of £10 cash, or strips of one each of restoration parts, the subscription for the competition, and entry form, are given in a folder, which can be obtained from the address given above.

UNUSUAL TRAVEL BOOKS

AFOOT IN PORTUGAL

By JOHN GIBBONS

Mr. GIBBONS leaves the beaten track and visits places which are little known. He gives an interesting and vivid account of his travels, and his pithy criticism makes a good book for both amateurs and professionals alike.

LONDON TO SARAJEVO

By JOHN GIBBONS

The whole book is quite out of the usual run of travel books.
LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query or query which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Reuter, Ltd., 6-11, Southampton St., Strand, London, W.C.2.

REBUILDING A SPEAKER MAGNET

"I have a magnet which I intend to use in my Portacoor circuit. Could I run this from the mains? If so, what resistances would be needed for dropping the volts and controlling speed?" - E. H. W. (Hollinwood).

LEAKING ELECTROLYTIC CONDENSERS

"I have a mains transformer which has a winding marked 20.2 1 amp. and 20.2 3 amps. Is this suitable for 4 volt indirectly-heated valves with rectification? Also, could I use a metal rectifier for a set which is shown with valve rectification?" - J. P. S. (Bertin- on-Trent).

MAIN TRANSFORMER PROBLEM

The 20.2 volt windings are intended for the operation of indirectly-heated valves and you should imagine that your particular specimen is intended for the operation of directly-heated valves. Rearrange the remaining 20.2 (1 amp.) winding for the heating of a rectifying valve. It is possible to use the metal rectifier of a circuit for valve rectification, provided the mains transformer is so wired. The actual alterations will, of course, depend upon the type of circuit which is used, i.e., voltage-doubler, half-wave, etc.

PRICE ADVICE BUREAU

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

PRACTICAL WIRELESS, 5/5/34.

INCREASE THE SELECTIVITY OF YOUR SET!

OVER 1,500,000 LISTENERS USE A

PEAKING CIRCUIT TO

separate those stations that overlap each other. Get rid of that annoying buzzing that spoils local reception. Just place the PEAKING CIRCUIT in your serial lead. You will be surprised how much better the quality of your broadcast reception can be improved in this manner. Send us 2/- (10 cents) for the PEAKING CIRCUIT. We will also be glad to send you a PEAKING CIRCUIT sample for you to test.

BRITISH PI( CO., LTD., LONDON, S.E.I.
PRACTICAL WIRELESS

May 5th, 1934

PREFACE

Advertisements are accepted for these columns at the rate of 5d. per word, prepaid—minimum charge 3s. per paragraph. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 2 Northampton Street, Strand, London.

PREFERRED SUPREME STORES

offer the following Set Manufacturers' Surplus New State whether power or pentode required;

0.250 ma., 0.1, 0.3, 0.5 amps.; all at 6/-.

20 henries, 2/9; 40 milliamps. 25 hys., 4/-; 37/6; 150 volts 50 milliamps, 27/6.

250v. 60 milamps, with 4v., 3.5 amps. C.T. L.T., charger 8/-

Super-Power, 2/6.

filament. Set of 3, consisting of Screen-Grid, Detector.

Screen-grid.

types of standard mains valves at 4/6 each.

Continental valve manufacturer. All the following

primary, 15/-.

with screened primary, 15/-.

L.T., 2/- extra;

IF primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER Mains Transformers, output 135v. 80 watts; 18/6.

PREMIER L.T. supply Units, consisting of Premier

connections, input 200-250v. 40-100 cycles, all windings

rectified, with 4v. 3.5a. and 4v. 1a. C.T., L.T., and screened

4v. 3.5a. and 4v. 1a. C.T., L.T., and screened

connections, input 100-120v. or 200-250v.

directly from Power or pentode, send only 5/- for 7 days trial. If approved, balance in 3 monthly payments of 3/-.

Cash or G.O.D. Carriage Paid.

