3-VALVE RECEIVER—GENERATOR

Practical Wireless

9d EVERY MONTH

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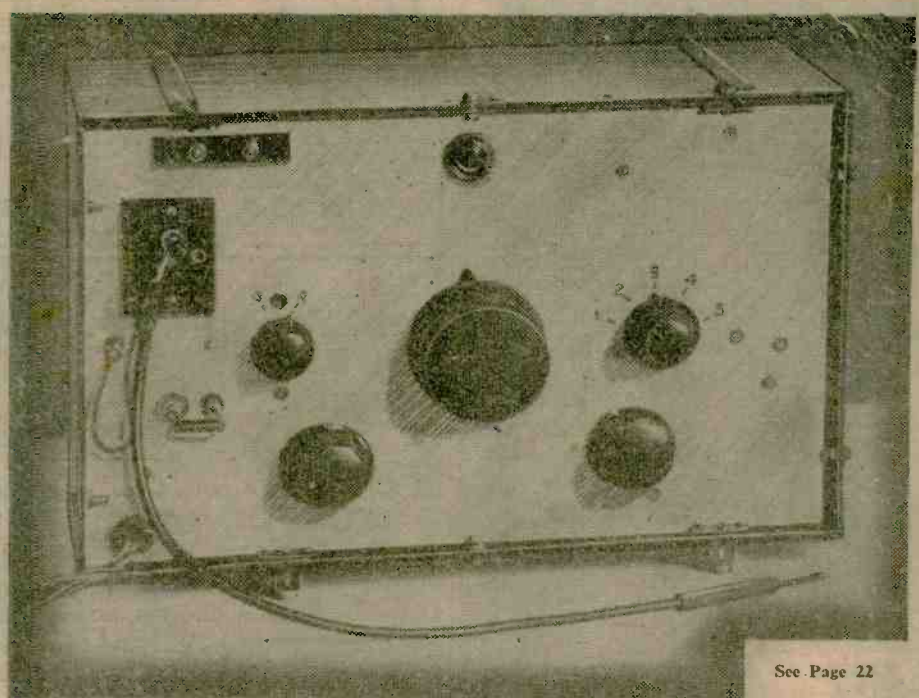

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PRINCIPAL CONTENTS

Practical Wireless and PRACTICAL TELEVISION
17th YEAR OF ISSUE
EVERY MONTH
VOL. XXV. No. 510 JANUARY, 1949
Editor F.J.CAMM

COMMENTS OF THE MONTH — BY THE EDITOR

Suppression of Interference

INTERFERENCE with television programmes caused by car ignition, diathermy, electric cleaners, and other electrical apparatus, has again brought into prominence the whole question of methods of suppressing it.

Interference with ordinary listening by man-made static has been a source of complaint for many years, but it is not an offence and all the Post Office can do when they have tracked the offender down is tactfully to suggest methods of eliminating the interference. Fortunately, this is often effective. It was not, however, until interference could be seen as well as heard that the authorities began to take official notice.

A new Bill recently placed before Parliament, if it becomes law, will make the fitting of suppressors to car ignition systems compulsory. These are already available in the shops, and doubtless the car manufacturers in future will fit them as standard to the ignition systems of cars which, it is said, are the cause of 90 per cent. of radio interference.

Such interference can largely be eliminated by the fitting of a resistor of from 5,000 ohms to 15,000 ohms, costing about 1s. 6d. The suppression of other electrical apparatus can be more difficult and costly.

On the other hand, manufacturers of electrical apparatus say that it is the duty of the manufacturers of television receivers to suppress interference in the receiver itself, and not expect every motorist to go to the expense of fitting suppressors to oblige about 50,000 viewers.

Of course, as the television service expands the nuisance will assume larger proportions. The motoring organisations say that it does not follow that all of the 3,500,000 private and commercial motor vehicles in this country do, in fact, interfere with television and short-wave reception. They argue that there must be some restriction on the extent to which motor vehicle owners are required to defray the cost of any fitments essential for the suppression of interference.

They think that steps should be taken to ensure that suppressors to be fitted are supplied as cheaply as possible, and that before motorists are called upon to bear any special expenditure technical evidence should be available definitely to establish that interference with television and short-wave reception cannot be satisfactorily eliminated at the receiving end.

Not every piece of domestic electrical equipment causes interference, but it is of importance that users of equipment which does do so should fit suppressors. Some of the estimates which have been published of the cost of doing this are on the high side. Some motorists are fitting suppressors to each plug lead, but we are of the opinion that a single resistor in the high-tension lead between the coil and the distributor will achieve all that is required.

All cars fitted wth car radio are already suppressed. The Radio Industry Council early this year embarked upon a campaign for the voluntary suppression of interference, but it has not been very successful. All G.P.O. cars are suppressed, and it is a condition of employment with the B.B.C. that owners of cars should fit suppressors.

It would appear that the final solution must lie with the manufacturers of electrical apparatus, and if this Bill becomes law it is obvious that the onus will shift from the user to the manufacturer, and the problem will automatically settle itself. At present the plans are to shift the responsibility on to the user of electrical apparatus.

We think the radio industry should justify its statement that 90 per cent. of interference with television programmes is caused by car ignition systems. We doubt the accuracy of those figures.

It is interesting to note that the B.S. Code of Practice: Abatement of Radio Interference caused by Motor Vehicles and Internal Combustion Engines CP 1,001: was published in March, 1947. A large number of users of motor vehicles are taking steps to see that the recommendations of the code are followed in connection with the vehicles for which they are responsible.

This action is undoubtedly reducing the total amount of interference arising from the ignition systems of internal combustion engines, but the Committee who were responsible for the preparation of this code realise that there are still a number of vehicle users who are not doing so.

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ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended September 30th, 1948.

Region	Number
London Postal	2,107,000
Home Counties	1,483,000
Midland	1,610,000
North Eastern	1,743,000
North Western	1,473,000
South Western	992,000
Welsh and Border	651,000
Total England and Wales	10,062,000
Scotland	1,065,000
Northern Ireland	184,000
Grand Total	11,311,000

This number includes 66,600 television licences, an increase of 4,900 over the previous month.

Three hundred and forty-six prosecutions were authorised during September for operating wireless receiving sets without a licence.

Owners of television receiving sets are reminded that a special comprehensive licence costing £2, covering both sound and television programmes, is required immediately a television set is installed (*not* merely when the old £1 licence expires). A rebate will be allowed at the rate of 1s. 8d. for each month of the unexpired portion of the 20s. sound licence, and can be claimed and collected at any *Head* post office.

British Television in Stockholm

THE Pye television demonstration in Stockholm was seen by 179,000 people, who watched the reception in sets placed in various parts of the N.K. Stores, Stockholm. In addition, 10,000 people saw the studio performances on the stage of the China Theatre. The studio audience were also able to watch the performances on the screens of sets placed near the footlights of the stage and facing the auditorium. The Pye team and mobile equipment returned to England after six weeks in Scandinavia, during which some 324,000 people have seen British television in action over the air. The impact on official and public opinion both in Denmark and Sweden is said to have been very considerable and the newspaper publicity has run to hundreds of columns.

Phototelegraph Service with Switzerland

THE Postmaster-General announces that a public phototelegraph service by wire is now available to Switzerland at the same charges as for the Cable and Wireless service by radio.

American Industrialists at Ekco

AMERICAN members of the Joint Productivity Committee, set up to investigate production methods in all sections of industry in this country, recently paid a visit to the Ekco Works at Southend.

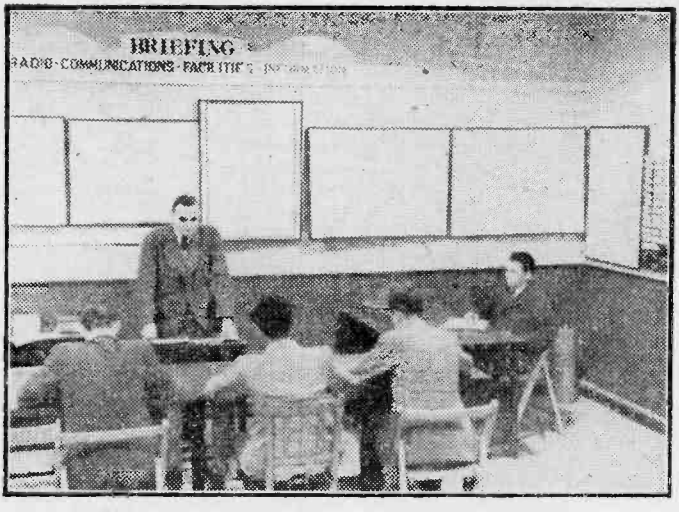
Accompanied by Mr. N. C. Robertson, M.B.E., deputy managing director of E. K. Cole, Limited, together with other officials of the company and workers from the Ekco Joint Production Committee, the American visitors were greatly impressed to see the versatility of the organisation housing three main industries—radio, Ekco-Ensign Electric Limited (lighting) and plastics—literally under one roof.

All-metal C.-R. Tubes

ACCORDING to a statement recently by the president of an American company, television tubes are now being made from metal. Most of the tube is made of spun chrome-steel alloy and ordinary plate glass is used for the face which is 16in. in diameter. The advantages claimed are lighter weight, larger viewing area, and better shielding from ambient light.

School Broadcasting

ACCORDING to a reply to a question in the House, the School Broadcasting Council have



Model briefing room at the radio school at Hamble.

found that reception in 30 per cent. of the 15,000 schools equipped with radio was unsatisfactory.

Television Link

THE American Telephone and Telegraph Co. announce that towers are being erected across Northern Indiana to chart a layout for television relays. They are of a temporary nature, but when permanent installations are made they will link Chicago with East Coast television facilities. The co-axial cable laid last year is now being used to handle long-distance telephone calls and when the relays are finished the cable will only be used for television in emergencies.

Egyptian Radio Centre

A 50-KILOWATT medium-wave transmitter has been purchased by the Egyptian Government from the International Division of the Radio Corporation of America. It is to be erected at Abu Zaabal, 14 miles from Cairo, where the studios are situated.

B.I.R.E. Lecture

A LECTURE was recently given to the London section on "V.H.F. Radio Equipment for Mobile Services." The paper was read by D. H. Hughes, A.M.I.E.E.

Mysore Minister Sees E.M.I. Television

BRITAIN'S latest television developments were explained and demonstrated recently to the Hon. H. C. Dasappa, Mysore Minister of Finance and Industries, in the course of a visit he has just made to the vast E.M.I. works at Hayes. The Minister, who was accompanied by Capt. S. T. Binstead, Trade Commissioner for Mysore, was received by Mr. B. E. G. Mittell, and Mr. H. W. Bowen, managing director, E.M.I. Factories Ltd.

Control room No. 1 at Radio Paris. Other pictures and details will be found on pages 19 and 20.

Radio Instructional Facilities at Air Service Training

ALWAYS up to date with radio instructional equipment, the radio school at Air Service Training, Hamble, has recently increased its facilities by the acquisition of a "Gee" Trainer, and the latest type automatic transmitter, sending up to 240 words per minute. Also, as an addition to the spacious lecture and demonstration rooms, workshops and laboratory, the school has recently completed the equipment of a modern briefing room supplied with the latest maps and radio information, in which students are instructed on the principles of and reasons for briefing. This briefing room, pictured opposite, might well serve as a pattern to flying units which have not yet realised the importance of adequate pre-flight briefing for radio officers.

Television in the Cinema

DISCUSSIONS between representatives of the Renters, Exhibitors and Producers' Committee of the film industry and representatives of the B.B.C. under Post Office chairmanship, were resumed on November 11th. The representatives of the film industry reported that their associations agreed in principle, to co-operate in arranging—for an experimental period—for television showing by the B.B.C. of selected films, and for the showing of selected B.B.C. television items in cinemas.

Further meetings will be held to work out details.

The party spent some hours in the research laboratories watching television, and were greatly impressed with the tremendous progress that has been made by the E.M.I. Television Research team.

The "Impossible" Achieved in Car Radio

ONE of the most remarkable exhibits in the recent Motor Show was the new Ekco all-wave car radio. This accessory is a technical triumph for the radio engineers, and provides for the first time in car radio real entertainment, volume and quality on short-wave stations—a facility hitherto regarded as virtually impossible.

The model is designed primarily for overseas countries where the motorist may be dependent on short-wave stations for his listening.

E.M.I. Evening Classes

THREE special evening courses are announced by E.M.I. Institutes, Ltd., of Grove Road, Chiswick, W.4. These courses, each of three months' duration, have been introduced to meet the ever-increasing demand for trained electronic engineers, and will deal with practical television, television principles, and practical radio.

MINISTRY APPEALS TO HOUSEWIVES
Keep Waste Paper separate, dry and clean for salvage.

The Reflex Klystron

Some Experiments With ex-Radar Equipment Described

By A. W. SIMPSON

KLYSTRONS and all the other hush-hush radar apparatus are usually looked upon by the experimenter as costly and difficult to operate. This is not always the case. Most of the smaller radar installations are now on the surplus market, and, as most of the new fundamental ideas are not so much new circuits but new types of valves, which do not have to be constructed as they are bought ready made, the difficulties are not so great.

The valve used in the circuit described below is a reflex Klystron (CV67), and is used as a local oscillator in several radar receivers, working at 10 cm. and below. Few radio dealers know what this valve is, and it can easily be obtained, with all the necessary gear trains to vary the tuning, for a few shillings. It is advisable when trying to obtain the valve to look for it, not ask for it, as few dealers know it by code number.

The Principle of the Klystron

As the frequency rises the efficiency of the usual inductance-capacity tuning circuit gradually becomes lower. When the frequency rises to the neighbourhood of 100 Mc/s. (3 metres) it becomes essential to use a co-axial line or trough line tuning unit; finally, at frequencies of about 3,000 Mc/s. (10 cm.), a shallow metal cylindrical box is the only satisfactory resonance tuning device. These chambers are known by the romantic name of "rhumbatrons."

The original Klystron was a very complicated valve containing two rhumbatrons connected by a co-axial cable; the reflex Klystron is a more recent development and far simpler in theory and practice.

The reflex Klystron contains only one rhumbatron, which has two metal grids (or meshes) on the two faces of the cylinder. The rhumbatron is built into the centre of a long, evacuated glass tube, with the two grids on the axis of the tube. At one end of the tube is the cathode surrounded by a cylindrical negatively-charged grid (similar to the electron gun in a cathode ray tube), and at the other end of the tube is a negatively-charged metal plate. The rhumbatron has an adjustable piston in it so that the physical dimensions of the chamber, and hence the resonance frequency, can be changed. Also, the chamber has fitted on one side a probe connected to a small length of co-axial cable to lead away the output.

The rhumbatron is at a high potential with respect to the cathode, so that when the valve is not oscillating a stream of electrons leaves the cathode at high velocity and goes right through the two grids. On emerging out of the rhumbatron the electrons come into a negative field and are repelled back to the rhumbatron, where they are finally collected.

To understand the oscillatory action of the valve it must first be assumed that on switching on the correct voltage to the three electrodes the rhumbatron is "shock excited" to oscillate at its natural resonance frequency for a short while. When the rhumbatron oscillates the two grids alternate between positive and negative, one being negative whilst the other is positive. These voltage changes affect the electron beam. When the grid nearest to the cathode is positive (with respect to the whole rhumbatron) the electrons are accelerated, and when it is negative they are retarded. Hence, they emerge from the two grids at various speeds. This is called velocity modulation of the electron beam. After travelling a short distance to the negative plate and partly back the faster electrons have caught up the slower ones and the electrons are

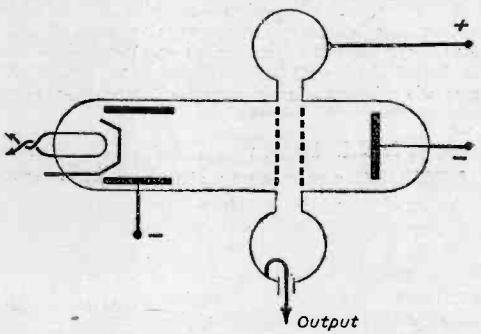


Fig. 1.—The standard circuit of the reflex Klystron.

"bunched," that is, at regular intervals along their tracks the electrons are much more closely packed.

The voltages on the three electrodes are so adjusted that these "bunches" of electrons arrive back to the rhumbatron in phase with the voltage oscillations on it, the sudden flow of current due to the electrons arriving on the grid, keeping the oscillations going continually.

