TWO NEW COSSOR VALVES

To meet the demand for valves of high impedance suitable for use in the I.F. Stages of battery super-hets and for use as H.F. Amplifiers, A. C. Cossor Ltd. introduce a Variable-Mu High Frequency Pentode, the 210 V.P.T.

Another innovation is a High Frequency Pentode, the 210 S.P.T., which is especially suitable for use as a high gain detector or as an I.F. Amplifier in non-variable-mu super-hets.

Full details of these new valves will be gladly supplied on application to the Cossor Technical Service Department.

COSSOR 210 V.P.T. BATTERY H.F. VARIABLE-MU PENTODE
Filament volts 2.0; amps 0.1; Max. Anode Volts 150; Max. Auxiliary Grid Volts 80; Grid Bias (Variable), 0 to 9v.; Mutual Conductance at Va=150, Vag=80, Vg,0 = 1.1 m.a./v. 15/6

COSSOR 210 S.P.T. BATTERY H.F. PENTODE
Filament volts 2.0; amps 0.1; Max. Anode Volts 150; Max. Auxiliary Grid Volts 80; Mutual Conductance at Va=150, Vag=80, Vg,0 = 1.5 m.a./v. 15/6

Please send me full details of new Cossor Valves, types:

Name: ____________________________
Address: ____________________________
Summer Time

The European countries which have now changed over to Summer Time include Great Britain, France, Belgium, Romania, and Portugal. Holland alters her clocks on May 16th.

Australian Empire Day Broadcast

In celebration of Empire Day, a programme from Australia will be given on May 24th in the National programme, and will be re-transmitted by the B.B.C. to other parts of the Empire, either by means of simultaneous broadcast or by electrical recording. The programme will be devised and produced by the Australian Broadcasting Commission, and will open with the chimes of the General Post Office clock at Sydney, New South Wales. A demonstration by Kookaburra (Laughing Jackass) will follow. As an introduction to the playing of "Australia will be there," a favourite war-time song of Australian soldiers, a message of goodwill to the Empire will be broadcast.

Larger Stations for Austria

It has been decided to replace the Dornbirn, Salzburg, and Linz relays during 1934-5; their power is to be increased by several kilowatts.

Ave Minor Competition—Correction

With reference to the announcement concerning this competition which appeared in a recent issue, we understand that a slight printer’s error occurs in some of the folders sent out in connection with the competition. On page 3 the last range of meter readings should be 0-3 megohms, and not 0-.3.

More Musical Interval Signals

Owing to the popularity achieved by the short musical phrase used by the Prague high-power transmitter, the Czechs have decided to adopt individual melodies as interval signals at all their stations. Prague (2) on 240.2 metres now uses a trumpet fanfare consisting of the first few bars of the Sokol March, and Bratislava a carillon of the folk song, Hei Siovari. At Kosice, more distinction is obtained by introducing a native wind instrument, the Fux, and from Moravaska Ostrava will be heard a short excerpt of a national song, played on a vibraphone. Brno has not yet taken a decision in the matter.

The Range of Small Stations

Although the power of Zagreb (Jugo-Slavia) is only 750 watts, its broadcasts have been recently well heard in the United States. This fact proved of interest inasmuch as it was discovered that the aerial was slung east-west, and thus possessed excellent directional properties. Most of the letters confirming good reception were received from St. Louis (Mo.). Here you have the explanation of the reason for which some small European transmitters are heard at exceptional strength in certain parts of the United Kingdom.

Radio to Assist French Railways

Following the recent Lagny disaster, the signalization on the French railways is to be completely modernized by the use of radio short-wave transmitters and receivers. In future trains will be equipped with apparatus permitting them to maintain communication with each other on the main lines. By this means the engine driver will be informed of the exact position of any train he may be following or which may be overtaking him.

The Egyptian Broadcasting System

With the imminent opening of the new Cairo transmitter on 483.9 metres, the future plans of the authorities have been officially revealed. Egypt was granted four channels by Lucerne, and will make use of them. Work is to be started without delay towards the end of the day's programme. Egypt was granted four channels by Lucerne, and will make use of them. Work is to be started without delay towards the end of the day's programme.
**ROUND the WORLD of WIRELESS**

**PRACTICAL WIRELESS**

**May 19th, 1934**

**Continued**

**Improve the Swiss Stations**

It has now been decided that in view of cost entailment, the power of the Beromünster station must be increased this year. In addition to improvements and additions to the existing plant, the aerial masts are to be extended to 800 feet in order to resist radiation. It is also proposed to change the wavelength of the old Berne station, now working on 218.2 m., to 900 metres, providing authority to do so can be obtained.

**Wings of the Morning**

LANCE SIEVERING's new radio play, *Wings of the Morning*, which is to be heard in the Regional programme on May 24th, and the National programme on May 29th, is the story of a "fantastic crime committed in the Fourth Dimension." As may be gathered, there is a scientific touch about the play, which includes members of the Royal Society, as well as the more commonplace "minions of the law." among the characters. The author will be the producer.

A Broadcast Revue from Plymouth

ON May 18th, West Regional listeners will hear an extract from the George Charke revue at the Palace Theatre, Plymouth. The Band of H.M. Royal Marines, Plymouth, Division, will be heard on May 19th. The Director of Music is Lieutenant E. J. Ricketts, R.M., and the programme will be relayed from the Abbey Hall, Plymouth. Frederick Harvey (baritone) will be the vocalist.

Dance Music by Scottish Studio Orchestra

ON May 19th, the dance music "reserved in the Scottish Regional programme will be interrupted for twenty minutes and a programme of "Jig Time" will be given by the Scottish Studio Orchestra directed by Guy Daines. This will provide a change for listeners who do not care for jazz.

**NOVEL COOLING APPARATUS AT H.M.V. FACTORY.**

A new form of miniature railway and wind tunnel has been devised by a member of the H.M.V. staff, and installed in the condenser-making plant at Hayes. The blocks of fixed condensers, after having been filled with pitch, pass through the tunnel on rails and are automatically cooled by air, which is pumped through.

**SOLVE THIS!**

**PROBLEM No. 87**

Template built up a disc television receiver, but although he obtained splendid results he decided that the brilliance of the image was not sufficiently reflected for his entertainment needs. He decided, therefore, to build a mirror receiver. He purchased a complete mirror, motor, and cricht, and built this up with tv'teaming reason and the necessary box, but could obtain no results. The important point had he overlooked? Three boxes will be granted for the first three correct solutions. Address your attempt to: The Editor, Practical Wireless, Geo. Newnes, Ltd., 4-11, Southampton Street, Strand, London, W.C. 2. Newnes must be marked Problem No. 87, and must be posted to reach here on or before the last post Monday, May 21st, 1934.

**SOLUTION TO PROBLEM No. 86**

The smallest values of Dave's push-pull amplifier were oscillating. A resistance in each grid lead, or a small capacitance in each outline lead, would have removed this instability and enabled good volume to be obtained.

The following are the 11th Street Problem, No. 86, and books have accordingly been forwarded to them:

Mr. James W. Forrest, 7, Haner Ave., Blackburn; Mr. S. W. Dunsmuir, 34 Park Avenue, Dundee; Mr. J. H. Hill, 81 Bly, Newcastle Street, Pia; Dr. Helen, Leeds.

**Edinburgh Entertainments**

A PLAY entitled *Edinburgh Entertainments*, by Christine Orr, will be broadcast in the Scottish Regional programme on May 23rd. Listeners, many of whom may remember Christine Orr's previous broadcast plays— *Walter Scott*, *Dundee*, and *P.Speede*, and her historic programme historical picture of Edinburgh, are being taken by her on this night to the four chief places of interest in Edinburgh, but in modern times. Miss Orr has chosen Assembly Week as being a week not only of solemn functions and deep debate, but of jumbling and jollity and the meeting of old friends. Gordon Gilchrist will produce the play and the principal parts will be taken by Margaret Adams, Bruce Morgan, and Isabelle Pagan.

The Finnish National Orchestra

IN the symphony concert by the Finnish National Orchestra, which will be heard by National Programme listeners in a relay from the Queen's Hall on June 4th, Helmi Laxkonen, soprano, will be the soloist. The programme consists mainly of Sibelius music and includes his second and fourth symphonies. Other of his works to be performed are *Night Ride and Sunrise* and *Laiskotsa*, for soprano and orchestra. The orchestra will also play *Meridano's*, *Pan and Swans*, by Rota. The conductor is Georg Schmoeve, who is already as well known to us, as he is to audiences in almost every city in Europe.
CAR RADIO
POSSIBILITIES

All of the Problems of Radio in the Car have Now Been Solved, and
the Solutions are Here Described.

By W. J. DELANEY

FROM time to time we have dealt with the problem which faced the
designer of a wireless receiver which had to operate in the confines of a
motor-car travelling along the roads under all conditions. Briefly, interference from
the magneto, sparking plugs, etc., had to be overcome. Some form of aerial or other
efficient pick up of the wireless signals had to be fitted so as to introduce a really
good signal to the receiver. Constancy of signal strength had to be obtained under
all conditions. That is to say, the screening effects of metal bridges, high hills, etc., had
to be completely removed. The receiver had to be disposed in the car in such a way
that it introduced no awkward boxes or other projections. The loud-speaker had
to be fitted also in an unobtrusive place, but in such a manner that it could deliver
its signal to the occupier of the car. The controls had to be arranged so that the
driver could turn the set on and off and control the volume delivered by the
speaker. A really good voltage (of the order of 200 or so) had to be obtainable
without introducing too much bulk or weight. Although there are other smaller
points, the apparently insolvable difficulties which have been enumerated have now
been overcome in a most satisfactory manner, and the following notes will show in
what an efficient manner the designers have been able to build a receiver which
fully satisfies every possible requirement of entertainment whilst driving.

Interference Suppression

Special resistances have been designed, and are now manufactured on a commercial
scale for fitting to the plugs and for use in conjunction with the magneto and associated
distributors, which remove all interference from those sources. With these fitments
and a suitably-designed radio receiver there are no crackles or other
extraneous noises to mar the reproduction. Many
car manufacturers are
now fitting these suppressors as part of the
standard equipment, but where it is desired
to equip an existing car with radio the suppressors may be purchased from any
good radio dealer. They are manufactured by firms who have had
much experience in the manufacture of resistances, and may
be relied upon to satisfactorily fulfill their function without breakdown.

Aerial Equipment

Many new cars have
an aerial built into the
body work or arranged
in the roof of the car in
such a manner that a fair length of wire is
accommodated and at the same time there
is little likelihood of interference being
picked up. Where such a fitting is not provided
some interesting types of aerial may be ob-
tained from various
firms for fitting to the
car in an invisible manner. In most cases a
copper gauge mat is employed, and this is
enclosed in some dirt-proof casing and is

A complete modern car radio receiver and
loud-speaker, generally designed to fit beneath the running boards.

A length of flexible lead is fitted and this
is of the ordinary or screened type, depend-
ing upon the particular make. Fitting
is only a matter of drilling one or two holes

Rubber Cement
High Tension Cable
To Suppressor.

Interference from the
plugs is removed by
means of special resistors.

This illustration shows the method
of operating the
controls from the steering column, and how the apparatus may be
enclosed in a metal case to be sunk in the floorboards.