B.B.L. Class "B" Amplifier Unit. Complete Class B Push-Pull Amplifier. Send only 5/- for 7 days trial. If approved, balance in 3 monthly payments of 3/-.

Cash or G.O.D. Carriage Paid.

N.T.S. Speaker Amplifier Class "B" Valve.

Send only 5/- for 7 days trial. If approved, balance in 3 monthly payments of 3/-.

Cash or G.O.D. Carriage Paid.

M.F. Valve.

Send for list.

THE HANDY RHYTHMETER

It contains practically every word in everyday English, alphabetically ordered, classified with other words with which it rhymes.

5d.
PRACTICAL WIRELESS

PRACTICAL HANDBOOKS

This series covers a wide field and will prove of great value to everyone interested in models and how to make them: woodwork and other crafts.

ACCUMULATORS

An up-to-date handbook dealing with every type of accumulator, methods of charging them at home, care and maintenance, etc.

MOTOR CAR UPGRADE AND OVERHAUL

Information covering the engine, decarbonising, valve grinding, the lighting system, the cooling system, lubrication, springs and shock absorbers, steering gear, brakes, wheels, axles, tracing noises, etc.

TOY MAKING FOR AMATEURS

How to make clockwork toys, model aeroplanes, model boats, ingenious toys operated by sand, wooden models and toys, electrical toys, steam toys, guns, kaleidoscopes, etc.

SIMPLE ELECTRICAL APPARATUS

An excellent little book for those who wish to make simple and useful electrical appliances, such as galvanometers, electric motors, dynamos and Leyden jars.

MODEL BOAT BUILDING

Contains designs for battleship, speed boat, paddle steamer and yachts. Excellent models can be built with the simple directions and diagrams given.

THE HOME WOODWORKER

Clear instructions on how to make a large variety of articles in wood, together with many useful hints on wood-working.

MODEL AEROPLANES AND AIRSHIPS

Contains full descriptions of easy-to-make models of every description that will fly.

THE HANDYMAN'S ENQUIRY

Hundreds of practical ideas and hints of value to the man who is clever with his hands.

25 SIMPLE WORKING MODELS

Ingenious and practical designs for electric, steam and clock-work models.

NEWNES' HOME MECHANIC BOOKS

Obtainable at all Newsagents and Booksellers, or post 1½s each from Geo. Newnes, Ltd., 8-11, Southampton Street, London, W.C.1.

SOUTHERN RADIOTEL'S BARGAINS.—Set manufacturers' guaranteed surplus.

COILS.—Irregular iron-core band-pass 3 coils units; Overseas nickel and mica; 75s. each.

LECOSS—Types —O.G.10/3, T.O.B.; T.O.B. and engraved 4½ and 6½ ins. in length, 12/-.

L CURL—Super-bolt 3 coils unit. Screened. Ganged on base with switch. 4½ ins. long, 6/-.

EACH BOOK DEALS AT LENGTH in considerable detail.

BOOKSTALLS, or by post 1/2 each. Obtainable from Geo. Newnes, Ltd., 8-11, Southampton Street, London, W.C.1.
THE PRIMA MAINS THREE

For your May super number of "RADIO GOLD-MINE" By far the most comprehensive lists of up-to-date surplus kits (kits, components & accessories) yet produced, with a general price level lower than ever before. The price alone falls short of this standard. We will stand by our promise to build the Prima Mains Three Kit A, 3-valve, 22/6; S.G.IV, 29/6; Class B II, 27/6. ADAPTOR KITS: 8.W. Adaptor, which will meet every home constructor's requirement. Complete to the last screw, with chassis, all components and accessories provided. From 6/-

THE PRIMA MAINS THREE

BUILD THE PRIMA MAINS THREE, KIT A.

If so, you cannot afford to carry on without reading our 256-page handbook. The book explains clearly and definitely every aspect of making and repairing modern sets. It explains the service of our many apprentices Department, and how amateurs can make the sets themselves. For just 6/6 you can build a super-heterodyne receiver of professional type and accuracy. Complete with wave-changer and shielded coils.

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