It is quite obvious that the Klystron will only oscillate for certain critical rhumbatron and plate voltages, which are such that the pulses or bunches of electrons arrive back in phase with the oscillations.

The Circuit

The circuit (Fig. 2) is very simple, consisting of two power packs, the larger supplying 1,500 to 1,800 volts at about 6 mA., and the other supplying a variable voltage at negligible current between about 100 to 350 volts.

The actual components used will depend largely on what the reader has available, as none of them is very critical, except the milliammeter and small voltmeter. The author used metal rectifiers for the E.H.T. supply, but valve rectifiers will work just as well. The larger voltmeter is not essential, and is merely used to see if there is any considerable drop in voltage due to the current flowing through

the Klystron. (If this voltmeter is used it should be the electro-static type or one with very high internal resistances.) The variable resistance R1 should be capable of passing a fairly heavy current (this current depending on the resistance of the voltmeter and the size of condenser used) and of varying the plate voltage sufficiently.

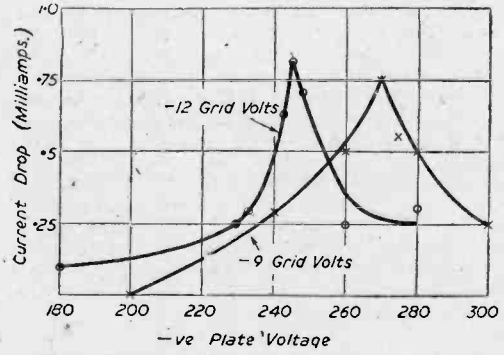


Fig. 3.—Two typical current-drop graphs.

Adjusting the Plate Voltage

The rhumbatron voltage is dependent on the current through the Klystron which, in turn, is dependent upon the grid bias voltage; therefore, the only two voltages which can be varied are the plate voltage and grid voltage. In the circuit shown it is more convenient to vary the plate voltage for a particular fixed grid voltage in order to find the best operating conditions.

As with more conventional oscillators, the current flowing through the circuit drops when the circuit is oscillating. This property is used to find the correct plate voltage. The total change in current flowing through the Klystron on varying the tuning of the rhumbatron from a maximum to a minimum (hence from a tuned position to an untuned position) is measured for various plate voltages (taken at intervals of about 20 volts). If a graph is plotted it shows a definite maximum; the voltage at which this occurs is the best operating voltage for that particular grid voltage.

The experiment can be repeated for several different grid voltages to discover which is best. The author obtained best results with the grid at −12 volts and the plate −270 volts. Fig. 3 shows two typical graphs obtained.

A Simple Way of Measuring the Wavelength

A whole series of small aerials is made varying in length from about 1 cm. to 10 cm. These aerials are made out of stout wire shaped like a letter "L" the base of the "L" being the same length for each aerial (about 8 mm.). These aerials are connected in turn to the plug of the co-axial output cable and the change in current measured for each one (the valve being in the best operating condition).

If a graph is plotted showing the current change against the aerial length (as shown in Fig. 4), it will show maximums at intervals of a quarter of the wavelength. The first maximum is at a quarter of a wavelength, and multiplying this length of aerial by 4 gives the approximate wavelength.

It is not necessary to switch off the E.H.T. every time a different aerial is connected. Rubber gloves or rubber-handled pliers may be used with safety, *if you keep one hand in your pocket.*

The Receiver

The simpler the receiver the better. It is very difficult to build an efficient valve receiver for such high frequencies, and a crystal detector was found to be the best solution. The old fashioned cat's-whisker type is useless, but either a Germanium diode or silicon wafer type work admirably. These detectors can easily be obtained either as advertised in this magazine or from a "surplus" dealer.

It is a good idea to build the crystal and quarter-wavelength aerial on to a small insulating handle,

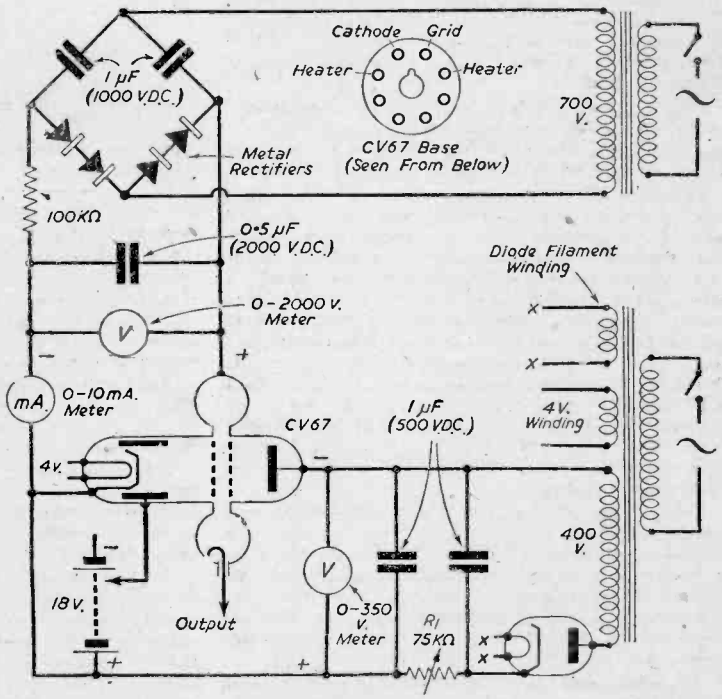


Fig. 2.—Circuit of reflex Klystron and associated power supplies.

so that its position can easily be moved about in a field under test. If a microammeter is used in place of the earphones a fairly good idea can be obtained of the vector diagrams of different types of aerials.

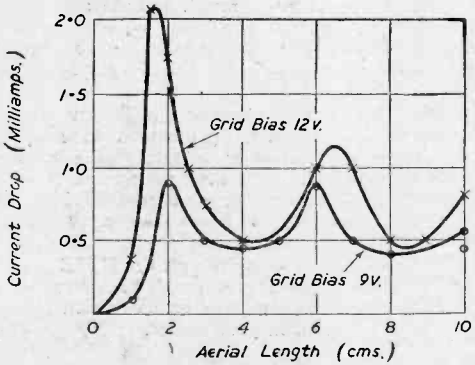


Fig. 4.—Wavelength graphs.

The signal can be heard in the 'phones because the high frequency is modulated by mains ripple getting through the filters in the voltage supply. If a quarter-wave aerial is placed in the co-axial output plug the signal can be received up to distances of a few feet.

Wave Guides

At high frequencies a long co-axial line, like the usual inductance-capacity tuning unit, becomes inefficient and difficult to tune, etc. Wave guides replace co-axial lines at such high frequencies as are used for radar, at such frequencies wave guides being nearly 100 per cent. efficient.

They consist of either circular or rectangular metal tubes, the energy being introduced at one end by a quarter-wave dipole, and extracted at the other by either a similar dipole, a slot, or by just allowing the waves to go out into space through the open end. Sometimes funnel-shaped tube endings are used to get a required shape of the beam of waves produced. The waves travel down the tubes by multiple reflections from the sides.

The only practical difficulty in wave-guide construction is the corners. The wave guide must either bend with its sides parallel (which is very difficult), or a plane metal mirror is to be used so that the waves are reflected according to the laws of optics; in fact, a good way of testing a corner is to send a beam of light down the guide and see if it comes out at the other end.

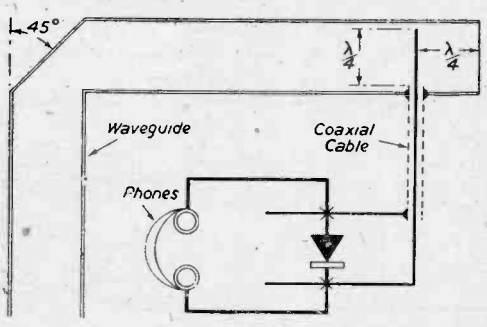


Fig. 6.—A waveguide corner and detecting device.

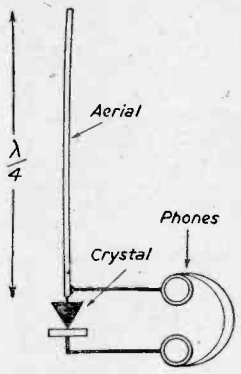


Fig. 5.—This diagram shows the simplicity of the receiver. The crystal is one of the Germanium or similar types.

The easiest type of guide to make is the rectangular; the size is not very critical, and 5 cm. by 7 cm. is quite suitable. (It is advisable to make wave-guide corners out of paper before cutting them out of sheet tin, etc., as they may be quite complicated.)

The most simple way to connect the Klystron to the wave-guide system is just to place one open end over a quarter-wave aerial and place the tube as near as possible without touching the Klystron. If it does touch, a serious shock may result.

The waves may be detected either by placing the aerial of the receiver through a small hole exactly a quarter of a wavelength from the flat end of the tube, or by using a matched short co-axial line as shown in Fig. 6. The crystal should be held to the two parallel wires by crocodile clips attached to the earphone leads, and it is slid along until a maximum signal is heard.

Voltage Reference Tube

THE rapid development of electronic devices during recent years has increased the need for a compact and stable source of voltage reference for direct use in electronic circuits. Such a need is fully met in the voltage reference tube 85A1 recently introduced by Mullard Electronic Products, Ltd. Working in a self-regulated, constant current circuit, this tube provides a voltage of extremely high stability such that it may, in the majority of applications, be used to replace a standard cell as a built-in source of voltage reference.

In construction, this new tube resembles a normal neon gas discharge tube, and is of all-glass construction with loctal type base.

The ignition voltage of the tube is 125 volts and the normal operating voltage is 85 volts. After an initial ageing period, the short-term stability (100 hours maximum) is better than 0.1 per cent., whilst the stability over a period of 1,000 hours is better than 0.2 per cent.

The tube operates as a regulator over a current range of 1-8 mA, but for optimum performance as a source of voltage reference, it is recommended to operate the tube at 4.5 mA.

A Singing Robot

How to Make an Amusing Radio Robot That Talks and Sings in a Realistic Manner

IT is possible for almost anyone to construct in relatively little time and with inexpensive materials, a most amusing robot, whose active jaw and dancing eyes as he recites a poem or sings a song will entertain for hours!

First a suitable mask is required—one of those sold for the celebrations of Guy Fawkes Day will do very well. This may be mounted as shown in Fig. 2—the lower jaw having been first cut away. To the latter a T-shaped piece of paper may be glued, so that, when the jaw is fixed in position, the cross of the T stands behind the eyeholes and may have drawn upon it two black pupils.

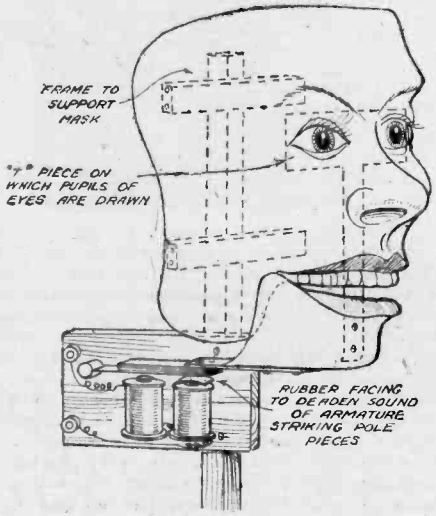


Fig. 2.—Method of mounting the face mask and lower jaw.

On the upright support are mounted the magnets and armature of a discarded electric bell. To the armature the lower jaw is now affixed, and we have the simple elements of our talking robot.

As the actual operating current will be relatively large, it is necessary to construct the following relay system—a system well worth assembly, as it may be used for wireless control of models, selenium cell operation, etc.

Fig. 1.—The robot mounted on a chair with the portable set underneath.

Referring to Fig. 5, the wires leading from the robot are connected to a relay R1, also made from a discarded bell, which closes the circuit of a two-cell cycle-lamp battery (Fig. 6), thus operating the jaw and eyes of the figure. The contacts of this relay are the armature itself, and the pole pieces of the magnets, and, in order to prevent sticking, a small square of thin sheet-copper was soldered to the contact face of the armature.

Relay R1 is operated by R2 and a small 4.5 volt flashlight battery. R2 is a sensitive 5 mA. relay, which can probably be picked up at one of the stores selling ex-service equipment, and it, in turn, is actuated by a valve. The latter may be any amplifying or power valve, and should have the requisite grid bias battery, as indicated in Fig. 5.

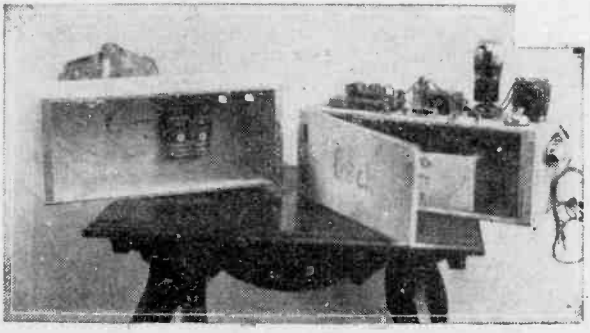


Fig. 3.—The "works" of the robot.

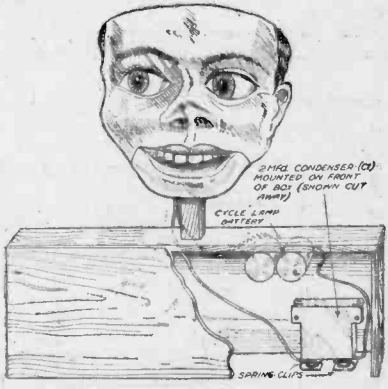


Fig. 6.—How the relays are covered to deaden sound.

The plate and H.T. + terminals go to the relay, and the grid and filament to the secondary of an ordinary intervalve L.F. transformer in the usual way.

A lead from the primary of the transformer is plugged in to the loudspeaker output terminals of a wireless receiving set (a portable receiver makes the whole assembly entirely independent of connecting wires to the mains, etc.) and it is now only necessary to tune in to a broadcast of speech or song when

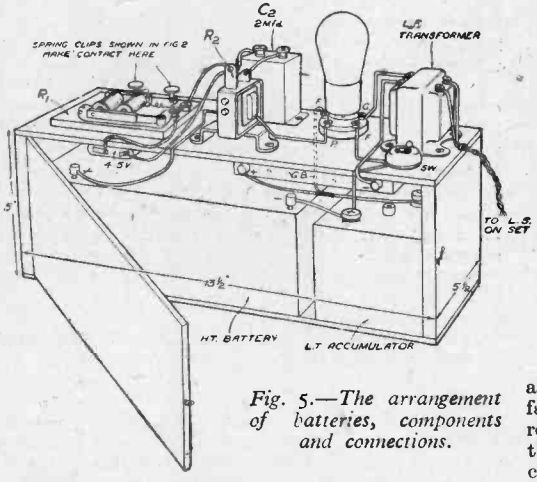


Fig. 5.—The arrangement of batteries, components and connections.

the talking robot will tell you all he hears! A microphone connected to the pick-up terminals of the wireless set will enable you to talk through the figure so that, with a friend, you might give a most entertaining dialogue!

Fig. 4.—The completed robot ready for work.

The figure may be completed with an overcoat and hat (Fig. 4) or in almost any way the constructor fancies. My own model sits on a chair, the portable receiver being arranged underneath (Fig. 1) so that there shall be no interaction between the relay circuits and the aerial of the set. Condensers C1 and C2 have been included for this reason, but, of course, there is still a little interference, which can be entirely eliminated only through the use of separate wireless sets for the sound, and for the operation of the figure—the latter set having the loudspeaker switched off.

I.P.R.E. Annual Dinner

THE annual dinner of the Institute of Practical Radio Engineers was held in London at the Connaught Rooms recently. The guests included Mr. H. A. Curtis, secretary of the R.T.R.A.; Mr. L. A. Sawtell, Mullard Electronic Products, Ltd.; Mr. F. J. Camm, Editor of PRACTICAL WIRELESS; and Mr. W. R. West, secretary of the B.V.A.

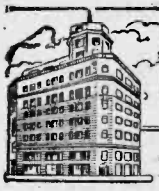
Mr. H. A. Curtis, who was elected an hon. life fellow of the Institute, said that there was a great need for first-class service engineers, and the I.P.R.E. was doing good work in establishing their qualifications. The Institute was now beginning to develop after laying a sound foundation of practice, and membership already exceeded a thousand. An equal number of students would soon be joining these ranks.

The president of the Institute, Mr. J. F. Tomlin, said the growth of the I.P.R.E. had been deliberately curbed by selective conditions of admission, a policy which ensured that all members upheld the highest standards of radio engineering. Their constant aim was to get the public to insist upon honest and expert service by qualified engineers.