This aerial fitment is intended to be mounted below the running board.
CAR RADIO POSSIBILITIES

(Continued from previous page)

Constancy of Signal Strength

Until one has experienced the testing of a simple receiver in a car travelling at speed over a road which passes through a hilly district, over or under metal bridges, one cannot appreciate the variations in signals which can occur. This has obviously been overcome with the simple automatic volume control circuit which is now so popular, and which is carried out by means of the double-diode type of valve. By employing the superheterodyne circuit good signal strength is obtained and the modern output pentode enables a really high output to be obtained under practically all conditions.

Apart from the actual circuit, the disposition of the receiver at one time seemed a tough proposition. To facilitate its incorporation in the car without intrusion the general procedure is to build the receiver into a small metal box so designed that it may be sunk into the floorboards, or else incorporated in a cabinet with a loud-speaker and designed to be fitted beneath or behind the dash.

Special loud-speakers of the Midget type have been designed and these may be built into the dash in the case of modern cars, or incorporated in a specially-built cabinet for inclusion beneath the dash in the case of older cars. The glove box may be extended to accommodate the speaker if thought desirable.

The Controls

In the design of the controls exceptional ingenuity has been displayed. It is an essential that the driver shall have these at his immediate reach and an indication must be afforded as to the tuning setting, in either wavelengths, or by means of a simple calibrated dial. In the case of the Lissen car radio outfit, a neat fitting is designed to be bolted to the steering column, and adjustment of the tuning knob is no more difficult than the manipulation of the horn control, and a neat window discloses a numbered dial to enable the tuning range to be identified. The tuning condenser is operated from this control through the medium of Bowden cables, and there is no backlash and tuning is delightful simple. In another case a neat dial of the clock face type is fitted to the steering column, and small knobs on the moulding enable the tuning to be carried out as well as providing for volume and tone control. The large pointer provides an immediate indication, visible at a glance.

High-Voltage Generators

It is obvious that ordinary H.T. batteries could be carried without taxing the engine, but the problem of replacement has to be faced and accessibility must at the same time receive attention. Special small generators have, however, now been developed and these operate from the starting or lighting battery and deliver a good 200 volts, thus permitting of the employment of ordinary mains-type valves with their resultant high efficiency.

There only remains the question of legislation which might be introduced regarding the use of a wireless receiver in a car. Does a wireless receiver distract the driver's attention from the road and increase the risk of accidents? Or, alternatively, is the fitting of a wireless receiver prove so entertaining that the driver is prevented from driving dangerously?
TRIMMING GANG CONDENSERS

The Methods to be Adopted and Some Simple Tests are Described Below

Any receiver having a gang condenser requires a certain number of preluminary adjustments if satisfactory results are to be obtained. These trimming adjustments are not usually very difficult to make, because there are not quite sure of the procedure which should be followed. The first thing to bear in mind is that, if a gang condenser is to be employed with any measure of success, it is essential that all the tuning coils upon which it is operative should have identical values of inductance; it is futile to attempt to use, say, two coils of similar type in conjunction with a two-gang condenser unless the coils have been bought as a matched pair. When the constructor has one coil of a particular type which he wishes to fit into a new receiver with ganged tuning, it is best to send the coil to the makers and ask for the other coils required to be exactly matched to it. This is especially true in regard to iron-core coils, and there are a few manufacturers of high-class air-core coils who guarantee all their specimens to be identical to within a margin of 1 per cent. or so.

Use Matched Coils

In case it should be thought that identical coils can be used with a gang condenser without the necessity for any further matching or trimming, it should be borne in mind that the connecting wires modify the coils' characteristics. These leads introduce all kinds of stray capacities which are probably appreciably different for each of the coils in use. The object of the trimmers is therefore to balance out such strays.

The actual system of setting the trimming condensers depends very largely upon the circuit in use, but the first thing is to turn the adjusting screws to their midway positions. To do this, they should first be screwed fully in, and then unscrewed until the springy plates upon which they work are in the "full open" position. If the coils in use are identical, and there is no variation in capacity between the aerial and earth terminals, it is an easy matter to turn back the screws for half the total distance of movement without any change of tuning. If this is not evident that the condenser is responsible, the trimmer screws very slightly in both directions, and must be treated rather carefully, rotating the trimmer adjustment as slowly as possible.

After all the trimmers have been set on the low wavelength mentioned, it is advisable to tune to a station somewhere near the top of the medium wavelength range in order to make sure that the settings "hold" as they should. Try moving the trimmer screws very slightly in both directions, and if it is found that any appreciable variation is called for, a third test should be made on a station at about 400 metres. It is scarcely necessary to point out that the adjustments should be made on a station which is not subject to fading, whilst the process is considerably simplified if speech is being transmitted, since this maintains an almost uniform strength; most music, on the other hand, varies considerably in sound intensity.

Coil and Condenser Tests

Whilst making the trimming adjustments the conclusion might be reached that the coils are not properly matched, or that there is some variation in capacity between the different sections of the gang condenser. In such a case a further test should be made by connecting a simple tuning condenser in place of one or other section of the gang component. If signal strength is better when the separate condenser is correctly tuned, it will be evident that there is a defect in either the coils or condenser. Very often it is possible to decide which item is wrong by changing over two of the coils (when they are of similar types). Should this make no difference, it will be evident that the condenser is responsible.

Unnecessarily if the trimming capacities are any greater than they need be. This also explains why some constructors of Practical Wireless receivers find that they cannot cover the tuning range for which the set was intended—simply because the trimming capacities are too high.

The above general method is applicable to all types of receiver, but the procedure is slightly different in the case of superhet. When trimming a superhet, a start should be made with that section of the gang condenser which tunes the oscillator valve. This is the most critical turn of the circuit in use, but the first thing is to turn the adjusting screws to their midway positions. To do this, they should first be screwed fully in, and then unscrewed until the springy plates upon which they work are in the "full open" position. If the coils in use are identical, and there is no variation in capacity between the aerial and earth terminals, it is an easy matter to turn back the screws for half the total distance of movement without any change of tuning.

The above illustration shows three common types of gang condenser with various kinds of trimmer adjustments. The condenser on the left has "star-wheel" trimmers, the other two having ordinary screwdriver screws.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

(2nd Edition)

By F. J. CAMM

(Editors of "Practical Wireless")

This invaluable encyclopaedia is written in plain language by one of the most accomplished wireless men and is a book which every constructor should have. The whole subject is fully covered, and the volume is remarkable for the number of practical illustrations it contains.


5/-
THE EVOLUTION OF THE SUPERHET

The Superheterodyne Receiver Offers the Best Demonstration of the Utility of the Modern Valve.

THERE is a common belief in the minds of many of the British public that any newly-introduced invention is brought about by a desire to obtain money from the public, without introducing any real advantage by that purchase. I have heard, for instance, several suggestions made by wireless enthusiasts that all the new valves were really unnecessary, and that they are really "manufacturers’ rams." Of course, this is not true, and I think a simple statement of the progress of the modern superheterodyne will prove that not only have these new valves actually introduced many benefits to the wireless listener, but that they have contributed to the above-expressed view, actually resulted in a saving of money for the purchaser.

The Original Superhet

I remember one of the really first commercial-general-purpose valve receivers. Owing to the size of the metal cabinet was a socket to contain the frame serial nearly two feet square. Such a receiver would be laughingly contemptuously stated at to-day, yet it was the only method then available for utilizing the usual superhet principle. It has already been shown in these papers how the superhet works. Briefly, H.F. amplification has to be employed to deliver a sufficiently powerful signal to a first detector, and this is employed in conjunction with an oscillating valve to change the frequency to that employed in the I.F. stages. This gave us, in the model mentioned above, three separate valves. Owing to the very low amplification given by valves, it was necessary to follow these three stages by four I.F. stages before coming to the second detector. To enable a really good output volume to be obtained, two L.F. stages preceded the output valve.

Modern G.P. Valves

The normal general-purpose valve has an amplification of 30 or 40, and is equivalent, at the very least, to two of the above-mentioned L.F. stages, thus enabling the over-all number to be reduced; but it is with the modern type of valve that I wish to deal. The triode has enabled the function of the oscillator and first detector to be combined, and such a valve will thus perform, in one single stage, the duties previously carried out by two valves. But more than this, the character-
CALLING UP THE LISTENER

Details of an Interesting Method by means of which Receivers can be Switched On from the Transmitting Station

By J. X. STONE

The ordinary calling-ring as used with a telephone tells the subscriber when he is wanted to receive a message. This simple yet essential part of the telephone service, with advantage, be applied to the needs of the broadcast listener.

Of course it can be argued that the latter is able to consult a daily list of programmes from which he can "spot" any particular item he wishes to hear, and then tune in at the appointed hour. But this does not always turn out to be as simple or convenient as it looks.

One may decide, perhaps, when reading the morning paper that such and such an item should be worth listening to; but by the time evening comes one has either forgotten all about it or has already forgotten the time or station.

And so, if the wireless set is handy, or if the programme is not handy, the occasion goes by.

But apart from helping the absent-minded listener, there is much to be said for the idea of being able to broadcast a "general call" on special occasions which would automatically switch-in sets that had been left on "stand-by." In this way one would be certain of receiving, say, an emergency news bullet, or any item of outstanding importance.

Automatic calling devices operating on the idea have already been used as a "watch-dog" for the all-important S.O.S signal at sea, where human lives may depend upon the safe receipt of the message.

There is also a rapidly growing field for wireless in connection with police work, where, similarly, it is of the utmost importance that every mobile patrol carrying a wireless set should be kept in constant touch with messages sent out from headquarters.

A Circuit Arrangement

The accompanying diagram shows a receiving circuit which has recently been designed for this kind of work. The set can be switched over to "stand-by" and left in that condition pending a "call." Directly upon receipt of the signal, a bell is automatically rung—or a lamp is lit—to warn the operator, who then switches over to "receive" and listens to the message.

It will be seen that the output circuit of the low-frequency valve V2 contains two transformers, T and T1. The first feeds a bridge detector D, whilst the second is back-coupled with the input of the first H.F. valve V.

If the switch S is left open, the set is on "stand-by," and the first signal received—on the wavelength to which the circuit L.C. is tuned—will send a rectified pulse of current through the valve V2. This is fed back to the H.F. valve V through the couplings T, T1, and after passing through all three valves, is fed back again, together with other rectified pulses from the incoming carrier.

The feed-back process is continued until, in a fraction of a second, the current through the bridge detector D becomes sufficiently strong to operate the relay R and light the warning lamp Z, or sound a buzzer alarm.

This warns the operator, who closes the switch S, to cut out the feed-back coil, whereupon the set receives in the ordinary way.

Much the same kind of idea is now being exploited in America in connection with broadcast reception. A type of relay is used which is sufficiently selective to distinguish between different control signals and to respond accordingly. The control signals are sent out in code on a frequency well below the audible range.

Coloured Signal Lamps

There are various interesting possibilities in this direction. For instance, suppose the set is left on "stand-by," an indication of any particular kind of programme then on the ether is given by means of differently coloured flash-lamps—red, say, for dances, blue for a symphony concert, yellow for the Children's Hour, and so on. Each lamp is energized by the same relay, which is rotated into different positions according to the particular "control signal" sent out at the beginning of each performance.