After paying a special tribute to Mr. W. Edwardes, the general secretary, Mr. Sawtell, said that he foresaw the time when the name of the I.P.R.E. would be changed to Institute of Practical Electronic Engineers. Developments already taking place indicated that there were far wider fields than radio and television maintenance to be covered.

Mr. Camm felt that the occasion could not pass without referring to the great loss of Mr. D. F. Harrison, late general manager of Mullards, who had done so much to encourage the objects of the I.P.R.E. As a special tribute he offered a premium of 20 guineas towards a Harrison Memorial Lecture.

In thanking the speakers, and in welcoming the other guests, Mr. Fevyer, this year's chairman, stated that the Institute was still seeking premises for a student-training workshop, a project proposed and sponsored by Mr. Camm a year ago. He was also able to refer to two annual premiums of 20 guineas each for the best design of any radio or television equipment and for the best piece of test-equipment—the former donated by member Fletcher and the latter by himself. Another member had offered to give up one of his own advertisement spaces in the *Wireless Trader* for an I.P.R.E. announcement. Mr. Fevyer welcomed representatives of the trade and technical press who were present, and said that no opportunity could be passed for recognising how much the strength of the industry was vested in these organs. The Institute's Exhibition of Servicing, planned for the new year, promised to be a great success.



ON YOUR WAVELENGTH

By THERMION

Denmark and British Television

THE demonstration by the Radio Industry Council of British television in Copenhagen produced some favourable newspaper comments, such as "clear and interesting reproduction," "it worked," "an inspiring experience," "an absolute living picture," and so on. Of course Denmark is not far advanced in the science of television, but this demonstration has undoubtedly awakened interest and a demand that their technicians should do something about it.

"Picture of Dorian Gray"

APROPOS my paragraph on this subject in our issue dated November last, Miss Constance Cox says: "'The Picture of Dorian Gray' is not, as stated by you, a play by Oscar Wilde. The original is a novel and the announcement both in the *Radio Times* and before the broadcast was "'The Picture of Dorian Gray,' by Constance Cox, from the novel by Oscar Wilde." Since there was comparatively little dialogue in the novel that I could use and the play lasted for one and three-quarter hours, the dialogue was almost entirely my own apart from my additions to the plot to make the story more dramatic and stage-worthy. Perhaps you will examine the novel and see if you can find a scene where Adrian Singleton tries to redeem himself, a love scene between Dorian Gray and Lady Gwendoline Wotton, or a scene in which Dorian shows Lord Henry the changed portrait."

I gladly give publicity to the comments of the remarks of Miss Cox, but the gravamen of my remarks concerned the credit and I maintain that the correct description should have been "'The Picture of Dorian Gray,' by Oscar Wilde, adapted by Constance Cox." I do not think that Charles and Mary Lamb, for example, claimed to have written Shakespeare's plays because they wrote "Tales from Shakespeare." I further maintain that anyone who adapts should not be put forward as though he or she were the originator of the theme. After all, if Oscar Wilde had not written his book there would have been no play. I thoroughly enjoyed the play which I consider one of the best which the B.B.C. has put over.

This is a modern tendency which I do not find to my liking. Search the announcements of the recent film production of "Hamlet" to find any reference to Shakespeare. You will find the leading actors, the producers, the photographers, and almost the office boy (of course, on the screen known as Director of Communications) cornering the credit, whilst Bill Shakespeare, if mentioned at all, appears in very small type as if he had written something of which he should be thoroughly ashamed. In saying this I do not detract one moment from the skill of the adaptor.

Television in the Cinema

MANY years before the war Baird gave a demonstration of large screen television which indicated that it was practicable. The announcement that the cinemas by arrangement with the B.B.C., are to show certain of the television programmes under a collateral arrangement, whereby the B.B.C. will broadcast certain films will do much to enhance the popularity of television. The screen, in fact, will provide a vast advertisement for it. Lots of people have had money tied up in television, without drawing dividends, and unless the Government nationalises that industry, too, it may be that they will even get their money back, which is as much as they can hope for, in these days, when the profit-motive is looked upon as something revolting and indecent.

The Suppression Wrangle

THE House of Commons was by no means unanimous when it debated the Bill making the suppression of electrical apparatus compulsory. The Postmaster-General informed the House that an effective mains suppressor costing about 14s. would serve five or six pieces of electrical apparatus in the house. He further stated that it would be some time before suppression of radio interference could be dealt with at the manufacturing end. He promised, however, to look into the matter to see if a method could be devised of shifting the responsibility from the user to the manufacturer.

Surely the Bill should have taken this point into consideration. It could have stipulated that as from an appointed day all manufacturers of electrical apparatus should supply them to the public with suppressors fitted. I am by no means convinced that it is impossible for manufacturers of television apparatus to design receivers unaffected by electrical interference.

However, in view of the P.M.G.'s remarks, the Opposition withdrew an amendment to the Wireless Telegraphy Bill. One member stated that an extra 2s. on the cost at the time of manufacture would do all that was necessary. Presumably he was dealing with electrical apparatus only as distinct from television receivers, for I am certain that a television receiver could not be suppressed for so small a sum.

Factories with electrostatic-operated dust collectors produce considerable interference, and the problem of suppressing such installations which radiate interference over a considerable area is a major one. The provisions of the Act, it was stated, would only apply to a few "selfish" people, but Mr. Henry Strauss said: "I wonder what causes most selfishness, the housewife using an electric kettle or people using loudspeakers which are on at all hours of the day and night, and preventing all serious work and recreation?"

Ten-metre Converter

Instructions for Modifying ex-Service R.F. Unit Type 24

By J. W. BARTON

R.F. Units Type 24 are now being advertised in these columns at 10s. and less. Though the case may be in poor condition, the interior is often brand new and in a very short time and at practically no expense a really efficient 10-metre converter can be built.

The first signals heard were from New Zealand on a Sunday morning, all Q5R9, whilst in the evening scores of U.S.A. hams were heard, particularly those of Southern California.

Fig. 1 shows the modified grid circuits, 35 condensers and resistors being removed quite easily, and replaced by seven, only three of which are additional. These comprise three 15 $\mu\mu$F. variable condensers, and if these are not to hand, they can be easily obtained by stripping down any S.W. condenser and leaving just one fixed and one moving vane.

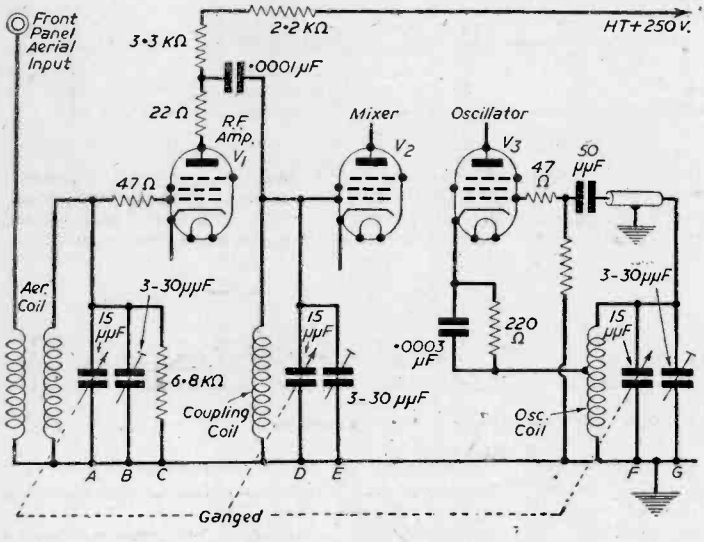


Fig. 1.—Theoretical circuit of the converter.

The modification will probably be most easily carried out by adopting the following procedure:

Dismantling

(1) Unbolt the fifteen Philips type 3-30 $\mu\mu$F. trimmers from the vertical panel. This will also free their associated parallel fixed condensers and resistors.

(2) Unsolder, or cut as close to the tag as possible, the connections to the three-gang switch. These can be distinguished, since they either pass through grommets in the chassis or go to the coils.

If this is done carefully, *no additional wiring will be required.*

(3) Remove the knob, cover and fixing nut of the three-gang switch. Note that the knob is secured by a pin as well as a grub screw, but the pin is easily tapped through.

(4) Unbolt the switch rear on the back panel. Remove the switch and it will bring with it the fifteen trimmers, etc.

(5) Withdraw the spindle from the switch and replace it in the unit and carefully mark its exact position on the two vertical inner metal screens. This will enable the three-gang variable condenser to be centred correctly.

(6) In some cases it may now be necessary to remove the centre upright metal screen (six screws) and file a slightly larger gap to take the bushing of the variable condensers.

Rebuilding

(1) Mount and couple together three 15 $\mu\mu$F. variable condensers, using *flexible* couplers, as in Fig. 2. If any mechanical difficulties are encountered remove the front panel.

(2) Carefully align the moving vanes and slightly increase their spacing, each by the same amount.

(3) Replace (in position shown in Fig. 2) one trimmer and parallel 6.8 kΩ. resistor in the R.F. compartment, one trimmer in the mixer compartment, and one trimmer in the oscillator compartment.

The positions shown must be adhered to to use the existing wire of the unit and to use the shortest lengths of wire.

Connections

(1) Connect moving vane tag of each of the three ganged condensers to the chassis tags.

(2) *R.F. Compartment.*—Connect fixed vane to V1 grid top cap and to outer end of coil, and to the trimmer.

(3) *Mixer Compartment.*—Connect fixed vane to V2 grid top cap and to outer end of the coil and to trimmer, and to the lead passing through the bottom of the chassis.

(4) *Oscillator Compartment.*—Connect the fixed

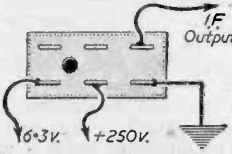


Fig. 3.—Connections to the Jones plug.

vane to the outer end of the coil, to the trimmer, and to the bottom of the "pipe."

The connections to the Jones plug are shown in Fig. 3. A short length of co-axial cable was used to carry the I.F. output.

Setting-up

Connect the I.F. output to the aerial terminal of the main receiver. Adjust the main receiver to about 8.3 Mc/s. Screw in the R.F. trimmer about one-third, mixer trimmer about two-thirds, and the oscillator trimmer rather more than this. Set the main tuning condenser vanes about half-way in, remembering that early evening and week-ends are the best times for signals.

Using a trimming tool, adjust the oscillator trimmer for resistance noise level and/or signal. This is the really critical adjustment and unless obtained signals will not be heard.

Readjust the main receiver tuning for maximum signal, and also the mixer and R.F. trimmers. A little practice will soon give the optimum setting.

If desired a slow-motion drive and dial can be added, though this may not be necessary since the 10-metre band covers between approximately 20 deg. to 160 deg. rotation of the tuning condenser. Both an outdoor vertical "Skyrod" and an 8ft. indoor horizontal wire gave excellent results.

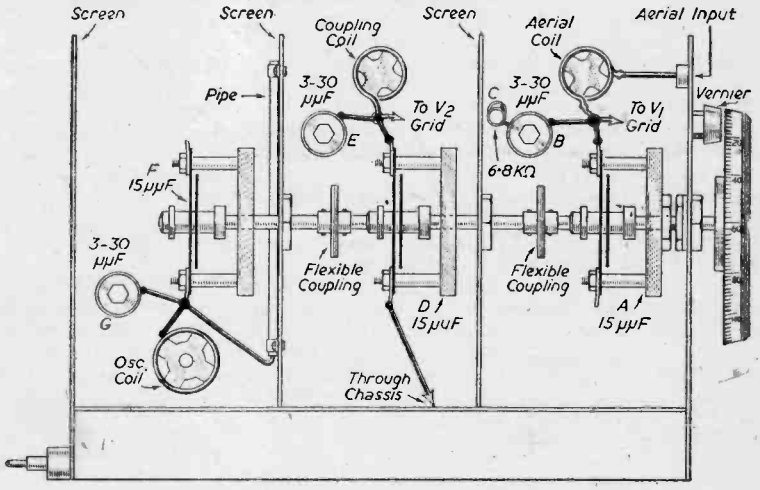


Fig. 2.—Layout and wiring details.

Wide Range Ohmmeters–2

Further Notes on this Useful Test Instrument

By E. N. BRADLEY

THE ohmmeter may be built up in any suitable wooden or metal case and literally any layout may be used so long as the switch and the "high" and "low" input terminals are well insulated. The only point of difficulty which might arise is obtaining R1 and R2, the 5 and 50 mA. shunts.

Code Switch : Switch Position	"High"	"Low"
1	OFF	OFF
2 "R"	0-10,000 ohms	0-100 ohms
3 "R×10"	0-100,000 ,,	0-1,000 ,,
4 "R×100"	0-1 megohm	0-10,000 ,,

It is sometimes possible to obtain shunt resistors for standard instruments from good supply houses (when ordering or buying a shunt the exact meter details, 0.5 mA. and 500 ohms internal resistance, in the present case, must be quoted), or it may be possible to make up the shunts on a Wheatstone Bridge. If the shunts cannot be bought and a bridge is not available, however, it is still possible to make the shunts, though considerable care must be taken to avoid error.

Connect the 0.5 mA. instrument in series with a good battery—a 12 volt accumulator is ideal—and a suitable rheostat; a 25,000 or 50,000 ohm wire-wound rheostat or potentiometer would serve with a 12 volt battery.

By adjusting the rheostat, bring the instrument to its full-scale reading—ensure, before switching on, that the rheostat is fully in circuit so that the instrument cannot be overloaded and damaged—then connect across the instrument terminals, leaving the rheostat set at the "full-scale" position, a length of resistance wire. The wire acts as a shunt and the meter reading falls.

On the 0.5 mA. instrument the first shunt needed is a 5 mA. shunt; i.e., a shunt which will reduce the instrument sensitivity to one-tenth of its unshunted value. It is, therefore, only necessary to adjust the length of wire connected across the meter terminals so that the meter reading falls to one-tenth of full-scale—in other words, to 0.05 mA.—to produce a 5 mA. shunt.

Refinements

Obvious refinements suggest themselves, such as heavy brass connecting lugs sweated to either end of the shunt wire, or winding the shunt wire on a former so that the wire cannot stretch, and so increase its resistance. The shunt must be checked again after such treatment (and any soldered joints

made must be allowed to cool completely to room temperature before the final check) and any slight change of resistance corrected. If the resistance is a little low, gently stretching or scraping the wire will increase it; if the resistance is a little high, tinning along the wire for a very short length at a time will reduce it.

Accuracy

Both time and patience are required if an accurate shunt is to be made by this method, and a frequent check should be made with the shunt disconnected to ensure that the instrument is still reading exactly on the full-scale mark; nevertheless, good shunts can be produced in this way.

With the 5 mA. shunt constructed and checked, connect it across the instrument and again make the instrument read to full-scale by adjusting the rheostat; the reading is now 5 mA. To make the 50 mA. shunt again connect a length of resistance wire across the meter terminals, adjusting the wire till the meter again reads to one-tenth of the full-scale reading. When this shunt is finished off it will be the 50 mA. shunt. Any error in the 5 mA. shunt will, of course, cause the 50 mA. shunt to be inaccurate.

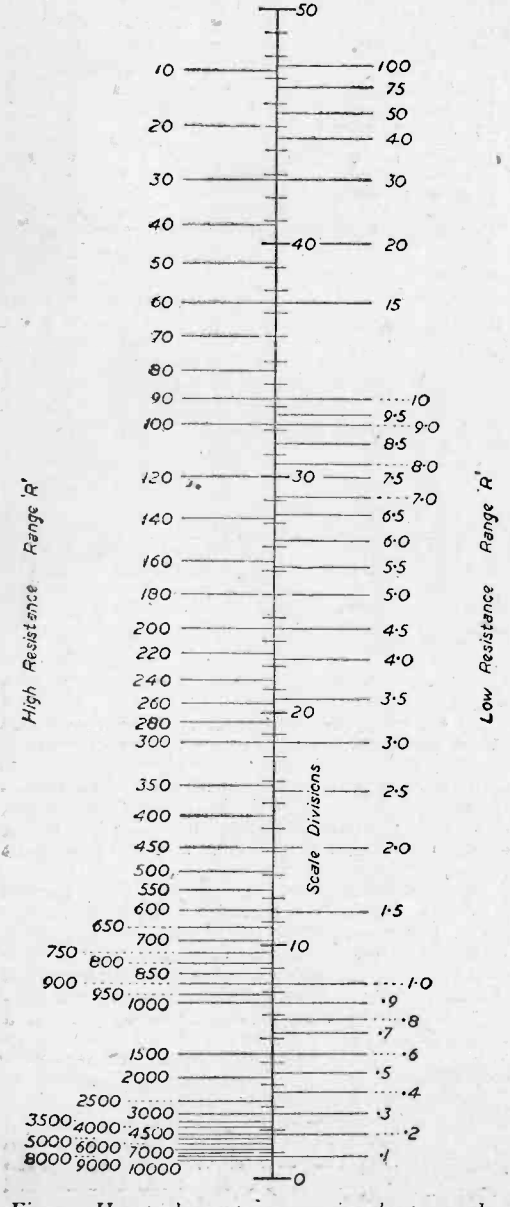


Fig. 5.—How to draw up a conversion chart or scale.