For instance, a long "dash" closes one circuit to light up the red signal, whilst one "long" followed by a "short" signal impulse brings a second contact into action to show a blue light. And so one can ring the changes. The owner of the set can elect either to switch off or to listen, according to his mood at the moment.

A further refinement allows the listener to push a button-switch under a signal-lamp of selected colour, so as to keep the set silent until the required kind of item is on the ether. As soon as this happens the relay automatically switches the set on and brings the loud-speaker into action.

Instead of using differently coloured lamps, a buzzer or alarm bell can be arranged to give audible warning to anyone in another room of what is afoot.

The use of such a calling device means, of course, that at least one of the valves in the set must be kept constantly in action, so as to amplify each control signal it can be done sufficiently to operate the relay. This, however, involves very little expenditure of power—particularly in a mains-driven set—which can hardly be taken into consideration on the score of luxury, particularly where a luxury set is concerned.

The calling signal may be transmitted on a note of definite frequency, to which a polarized relay in the output of a single "live" valve is tuned. The receipt of the signal is sufficient to throw over the relay and so close a contact which brings the remaining valves and loud-speaker into action.

An alternative scheme, which does not require even one valve to be left constantly in circuit, is to use a clock switch to turn the set on, say, for thirty seconds every half-hour, and then to switch it off if the programme is not to the listener's liking. If it is, he closes another switch to keep the set going.

By fitting an automatic selector, the relay can be made to switch on the remainder of the valves automatically as soon as a particular type of programme is available and to switch them off again on receipt of a new control signal indicating a change in the type of programme.

Special calling-up signals are usually radiated on a frequency well below the audible range. In the first place this is a part of the frequency-band not otherwise required, and in the second place it does not interfere with or obstruct itself on any receiver already in operation.

Order Our Correspondence Journal "THE PRACTICAL MOTORIST" To-day! 3d. Every Wednesday.
PERMEABILITY TUNING POSSIBILITIES

An Explanation of the Function of Iron-Core Coils and of the Principles Underlying Permeability Tuning

The tuning of radio receivers consists of establishing a resonant circuit which is required to match the desired programme, the circuit accepting a relatively low band of frequencies, and rejecting signals outside this band. The fundamental properties of a tuned radio circuit are capacity, inductance, and resistance, and it is an elementary principle that a variation in one of these may be brought about by varying the other two. From a study of the behaviour of a tuned circuit it is apparent that the relationship of inductance to capacity, or both, is of great importance to the designer of radio receivers.

Practical Methods of Tuning

For many years now we have used variable capacity condensers to tune coils of fixed inductance, or both. As the inductance of these condensers usually varies with the capacity, a means of establishing a resonant circuit which is responsive to the desired frequency is arrived at by using a coil of fixed inductance and a variable capacity condenser. It is difficult to explain the reasons for the introduction of iron-core coils, and the results obtained by their use, due to the fact that the resistance increases with frequency. This variation in the decay co-efficient changes if inductive tuning can be arranged so as to maintain the ratio of resistance to inductance or vice versa, many highly desirable results will accrue such as uniform selectivity over the whole of the wave-band.

Uniform Sensitivity

It has always been the aim of designers to bring about a tuning device which will be equally sensitive and selective at all points of its tunable range, and since the decay co-efficient is a direct measure of the selectivity of a single tuned circuit the necessity for maintaining this factor at a constant value will at once be apparent. The aim of the foregoing is to show that if inductive tuning can be arranged so as to introduce renders such circuits aperiodic, and since for selective tuning periodic tuning is necessary, a method has had to be devised to overcome the losses which the introduction of iron would bring about. This has resulted in the commercial production of finely powdered or divided particles of ferro-magnetic cores. These cores are made of highly-permeable alloys so as to compensate for the losses resulting from the numerous air-gaps between the particles.

Another type of coil in which matching may be carried out by varying the position of a small iron core.
May 19th, 1934
PRACTICAL WIRELESS

With the **LISSEN** "SKYSCRAPER" 4

you get radio on long, medium and short wave stations from ENGLAND, EUROPE, AMERICA, AUSTRALIA, and AFRICA

All you need is

A SCREWDRIVER

**A PAIR OF PLIERS**

and **THIS**

Read what these enthusiastic 'Skyscraper' owners say:

**From SOUTH AMERICA:**
"Kit used on voyage to Buenos Aires with 60 ft. aerial. On the long and medium waves, British and European stations received at good strength. ALL EMPIRE PROGRAMMES CONSISTENTLY RECEIVED AT GOOD STRENGTH. Also received SYDNEY and MELBOURNE."

**From SOUTH AFRICA:**
"London comes through quite clearly. The best battery set we have heard."

**From INDIA:**
"Assembled 'Skyscraper' Four in two evenings. Set worked marvellously. Wonderfully clear. Just in Bombay, am receiving London programme on 195 metre in loudly and clearly as ever I heard it on an ordinary Receiver in England."

**From NORWAY:**
"Set working splendidly. Over 60 stations with inside aerial."

USE LISSEN BATTERIES—LISSEN VALVES
LISSEN ACCUMULATORS FOR YOUR SET

Or you can now buy it completely factory assembled and factory tested at exactly the same price.*

You can assemble these 'Skyscraper' Kit sets in a couple of evenings, and get full-power, moving-coil reception on all wavelengths. Besides the fun of building your own set you have the satisfaction of knowing before you start that the results will be everything you expect—because every component part of the 'Skyscraper' kit has been subjected to vigorous tests under actual working conditions.

For just a few hours fascinating work, the vast range, mighty power and real economy that have made 'Skyscraper' radio famous throughout the world, will be yours—to enjoy day after day. Act now. Post the coupon for full instruction chart FREE.

**HOW LITTLE IT COSTS**

Chassis Kit, complete with 4 valves... **£5.12.6**
With Walnut Cabinet and Moving-coil Speaker... **£8.2.6**

Use LISSEN BATTERIES—LISSEN VALVES
LISSEN ACCUMULATORS FOR YOUR SET

*Every Factory Built and Factory-tested Receiver carries a label to this effect.*
"Old hands" use
DUBILIER
Condensers

unequaled
for reliability

The new range of Dubilier Condensers marks the greatest advancement in Condenser design and more than maintains Dubilier's established position as the foremost manufacturers of the highest quality products at the lowest possible prices. It would pay you to be more familiar with the latest developments in condenser design. The new Dubilier booklet tells you all there is to know. Write for your free copy.

DUBILIER
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Simple Drilling Jig

It often occurs that a hole has to be drilled a certain depth into ebonite or metal, and the following dodge enables the operation to be done accurately. Insert the drill to be used in the drill chuck, take a length of No. 16 or 18 S.W.G. wire, push one end down between the jaws of the chuck, then proceed to wind the wire on to the drill by turning the handle of the brace. Take care to keep the wire tightly wound, until the length of drill protruding from the coil of wire is the same as the depth of the hole to be drilled. Cut off the wire not required, close to the drill.—E. T. Bowes (Twickenham).

Making Five- to Seven-way Battery Cords

Neat five- to seven-way battery cords can be made in the following manner. Obtain a good quality tubular bootlace, and after cutting off the metal tags, push through it a long wooden knitting needle at least ¼ in. diameter. Remove the needle and proceed to thread through five to seven strands of flex of medium thickness, afterwards cutting it to the length required and attaching a wander plug to each end. Unless different coloured flex is used, it will be necessary to mark each strand with a piece of stamp edging, for indicating purposes, before the flex is passed through the lace covering.—W. V. Andrews (Swansea).

Remote Control On-off Switch

A small clock which refuses to function may be brought into very useful service as a remote control switch, as follows:

The clock, represented by (a) in the illustration, should have the balance wheel, face, and hands removed. Next, the small pin (c) on lever (b) should be broken off and armature (d) (a small piece of tin) soldered on to the lever. The electro-magnet (e) is easily made by winding about 500 turns of No. 32 gauge wire on a cardboard bobbin with a piece of stout iron nail for the core. The magnet is energized by a 4½-volt battery, operated through the distant bell push. On pressing the button the armature is pulled towards the magnet, thus disengaging the lever and allowing the escapement (f) to revolve. A weak wire spring (g) brings back the lever when button is released.

For the switch proper, a piece of springy brass (h) should be soldered to the spindle which once carried the minute hand of the clock. The switch panel (j) is secured to the clock frame and can easily be made from a piece of red fibre ¼ in. thick into which sheet copper contacts (k) are inlaid so as to form a flush surface for the revolving switch arm. The instrument should be fitted into the receiver cabinet with the clock hand adjusting knob in a suitable position and which thus serves as a normal on-off switch in place of the existing one. It is important that the gap between the armature and magnet be made as small as possible, and in order to regulate this to a nicety an adjustable brass stop (l) should be bolted to a convenient part of the clock. As this switch is very sensitive and requires only a feeble current to operate it, the extension leads can be made of quite fine cotton-covered wire. Its one great advantage over most gadgets of a similar type is that the rotary switch is operated by the powerful force of the clock spring. and, therefore, the contacts can be made very efficient and never wear out. The battery lasts many months, and the clock needs but an occasional wind.—H. J. Watson (Southampton).

Switching Arrangement of Class "B" Stage

Probably many readers would like to try Class "B" owing to its economy, especially if they are using batteries with a small output in milliamperes. This was my experience, so I devised the switching arrangement shown in the accompanying diagram. By using a four-way switch, which I found in the junk box, I am now able to switch over to Class "B" or to power outputs, as required. On occasions when it is required to boost up the set, this dodge will be found very handy, if the speaker is of the permanent magnet type. If the speaker is not of this type wires A and B can be taken to an ordinary speaker. Also, if the valve is of the German type make wire C a flexible one, and take it to the grid-bias battery (about 3 volts) instead of to L.T.—W. Roozen (Dorset).

(Continued overleaf)
READERS’ WRINKLES
(Continued from previous page)

An Easily-made Speaker Chassis
The following description of how I constructed a speaker chassis from an old motor-headlamp reflector and a piece of aluminium may interest other readers.

First of all I took the reflector and cut out four sections with a hacksaw. The outside rim of the reflector was then hammered flat and four fixing holes drilled in it. The strip of aluminium was then taken and the unit bolted to it. The aluminium strip is fixed by bending the ends down and holding the rod of the unit exactly in the centre of the hole in the apex of the reflector. When four holes were drilled in each corner, the strip was bolted to the chassis with four small bolts. The cone is made of cardboard paper and fixed to the front face by adhesive tape.

A Simple Coil Winder
It is not an easy matter to wind coils, chokes, and transformer coils calling for many turns of very fine wire. The simple coil-winder shown in the accompanying sketch will be found useful for winding transformer coils and chokes. At one end of the wooden base, wooden blocks are fixed with clamps to support the hand-drill horizontally and in line with the end of the board.

At the other end is fastened a U-shaped piece of sheet metal, as shown. Its inside height is 1½ in., and a hole is made at the top, and one in the baseboard for the spool spindle. The winding bobbin consists of a suitable piece of wood with the shank of an old drill driven in length-wise. The wire is fed from the wire spool through a screw-eye near the edge of the board and then to the bobbin. The number of turns of the chuck to each turn of the crank is then ascertained so that the bobbin turns can be tallied. The run of the wire along the bobbin is maintained by slight finger pressure on the wire between the

eye and the bobbin. A thousand turns can be wound by this little device in less time than ten minutes.—J. CROSHAW (Bolton).

A Novel Drawer Arrangement
Here is a useful hint which may appeal to those readers who like to have a tidy workshop, and are at a loss for storage for small parts such as terminals, wander plugs, drills, etc. The writer purchased a dozen pencil boxes with sliding lids at the price of 2d. each. These were fixed to the underside of a shelf in the following manner. The shelf was first removed for convenience in working. Twelve lines were then marked across the underside, the distance apart being a little more than the width of each box, to allow for clearance. The lids of the boxes were removed and a centre line drawn down each. On this centre line, holes were bored to take small counter-sunk screws, and each lid was then screwed down to the shelf, as shown in the sketch, a thin brass washer being slipped over each screw between the shelf and the lid. The shelf was then refixed to the wall, and the boxes slid on to the lids. The addition of a small round-headed screw to the front of each box, to act as knobs, completed the job.—R. W. FARMER (Manchester).

A Novel Escutcheon Plate
The accompanying sketches show how an escutcheon plate can be fashioned from a lady’s belt buckle. These buckles are obtainable in a variety of shapes, and the one used for the escutcheon shown in the sketches was chromium plated with bevelled sides. The escutcheon can be fixed to the panel with two screws, as indicated.—R. L. PRESTON (Sheerness).

A Source of Trouble
If you are finding your receiver is not giving the results with which it has been accustomed in the past, try cleaning the aerial and earth switch. It will be found on examination the copper switch points have oxidized and this sets up a very high resistance. Clean the blade and the jaws with fine sandpaper so that they make good contact. Unless the wires connected to the switch are sealed in lugs, which, in turn, are clamped under screws, remove the wires, polish them thoroughly with fine sandpaper and replace, tightening the screws as much as possible.

Drilling Ebonite
I have always found, when preparing a panel composed of bakelite or ebonite, that it is necessary to drill of the best high carbon steel variety. They should be kept sharp, so as to avoid burrs on the face of the panel. When sawing this kind of material do so with a hacksaw having about twenty-four teeth to the inch.

A novel tape machine for recording morse

THE accompanying sketches show how an'...
SIMPLIFIED MAINS TRANSFORMER CONSTRUCTION

The Making of Mains Transformers

A very large percentage of readers will have some interest in the subject of transformer construction, and, although a number of practical articles have previously been published no apology is considered necessary in presenting yet another one.

In the past many readers have experienced some little difficulty in obtaining the component parts required in making transformers, and, therefore, it will be of especial interest for them to learn that complete kits of parts can now be bought quite cheaply. Moreover, by using these parts, it is an easy matter to construct a mains transformer on the dining table without the use of any other tools than a screwdriver and, perhaps, a pair of pliers and a soldering iron.

Winding spools can be obtained in a variety of sizes, whilst terminal strips, core clamps, and mounting bolts can be obtained ready made and finished in a workmanlike manner. Those who wish to avoid the rather tedious process of winding the many hundreds of turns of wire on to the spool can buy the latter already wound to the appropriate specification and ready to fit on to the core stampings.

A Transformer for a Type "A" Rectifier

A complete set of parts for a mains transformer giving outputs of: 220-0-250 volts at 60 milliamperes, 2-0-2 volts at 4 amperes, and 2-0-2 volts at 1 amp., is shown in the photograph, Fig. 1. This kit, with wound bobbin, costs 1s. 4d., and it can be completely assembled in a quarter of an hour. If desired the same parts, but with bobbin unwound (all wire supplied), can be obtained for 9d. 4d.; the construction in this case will occupy five or six hours, whilst the work involved will be found both interesting and instructive.

As mentioned above, the kit includes the core stampings—6 dozen size No. 4 stally,winding spool to fit, three bobbins containing the required wire, and the special shroud clamp fitted with a neat paxolin terminal plate and terminals. For those who prefer it, however, four angle clamps, the necessary clamping bolts, and two terminal strips (shown in Fig. 2) can be obtained in place of the shroud clamp, the total price of the kit in this case being 11s. 4d. with the unwound bobbin, or 1s. 6d. ready-wound.

Constructional Details

The method of construction is practically the same no matter which set of parts is used, and a very satisfactory instrument is sure to result in either case. First of all the bobbin must be wound, the primary being put on first. For the type of transformer previously referred to the primary and the transformer is suitable for use on 200-volt A.C., mains having a frequency of about 60 cycles per second, for making connection to the "beginning" end of the winding and the 1,600-turn tapping the transformer is made to the 1,760-turn tapping and the winding respectively. For intermediate voltages it is in order to use the nearest tapping point.

Before commencing the winding make a small hole in one end cheek of the spool and pass a short length of flex through this. Solder the end of the 32-gauge wire to the flex and cover the joint with a strip of insulation tape. The appropriate number of turns can then be wound on either by hand, or by mounting the spool in a lathe or in the chuck of a hand-drill, this tool being held in a vice. So as to guard against breakdown the winding should be put on as nearly as possible in layers, and a sheet of oiled silk should be used to separate the winding appropriately into two halves.

Tappings are made by baring the wire for a short distance, making a loop, and soldering short lengths of flex. The flexible leads can be brought out through the end cheeks.

The Secondary Windings

After the primary has been completed it should be covered with a layer of oiled silk before commencing to wind the secondary. It is desirable to screen the primary since this reduces the possibility of mains hum. The screen may consist of a sheet of copper foil wound nearly round the bobbin, or for the 4-volt, 4-amp., low-tension winding might itself be employed as a screen. If the copper foil method is employed it is very important that the foil should not completely encircle the bobbin, because, if it does, it will act as a short-circuited turn and cause the transformer to overheat, besides reducing the output almost to zero. A flexible lead should be soldered to the screen and this will later be clamped up in contact with the core. Incidentally it might be mentioned that a screen is provided on the ready-wound bobbins previously referred to.

Another layer of oiled silk must be used to cover the metal screen. If the L.T. secondary is to be used as a screen it should simply be wound on top of the primary in the form of a single layer comprising 32 turns of 18-gauge d.c.c. wire. A tapping being taken after winding 16 turns. Again insulate, and finally wind the high-tension secondary. This will consist of a total of 4,000 turns of 38-gauge enamelled wire, a tapping being taken after the 2,000-turn stage, the winding being evenly as possible and insulated after about every 1,000 turns, taking care that no later turns cross the insulation.

The set of No. 4 stally stampings comprises 6 dozen pairs, and there will be two or three left over. The stampings are

FIG. 1.—A set of parts for making a mains transformer, which, complete with wounded bobbin, costs 1s. 4d.

FIG. 2.—Another set of parts for a mains transformer including angle clamps, clamping bolts, and terminal strips.
Both valves receive their correct bias due to a .5 megohm leak also being connected between the grid and H.T. negative. A .01 rad. condenser and a 1 megohm grid resistor, which is by-passed by an 8-mfd. electrolytic condenser.

A Double Rectifier
The power-supply system is very interesting and includes a "double" half-wave rectifier—an Ostar-Ganz type NG100. This is again followed by a large smoothing choke and two 8-mfd. electrolytic smoothing condensers. Very ample decoupling is used throughout, with a result that mains hum and signs of L.F. instability are entirely absent. The undistorted output is just about twice that provided by the smaller unit, or, in other words, between 6 and 8 watts. It is thus more than sufficient for "home" use, and certainly adequate for many forms of public address work and for use in small halls.

Like the 3.5 watt amplifier, the larger one can be bought either completely assembled or as a kit of British-made parts; the prices are £8 8s. and £10 10s. respectively. Both amplifiers are sure to prove very popular, and it need scarcely be mentioned that the prices are distinctly reasonable when D.C. mains are employed. The resistance is, of course, quite low and therefore does not reduce the H.T. voltage to any appreciable extent. In fact, it might here be mentioned that the special mains-voltage rectifying valve has a heater which is fed directly from the mains supply, in the same way as are the heaters of the receiving valves. This rectifier functions in the normal manner when the amplifier is fed from A.C. mains, but behaves purely as a series resistance when D.C. mains are used by a dealer or tradesman for demonstration purposes, although it is by no means insignificant from the amateur's point of view, since it enables him to test out quickly any type of set with the amplifier in circuit. Those readers who at present have a D.C. mains supply which will in all probability be changed to A.C. in the very near future (as soon as the grid scheme is completed), will readily appreciate the advantages of a universal receiver or amplifier which can be used just as well after the supply change-over as it can now, and without the slightest modification being necessary.

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A Larger Amplifier
The larger amplifier has the same input circuit, but the first valve feeds into a double amplifier using a modified d.c. circuit arrangement. There are two triode valves (Ostar Ganz type K3560) and the two ends of the primary winding on the output transformer are connected between their anodes, a centre tapping going to H.T. positive. The grid of the second valve is fed from the anode of the first through a .01 mfd. condenser and a 1 megohm grid leak, a .5 megohm leak also being connected between the grid and H.T. negative. Both valves receive their correct bias due to the voltage-drop across a 500-ohm resistance, which is by-passed by an 8-mfd. electrolytic condenser.

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NOTES OF THE WEEK
By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc., A.M.I.E.E.

Additional Power for Television

Many readers using simple disc receivers have found that their radio set used in conjunction with it just lacks sufficient power adequately to modulate the neon lamp or give a strong enough synchronizing signal to hold the image steady. In such cases one of the easiest solutions to the problem is to make up an amplifier adaptor to connect between the radio and television receivers.

Although many circuits can be furnished to cover such a scheme as this, that shown in Fig. 1 is of quite a representative and efficient type. It converts the output valve of the radio receiver into a choke-capacity stage coupled to an additional super-power valve. The "open" anode circuit of the receiver's output valve is connected across the pair of input terminals of the unit, thereby inserting in circuit an efficient constant-inductance low-frequency choke L.F.C.1. The input potentiometer, which should have a resistance of 100,000 to 250,000 ohms, serves as an efficient volume control.

In the anode circuit of V are two switches, S1 being a triple-pole double-throw type and S2 a double-pole double-throw type. The object of S1 is to change a negative image into a positive one merely by reversing the primary transformer T alone, as shown in Fig. 2, which represents a simplified diagram of Fig. 1 with S1 switch blades down, S2 omitted (this only is for positive and negative pictures) and the jack J ignored. The voltage applied to H.T. +1 must suit the valve employed—a valve such as the Cossor 620T is admirable for a unit of this character—and since the neon lamp (and synchronizing coils if included) are joined across the output terminals the voltage for H.T. +2 should be 200/250 and drawn from a source capable of furnishing the full polarizing neon lamp current.

With the switch blades of S1 in the top position the circuit connections are changed to a choke-capacity transformer link with the television apparatus as indicated in the simplified diagram of Fig. 3. The high-impedance choke L.F.C.2 is now inserted directly in the anode circuit of V, the transformer primary of T being linked to L.F.C.2 by C2.

If switch S1 is left in this top position and a loud-speaker plug inserted into jack J, then the transformer and television apparatus are cut out of circuit, Fig. 4 showing the simplified arrangement. The unit then functions as an additional power amplifier for ordinary sound reception.