A Very Wide-range Ohmmeter

Whilst the ohmmeter shown in Fig. 3 has a useful range, the circuit does not cover all resistance values to be found in some modern receivers and radio gear. Accordingly, a more comprehensive circuit is shown in Fig. 4, with an overall range which is, in effect, 100 times greater, since it will measure resistances between the values of 0.01 ohm to 10 megohms.

The greater sensitivity is obtained by using a more sensitive moving-coil instrument as the meter indicator; in place of the 0.5 mA. instrument is employed a 50 microamp instrument. The circuit of Fig. 3 is extended to include an 0.5 mA. shunt, with the necessary further series resistances, and the rheostat is increased to 10,000 ohms with suitable shunting resistors.

A 5-way switch is necessary in place of the 4-way switch used for the simpler ohmmeter (a 6-way switch may be used if a 5-way switch is unobtainable), so that a banked switch with separate leaves will be required, and the switch coding is as follows:

Switch Position	"High"	"Low"
1	OFF	OFF
2 "R"	0-10,000 ohms	0-10 ohms
3 "R × 10"	0-100,000 ,,	0-100 ,,
4 "R × 100"	0-1 megohm	0-1,000 ,,
5 "R × 1,000"	0-10 megohms	0-10,000 ,,

Components Required

The components required for this instrument are:

M, 50 microamp, 500 ohm resistance moving-coil instrument.
R1, 55.55 ohm, 0.5 mA. shunt.
R2, 5.05 ohm, 5 mA. shunt.
R3, 0.5 ohm, 50 mA. shunt.
R4, 160,000 ohms.
R5, 15,000 ohms.
R6, 16,000 ohms.
R7, 1,600 ohms.
R8, 150 ohms.
R9, 6,800 ohms.
R10, 470 ohms.
R11, 62 ohms.

All fixed resistors, 1 per cent. accurate, for best results, but 5 per cent. resistors can be used. All resistors, 1 watt rating. Except for R1, R2 and R3, all resistors are standard values.

R12, 10,000 ohm wirewound potentiometer.
S 1, 2, 3, 3-pole 5-way rotary switch.
B, 9 volt grid-bias battery.
2 control knobs, pointer type.
4 terminals.

The conversion chart for the very wide-range ohmmeter is drawn in exactly the same way as that for the simpler ohmmeter, and the figures of Table 1 can be used to determine the points on the chart if the "low" range figures are divided by 10. Thus, for the low range, the figures will commence at

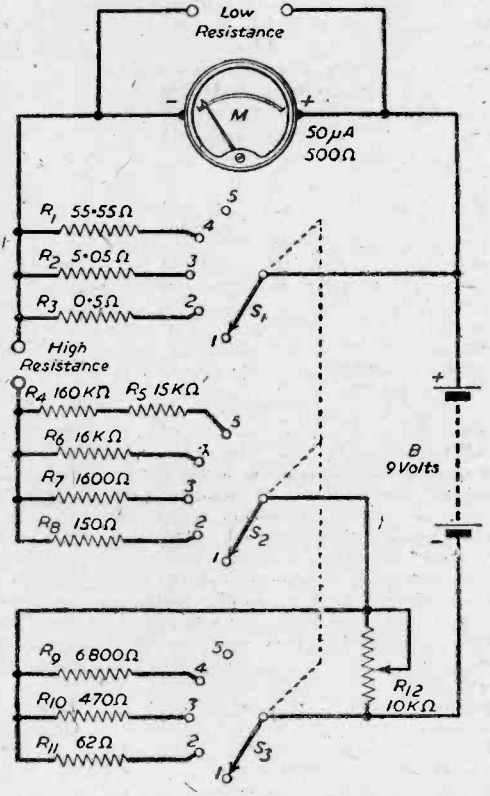


Fig. 4.—Circuit of the very wide-range meter.

10 ohms, the scale reading being 47.61, and carry down to 0.01 ohm at a scale reading of 0.98. When using the conversion chart with the very wide-range ohmmeter, it must be remembered that there are three multiplying factors for the instrument, the factor "R × 1,000" having been added.

TABLE I

Resistance-scale Reading Conversion Figures for Range 'R' of the Wide-range Ohmmeter

HIGH "R"		LOW "R"	
Ohms	Scale Reading	Ohms	Scale Reading
10	47.36	100	47.61
20	45.00	75	46.87
30	42.85	50	45.45
40	40.90	40	44.44
50	39.13	30	42.85
60	37.50	20	40.00
70	36.00	15	37.50
80	34.61	10	33.33
90	33.33	9.5	32.75
100	32.14	9	32.14
120	30.00	8.5	31.47
140	28.12	8	30.76
160	26.47	7.5	30.00
180	25.00	7	29.16
200	23.68	6.5	28.26
220	22.50	6	27.27
240	21.42	5.5	26.19
260	20.45	5	25.00
280	19.56	4.5	23.68
300	18.75	4	22.22
350	17.98	3.5	20.58
400	15.51	3	18.75
450	14.28	2.5	16.63
500	13.23	2	14.28
550	12.32	1.5	11.53
600	11.54	1	8.33
650	10.84	.9	7.62
700	10.22	.8	6.89
750	9.67	.7	6.14
800	9.23	.6	5.35
850	8.73	.5	4.54
900	8.33	.4	3.70
950	7.96	.3	2.83
1,000	7.62	.2	1.92
1,500	5.35	.1	.98
2,000	4.10	—	—
2,500	3.35	—	—
3,000	2.83	—	—
3,500	2.44	—	—
4,000	2.15	—	—
4,500	1.92	—	—
5,000	1.73	—	—
6,000	1.45	—	—
7,000	1.25	—	—
8,000	1.10	—	—
9,000	.98	—	—
10,000	.88	—	—

Canadian Television

BRITAIN'S television prospects in Canada are excellent. That is how Sir Ernest Fisk, managing director of E.M.I., sums up the position following his visit to Canada.

Sir Ernest, on his return to England, revealed that although the decision on applications for commercial transmitting licences has been indefinitely postponed, the Governors of the Canadian Broadcasting Corporation have decided that C.B.C. will establish stations requiring Government loan. A viewer's licence at 10 dollars yearly is envisaged as well as sponsored television programmes.

In his conferences with C.B.C. Governors and Canadian Government Officials, Sir Ernest Fisk has been able to assure the authorities that transmitting equipment for the U.S. standard of 525 lines could be supplied by Britain with British high-quality standards of engineering, which would save Canada hard currency dollars.

In the opinion of Sir Ernest Fisk it will be two years before there is any appreciable market in Canada for television receivers, but both British and Canadian makes will then be readily saleable.

Long-playing Micro-groove Records

Latest American Development Described by DONALD W. ALDOUS

THE production of a satisfactory long-playing record has been investigated many times from the earliest days of commercial sound recording and reproduction, but without real success. One can instance the "Longanote" record, marketed by Filmophone Flexible Records, Ltd., in 1932, which was recorded by the constant groove-speed method and gave 18 minutes recording per 12in. side, and later, in America, an embossed recording system, which, used in conjunction with constant groove-speed recording, provided about 30 minutes' music or 45 minutes' speech recording on one side of a 12in. disc. However, these and other systems were not capable of providing the technical quality demanded.

The latest attempt has come from America, where Dr. Peter Goldmark, director of research of the Columbia Broadcasting System, Rene Snepvangers and William S. Bachman, of the Columbia Record Company, have developed a long-playing record for commercial sale.

High-quality

The research began in 1944 with the experiments of Dr. Goldmark, who, although a C.B.S. television engineer, is an enthusiastic gramophone record collector and music-lover, and, in common with fellow-enthusiasts, sought a long-playing record that would yield uninterrupted high-quality reproduction of classical music and save storage space taken up by the usual multi-record sets necessary for complete orchestral and operatic compositions.

The outcome of the combined work of Dr. Goldmark and his associates is the Columbia LP record recently placed on the American market. These are 10in. and 12in. pressings of a high-grade plastic material (unfilled vinyl) with a playing-time of up to 25 minutes per side. To achieve this long-playing time the pitch, i.e., the number of grooves per inch, has been increased from the usual 96 to 100 to 224 to 260 grooves per inch, and the rotational speed reduced to 33⅓ r.p.m., with a minimum recording diameter of 4¾in.

To reproduce such a fine groove, known as a "micro-groove," a special stylus and pick-up are necessary. The reproducing stylus has a tip radius of only 0.001in. and the pick-up used is of the crystal type with a head weight of 6 grams. The Philco Corporation has collaborated in the design of a suitable two-speed turntable which is rumble-free and constant at the slower speed, and is fitted with the lightweight pick-up and separate arm for LP records, priced around 30 dollars.

Groove Shape

The record groove radius is less than 0.00025in. and the groove shape has an included angle of 90 deg. The linear speed and the wavelength are decreased, in the change of speed from 78 to 33⅓ r.p.m., by a factor of about 2.3, but the tip radius has been reduced by a factor of 2.5 to 3, so that the loss of high frequencies due to varying diameters from outside to inside of the disc is less than on ordinary records.

A pre-emphasis recording characteristic that follows closely the N.A.B. (National Association of Broadcasters) standard transcription curve is employed. Above 200 c/s. the recording characteristic is identical with the N.A.B. transcription curve, reaching 16 db. pre-emphasis at 10,000 c/s., relative to the 900 c/s. level. Below 200 c/s. the characteristic is higher than the N.A.B., being 7 db. above constant amplitude at 50 c/s. The absolute level recorded is about 4 to 6 db. lower than that of an ordinary record. A dynamic range of 45 db. is claimed.

Noise-free

The micro-groove lacquer originals are re-recorded from 16in. slow-speed lacquer masters, made with a useful response up to 12 kc/s. and cut during sessions from 1939 onwards. To obtain a final quality noise-free record the processing must be done with the greatest care, and it is stated that each individual pressing is checked.

Interesting examples of the couplings that will be available are: "Pastoral Symphony" of Beethoven, Movements 1 and 2 (Side 1) with "Pastoral Symphony," Movements 3 and 4 (Side 2); Ravel's "La Valse" (Side 1) with Debussy's "Iberia" (Side 2). Compositions or items of less length than one side are arranged in bands, so that any separate section can be played as desired. The Columbia 12in. LP records are sold at 4.85 dollars each and the 10in. LP records cost 3.85 dollars.

The practical advantages of ease of playback, locating particular sections on a record, saving of storage space when coupled with uninterrupted reproduction of a high standard, would seem to make these LP micro-groove records the gramophone industry's answer to the intensive development and application to-day of magnetic tape recording.

French Television Service

Some Interesting Data of the Present-day System

By A. K. CLARKE

THE French Television Service, which resumed transmissions on October 1st, 1945, has a unique advantage, as far as the service area is concerned, by virtue of the height of the radiating system, which is situated at the top of the Eiffel Tower, some 984ft. above its surroundings. The eight vertical dipoles comprising the vision aerial are fed by a coaxial line running from the transmitter, which has a peak power of 30 kW. and which is located at the foot of the tower. The quarter-wave sound aerial is similarly fed by a coaxial cable.

The headquarters of the organisation are remote from the transmitter and are housed in a palatial building in rue Cognac Jay in the Government offices district of Paris, just behind the Quai d'Orsay. This building houses the new studios which are being built, and also the administrative departments. Liaison between the studios and the transmitter is again by a coaxial cable, just over half a mile in length.

In addition to the studios there is a mobile equipment consisting of three vans which can either be connected to a cable running to the headquarters for local events or for more distant items transmission is made to the studios by radio link operating on decimetric wavelengths, the aerial being suspended from a captive balloon.

The above is a brief outline of the service, which will now be described in more detail.

Signal Details

The signal, which is positive, does not differ greatly from the English system. The vision signal being on a frequency of 46 Mc/s and the sound on 42 Mc/s, 450 lines and 25 frames (interlaced) are the standards used at the moment, although an 819 line system will be in operation before the end of the year.

Line pulses occupy 18 per cent. of the line time, the "blacker than black" amplitude being of the order of 30 per cent. of "peak white," but it is intended that this amplitude shall be increased to 40 per cent. In the equipment built by the Compagnie Française Thomson-Houston vision is suppressed for at least 15 lines, line pulses being lengthened and doubled in frequency, while the Compagnie Française de Television utilises a signal which suppresses vision for at least 15 lines as before, and also in the middle of the frame pulse period transmits six line pulses which each last for 90 per cent. of the total line time. This type of signal permits easier integration to form the frame pulse, and also has certain advantages on the transmitting side.

The band width transmitted by this latter system is greater than 3.5 Mc/s—at one time a greater band width than the aerial could adequately deal with, but this is not the case now.

Construction of new studios is rapidly nearing conclusion in the Video-Centre, the big new Studio No. 2 being almost completed. Actually in use is Studio No. 1, which is in the nature of a small theatre seating 265, to which the public can be admitted. A glass-enclosed control room occupies the position normally taken by the operating box in a cinema, and looks down over the banked seating a distance of some 120ft. to the sets. Three hundred kilowatts of lighting is available to illuminate the scenes. When the studios were first put back into service after the war this control room was the only one available, telecine also being monitored from this point.

Interior of lorry containing 441/819 line mobile equipment.

Studio No. 2 is a much larger and more ambitious one, measuring 80ft. by 55ft. A steel structure in the roof carries three travelling cranes for moving scenery, carrying lighting equipment and microphones, etc., whilst in the floor of the studio and covered over to permit normal use as a studio is a swimming bath. An auxiliary glass-lined chamber will permit cameras to take under-water views of the swimmers. A lighting console in the studio itself will be operated under instructions relayed by headphones from the control box, which overlooks the studio from a considerable height.

Also nearly completed are other smaller studios designed primarily for interviews and other presentations of a more intimate nature such as cabarets and small revues.

The camera control equipment and scenery generators are housed in a separate room. A comprehensive intercommunication system links the whole organisation, including the transmitter hall at the base of the Eiffel Tower, permitting commands to be relayed by loudspeakers in the

control rooms and generating rooms and by loudspeaker or headphones in the studios.

Mobile Equipment

As previously mentioned, current events are covered by the mobile equipment, using either cable or radio link. This equipment has been designed to operate at will on either 441 lines or the new 819 line high-definition system which will be in operation this year. It was used with the

Turret-headed camera and the balloon carrying the aerial as used for certain O.B. programmes.

new three-lensed turret-headed cameras to transmit the finish of the great French cycling event, the Tour de France in the Parc des Princes.

For more distant events beyond the range of this mobile service use is made of 16 mm. ciné equipment, the films being transmitted the same evening if desired.

The telecine equipment is very comprehensive. Two 35 mm. sound projectors project towards each other, the beams being rotated through 90 deg. by 45 deg. prisms so that either of them forms an image on the iconoscope. The changeover at the end of reels is entirely automatic: A small metal ribbon is threaded through several sprocket holes at the end of each reel and provides an electrical connection which starts up the second projector and also moves the associated prism into position. The 16 mm. projectors are arranged similarly, all four projectors being on the same mounting, so that the same iconoscope can be rotated for use with either the 16 mm. or 35 mm. system.

Until recently, since only the one studio was available, films have of necessity been transmitted in a large part of the programmes, but as the new studios come into operation more "live" television will be possible.

Another interesting piece of equipment is the ciné camera which is electrically locked to the transmission and which records all television programmes directly from a high intensity photographic tube. It is intended that all programmes shall be so "canned" for two reasons: Firstly for representation a second time on the French service at greatly reduced cost, and secondly for exchange with other countries.

Stereoscopic Pictures

Programmes of an educational nature will also be transmitted using a stereoscopic system with 819 lines. The two images appearing on the screen are reconstituted as a stereoscopic pair by visual aids resembling binoculars, the resulting image appearing as a 409 line stereoscopic image.

For the new 819 line service which will be coming into operation soon and which will work on a frequency in the neighbourhood of 200 Mc/s, plans are ready for the mass production of receivers capable of operating on both systems at a price not greatly exceeding that of the present ones. It is difficult to form an estimate of the number of viewers in the Paris area, but it is probably between 8,000 and 10,000 at the moment, although sales of receivers are steady, and amateur constructors are well catered for, so that this may well be a conservative assessment.

It is obvious, in view of the economic conditions in France, that French television is existing on a limited budget, and within the limited framework of that budget, the progress that has been made is very praiseworthy.

Future Plans

Looking into the future, plans are being made for the erection of further stations at Lille and Lyons. Radio links will be used between the centres, utilising a frequency in the neighbourhood of 900 Mc/s. The choice of Lille for the second station is particularly interesting, since this town is very close to the Franco-Belgian frontier. A large part of Belgium will thus be within the service area, providing a possible export market for set manufacturers. Reception will undoubtedly be possible in southern England also, but whether it will be reliable remains to be seen.

These extensions of the service will, of course, need additional finance, and it may be noted that although French television is a Government service, the question of sponsored programmes will most probably be considered as a means of raising funds. What that decision will eventually be remains to be seen.

Finally, the writer wishes to express his indebtedness to the various officials of Tele Paris, who facilitated his tour of the organisation and supplied the information contained in this article.

Amateur Licences

TECHNICAL and Morse qualifications obtained by service in certain trades or specialist duties in the Armed Forces during or since the war are at present accepted by the G.P.O. as giving exemption from parts of the amateur wireless examination.

The G.P.O. states that as from January 1st, 1949, these qualifications will be regarded as valid only if applicants have been engaged in the Services in one of the specified trades within two years of the date of the application for a licence.

Practical Hints

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints."

SPECIAL NOTICE

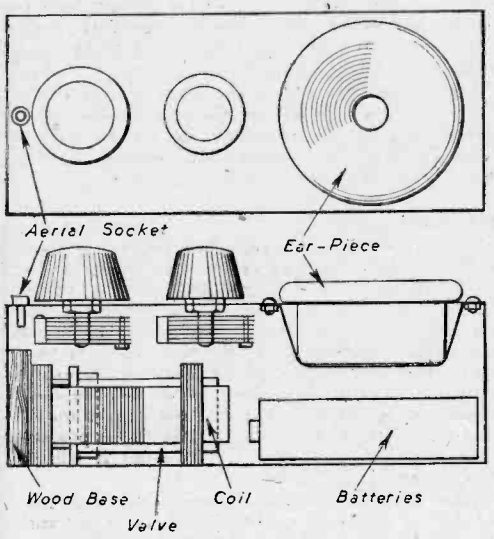
All hints must be accompanied by the coupon cut from page iii of cover.

Radio Hand Set

THE accompanying illustration gives details of a radio hand set which was successfully used with the 6K7 set described in the July issue and which may be of interest to your readers.

The case consists of a tin of suitable dimensions (say 6in. x 2in. x 2½in.). A hole is cut in the lid to take a single ear-piece.

The tuning condensers can be mounted on the lid as shown and the knob next to the ear-piece should be as small as possible to allow for ear room.



A one-valve receiver in the form of a hand set.

The other components can be placed in any position inside the tin.—MICHAEL S. COOK (Dollis Hill, N.W.10.).

Dial Lights

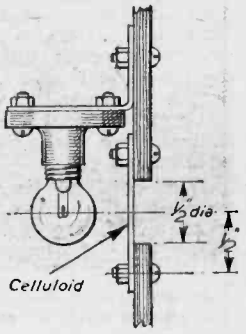
A SHORT time ago it was found necessary to include several pilot-lamps in a piece of equipment under construction.

The lamps were devised as follows:

Ordinary flash-lamp bulb-holders were bought at 3d. each from the popular stores. These were then mounted on bent strips of aluminium, as will be apparent from the diagram, behind the panel. Then a ¼in. hole was drilled over the bulb filament (first removing the bulb and holder), and opened out to ½in. D with a file-tang. Two 6 B.A. clearance holes were then drilled ¼in. either side of the edges of the ½in. hole, i.e., ¾in. from the centre of the ½in. hole. A piece of green or red celluloid was next cut in such a way that the two 6 B.A. bolts held it in place flush behind the panel, and over the hole. When this was completed, the edge of the ½in. D hole was "picked out" in black dope with a fine paint brush. Then the green or red celluloid was finally bolted in position with 6 B.A. roundhead brass nuts and bolts, and the round heads also picked out with black dope. The aluminium bracket holding the bulb-holder was fixed on the panel with one countersunk steel (or plated) 6 B.A. bolt.

The finished article presents quite a commercial appearance, and has the advantage that it is unobtrusive when not lit up.

Any colour of celluloid can, of course, be used. One side of the bulb was earthed, the other contact being taken direct to one side of a valve heater.—TERENCE P. HATTON (Kingston-on-Thames).



A simple and effective dial light.

Meter Shunts and Chokes

WHEN constructing shunts for test meters, and small H.F. chokes for certain types of U.S.W. equipment, some constructors find difficulty in obtaining suitable formers upon which to wind the wire. Provided that the shunts will only call for a small quantity of wire, and that the chokes can be "pile wound," one of the most useful types of ready-made former is a Dubilier wire-end resistor of the ceramic type. By obtaining one with an extremely high resistance (which will have little effect upon the shunt or choke) the wire may be overwound on the ceramic body and the ends soldered to the wire ends of the resistor. Remember that the actual resistor is wired in parallel with the shunt or choke and choose a suitable value so as not to affect the final component.—W. C. COX (Highgate).

Three-valve Re

A Combined Battery-operated Receiver and

By F.

THIS piece of apparatus will function as either a receiver or signal-generator, a switch being provided to accomplish the necessary changes in the circuit. Used as a receiver, it covers all wavelengths between approximately 10 and 3,000 metres, while as an oscillator a further range down to 5 metres is provided by means of the second harmonic. When calibrated, as will be explained, the unit is useful for short-wave and general reception, for testing the A.F. stages of receivers, for testing and ganging I.F. and R.F. circuits, for checking frequencies and the wavelengths over which coils and frame-aerials will tune, etc.

How the Unit Operates

An examination of the circuit (shown in Fig. 1) will help to make this clear. When used as a signal-generator, the A.F. valve generates an audio-frequency note, and this provides a modulated R.F. signal at the socket marked "R.F. Output." This signal can be adjusted to any desired frequency by means of the waveband switch and .0005 μF tuning condenser.

From the socket marked "A.F. Output," a note suitable for testing speakers, amplifiers, etc., is obtained.

Occasionally, it is an advantage to use some external means of modulation (such as pick-up or microphone). To do this, the link connecting the A.F. valve grid to the transformer is removed and the pick-up connected to the terminals marked "A."

When used for reception, the A.F. valve functions as an amplifier, feeding earphones (or a speaker on strong stations). Tuning is then carried out in the usual manner.

In both positions of the Oscillate/Receive switch the screen-grid valve acts as a buffer, ensuring that calibration is not upset by external capacities, whether these be from an aerial when the unit is used as a receiver, or from components in the receiver being tested when the switch is turned to the "Oscillator" position. The potentiometer controls volume both for reception and R.F. output purposes.

When the unit is used for reception, an aerial is connected to the "R.F. Output" socket. This aerial must be disconnected when the unit is used as an oscillator, otherwise interference will be radiated. Instead, a test prod with a screened lead is used, as shown in Fig. 7, this being plugged into the R.F. or A.F. output sockets, as required.

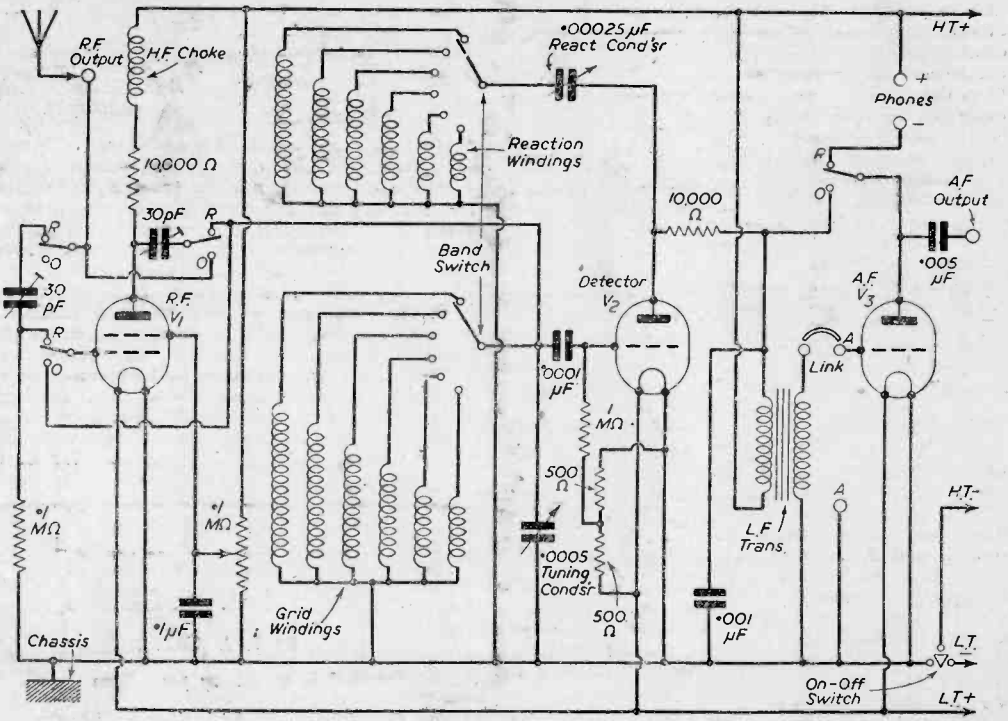


Fig. 1.—Theoretical circuit of the combined receiver-generator.

ceiver-generator

l Generator for Use from 5 to 3,000 Metres

RAYER

Constructional Details

Fig. 7 also shows the panel layout, and the positions of the other components will be seen from Figs. 2 and 3. Both rotary switches are mounted back slightly from the panel, brackets or plates and long bolts being used.

Construction should be absolutely rigid, stout material being used with extra brackets between chassis and panel if necessary. The panel itself was made with a ¼in. flange bent forward all the way round. Besides the strengthening effect, this enables the flanges to be bolted to the metal cabinet all the way round, making the whole absolutely solid. The metal cabinet is essential for stability of calibration and freedom from hand-capacity effects on the higher frequencies. It also prevents troublesome stray radiation. A panel size about 12in. by 8in. with a cabinet about 6½in. deep is convenient.

Tuning and reaction condensers should be of high quality to prevent noises and erratic operation. The reaction condenser is mounted back from the panel on an insulated extension spindle because it is connected directly in the anode circuit of the detector. If it is mounted on the panel all the six reaction windings will have to be returned to the fixed plates, and this will introduce so much stray capacity that it will be difficult to prevent oscillation on the higher frequencies. Because of this the method of connection shown is recommended.

Wiring Up

Figs. 4 and 6 illustrate the switch connections, and other wiring is shown in Figs. 2 and 3. All leads should be short and solid. Those to coils 1 and 2, in particular, must not be longer than absolutely necessary. Also avoid unnecessary capacity between grid leads and chassis, otherwise it will not be found possible to reach the low wavelengths on range 1.

Insulated terminal or socket strips are used for 'phone connections, etc., as shown in Fig. 7. An additional terminal is mounted directly on the panel so that a flexible lead may be taken from it to the screening of the test prod lead. This terminal is also used as a return if a pick-up or other means of external modulation is employed.

Battery leads are brought through a hole near the bottom of the panel.

The Tuning Coils

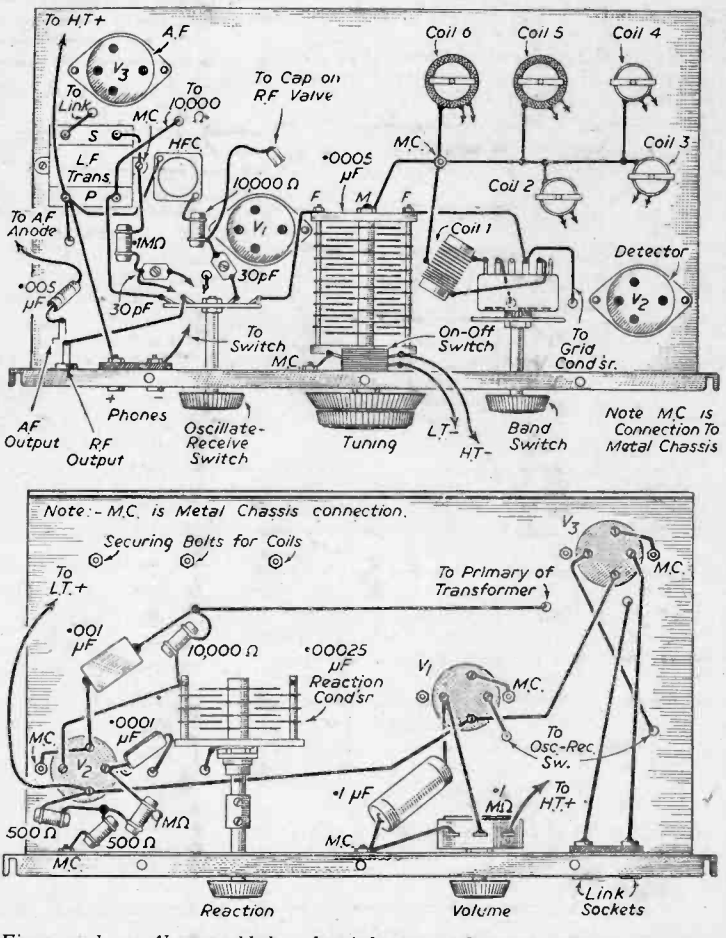
Small coils of various makes can be bought, or if these are to be made, the number of turns on the grid windings can be as follows:

Coil 1.—6½ turns 18 s.w.g. wire on ⅝in. diameter former.

Coil 2.—12 turns 20 s.w.g. wire on ¾in. diameter former.

Coil 3.—23 turns 32 s.w.g. wire on ¾in. diameter former.

Coil 4.—77 turns 32 s.w.g. wire on ¾in. diameter former.



Figs. 2 and 3.—Above and below chassis layout, and an indication of the wiring.

Coil 5.—212 turns 36 s.w.g. wire on 1½in. diameter former.

Coil 6.—600 turns 42 s.w.g. wire on ⅝in. former in three piles of 200 turns.

With coils 1, 2 and 3, turns should be spaced by the diameter of the wire used. The coils should be varnished after winding to prevent turns moving. The frequencies and wavelengths covered will be approximately as follows :—

Coil 1.—30 to 15 Mc/s. 10 to 20 metres.
Coil 2.—15 to 7.5 Mc/s. 20 to 40 metres.
Coil 3.—7.5 to 2,500 kc/s. 40 to 120 metres.
Coil 4. 2,500 to 600 kc/s. 120 to 500 metres.
Coil 5.—600 to 200 kc/s. 500 to 1,500 metres.
Coil 6.—200 to 100 kc/s. 1,500 to 3,000 metres.

(This disregards the overlap at the extreme ends of each tuning range.)

For reaction, the smaller coils will require three-quarters the number of turns used on the grid windings. With the larger coils, only one-third to one-quarter of the number of turns on the grid windings will be necessary, or reaction will be too fierce.

Fig. 5 shows the coil connections. Each coil should be tried and the number of reaction turns reduced if reaction is fierce. With the larger coils it is some advantage to use reaction coils wound on

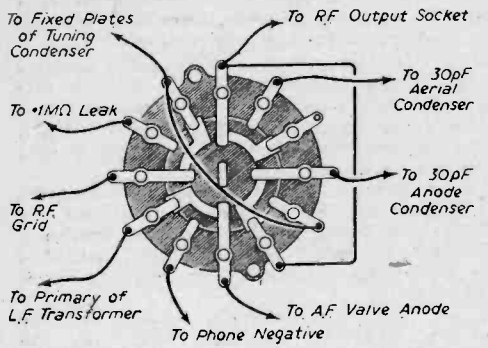


Fig. 6.—Connections to the generator-receiver switch, shown in the "oscillate" position.

a strip of insulating tape placed round the bottom of the grid winding. Capacity between reaction and grid windings, and between anode and grid leads, should be avoided, otherwise the setting of the reaction condenser will slightly influence tuning.