Polarized Light

The original Kerr cell, which was later
developed by Dr. Kardos for television purposes, has played an important part in the science of television. It enables a bright source of light to be modulated in intensity and, as far as low definition television is concerned, it gives the brightest and largest image.

The complete unit operates on the principle that light polarized, of which the following is a simple explanation. Light itself is an electro-magnetic manifestation, and a beam of light consists of transverse vibratons in all directions at right angles to the direction of propagation. Many years ago it was discovered that light could be polarized, or limited to a single plane of oscillation or vibration. Later it was found that a crystal of Iceland spar, cut along its axis and with a segment removed, could be rejoined in such a manner that this would advance light in one plane only.

Two of these crystals in series with their axes crossed at right angles would entirely prevent the passage of light. In other words, the action of a Nicol prism (Fig. 3) is that of a cross polarizer. The Kerr effect is similar, but as the passage of light through Iceland spar, cut along its axis and with a segment removed, could be rejoined in such a manner that this would advance light in one plane only.

If now the second diaphragm is turned through a right angle, as in Fig. 2, so that the slots are as indicated, the wave motion will stop at this second diaphragm. In effect this is analogous to the operation of the two Nicol prisms with their axes crossed. Light passing through a Nicol prism is said to be plane polarized since it exists in one plane of oscillation only. (Although there are two prisms the first is called the polarizer and the second the analyzer.) Thus, if two such prisms are placed one behind the other, no light will pass, but if it was possible to rotate the first prism a gradually increasing passage of light would be secured as the axis of the two prisms approached the parallel state.

It is not possible for television purposes to effect this actual rotation rapidly enough by mechanical means to make this property of any value, but by means of the Kerr cell, it is possible to utilize the polarization effect. The simplest type of Kerr cell consists of a pair of plates suspended or immersed in a medium of niter-benzene, carbon bisulphide, or other highly refractive electric fluid. If the device is placed between the two Nicol prisms it has the effect of distorting the line of vibration passing through the first prism into an elliptical eccentricity progressively changing as the voltage between the plates is increased, passing through a circle and eventually becoming a straight line at approximately right angles to the initial direction. Accordingly, a progressively increasing component is available for passage through the second prism.

As the light-voltage characteristic curve of a cell of this nature is not a complete straight line (it resembles somewhat a static characteristic curve of a thermionic valve) it is necessary, in order to avoid distortion, to apply an initial D.C. biasing voltage to the lamp to small amount which gives for a L.F. amplifying valve. Whereas for a valve the bias is negative, however, that for a Kerr cell is positive and of much greater magnitude (up to 400 volts) and under these conditions the light variation with voltage of the cell is linear over quite a large range of signal voltage.

If the received and amplified television signals are fed to the Kerr cell it is possible to secure an amount of light passing out of the second or analyzer prism, which is proportional to the light passing through the photo-electric cells at the transmitting end. The addition of a scanning mechanism, preferably of the mirror-drum type, completes the television receiver, as was the case of the Mirrorvisor described recently in this journal.

A TELEVISION STROBOSCOPE FOR D.C. MAINS

A TELEVISION receiver is only capable of giving images which can be watched satisfactorily when the speed of the rotating scanning member (disc, mirror drum, mirror wheel, etc.) is identical with that employed at the transmitting end. For the standard B.B.C. transmissions this is 750 revolutions per minute, but without some means of checking or measuring the variations or out of step, the work of the Nicol prism would be of little use. The simplest way to avoid this is to throw on to the discharge condenser a D.C. voltage of 500 to 600 volts, this varying in direct proportion to the frequency of the television transmissions commences, the image will appear stationary right at the beginning, and time is therefore not wasted. But what can be done by those readers with D.C. mains, or alternatively use H.T. batteries and a 6-volt motor to feed the television receiver? If the ordinary neon lamp is connected in series with a D.C. voltage, it will pass a steady current and this will pass through the entire duration of its existence, and, although the electron flow is interrupted a steady current will pass and this is the case of a normal neon lamp. With such a lamp the pulsations will obviously vary with each form of assembly, but as a rough guide it can be stated that with a 2-mfd. condenser the pulsations will be seen as light flashes which can be varied. The frequency of the flashes and the variable current will be found to be such that there is no image drift. Now adjust the speed of the mirror or drum to this, and the television receiver is complete.

The complete circuit for a D.C. television stroboscope.
THE EASY ROAD TO RADIO

THE BEGINNER'S

FADING—ITS CAUSE AND PREVENTION

A Simple Explanation of a Summer Topic.

Those readers whose interest in wireless dates only from last winter may have been surprised and rather perturbed of late to find that the reception afforded by their receivers is now considerably worse than it was, say, a month ago. The longer periods of daylight are largely responsible, so there is no need to start to dismantle the set with the idea that it has suddenly developed a fault. There is, in fact, every little that can be done except to add an H.F. amplifying stage or to erect a new and more efficient aerial, but both of these points should be considered.

The reason for the falling-off in strength of the more distant stations is very similar to that which accounts for fading, a phenomenon which is often more pronounced in winter than in summer. To understand the cause of fading and reduced signal strength in summer it is necessary to consider how wireless signals actually travel from the transmitting to the receiving aerial.

The Reflected Wave

It is known that the upward set of waves is reflected back to earth again in the manner represented diagrammatically in Fig. 1, and reflection takes place at what has come to be called the Heaviside Layer. This is a layer of gas situated some sixty miles above the surface of the earth, the condition of which depends upon the strength of the sun’s rays upon it. When the rays are strong the Heaviside Layer is a very poor reflector, and it absorbs the greater portion of the wireless waves which strike it. When it is in darkness, however, this layer of ionized gas acts as a very good reflecting surface, and so “returns” the waves to earth.

Reflection and Wavelength

Not only does the effect of the Heaviside Layer vary with the amount of sunlight falling upon it, but also with the wavelength of the high-frequency wireless waves which strike it. The conditions of reflection stated above apply most accurately to medium-wave broadcast signals, for waves shorter than 100 metres or so are reflected very little by the Heaviside Layer, and pass through it. The “transparency” of the Layer increases rapidly as the wavelength is reduced, so that wavelengths of 20 metres or less pass through it almost without hindrance.

In Fig. 1, this layer is shown as a continuous layer at an altitude of 60 miles. In reality, however, it is divided into two regions, the lower layer being more transparent than the upper. It is this lower layer which is of more importance to radio work, and it is the reflection of waves from this lower layer which causes the phenomenon known as fading.

How Fading Arises

It is now possible to understand exactly how fading takes place. Consider for instance, the case of the medium-wave broadcast station, which is thought to be nearly 160 miles above the earth’s surface. The shorter waves, however, are reflected back to earth again from the Heaviside Layer, and are strong, and therefore produce good signals. If the surface of the Heaviside Layer remained perfectly still, signals would be received at uniform strength so long as darkness prevailed.

But it is considered (no one has yet produced a definite proof) that the layer is in constant movement, with a result that the degree of reflection varies from one moment to the next. At one moment the signals from any particular station might be directed right at the receiving aerial, and shortly afterwards the angle of reflection would have changed so that the signals were not received so well.

Phase Difference

There is another point to consider, which is in relation to the “phase” of the ground and reflected rays. Supposing that both waves were in the same “phase,” as shown in Fig. 2, then they would be added together, the signal strength being equivalent to the combined effect of the two. On the other hand, if the two were of opposite “phase” (see Fig. 3), the effect upon the receiving aerial would only be equivalent to the difference in strength between them.

It is not difficult to imagine what would be the combined effect of changes in the reflective angle and also the changes of phase! Nor is it difficult to understand why signals from any particular (distant) station may vary from full strength to inaudibility in a few minutes.

Fading on Long and Short Waves

Before considering methods of preventing fading, we must see what happens on wavelengths other than those generally referred to as “medium” and being between 200 and 600 metres. On long waves, for instance, fading is almost entirely absent. This is because the transmission is almost entirely confined to the ground waves; any upward waves that there might be would be completely absorbed by the Heaviside Layer.

It is also worthy of note that there is less absorption of the ground wave, and therefore the distance over which the signals can be sent without any trace of short distance, due to the fact that they are fairly readily “absorbed” by metallic objects, hills and buildings. The reflected waves, however, are strong, and therefore produce good signals. If the surface of the Heaviside Layer remained perfectly still, signals would be received at uniform strength so long as darkness prevailed.
THE BEGINNER'S SUPPLEMENT
(Continued from previous page)

fading and with a given power is greater on long than on medium waves.

It is explained that short waves are reflected from the Appleton Layer, and the effect is very similar to the reflection of medium waves from the Heaviside Layer. The principal difference is that on the shorter wavelengths the ground wave is almost non-existent, due to the fact that it is so rapidly absorbed by metallic objects. Thus, the reflected wave gives somewhat more steady reception because there is no question of phase difference. It is also very important to note that the Appleton Layer is not so greatly affected by daylight and darkness; in fact, wavelengths in the region of 20 metres can generally be received better in daylight than after dark.

Beam Transmission

One method of overcoming fading is to direct the transmission along a narrow beam, and although this has proved a very effective method it has the great disadvantage that the signals can only be picked up by aerials situated in the line of that beam. The only other method of preventing the effects of fading is to fit an automatic volume control device to the receiver itself. There is no need to describe here the method of doing this since the subject has been very fully treated in these columns before. At the same time a warning should be given that constructors should not expect too much of A.V.C. It is possible to design a receiver the output volume of which will remain constant for signal ratios of 1,000 to 1, but such results cannot be expected from a simple set modified to incorporate an A.V.C. arrangement. The average modified receiver of the type having a couple of H.F. stages and fitted with an A.V.C. unit can scarcely be expected to provide a uniform output for signal ratios in excess of 60 to 1 or so on the medium waves. In other words, if the signal voltages applied to the aerial exceed a value which is fifty times greater than that ten times less than the average value, the output volume will be affected. With a good superhetrodyne having two I.F. stages and fitted with an A.V.C. unit, A.V.C. can scarcely be expected to be complete on any signals whose aerial-voltage ratio exceeds about 15 to 1, but even this apparently small degree of compensation is extremely useful.

There is just one other point which should be made clear in connection with A.V.C. This is that the control does not—cannot, in fact—increase the strength of fading signals; it can only reduce the strength when the signal voltages become greater than some particular value. It is therefore useless to expect A.V.C. to be of any appreciable value in a comparatively insensitive receiver.

The only other solution to the fading difficulty rests with the wider use of short waves, and those readers who are D.X. (long-distance) "fans" would do well to build a short-wave receiver for reception during the summer months.

THE IMPORTANCE OF VOLTAGE MEASUREMENTS

P is small wonder that in many sets valves have a tendency to fail in their emission or suddenly fade out altogether. It is common practice with set operators to feed the valves in a set with a high-tension potential which according to their reasoning is correct. The method usually adopted is to increase the I.T. until the reproduction in the speaker is what they consider it ought to be. This adjustment by ear, whether high-tension batteries or eliminators are used, is a very bad policy, for it almost invariably results in the use of excessive plate voltage, and is frequently responsible for dissatisfaction on the part of the listener at the service life of the valve. This point is particularly true in the case of power valves, with which the reception, when judged by the ear, improves as the valve is overloaded as regards plate voltage. If the best life is to be expected from a valve, a careful survey and study should be made of the complete specifications and operating characteristics regarding the proper use which valve manufacturers supply with the valve, and is usually to be found in the carton. The information regarding the proper filament voltage, plate voltage, and grid bias to use and the best application of the valve in a circuit should be studied carefully, so that full advantage can be taken of the knowledge gained by the manufacturers in the experimental and development work which has been done with the valve. It is very essential, after having done this, to measure the voltages applied correctly. As these eliminators and the conditions under which they are used vary greatly, it is almost impossible to determine the correct settings merely by listening to the reproduction of the receiver and adjusting the supply until reception sounds all right. The variable adjustments on these units should be set accurately to the receiver with which they are used, and a high-resistance voltmeter employed for the purpose.—C.D.K.