Testing the Unit

Connect accumulator and 60-volt H.T. battery, turn switch to "Receive" and switch on. With 'phones connected and a short aerial plugged into the "R.F. Output" socket, stations should be received throughout the ranges tuned in the usual way. The tuning condenser should be fitted with an efficient reduction drive and accurate dial. On ranges 1 and 2 operation of the reaction control will also be quite critical. The two 30 pF. condensers should now be adjusted for best results. Reducing their capacity will increase selectivity. The two lower terminals in Fig. 7 should be left bridged with a piece of wire.

When the switch is turned to "Oscillate" an audio-frequency note should be heard in 'phones or speaker connected between the "A.F. Output" socket and chassis. If not, reverse the leads to the secondary of the transformer. If the note is unpleasant, it can be modified by replacing the panel link by a resistor of 10,000 to 500,000 ohms. This can be left connected as it will not influence reception.

If the test prod lead is plugged into the R.F. socket and the prod touched on the aerial terminal

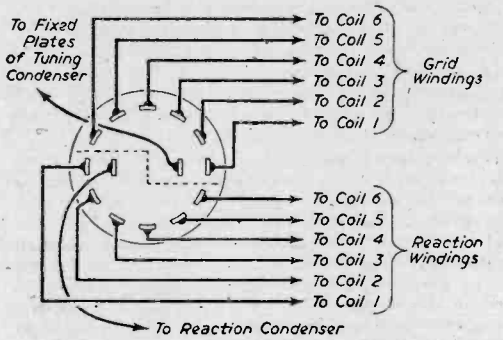


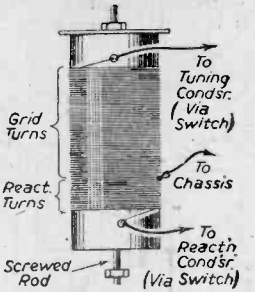
Fig. 4.—Details of the wiring to the band-switch.

of a receiver, the A.F. note generated by the oscillator will be heard when generator and receiver are set at the same wavelength. Note that the reaction condenser must be left so that the detector is oscillating, and that coil 1 will not oscillate throughout the whole of the range because of the comparatively large tuning capacity. However, coil 2 provides sufficient overlap despite this.

When the apparatus is found to operate correctly it should be bolted in the metal cabinet.

For the apparatus to be most useful, it should be calibrated accurately throughout the six ranges provided, both for reception and signal generation. If tackled in the proper manner this calibration is not difficult and it may also be carried through

Fig. 5.—The tuning coils are constructed as shown in the illustration which also indicates the connections.



with ranges where no known stations will normally be received. (E.g., range 5, 500 to 1,500 metres, useful for I.F. checks with some receivers.)

If a calibrated all-wave oscillator is available, it is only necessary to set the unit to "Receive" and tune oscillator and receiver through the wave-ranges, noting down dial-readings on the latter against frequency readings on the former.

(To be continued.)

Beam Power Tetrodes

Their Practical Applications Explained

by E. G. BULLEY

VALVES of this design can be considered as a development from the pentode and consist of an emitter, two grids and an anode. It can be stated, therefore, that they are similar in many respects to the common screen-grid valve but having the electrical characteristics of the pentode.

It is common knowledge that in the pentode a suppressor grid is located between the screen grid and the anode, the presence of which assists in the prevention of secondary emission.

Beam power tetrodes, however, although having the same number of electrodes as the ordinary tetrode, are so designed that secondary emission is prevented by having the helix wire of the two grids wound with the same pitch and assembled in optical alignment. That is to say, each grid turn on the control grid is in line with the equivalent turn on the screen grid. This arrangement reduces the screen current, because the electron emission from the cathode is directed towards the anode in beams and the function of the suppressor grid is, therefore, performed by the presence of a minimum potential between the screen grid and the anode. In other words, an electric field or concentrated space charge is set up which suppresses any secondary emission to the anode.

This phenomena gives the beam power tetrode the characteristic of the pentode. It is as well to mention, however, that beam forming plates, or earth plates as they are sometimes called, are used in these valves to assist in directing the electron beams and so keep the electrons in the active portion of the valve. These earth plates are always at cathode potential.

The advantages of beam power tetrodes are such that they enable a high-power output to be obtained with a fairly low grid drive, resulting in high-power sensitivity and anode efficiency. The use of these valves reduces the actual number of stages required to obtain a specific power gain and they are, therefore, very useful in A.F. and R.F. amplifiers, oscillators and frequency doublers.

The Tritet

Reference to Figs. 1 and 2 indicate the application of such valves in typical oscillatory circuits, the former being the well-known "tritet oscillator" and the latter the "E.C. oscillator," or, to put it in full, the electron-coupled oscillator.

To-day, beam tetrodes are used in many audio-amplifier designs where two such valves in push-pull give a very large output with the minimum amount of harmonic distortion. This can be attributed to the fact that the second harmonic cancels out with the push-pull arrangement, and in addition the valves have a fairly low impedance.

For the interest of the reader, two such valves in push-pull are shown in Fig. 3, this circuit being one of an experimental television sound receiver. The first stage is a regenerative detector followed by an L.F. amplifier, phase splitter, and then two beam tetrodes in push-pull for output.

Referring now to the circuit shown in Fig. 3, let us first examine the detector stage. This consists of a set of coils wound on a common paxolin or ebonite former, details of which are given in Fig. 4. The coils are made to slide along the former to give optimum adjustment of coupling.

The anode coil L1 and the variable condenser C1 determine the degree of regeneration, and the grid coil L2 is tuned by C2. L3 is the aerial coil. R.C. coupling is used to couple stage 1 to that of stage 2, and this method of coupling is adopted throughout.

R3 and C4 form a decoupling arrangement, the former also acting as a voltage dropper for the H.T. supply to the anode of V1, whilst R2 is the anode load resistance of V1. An R.F. choke is

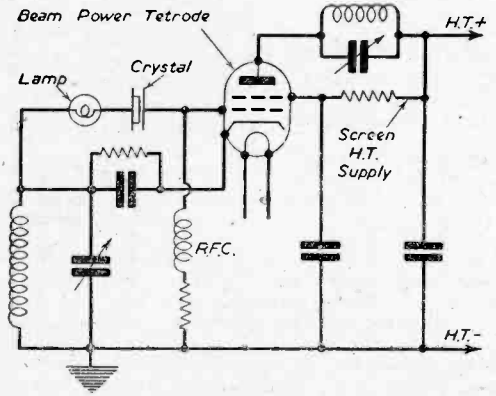


Fig. 1.—The well-known tritet oscillator.

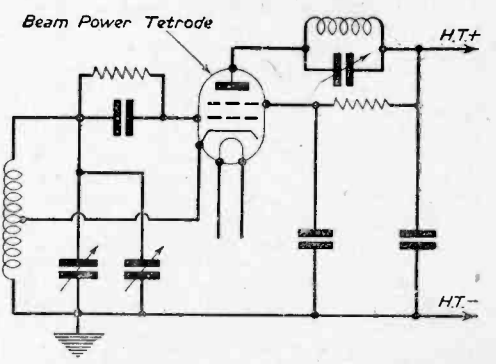


Fig. 2.—A typical electron-coupled oscillator.

incorporated between the anode load R2 and the anode of V1, the presence of which needs no explanation.

The signal is transferred from this stage to that of the L.F. stage via a coupling condenser C17 and a volume control, the latter controlling the strength of the signal being transferred. R4 and C5 in this stage form a similar decoupling arrangement as explained in stage 1, whilst R6 and C6 provide the automatic bias for V2.

The Phase Splitter

Coupling to V3, which in this case is the phase-splitting stage, is by means of C8, C7 and R10, being the conventional by-passing arrangement. Before proceeding with the description of the circuit, it is as well at this point to explain why it was necessary to include a phase splitter.

This stage enables signals of equal strength to be fed to the grids of the beam power tetrodes, and yet be 180 deg. out of phase with each other, which in turn results in the two tetrodes in push-pull giving two separate anode currents, equal in value but in opposite phase. These anode currents must combine and assist one another so as to get the desired output.

This problem is mostly encountered with the

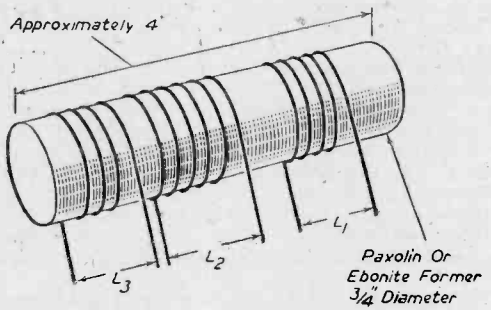


Fig. 4.—Details of the coil. L1 (anode) 5 turns 16 S.W.G. located approximately 1in. from L2. L2 (grid) 6 turns 16 S.W.G. located near L3. L3 (aerial) 4 turns 16 S.W.G.

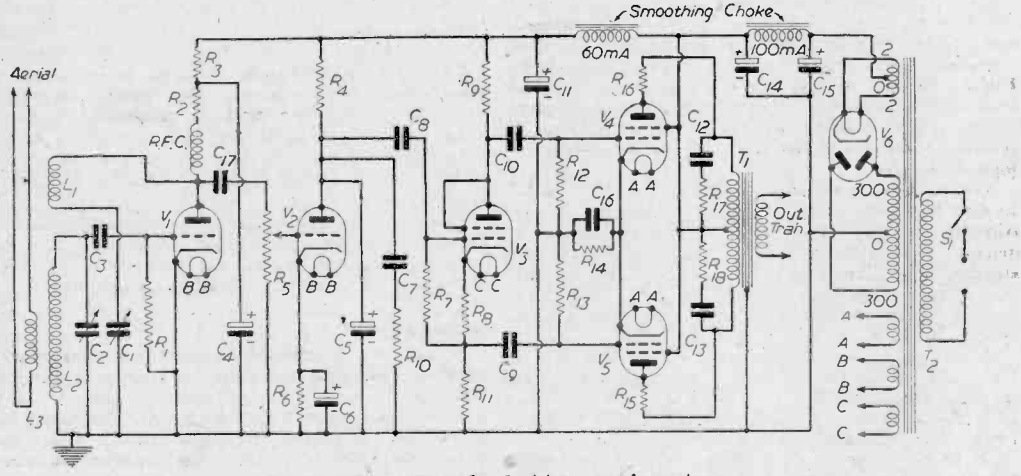


Fig. 3.—Experimental television sound receiver.

LIST OF COMPONENTS

R1—3 ohms.
R2—20k ohms.
R3—50k ohms.
R4—10k ohms.
R5—100k V.C.
R6—1,400 ohms.
R7—0.5 megohm.
R8—750 ohms.
R9—3k ohms.
R10—250k ohms.
R11—3k ohms
R12—250k ohms.
R13—250k ohms.
R14—100 ohms.
R15—100 ohms.
R16—100 ohms.
R17—4,700 ohms.
R18—4,700 ohms.
V1, V2—HL41.
V3, V4, V5—Pen. 45.
V6—UU6.
C1—100 $\mu\mu$F variable.
C2—50 $\mu\mu$F variable.
C3—100 $\mu\mu$F.
C4—4 μF 350 v. D.C. (electrolytic).
C5—4 μF 350 v. D.C. (electrolytic).
C6—50 μF 12 v. D.C. (electrolytic).
C7—.01 μF 350 v. D.C.
C8—.1 μF 350 v. D.C.
C9—.1 μF 350 v. D.C.
C10—.1 μF 350 v. D.C.
C11—8 μF 350 v. D.C. (electrolytic).
C12—.005 μF 350 v. D.C.
C13—.005 μF 350 v. D.C.
C14—8 μF 350 v. D.C. (electrolytic).
C15—8 μF 350 v. D.C. (electrolytic).
C16—50 μF 12 v. D.C. (electrolytic).
C17—1 μF 350 v. D.C.
T1—Output transformer to suit Pen 45's in push-pull.
T2—Mains transformer. 300-0-300 sec.
4 volt 2 amp.
4 volt 2 amp.
4 volt 5 amp.
2-0-2. 2 amp.
240 v. A.C. Primary.
S1—Switch, Bulgin, 250 v. 5 amp., or can be included in volume control.
Smoothing chokes as specified for Fig. 3, or similar.

push-pull arrangement where R.C. coupling is used, and it is as well to mention that a beam power tetrode was used as the phase-splitting valve in Fig. 3, but with the screen grid strapped to the anode. The reason for this is that a valve of high efficiency and fairly low impedance is obtained, but, of course, a suitable triode can be used.

Further examination of stage 3 will show that R9, the anode load of V3, is equal in value to R11. This is essential in order to obtain correct operation of this stage.

Coupling of V3 to that of the output stage, namely, the two beam tetrodes in push-pull, is by means of condensers C9 and C10. The biasing components for these valves are R14 and C16.

The high-tension supply to the anodes of the tetrodes is conventional, that is, the supply is fed into the primary at the centre-tap and the anodes obtain their D.C. supply from opposite ends of the primary winding of the output transformer.

It will be noted, however, that a small resistor is included in each anode lead (R15 and R16), the purpose of which is to act as a stopper, this being essential when tetrodes are used in push-pull—in order to maintain stability. The tone of the receiver is somewhat improved by strapping across each half of the primary winding a resistor and a condenser; the values for each half should be equal so as to avoid distortion.

We have now discussed in general a circuit in which beam tetrodes are used. The power pack is conventional and requires no detailed explanation except that it employs an indirectly heated full-wave rectifier and the usual filter system.

Locating Thunderstorms by C.-R. D/F

THE location of a thunderstorm area can now be fixed with a high degree of accuracy up to a range of 1,500 miles by the use of special cathode-ray direction-finding apparatus known as "Sferics" sets made by The Plessey Co., Ltd., Ilford, Essex, to the design developed by the National Physical Laboratory for the Meteorological Office. Sets have been installed at four specially selected sites controlled by the British Meteorological Service.

The apparatus at each station is accommodated in two huts, one of which houses the cathode-ray direction-finding (C.-R. D./F.) equipment, consisting of power supplies, signal amplifiers and display unit. The other contains the aerial system, which comprises four multi-turn loops, 6ft. high, two of which are placed in N.-S. line, and two in the E.-W. line.

A compass scale is superimposed on the face of the C.-R. tube, for recording the direction of the impulse received from a lightning flash occurring in a storm area. Impulses received from a N.-S. or E.-W. direction would be picked up by the N.-S. or E.-W. aerials respectively, causing a bright line to appear momentarily on the face of the cathode-ray tube, along the corresponding diameter of the scale. Signals from any other direction will give a line on the tube in an intermediate position.

Ensuring Accuracy

Although a lightning flash may have a duration of only a few thousandths of a second, a "persistent" fluorescent coating on the tube gives an after-glow which enables the observer to make an accurate reading of the bearing. In addition, a device known as a "brilliance modulator," is provided by means of which only the flashes with amplitudes greater than the predetermined value are shown on the cathode-ray tube. This eliminates flashes from storms which are too distant for their positions to be located accurately, and allows the operator to concentrate on the more important flashes.

Operating Frequency

The receivers operate on a frequency of about 12.5 kc/s., equivalent to a wavelength of 24,000 metres, this being the frequency at which maximum energy is radiated by lightning discharges. Another reason for using this low frequency is the freedom from interference by commercial W./T. stations.

The four observation stations are located at Dunstable, Bedfordshire; Camborne, Cornwall; Leuchars, Fifeshire; and Irvinestown, Northern Ireland. Dunstable is the control station of the four, and is also, of course, the central forecasting station and communications centre of the Meteorological Office.

Observations are made simultaneously from the four stations 12 times daily, between 7 a.m. and 10 p.m. and the results are plotted at Dunstable on a special chart of gnomonic projection.

Aiding Aircraft

The "fix" is normally taken to be at the centre of the quadrilateral made by the four bearings. The information is then broadcast over the teleprinter network and by W./T. and enables pilots of aircraft, particularly those flying over comparatively short routes to the continent, to avoid "storm" areas and thus reduce the risk of accidents. The information is also of great importance to the synoptic meteorologist in the analysis of daily weather charts.

An important feature of the "Sferics" organisation is that by using the C.-R. D./F. equipment only a few observers are required for a wide "storm" coverage of 1,500 miles radius.

A "Utility" Four

Preliminary Details of an A.C./D.C. 4-valve Receiver Which Can be Used with Any Desired Form of Tuning.