ALTERNATIVE METHODS OF FIXING AERIAL AND END LEADS

ATTACHING INSULATORS

ATTACHING INSULATORS

ALTERNATIVE METHODS OF FIXING AERIAL AND END LEADS

THE GROUND UNLESS PROPERLY GROUNDED.

THE GROUND UNLESS PROPERLY GROUNDED.
Broadcast Reorganization in Switzerland

It is reported that Marconi's Wireless Telegraph Company, Limited, have received an order from the Swiss Telegraph Administration to increase the power of the existing Marconi station at Berominster from 60 to 100 kilowatts. At the same time, a number of modifications will be effected which will make the station one of the most up to date in existence.

One of the most interesting of these modifications is the incorporation of the "floating frequency" system, which automatically controls the carrier wave radiated by the station. In this system both the carrier power and the input power are small in the absence of modulation, or when a low degree of modulation is present. Deeper modulation automatically increases the carrier power, and, consequently, the input power, so that higher modulated voltages can be correctly reproduced. By this means large savings are effected. The transmitter will be still further improved by the introduction of the Marconi "series modulation" system, similar to that incorporated in the design of the new Drottich station and that at Motala in Sweden. This feature represents the latest development in broad-casting transmitters, ensuring the highest possible quality of reproduction and, at the same time, a marked simplification of design and construction.

Lucerne Wavelength Plan

Under the re-allocation of wavelengths recently decided upon at Lucerne, the question of stability of the transmitted frequencies has become of the greatest importance, and existing broadcasting stations are now being re-equipped with drives of a far greater precision than those in use previously. To meet these new conditions, Berominster will be provided with a high-precision crystal-controlled frequency that will comply with the most stringent international frequency stabilization requirements.

The increase of power from 60 to 100 kilowatts will be effected by replacing the existing power amplifier at Berominster, which consists of two aluminium and glass units, by a new stage of a similar construction containing two Marconi CAT. 14 valves, the largest water-cooled valves of their type in existence. Drottich, Motala, and other high-power stations now under consideration are being fitted with the same type of valve. The appearance of the other units of the Berominster transmitter will not be changed, but the technical alterations projected will naturally require considerable modification to the internal layout of the circuits. The new equipment necessary is being manufactured at the Marconi Works, Chelmsford, and it is expected to be ready for fitting at Berominster in the autumn of this year.

Wembley's New Amplifying Apparatus

The Empire Stadium, Wembley, after using various types of amplifying equipment since its opening, is now equipped with a permanent installation. Probably the biggest of its kind in Europe, since the Stadium holds nearly 100,000 people, the apparatus is the work of Philips, the lamp and radio manufacturers.

Formerly, a stand carrying the amplifying gear used to be placed in the middle of the grass and dragged off after the music had finished, just before the beginning of play. But spectators at the England-Switzerland international will have noticed the shining new aluminium and glass units, by a new stage of a similar type, comprising two rectifier valves, type 1762. The amplifier is housed in an earthed metal casing so constructed that all power is automatically cut off on the opening of tilt, casing so constructed that all power is automatically cut off on the opening of tilt, casing so constructed that all power is automatically cut off on the opening of tilt, casing so constructed that all power is automatically cut off on the opening of tilt, casing so constructed that all power is automatically cut off on the opening of tilt, casing so constructed that all power is automatically cut off on the opening of tilt.

The amplifier valve is a Philips type MA. 4/600, operating at an anode potential of 4,000 volts, and dissipating approximately 800w. There are two rectifier valves, type 762. The amplifier is housed in an earthed metal casing so constructed that all power is automatically cut off on the opening of the inspection gate.

Early Morning Broadcasts

The British listener who rises at an early hour is now given many opportunities of hearing musical broadcasts whilst enjoying his breakfast. Hamburg is already on the air at 7.30 a.m., and the concert is taken by a number of German transmitters; Cologne (Langenberg) follows at 7.0 a.m., with Stuttgart giving the last show at about the same time. The Dutch stations are usually heard working from about 7.40 a.m., and Poste Parisien, Radio-Normandie and Radio-Paris also offer recital dates of gramophone records almost daily from 7.0 a.m.

"Intimate" Stagecraft

An entirely new type of stagecraft performance has been designed by Marconiphone Publicity. Previous shows embodying the stagecraft principle were restricted to certain parts of the audience and, as by now well known, were distinctly successful and fulfilled their object. The new entertainment, whilst embodying the above-mentioned stagecraft principle, differs materially from its predecessors. More attention has been devoted to the stagecraft of the entertainment as well as to subject matter. The show is designed for presentation to audiences of not more than fifty people and, when properly given, the listener the impression that he or she is seated at home listening to broadcasts in normal home surroundings.

Marconiphone have taken as the basis of their operations two B.B.C. plays, namely, Plays on the Matterhorn and Chopin. Both of these have been recorded on the air, and have been recorded on ordinary gramophone records. Both are entrusted with the task of presenting this entertainment have a very important psychological factor to bear in mind, to which every attention will be given. These recorded plays will be put over on a single instrument, which will be placed to one side of an ordinary domestic fire-place. The show will take place in a very dim light in order to lend that intimacy to the occasion which home listening demands. The new entertainment, whilst embodying the above-mentioned stagecraft principle, differs materially from its predecessors. More attention has been devoted to the stagecraft of the entertainment as well as to subject matter. The show is designed for presentation to audiences of not more than fifty people and, when properly given, the listener the impression that he or she is seated at home listening to broadcasts in normal home surroundings.

"Tom Thumb" Valves

The B.B.C. introduction of a "Tom Thumb" valve, Oregen valve may mean that in the future the police throughout the country will be equipped with miniature wireless receiving sets in which these valves are incorporated. As these valves are only about two inches long, with a circumference not much larger than that of a shilling, it is obvious that they can be installed in a set of very small dimensions, particularly as they can be associated with the most compact coils and condensers of a highly efficient character, which are now available.

An Interesting Lecture

The last lecture of the present session to be delivered before members of the British Radio Institution, members of the International Faculty of Sciences and visitors will be given at King's College, Strand, W.C.2, on Thursday, May 24th, at 7.0 p.m., by Professor A. M. Low, D.Sc. The subject will be "Sound and Noise," Readers of Practical Wireless are especially invited. Admission is, of course, free, although invitation cards may be obtained, if desired, from the Secretary, 38, Gordon Square, W.C.2. The lecture includes a very successful session before large audiences and has the strong support of the Faculty of Sciences and of King's College.
Eliminating noises in A.C. mains-driven short-wave receivers

By A. W. MANN

Some useful hints on tracking noises which apply to both broadcast and short-wave receivers

The elimination of parasitic noises, should they develop in A.C. mains-operated short-wave receivers, is not a difficult undertaking, but one which requires systematic methods of procedure and common-sense reasoning. The purpose of this article is to enable technically-minded readers, who may look upon the chassis of an A.C. short-wave receiver as a mass of complications which is a little beyond them, to tackle the elimination of minor troubles without difficulty.

Do not get into a panic and jump to the conclusion that the source of the trouble is inside the receiver. It may be external— and, above all, do not guess or take anything for granted when trouble tracking. File this article for future reference in case of doubt, should hum, crackling, buzzing, and ticking noises be superimposed upon the programme matter emitted by the loudspeaker, and proceed to trace and eliminate them as follows:

Hum

In order to trace the cause, examine all external leads. Aerial, earth, or speaker leads may run too close to a wall in which mains wiring is embedded. Remove each lead in turn from the wall. If this procedure causes hum to cease, direct inductive pick-up by the respective lead which, when moved, cured the hum, was responsible for it in the first place. The possibilities of sound-wave emission from the speaker causing vibrations of the internal valve elements, should not be overlooked. Move the speaker away from the receiver, and note the effect.

Microphonics

Tap valves in turn (set working), in order to test for microphonics, and if any particular valve causes a howl to build up in the speaker when tapped, replace with a new valve.

Crackling

Remove aerial and earth leads, switch on receiver (as in case of hum). If crackling stops, examine all lighting and power switches, operate them, and note if crackling is heard in speaker when doing so. Examine and operate all domestic appliances. Examine fuse and junction boxes.

An obscure fault

The writer recently traced two causes of crackling in a mains receiver; another, however, remained, and tests as described above showed O.K. It was noted that when someone overhead crossed the landing, crackling was heard in the speaker. Examination showed a slack connection in a junction box of the house wiring under floorboards. One of the latter, when walked upon, pressed down on to mains lead, causing sparking between the bare ends and junction box terminals, which, being in effect a miniature transmitter, caused crackling in the speaker, due to pick-up by aerial system. This was cured by switching off mains and tightening junction box terminals.

Common sources

Do not forget, that unless suppression devices are fitted, electric neon signs, robot traffic signals, trolley systems, and car ignition systems are all sources of crackling and interference.

Rock each valve in its associated socket (set operating). Increased crackling denotes faulty contact between valve pins and sockets respectively. Hum, if heard, denotes open circuit between valve pins and socket. Adjust sockets or valve pins.

Clean between-winding and other variable condenser vanes with a pipe cleaner. Before using the cleaner compress it between two pieces of board, so that it will pass between vanes without forcing.

39 TYPES IN THE DARIO RANGE

GOOD VALVES THAT SAVE YOU POUNDS!

Get our list and study the table which shows the DARIO alternatives for all popular valves. Note the prices and you will see that to use DARIO means a worth-while saving of money—something like £1.10.6 in the case of a mains 5-valver.

More than that, the DARIO range is so complete that whatever set you have or contemplate, there's a highly efficient DARIO exactly suitable for every valve-holder.

Few low-priced valves can show you anything like so comprehensive a range and no valve at any price can give you more up-to-date design or more consistently accurate manufacture than DARIO!
A "SAFETY-FIRST" SWITCH

Constructional Details for a Simple and Novel Switch, for Disconnecting the H.T. Supply when the Lid of the Set is Opened

Immediately the lid of the receiver is opened more than an inch the set is switched off and remains so until the lid is almost closed again, the switch operating on the initial opening movement and the final closing movement.

The actual method of operation of the switch is clearly shown in Fig. 1. With the lid open the switch knob is in the "Off" position. On closing the lid the sliding arm slides down the knob until the spring catch position. On closing the lid the sliding arm is in the "Off" position.

The Sliding Arm

The sliding arm is made from a lid stay, the part which is usually fixed to the side of the cabinet being removed. This can be accomplished by filing away the top or cutting the arm at the bottom and resoldering after removal. This latter operation will definitely be necessary if a lever switch is used, because the slot must be narrower than the diameter of the switch knob, otherwise it will slip through.

With the rotary switch this is not necessary, because the screw can be fitted through the slot. The soldered cut will be seen in Fig. 1.

The spring catch is clearly illustrated in Fig. 1, and is made from spring brass. Do not make the arm too short, otherwise the movement may be somewhat erratic when it is in use.

Soldering in position is in the lower parts of the "U" can be necessary if a lever switch is used, otherwise it will slip through.

To simplify the fitting of the switch, make the two distances (marked X) equal, it will then be found that as the stay is in the right position.

The distances X should also be chosen so that in the maximum open position the switch is in the right position. The ideal aim at is—when the lid is closed, one or two dimensions will suffice to ensure that the switch is in the right position.

When Using a Rotary Switch

If a rotary type of switch is used the method of connection is shown, inset Fig. 1, the lower inset showing how the lever type is utilized. An arm will be necessary with the former type, but it can easily be made from a piece of aluminium or, preferably, brass. If the latter material is used the nut in the lower parts of the "U" can be soldered in position. A screw is inserted into this nut and turned until it grips the spindle, holding the arm in any desired position.

A round-headed screw is inserted in a nut soldered on the end of the arm, a further lock-nut securing it in position, the head of this screw taking the place of the knob of the lever type. A less workmanlike, but quite efficient arm, is illustrated in Fig. 2, the inset showing the arm before bending.

The switch is operated in a brass or aluminium bracket of the type shown. This bracket should be large enough to clear the connections to the switch, and to prevent these connections being touched by hand without removing the bracket from the side of the cabinet. The actual connections should be made with heavy flex leads before the bracket is fixed in position.

Fig. 1.—A view of the finished switch, and constructional details.

Fig. 2.—An alternative form of connecting arm.
Before You Go For Your Holidays!

Some Timely Hints On Leaving Your Radio Behind.

By A RADIO ENGINEER

T

hose who are about to depart for

ay will assuredly wonder... if you

not to turn off the gas and the

water, to look and bolt all the doors

and windows, and, if possible, to

board. Will they, however, expend an

equal amount of care upon the radio
equipment which has served them so

well month in and month out? Probably

not, but here are a few suggestions which

are worth considering if you intend to be

away from home for any time.

Let us start at the very beginning of

tings—the front and back doors of our

radio, so to speak. I mean the aerial

earth. The risk of an aerial being struck

by lightning is very remote in any case,

but certain periods usually bring one or

more thunderstorms, so it will be as

wise to leave home to disconnect the

aerial and earth leads from the set and

connect them together, thus earthing the

aerial.

One listener I know goes further than this. He actually lowers his aerial (not the pole but only the wire) and coils it up for storage in his garage. His explanation is that it is as well to be on the safe side, and he feels, if he takes the aerial down it gives him an automatic reminder to clean or renew the insulators when he comes back, and to examine and, if need be, to repair the halliards. Quite an excellent scheme, this. If you decide to leave your aerial up, and to earth it, I think I should give one or two useful tips. Next, nowhere else where there is a stone floor so that should any acid leak out, no damage will be done to carpet or furniture.

As for the high-tension battery, I think I should disconnect it in order to remove the slight possibility of its running down if the insulation of the circuit is not perfect, or the unlikely risk of damage should chemicals leak out. I have known instances where that has resulted in the formation of a sticky mess of chemicals which could damage neighbouring components and at all events cause unsightly stains.

If your high-tension battery does not live in the radio cabinet, see that it is not placed where it will be exposed to any form of heat. Neither should it be stored in a damp place. Provided these simple precautions are taken, no harm is likely to occur to your high-tension battery.

Now let us see if there are any other points which require attention before you lock up the house. The set itself—that will come to no harm if left in its normal position. As for the remainder of your equipment, speakers, extensions leads, and so forth, they will come to no harm whatsoever if you leave them as they arc.

Overhauls

But the fact that you are going away gives you an opportunity of having any overhauls or repairs done which you may have been inclined to put off previously because of the inconvenience of being without the radio. Perhaps the radio service is assuming the battery is in reasonably good condition. If, however, you suspect that your battery is in poor health—if that is to say, it has not been retaining its charge well—why not give it an overhaul as well? Hand it over to the care of a really reliable charging station, asking the proprietor to examine it thoroughly and have it properly charged and ready for you by the time you return.

The cost will not be great, and you will have the satisfaction of knowing that your battery will return to you with a new lease of life. If you are leaving your battery in the house, it will be wise to remove it to the kitchen or another room, somewhere else where there is a stone floor so that should any acid leak out, no damage will be done to carpets or furniture.

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SHORT-WAVE ADAPTOR

Can be used on either A.C. or D.C. without alteration and also on any mains from 100-500 volts. Simple to connect. Just plug the unit into the mains, connect the aerial to adaptor and take another lead from top of adaptor to aerial terminal of receiver. Suitable for all wavelengths between 15 and 85 metres.

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Complete. Fitted with the famous Ostara-Ganz High-tension Valves. Adaptable to any Mains Receivers.

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Employing the famous Ostara-Ganz High-tension Valves.

4 to 10 Watts Undistorted Output

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SINGLE OUTPUT DOUBLE OUTPUT

Assembled £5.6.0 Assembled £10.10.0

Complete £5.5.0 KIT with Valves £25.5.0 Complete Public Address Unit 22 Bits. District Agents Wanted. "Phone Temple Bar 6865."
A TREAT TO LISTEN NOW with the

**T.C.C. CONDENSER ANTI-INTERFERENCE UNIT**

A nightmare of "crackles" and "buzzes" has ended for this Southampton listener who fitted a T.C.C. Anti-Interference Unit. Neon signs, motors and generators do not cause him as far as his radio is concerned. Don't let your listening be marred by such "man-made static"—this T.C.C. Unit will cut it out. Ask your Dealer to-day.

The Telephase Condenser Co., Ltd.,
Wales Farm Road, N. Acton, W.3
A new type of variable resistor which is of the three terminal, or potentiometer type and contact with the resistance element is made by means of a small graphite stud. This provides a very smooth movement practically frictionless, and at the same time removes the possibility of noises due to erratic contact. The connection for the moving arm, and the arm itself are well insulated from the control spindle, so that the component may be mounted direct on a bracket to contact, with a metal chassis if desired. The component is very well made and should prove highly satisfactory in use. It is obtainable in five ranges from 5 megohms down to 25,000 ohms, and the price is 3s. 6d.

MAGNUM MIDGET SCREENED COILS

ALTHOUGH we are now accustomed to seeing tuning coils of very small dimensions, due to the introduction of the iron-core, the new Magnum coils are very interesting in view of the fact that they are of the ordinary air-core type. The illustration shows three of these coils. For full details of their construction we have reproduced the necessary electron emission for the triode. The filament system is divided into two halves, one half encloses the two small diodes, necessary for detection, and A.V.C., and the other diode encloses the triode system necessary for amplification. Due to this method of construction the diode system can be enclosed within an earthed screen which provides a very effective electrostatic shielding within the valve. In addition, the whole of the filament is surrounded by a very thin wire to provide the necessary electron emission for the triode.

The main points, therefore, of interest in the Osram HD21 valve are as follows:

1. Two diodes provide linear detection and delayed action A.V.C. combined with the triode for high efficiency amplification.
2. Extremely efficient shielding between the diode and triode elements avoids distortion and improves the action of the valve.
3. The full characteristic of the triode element in this case is similar to that of the Osram H12 valve, and is realised, giving great sensitivity on weak signals.

The Osram HD21 is fitted with the element, taking 0.2 amp. at 2 volts, and giving the following triode characteristics: Amplification factor 17, impedance 18,000 ohms, mutual conductance 1.5 m.a./volt.

The valve is supplied in a 7-pin base with metalised or clear bulb, and in this valve the control grid is taken to a small metal cap on the top of the bulb. The metal cap takes the place of the screen terminal, and is a convenience in making a quick and firm connection by means of a metal clip. This metal cap takes the place of the screw terminal, and is a convenience in making a quick and firm connection by means of a metal clip.

New Magnum coils are very satisfactory in use. They are of ordinary air-core type and contact with the resistance element is made by means of a small graphite stud. This provides a very smooth movement practically frictionless, and at the same time removes the possibility of noises due to erratic contact. The connection for the moving arm, and the arm itself are well insulated from the control spindle, so that the component may be mounted direct on a bracket to contact, with a metal chassis if desired. The component is very well made and should prove highly satisfactory in use. It is obtainable in five ranges from 5 megohms down to 25,000 ohms, and the price is 3s. 6d.
A NUMBER of fine records are introduced this month by the British Homophone Company, of special note being a number of popular dance tunes by Teddy Joyce and his Band, who are now playing at the Kit-Cat Restaurant, and are recording exclusively on Sterno records. His records include such favourites as In Town Tonight, composed by Eric Coates, and Go to Sleep on Sterno 1384, In a Little Rocky Valley and Oh! Poppy on Sterno 1385, and Spin A Little Web of Dreams and Because it's Love on Sterno 1386. The Casani Club Dance Band, ably directed by Charlie Kuna, also supply a number of up-to-the-minute numbers in Who's Gonna Take You Home To-night and Gosh! I Must be Falling in Love, Sterno 1376. Depمضtions F.E.E. H, with xylophone effects by Tommy Blades, and Hello Bells, Sterno 1377, and It's Time to Say Good-night and Oceans of Time on Sterno 1378. Each of the above six tunes have vocal refrains ably sung by Dawn Davies and Harry Bently, the well-known vocalists of Charlie Kuna's band.

Light Music

Mantovani and his Tipica Orchestra, who have made a number of very fine records for the above company, make yet another fine record, which you should certainly hear. This introduces two fascinating tunes from the film Princess Charming, these being Near and Yet So Far and Draw Hearts, Sterno 1389. The vocal chorus of each is sung by Parry Jones, the well-known tenor, who is often heard on the "air." That versatile composer Haydn Wood personally conducts Joseph Lewis's Orchestra in two of his own compositions—namely, Prelude and The Unforgotten Melody, on Sterno 1405. Andre Astan and his Orchestra give a fine recording of Footlight Parade," which is a selection from the film of that name, introducing such popular tunes as Sitting on a Backyard Fence, Shanghai Lil, By a Waterfall, The Moon is Here, and Honey-moon Hotel. On the other side of this record is Moulin Rouges, which is also a selection from the film of that name, introducing Boulevarde of Broken Dreams, Song of Surrender, and Coffee in the Morning. This record, which is Sterno 5015, is a long playing record, the playing time of which equals two 10in. discs.

Vocal Records

If you want to enjoy a good laugh you should certainly hear Leonard Henry, who has made a number of very fine records on Sterno 1403. Dan Donovan, the light baritone, who has made a number of fine records for the above company, gives a clever rendering of In the Hills of Colorado and Am I Ever Remembered in Erin on Sterno 1390. Other fine vocal records are Old River Road and Wagon Wheels, sung by The Singing Minstrel on Sterno 1482, and Little White Church, the Hill and I, a Shelter from a Shower on Sterno 1404.