By W. J. DELANEY (G2FMY)

IT is extremely difficult to design a receiver of any type which will satisfy everybody. Whenever we describe a receiver in these pages we receive letters from readers complaining either that it is another battery set, or that it caters for the expert, or that it is too simple, and so on. It is apparent, however, that mains-operated receivers are required by the majority, and also that compactness is one of the main modern requirements. Some attempt has been made, therefore, to design a receiver which could be called more or less "adaptable." To keep to simple ideas is also a rather difficult task and, finally, it has been decided to offer a small A.C./D.C. type of receiver which can be built very cheaply, and in which no set type of tuning system has been incorporated.

Circuit Features

Nothing exceptional is claimed in the design, a standard T.R.F. circuit being used, but two or three separate models have been built up with different forms of tuning and the one actually now in use is of the "pre-set" type, being fixed-tuned to the two principal stations. It is built into a small home-made wooden case, white cellulosed, and resembles one of the popular American midgets, being used in a bedroom for special early morning and late night broadcasts. With its self-contained 5in. loudspeaker it can produce nice volume for normal listening, but can be turned down to the "personal" level so that no one outside the room can hear it.

To keep expense down, the line-cord system of supply has been adopted, and here there are also alternative ideas which each constructor can consider. By using two lengths of cord, as will be described next month, a tapped line-cord effect may be obtained, or the H.T. dropping resistor may be of the larger type built into the set. Using the tapped line-cord, however, enables all heat to be kept outside the cabinet.

The chassis is of a commercial type readily available from almost any good radio store. It can, however, easily be made from aluminium or sheet steel. The valves are of the standard type, at least two of which can also be readily obtained in the form of ex-Service types.

Tuning Circuits

It is in the tuning arrangements that the main novelty lies. In the existing model, two standard Wearite "P" type coils are used, each having its own pair of pre-set condensers. By mounting one above the chassis, and one below, no additional screening is called for and the circuit is quite stable. A rotary switch is used to select either "Home" or "Light," but it is a simple matter to replace these coils by either standard dual-range components and a tuning condenser, or even a set of all-range coils. The main difficulty which the home-constructor experiences in building receivers such as these is that a properly calibrated tuning dial cannot be obtained for any type of coil. Each maker adopts a slightly different coverage or uses a slightly different inductance value, and although calibrated dials are available it is generally found that they do not match up with the coil and condenser combination which is used. It is possible to draw your own dial by taking fixed points first located by tuning-in the actual stations, but many constructors prefer the neatly printed dial, usually with separate colours for the different wavebands, and probably the only way to obtain such a dial which is satisfactorily calibrated is to obtain one of the completely wired tuner units. These are, of course, too large to incorporate in the receiver under discussion.

The Cabinet

At the moment bakelite cabinets suitable for the home-made receiver are apparently not available, and the constructor will have to make his own. Plywood is also in short supply, but suitable small pieces may be found in the "spares box" or obtained from packing boxes, and a very neat design may easily be made up by using some quarter-round moulding for corners. This is now available from dealers who specialise in woodworking accessories, and the completed cabinet may be given a very professional finish resembling bakelite by painting thickly with cellulose paint. Louvres for the speaker may be contrived with thin strips of wood set at an angle, and this enables one to dispense with the silk or other fabric which is sometimes used and which often detracts from the finished appearance.

Main Features

To sum up the design, the circuit uses an R.F. stage and detector, each consisting of H.F. pentodes (12K7), an output pentode (35L6, or 50L6) and a rectifier (35Z4). No reaction is employed, and a resistor is used for H.T. smoothing, thus removing one of the larger iron-core components. R.C. coupling is used between detector and output stage and the overall size of the chassis is 9½in. by 5in. by 1¼in. With valves in position the internal clearance required in the cabinet is 10in. by 5¼in. by 5¼in.

So far as the question of cost is concerned it is not possible to make a definite statement. Using ex-Service valve-holders, valves, and other parts, the entire set should be obtained for less than £5. The usual warning must, of course, be issued regarding the use of these surplus parts. Although valves, etc., may be "guaranteed," they are, in many cases, merely tested for unbroken filaments, and the emission may be very low. Similarly, electrolytics may have been stored under unsuitable conditions and have a very high leakage or even be open-circuited.

Underneath the Dipole

Television Pick-ups and Reflections. By "THE SCANNER"

TIME flies! Television as a properly organised public service commenced in England very nearly 10 years ahead of a similar service in the U.S.A. This margin would be even greater if one took into consideration the original low-definition television transmissions on medium wave, using the early Baird mechanical system. Still, a 10-year start with high-definition television would seem to give us a big advantage in the development of the medium, even allowing for the war years, which brought to a standstill the public service side. Of course, research and development on radar, cathode-ray tubes, electron microscopes and similar devices were greatly intensified in both countries during the war, and television has thereby benefited.

Nevertheless, it is galling to find that after a little more than one short year of public television services in the States—wham!—America has practically caught us up. Some people who have recently returned from America go so far as to say that, technically, we have already been overtaken.

Healthy Competition or——?

Many of the reports now coming from America may be exaggerated, but it is pretty obvious from a brief survey of American technical publications that things have been moving very fast indeed. Over there feverish competition between rival radio "networks" has had the usual effect of spurring the engineers to do the impossible, and within a very short space of time there have been erected literally dozens of transmitters and relay stations, and hundreds of thousands of television receivers are installed in clubs, hotels and homes. The television craze is on! And if America gets a craze about anything—well, enterprise cuts right through red tape and "delivers the goods." The big (and small) electrical and radio companies are already turning out a wide range of transmitting equipment in addition to an interesting and rather ornate selection of television receivers. In a large number of American cities the owning of a television set has become a "must" of the very first priority. Thus a great new industry is born, while the older entertainment industries of stage and cinema face a temporary decline in customers. I say "temporary" because, from all accounts, the programmes presented on American television stations are of primitive type, with sporting events and re-presentations of old films taking leading place in public estimation. Lacking the B.B.C.'s years of television production experience, the programmes do not yet possess the qualities and variety of the British service. American television has a very slightly higher definition than ours, necessitating receivers which are rather more expensive to manufacture. Readers are probably already aware of the fact that, unlike British practice, transmitting and receiving dipoles are arranged horizontally, and that high modulation produces black in the picture. This system appears to give rather less "snowstorm" interference from motor-car ignition, though pictures are less steady when the signal is weak at extreme ranges or in screened situations.

Red Tape

Contrast the exciting lot of the American television engineer with the frustration of his British counterpart. Contrast the erection of—we hope—one more British television station during a period when probably a hundred American stations will be opened. Contrast our very large outside broadcast television lorries with the light and mobile American sports relay transmitters. Think of the dozens of studios in American cities, when we have at the Alexandra Palace the same two studio stages that did duty in 1937. And then marvel at the fact that our programmes have a slickness and polish not yet attained by the Americans, and that our average technical results are not inferior to the best that America can give. While the Americans are spending thousands on equipping television studios, the B.B.C.'s technical committees are having to worry their heads about the most trivial items of expenditure, about permits to build, about internal and external forms in triplicate and miles of red tape. What would our British engineers accomplish if they were unfettered by such things? Spurred on by the kind of competition which now exists between the American television companies, and rewarded with remuneration which is its natural consequence, they would maintain their 10-year lead. They may take comfort in the fact that a sympathetic Government permits them to retain "British" in the title of the organisation!

Progress and development of television studio and outside broadcast technique were recently reviewed in an interesting paper read by T. H. Bridgewater, A.M.I.E.E., of the B.B.C. to the British Kinematograph Society. After dealing with the trends of design at the studio end of television, he revealed that great advancements had been made in certain fields, and that viewers would soon be reaping the benefit. The new C.P.S. cameras, experimentally used on the Olympic Games, would come into general use; a new studio stage would be opened; outside television equipment would be improved in many details; an improved tele-cine projector would be installed; and an entirely new method had been devised for making picture recordings on film of transmissions. Rumours of many of these things have been rumbling on the jungle telegraph to me for several months, and I have mentioned them in this column from time to time. Sometimes I have wondered if they would ever materialise, and it gave me considerable satisfaction to hear this progress officially endorsed in public by an eminent B.B.C. engineer. Mr. Bridgewater had a gruelling time after concluding his paper, when he spent no less than 1½ hours answering a multitude of questions from a packed audience of members of the B.K.S. and the Television Society. Film technicians paid tribute to the creative work of engineers and producers of

television plays and were eager for details of the manner in which various trick effects were obtained. The ghost effects in "Haunted" were mentioned, interest being taken in a scene in which a transparent ghost appeared to move behind solid figures, an illusion which requires a complicated set-up for film work. While remaining somewhat cautious about technical details, Mr. Bridgewater stated that the new Birmingham transmitter would be a considerable improvement on the Alexandra Palace installation, and would radiate a much stronger signal. Many other questions gave indication of the very great interest now being taken in television by the leading technicians of the film industry, and it is not surprising that Mr. Bridgewater coyly evaded baits which would have drawn him into expressing opinions on American television and also on various matters of technical policy.

Television Aids in Filming

The movement of ideas between television and films is a two-way one. The film people have been experimenting with a television aid fitted to the side of their picture cameras. This enables the director on the studio stage and also the managing director in the "front office" to have a viewfinder point of view of every scene as it is being shot. A nice idea, but it does seem to introduce a lot of complication, cables and staff to film units which are already overloaded with personnel. On the other hand, the substitution of a number of television cameras for the actual cinema cameras at sporting events, with the resultant pictures "piped" to one central recording camera, seems to be a sound scheme. The editing and cutting from shot to shot is then carried out on the spot, and ready-made film versions of—for instance—the Derby from start to finish, would merely require developing and printing. The development and printing of dozens of separate lengths of film, the editing, splicing, negative cutting and so forth, would be avoided. No wonder the newsreel people are becoming television minded!

Interference Suppression

Details of Some of the Simpler Schemes Which Can be Adopted by the Amateur

THE proposed new Bill making it illegal to use any apparatus capable of interfering with radio or television programmes may introduce a number of problems, and some clarification of the position is awaited. As most readers know, in the case of a simple electric motor the inclusion of a small fixed condenser between each brush and earth generally effectively removes the sparking interference. There are, however, many homes where a three-wire system is not employed, and therefore some difficulty can be anticipated when it comes to fit such condensers to a vacuum cleaner which has no earthing point. It may be found in certain cases, however, that the inclusion of a condenser across the armature or across the brush may remove the trouble.

Theoretically, most electric-light switches can cause interference and should be suppressed. Electric door bells, all thermostats, all motors and bad contacts can all give rise to interference, but obviously in many cases it may prove impracticable to prevent clicks and flashes on the television screen. The responsible authorities will undoubtedly issue recommendations in due course, stating just what degree of interference can be tolerated, and what steps must be taken to prevent trouble.

Car Interference

As we have pointed out on previous occasions, the ordinary car may be suppressed from a television point of view by a single resistor in the coil-distributor lead. This does not work in every case, however, and dirty plugs or poor contacts can also cause flashes on a television screen which the single suppressor will not stop. If a car radio is fitted, however, a resistor on each plug will almost certainly be necessary, and therefore no trouble need be experienced from the car. Similarly, any type of motor which has the ordinary carbon brush will cause crackles due to the minute arc which takes place as the commutator revolves, and dirt or grease on the commutator or brushes will aggravate the trouble. Thus, whilst a .1 μF condenser from each brush to earth may cure the trouble with one motor, another may require a much larger condenser. As a point of interest interference was being experienced on a television screen from a small motor used by a neighbour in his garage. Ordinary suppressing devices failed to remove the trouble and eventually the motor had to be screened entirely with $\frac{1}{2}$in. wire netting.

Mains-borne Interference

In some cases interference may be fed to radio apparatus through the mains supply leads, and special H.F. chokes may be obtained for inclusion in the supply to remove this. But again, the user of the apparatus will presumably have to fit these, and then the question of the current rating may play an important part, and the apparatus may consume a very much greater current than that taken by the wireless receiver.

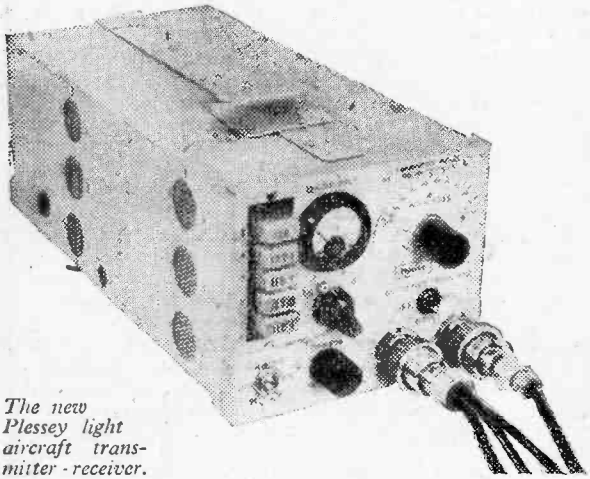
As soon as details have been released, and the full implications of the new Bill have been realised, comprehensive details will be given in these pages to enable each reader to play his part in carrying out the requirements of the Bill.

Trade Notes

Plessey Light Aircraft Radio

A FIVE-CHANNEL lightweight V.H.F. transmitter-receiver which is the first multi-channel set to be produced for light aircraft, has been developed by the Plessey Company, Ltd., Ilford, Essex, to enable both the private flyer and the small charter aircraft owner to meet all expected official regulations for two-way radio communication.

A lightweight MF Broadcast and HF receiver with simple D/F facilities on MF and Broadcast, combined with an HF transmitter, TR52, has also been developed as a companion set to the VHF transmitter-receiver, to provide all communication and navigational facilities essential to a light aircraft flying anywhere in the world.



The new Plessey light aircraft transmitter-receiver.

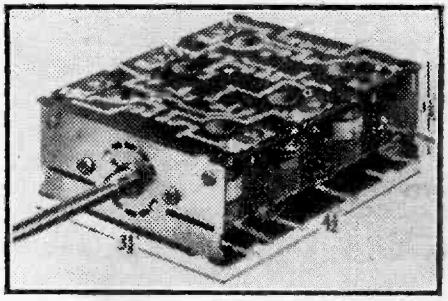
To be known as the TR51, this VHF set has a frequency range of 116-132 Mc/s, the five channels within this band being made available by plugging-in appropriate crystals. Should a lengthy flight or change of route necessitate the use of frequencies other than the five originally selected, further frequencies in the 116-132 Mc/s band may be set up simply by inserting new crystals. All adjustments to the transmitter can be made in flight, channel changing being carried out by rotating two controls on the front panel.

The receiver tuning is adjustable from the front panel over the range, 116-132 Mc/s, by a single knob and the crystal controlling the transmitter can be used to calibrate it. Remote operated press-to-transmit facilities are provided and electro-magnetic phones are also fitted, while the receiver audio section provides intercom. facilities for two stations. Aerials and all cables are supplied with the equipment.

"Cameo" Portable

THE Rees Mace Manufacturing Co., Ltd., have pleasure in announcing that they are now in a position to reduce the price of their "Cameo" S.C.70 Battery Portable Radio Receiver. A copy of the "Retailers Rebate Claim Form" will be sent on request to enable holders of these receivers at the price of £15 to obtain a credit towards the further purchase of Rees Mace products.

The price of the "Cameo" S.C.70 receiver is now £11 10s., including batteries, purchase tax, £2 9s. 10d.

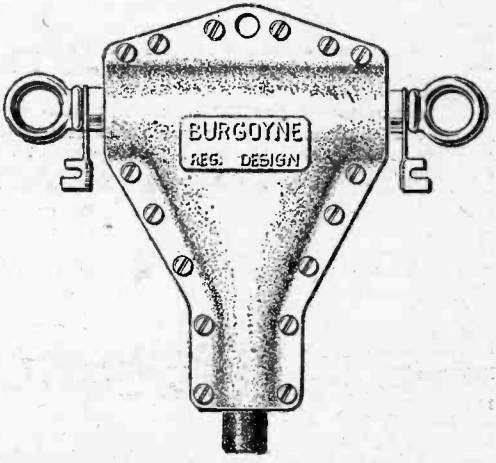


The new Wearite pressed-wire coil pack.

They also announce that the manufacture of extension loudspeakers S.85, S.84, S.59, S.62 is being discontinued.

Wearite "Pressed Wire" Coil Unit

THE conventional coil assembly consisting of three ranges of aerial and oscillator coils, switch for wave-change and gramophone change-over, padders and trimmers, constitutes a combination difficult to wire in its confined space and needing approximately 90 soldered joints for its completion. Such an assembly embraces components each in its own way a finished product of a specialised manufacturer, e.g., the wave-change switch and trimmer condensers.