Parlophone Records

These clever harmonists of the Modern-Jives indulge in some amazing vocal impersonations of musical instruments on Parlophone R1802, the tunes on this record being You're O.K. and After You're Gone. Harry Roy and his Band, who are heard quite frequently over the radio, make a fine record in Keep Young and Beautiful and Build a Little Home, which are two numbers from the film Roman Scandals, on Parlophone R1795. For those who like pianoforte solos, Ivor Moreton and Dave Kay, the two pianists playing in Harry Roy's Band, give a good rendering on two pianos of Kittens on the Keys and Notes; Polly on Parlophone R1797. Also worth hearing is Allotria and Lucy's Lips, played by the Harmonia Dance Orchestra on Parlophone R1798.

Home chord Records

Best and Best, the two popular duettists who have made a number of very fine records for the British Homophone Company, make yet another big success on Homochord H.R.96, I have had to change the mask singer, records two popular numbers in What is There to Get Its Place and Masquerading in the Name of Love on Sterno 1403. Dan Donovan, the light baritone, who has made a number of fine records for the above company, gives a clever rendering of In the Hills of Colorado and Am I Ever Remembered in Erin on Sterno 1390. Other fine vocal records are Old River Road and Wagon Wheels, sung by The Singing Minstrel on Sterno 1482, and Little White Church, the Hill and I, a Shelter from a Shower on Sterno 1404.
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).

Schedule of Interesting Foreign Transmissions

Sir,—The following information may be of interest to readers of PRACTICAL WIRELESS:

VTBC, Broadcasting Caracas, Apartado 290, Caracas, Venezuela, works on 312.3 m., 960 kc/s, 5 kW, and on 49.08 m. (6,112 kc/s) and 25.65 m. (11,685 kc/s), 200 watts, daily, 11.9 a.m. to 1.30 p.m. and 7.30 to 8.30 p.m., Sunday.

On Saturdays, 9—11 a.m., 2—3.30 p.m., 7.30 to 8.30 p.m., and 8.30 to 10.30 p.m., Caracas time.

VY3BC, Radiodifusora Venezuela, Caracas, works on 1,200 kc/s, 6,150 kc/s, and, occasionally, on 9,510 kc/s.

VE9GW, Canadian Radio Commission, Bowmanville, Ontario, works on 6,095 kc/s with 500 watts. Mon., Tues., and Wed., 2.30—5 p.m.; and on Thurs., 2.30—5 p.m., and 9.30—12.30 p.m.

PKA3, Radio Club do Brazil, Rio de Janeiro, is S.B. on 860 kc/s daily, 8 a.m. to midnight, E.S.T.; and S.B. on 6,150 kc/s daily, 11.0 a.m. to 1.30 p.m., Caracas time.

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 Lamp Unit for Television

Sir,—In an article on the use of ordinary neon lamps for television purposes which appeared in the April 21st issue, I noticed that the writer recommended readers to use a "bochee" lamp.

Now the area of the neon disc is small, and the fact that the light is emitted at an angle is a great drawback. Therefore, I would like to point out that I use a Phillips neon lamp with the wires wound on in a circular form. These lamps work on from 100 to 130 volts, so that by using 200 volts high tension in the output stage of the receiver it is possible to obtain a good degree of light from the lamp. Another advantage is that it can be used upright, quite close to the wall, and also that the light area is approximately square in shape. —J. W. HOBLEY (Wellingborough).

CATALOGUES RECEIVED

To save readers trouble, we undertake to send an index of copies of our advertisers' catalogues, on request, to every subscriber to PRACTICAL WIRELESS at a nominal subscription price. Copies of catalogues are sent free to readers of PRACTICAL WIRELESS on request.

LISSEN RECEIVERS

An attractive range of Liszen receivers, including the popular "Skyzerper" series, is displayed in an extensive folder issued by the Corporation. These receivers are set to such varying tastes and purposes, and from which the most discriminating listener should have no difficulty in choosing a receiver to suit his requirements. The model 4000, a high-class all-mains receiver, equipped with a V.C.B. phono-pneumatic, and an electro-static input transformer, is priced at $12 10s. 6d.

Other models include A.S. and D.C. models with moving-coil transformers, and battery-operated portable and table sets, all housed in handsome cabinets of modern design, and at prices ranging from $12 to $25. Several particulars of all the receivers are given in the folder, copies of which can be obtained on application to Liszen Limited, Corporation Works, Worpole Road, Islington, Middlesex.

CHARGING FOR PROFIT

A useful handbook by H. W. Gambril and T. W. Price, bearing the above title, has just been issued to the trade by the Edison Swan Electric Co., Ltd. The purpose of the book is to give practical suggestions and advice on the questions of layout of battery-charging stations, and the choice and operation of suitable equipment.

COSBOR BOOKLET ON CLASS B AMPLIFICATION

In these days of specialized interest it is, of course, quite possible to incorporate a Class B valve in a receiver to obtain an outfit capable of full performance comparable with that of the original receiver. Several circuits are given, together with advice on how the familiar form of transformer may be adapted for this purpose. Further, a range of Lissen receivers, including the popular "Skyzerper" series, is displayed in an extensive folder issued by the Corporation. These receivers are set to such varying tastes and purposes, and from which the most discriminating listener should have no difficulty in choosing a receiver to suit his requirements. The model 4000, a high-class all-mains receiver, equipped with a V.C.B. phono-pneumatic, and an electro-static input transformer, is priced at $12 10s. 6d.

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SELECTION OF MICROPHONES

Various types of microphones, from pocket voice amplifiers to studio instruments, are listed in a folder issued by Electro-Acoustics. Included in the comprehensive range are microphones for home recording, broadcasting, and public address work. Also included in the folder is a range of microphone transformers, telephone, and microphone parts. Copies of the folder can be obtained from 318, Lloyd's Chambers Street, London, E.C.4, by enclosing a stamp for postage.

FULL particulars with characteristic curves of the Bell range of Microphones is given in a booklet of data. These valves are the result of years of intensive research work, and no pains have been spared to ensure that the best available, quality at any reasonable price. They embody the latest and most advanced methods of construction, and a great care has been taken to ensure that individual valves are up to the highest standards. The valves, which are of the "bochee" variety, from which can be seen at a glance the quality of manufacture and workmanship, in comparison with similar valves of other makes, is given in an attractive folder, which is available on application to the High Vacuum Valve Co., Ltd., 111-113, Fargion Road, London, E.C.I.

May 19th, 1934

PRACTICAL WIRELESS
LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

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

DATA SHEET No. 79
Cut this out each week and paste it in a notebook.

<table>
<thead>
<tr>
<th>GRAMOPHONE RECORD PLACEMENT</th>
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THE MAINS UNIT

"I have recently built a three-valve receiver exactly to specification, but I can only get a loud buzzing noise. I am working from the mains with a good mains unit. Aerial, earth, and earth loop are in good order, as they work with my old set."—S. F. (Ashington).

In all cases where a mains unit is employed and the set proves unstable it is worth while trying to make sure that the wiring and connections of the valve receiver are in order. If results are then satisfactory and instability is introduced by changes made in the mains unit, it proves that the unit is unsuitable. The reason may be that the unit will not deliver sufficient current for the set and is seriously overloaded, or it may be necessary to employ separate voltage supply leads for each valve. In some cases it may be necessary to connect large capacitors across the valves to reduce stray capacitance and improve the performance in the mixer stage. The exact cure will depend both on the receiver circuits and the mains unit wiring.

TELEVISION AND A 4-VALVE

"My set is a four-valve S.G., det., power, and pre-amplifier, and it is used with an A.C. mains unit. Could I work television from this? I am very keen to try out some experiments in television,"—W. M. (Ashington).

We see no reason why you should not be able to obtain good results from a set of this type provided you can obtain a really good loud signal from the London station. This station transmits the television signals. If this station provides you with a signal which is very confusing, you may build up a disc receiver and obtain quite good results. If, however, the signal from that station is weak, you would probably need a further H.F. stage to give you sufficient strength to obtain a well-modulated picture.

A CLASS B ELIMINATOR

"I am thinking of building an eliminator for my present set, which is an ordinary S.G., detector, and power amplifier. I can only get a loud buzzing noise. My set is in old G. Will it be satisfactory to build a Class B unit now, or will we need one with my present set?"—F. S. (No address).

It would be preferable to build the unit as it will be required for the Class B converters. It will work quite satisfactorily with the straight circuit and will not then require alteration when you modify your set.

SPARK FROM SPEAKER LEADS

"I have seen the circuit in a Valve and the set proves unstable. It is worth while trying to make sure that the wire and connections of the valve receiver are in order. If results are then satisfactory and instability is introduced by changes made in the mains unit, it proves that the unit is unsuitable. The reason may be that the unit will not deliver sufficient current for the set and is seriously overloaded, or it may be necessary to employ separate voltage supply leads for each valve. In some cases it may be necessary to connect large capacitors across the valves to reduce stray capacitance and improve the performance in the mixer stage. The exact cure will depend both on the receiver circuits and the mains unit wiring.

FREE ADVICE BUREAU.
COUPON

This coupon is available until May 30th, 1934, and must be countersigned by writers containing queries. PRACTICAL WIRELESS, 19/5/34.
PRACTICAL WIRELESS

May 19th, 1934

ALL I ASK OF YOU

Is it to look into this Revolutionary Announcement:—

The CHASSIS BY BRITISH RADIOPHONIC. THE CABINET AN ULTRA "PANTHER." A table model polished walnut cabinet of superb design and finish. Must be seen to be appreciated. A credit to any furnishing scheme. Worth £10.


THE BARGAIN OF THE AGE

£2 22/- Superhet with A.V.C. for £6 19 6d. or 15/- down.

THE CHASSIS BY BRITISH RADIOPHONIC, THE CABINET AN ULTRA "PANTHER." A table model polished walnut cabinet of superb design and finish, must be seen to be appreciated. A credit to any furnishing scheme. Worth £10.


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PRACTICAL WIRELESS

PEARL & PEARL


PODAR 2-staged Sound Condensers, with trimmers, pilot lamp holder, calibrated and encased; list 15/-, our price 11/.

WESTINGHOUSE Rectifiers: H.T. 10, 9/-; H.T. 20, 15/-.

UNIVERSAL A.C./D.C. Eliminators: with three positive H.T. terminals, 30½w., 25/-. A.C. Eliminators as above. H.T. Eliminators 11/-.

Mains Transformers.--Full list of mains transformers and chokes sent free; specials can be supplied in 3 days.

VARLEY Constant Square Peak Coil packs, complete with coil units and brass terminal leads, J and 5/- each (list 1/-);

WOBURN RADIO offer following new and special prices to trade, 36/- per gross.

BRITISH ELECTRICAL EXHIBITION, White City, London, W.2. (List 39/-).

Send for Sale List No. 9. It will save you pounds.

1000 ELECTRAC BARGAINS.

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The Mains Transformer, tapped with terminals, 4/-; Volume controls with switch, 5/-; bulk 10 per lot at 9d. each.

STATION named scales and metres for radiopaks, size 31" high, £10.00. Valves holders, 2d. 3d. 6d. each.

B.D.I. Resistors, 1½ to 1/2, 2d. each.

VARIABLE transformers. A.C. only, B.T.M. Trustee 100-250 volts, 32/-.

Radio-GRAM Radiophones, A.F. or R.F., 2½w. and 5½w., 20/-.

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Patents allowed. Mains transformers, etc. Receivers. B.W.C. Radios, etc. W.B. & C. Radios, etc. Write Repair Dept. C.

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