The very useful Burgoyne co-axial aerial connector which transmitting amateurs will find very handy. Price 24s. 6d.

In order to lower the production cost of a coil pack it is necessary to reduce the material content as well as manufacturing time. Both of these objects have been achieved in the new "Wearite" approach whereby the switch, trimmer condensers and all the wiring are pressed out in one blow of a tool. As well as the saving in production cost, there are many added advantages.

Wave-change alternatives are (a) 12-35, 30-100 and 200-550 meters; and (b) 16-50, 200-550 and 800-2,000 metres. The size is 4½in. x 4in. x 1½in.

Erie Price Reductions

EFFECTIVE from November 8th, 1948, the retail prices of certain Erie components have been reduced, in some cases by 25 per cent. and in others by as much as 50 per cent. Trade discounts, however, remain at the same percentage. Typical of the reductions are ¼ and ½ watt insulated resistors which previously were 6d. each and are now 4d. each; 1 and 2 watt non-insulated resistors previously priced at 1s. and 1s. 6d. each respectively are now 8d. and 1s. each. Resistor kits are now reduced by 33⅓ per cent., i.e., the IR.48 is now 16s., and the IR.96 is now 32s. as against 24s. and 48s. respectively.

Carbon track potentiometers have been lowered in price also. Non-switch types previously 4s. 6d. each are now 3s.; single pole switch types reduced from 6s. 6d. to 5s. each, and double-pole switch types from 7s. 6d. to 6s. each.

Vitreous enamelled wire-wound resistors come under the axe also. The five standard types which ranged from 3s. to 12s. 9d. each previously are now 2s. to 8s. 6d. each. Erie "Ceramicons" in both the N750 and P100 temperature co-efficients are reduced from 1s. 9d.-2s. 6d. each, to 1s.-1s. 6d. each, according to capacity range.

New price lists are now being distributed to wholesalers, but may also be had direct from The Sales Department, Erie Resistor, Ltd., Carlisle Road, The Hyde, Hendon, N.W.9.

Press-button Single Record Player

A SINGLE record-player for 10in. or 12in. records, operated by press-button which automatically places the pick-up on the record and starts and stops the turntable, has been developed by The Plessey Co., Ltd., Ilford, Essex.

Two buttons are incorporated, one for 10in. and the other for 12in. records. When either is depressed the pick-up arm is lifted over the playing groove of the selected record and the turntable is set into motion. Upon release of the pressure on the button, the pick-up is lowered on to the playing groove, the record is played through, and the turntable stops.

Since the user does not have to place the needle on the track, visibility of the playing table and its height are no longer of primary importance; the cabinet manufacturer is therefore allowed much greater freedom of design. Damage to records is also reduced, as the automatic device ensures that the needle is placed accurately on the track.

The mechanism is almost entirely of nickel-plated pressed steel, while a system of interlocked assembly has reduced servicing to a minimum. The turntable is rim driven by an A.C. electric motor, at a constant speed. The baseplate is of pressed steel finished in a high lustre brown cellulose.

The pick-up is a high-class moving iron unit housed in a moulded case of contemporary design.

Weighing approximately 4½lb., the unit requires a clearance of only 2⅝in. below the top of the mounting board and 2in. above.

Ex-R.A.F. Capacitors

Further Details of Reference Numbers and Capacities Together With Details of Some Resistors

IN our issue dated November last we gave reference numbers and equivalent capacities of a number of ex-R.A.F. capacitors which are now on the market. Many readers have written in appreciation, having found the list of great value. One reader has checked the list against official records and has found it correct with the exception of the following:

Reference No.	Capacity
2013.	255 pF.
2076.	300 pF.
3124.	0 to 30 pF. trimmer.
3789.	variable
4502.	1,000 pF.
14719.	2.2 pF.
14757.	3.9 pF.

Another reader has supplied a further list which may be added to that already published, as it fills in a number of gaps.

Reference No.	Capacity
10c/ 288.	2 μF.
437.	.5 μF.
651.	.001 μF.
800.	.1 μF.
965.	.001 μF.
2010.	200 pF.
2018.	10 pF.
2038.	.0002 μF.
2039.	50 pF.
2040.	.25 μF.
2041.	.0002 μF.
2042.	.004 μF.
2043.	.004 μF.
2044.	.005 μF.
2045.	.0003 μF.
2053.	Block. .25 and .5 μF.
2086.	6 pF.
2220.	2 μF.
2239.	2 μF.
2240.	4 μF.
3101.	.0003 μF.
3102.	.004 μF.
3103.	.01 μF.
3105.	.004 μF.
3381.	.001 μF.
3283.	40 pF.
3404.	2 μF.
3415.	.0006 μF.
10825.	4 μF.

Resistors

We are also able to give the following details relating to fixed resistors:

Reference No.	Rating.
10c/ 56.	20,000Ω.
677.	510Ω.
851.	51Ω.
877.	5,100Ω.
1042.	51,000Ω.
1043.	50,000Ω.
1041.	20,000Ω.
1045.	75,000Ω.
1046.	12,000Ω.
1047.	5,000Ω.
1048.	350Ω.
1049.	15,000Ω.
1050.	20,000Ω.
1051.	7,500Ω.
1052.	820Ω.
1053.	680Ω.
1054.	16Ω tapped at 10Ω
1055.	10Ω+2.9Ω+5.3Ω +12.6Ω+69.2Ω
1056.	10Ω+19.5Ω+ 19.5Ω
1903.	100Ω.
1916.	75,000Ω.
6119.	24,000Ω.
6833.	16Ω tapped at 10Ω
6835.	1 meg Ω.
7908.	1.5 Ω.
8208.	5,000Ω.
8528.	1Ω.

TELEVISION

Valves

6DL, 6D2, 6L18, SP41, SP42, DD11, PEN44, PEN45, PEN46, P41, HL41DD, D1, T41, UU7, U22, AC6PEN, ACP4, 6F12, 6F13, 6F14, 6P28, P61, P42, D43, MSP41, KTZ41, X41C, KT41, U16, U17, GT1C, GU50, KT44, KT45, U19/23, U33, Z63, Z77, X81, EA50, HVR2, HVR2A, EF50, EF6, TSP4, EL50, TSE4, EB91, PL33, PL38, PY31, PZ30, 4TSP, 4THA, 4TPB, 202VPB, 202VP, 202DDT, 203THA, 405BU, 225DU, 42SPT, 42MPT, 451U, 4TSA, 41MPT, 41MTL, 41MTA, 41MTS, DDL4, S130, S130P, 807, GD4TB, SU2150, and 101 more types of **Radio Valves.** Please enquire for any type not listed. Also obsolete and rare valves. Replacements for such difficult types as 47, 12A7, 25A7, 32L7, 70L7, etc.

TELEVISION Construction Books: Wireless World Telev. Constr., 2/6; Electronic Eng. Televisor, 2/6; Telev. Constr. Manual, 3/6; **Telev. Parts**; Vision Unit Chassis, 22/6, or completely wired, £7/15/10. Sound Unit Chassis, 18/9 (compl. wired, £5/5/5). Time Base Unit Chassis, 17/6 (£8/14/2). E.H.T. Combined Power Transformer, 5,000 v., 2-4-8 v., 91/6. 2,000 v. 2-4 v., 54/9. Focus Coils for 35 mm. Tubes, 32/6. Deflector Coils, 32/6. Line Output Transformer, 32/6. Varley Choke, DP52, 5.5 Henries at 250 mA., 18/9. Rubber Masks (cream for 9in. C.R. Tubes), 11/-. Co-axial Cable, white, brown or black, 1/3 per yard. Screen Enlargers, £6/6/0.

4 mfd. 500 v. Condensers, 1/9. Pifco All-in-One Radiometer, A.C. D.C., 25/-. Test prods, red and black, plastic insulated, pair 3/6. 25 mfd. 25 v. Condensers, 1/9. 0.5 mfd. 350 v. Condensers, 1/6. Wonder Crystal Set with pair of headphones, 25/-. Rotax Ammeter, 30-0-30 amps, 19/-. Crypton 0-6 Ammeter, 15/-. 5in. Speakers, Goodman, etc., 15/-. "Door Light," new Varley product, with automatic switch, 11/10. Vibro-Arc Metal Engraving Tool for mains and/or accumulator, 15/-.

BOOKS: Radio Receiver, Maintenance and Servicing, 8/6. Radio Upkeep and Repairs, 7/6. Wireless World Valve Data, 2/-. Chassis Cutters, 1¼, 1¾, 1¾in., each 12/6. Uniflex Wax Polish for cabinets, etc., 1/3. O-Cedar Polish, bottle, 1/-. Elco Soldering Irons, state voltage, 10/-. Varley V40 Accumulators, 16/6. Flat Irons, new and boxed (a few to clear), 10/-. B.P.L. Universal Meters (a few to clear), £5 5s. Servisol, switch cleaner, per tin, 5/-. Cement, per tin, 5/-. Mains Resistance, 1,000 ohms .2 amp., 4/-. 8 mfd. 500 v. Electrolytic Can Condensers, 6/-. Line Cord, 3 amps (60 ohms per foot) per yard, 2/6. Holders: Mazda octal, 5-pin British, 5-pin UX, 4-pin, per dozen, 9/-. "Radio Craft," new improved American Radio Reference Library of ten illustrated books, clearing at 35/-. "Goldring" Pick-up Head, gives old gramophone, radiogram quality reproduction, 31/6.

RADIO.—Burgovne Table Model Sets, medium wave, a few left (then discontinued), reduced to £9/17/6. Weymouth, pair of T.R.F. coils with basic circuit, 9/6. Aerials, ex-Govt., 7 extensions, 14ft., collapsible (suitable as fishing rods), 7/6. "Radiocraft." American Library of Ten Books (last import quota), 35/-. Fabric for speakers, etc., modern weave, sq. ft., 3/6. 2in. Radio Extensions (also suitable for MCRD), 7/6. Radio Extensions in modern plastic cabinet, 15/-. Service Sheets, Amer. and Brit., our best selection, 10/6 per doz. Amplion Pocket Volt and Milliamp Meter, 0-25 v., 0-250 v., 0-25 mA., 21/-. Trimmer Tool Kits (redesigned), 30/-. Avo-minor Universal, £8 10/0. Taylor Meters on **EASY TERMS.** Midget Soldering Iron, "Pencil" type, works off 6 v. car battery, 10/6. Electr. Mixer and Whisk, with 3 different attachments, 31/10. Soldering Irons, heavy duty, on/off switch, 230/50 v. ex-Govt., 18/9. Compass (liquid, ex-Govt.), 18/9; 4in. dial precise instrument 15/9.

Please write immediately to Bulls (P.W.)

RADIO **BULLS** VALVES
246, HIGH ST., HARLESDEN, N.W.10

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Programme Pointers

This Month MAURICE REEVE Discusses the Critics and the Last of the Proms.

THE Critics, one of my favourite radio items, were recently discussing, with their accustomed happy combination of erudition and sociability, the pros and cons and the do's and don'ts of the wireless serialisation of famous novels. One or two recent examples, though very good in their way, left things to be desired and points to be cleared up. The three chief problems would seem to be as follows: (a) The reader of a novel brings its scenes and characters to life in his own imagination and with his own personal bias brought to bear on all and sundry. To what extent and in what manner shall that "secret world" be intruded into? (b) To what manner and extent shall the author's personality be permitted entrance on to the stage, if at all? In a recent example it was the author who told the story, with not too happy results. And (c) in what directions can the radio adaptation compensate the listener for the absence of the visual stimulants and excitements he gets from the dramatic or cinematic presentation of a book?

The latest dramatised work in serial form is Dickens's "Great Expectations," the first three numbers of which promise to make it one of the best the B.B.C. has so far put over. Comparisons with the film, one of the best of recent years, are inevitable—it was so dramatic and vivid. Inevitable because they are just two mediums of entertainment, no matter how divergent in methods and results. Were there a stage presentation of the work also going on, the discussion would become a threesome, with the radio coming up in the rear a bad third. Or should I say a fourth, if we include the original and indisputably the best form the entertainment originally took, in Dickens's own hands?

The Beggar's Opera

Similar comparisons become even more potent with the radio transcription of plays and operas, and I'm afraid too much was missing from Benjamin Britten's new version of the Beggar's Opera for me really to enjoy it. So much of its delicious vulgarity and hearty pointedness is visual, coupled with the acrid modernity though not unpleasantness of Britten's music, that I spent most of the time conjuring up memories of Lillian Davis, Violet Marquesita and the others. It seems that only the actual acting of parts like these can infuse them with life sufficient to stimulate the listener's imagination and set the blood coursing through his veins. Little boys must be seen and not heard, and most little musicians should be heard and not seen. Opera, however, must be seen and heard, tasted, smelt and felt. It should engage all the sensory organs, but I'm afraid on the radio only half of one of them is given anything to do.

Whether it be Macheath, Carmen, Lohengrin, Ivan the Terrible, or who you will, colour and personality, and all the trappings of life itself, are integral parts and indispensable. Broadcasting House's efficient effects staff can never be a substitute, no matter how hard they may work at reproducing thunderstorms and tempests or rejected suitors tearing up love letters and banging the door behind them in high dudgeon. With books it is vastly different, and plays only slightly less so. Both leave the listener's imaginative faculties comparatively free.

The Proms.

The Promenade Concerts ended on an unbelievably prosaic and vulgar note, even for them, with a flash photographer walking round the orchestra doing his stuff during, of all things, the slow movement of the Ninth Symphony! Shades of Henry Wood! And reproach to those who claim to be "wrapped up" in the music to a greater degree than probably any other concert audience. At any rate, when you are standing amongst them, they resent your turning over your programme as much as if you took out a packet of sandwiches. Why, in the name of goodness, couldn't this fell work have been accomplished during the 1812 or the Nutcracker Suite?

If the culprit is actually unknown, the strictest inquiry should be held, and steps taken to see that the offence is never repeated. But I have the strongest hunch that the photo will be used to advertise next year's Proms, and that it may even appear in radio's official organ!

The B.B.C. Symphony Orchestra's winter season began on October 13th, with a magnificent programme very finely played. Star of the evening was the dazzling Chilean pianist, Claudio Arran, in Brahms's First Concerto. This happy and youthful work, to me, lacks the incomparable lilt, grace and melodic charm of the second, though some prefer its structural virtues. Both are incredibly difficult, but Arran's astonishing virtuosity made it sound like a pre-breakfast canter—technically. All the other virtues of great playing were also there.

One of the most discussed broadcasts of recent years has been "The Story of Munich," three documentary programmes, each lasting one hour, based on Mr. G. W. Wheeler-Bennett's best-seller, "Munich: Prelude to Tragedy."

"Munich" has become a term of odium and reproach almost comparable with others like "Inquisition," "Ogpu," "Star Chamber," and many others one could cull from history, all of which symbolise the basest traits in the human character. Although much of this is, of course, the nonsense that most things are until the mellow hand of time has smoothed out the passions of contemporary politics, the fact does remain that to have been one of the "Men of Munich," or anyone remotely connected with the "Men of Munich," is to have done something of which one should be ashamed. And, listening in to the whole incredible story, factually and dispassionately, exactly 10 years after the event, is an experience calculated to make one ponder deeply. To put it mildly: When we hear of the British Prime Minister of the day saying to the

House of Commons. "Of course, I didn't for one moment believe that Herr Hitler had deliberately tried to deceive me. I couldn't think that" (my quotation from memory), we turn away from our thoughts to face our companion on the other side of the hearth to study his or her reaction and expression.

But, the Men of Munich apart—and even now, those of them still in the fray prevent us from contemplating the scenes with complete detachment—the "Days of Munich" will never be forgotten by those who experienced them. Only August, 1914, can in any way compare.

Incorrect History

These broadcasts brought it all back to us with the utmost reality by means of quotation both from contemporary sources made public at the time and revealed later at Nuremberg and in von Hassel's Diaries, etc.

With the anonymity of all the protagonists carefully concealed by impartial and natural voices, it was difficult to see why an exception was made of Hitler's, whose impassioned soap box oratory was faithfully portrayed. And there was at least one incorrect piece of history. In the first programme—I heard the first two, being prevented from listening to the third by the date of going to press—it was stated that it was probably too late to stand up to Hitler over the rape of Austria; he had rearmed. We had lost our golden opportunities of scotching him at the invasion of the Rhineland, breaking the disarmament clauses of the Versailles Treaty and the various other *faits accomplis* he had presented us with up till that event. Whereas all the facts prove that Munich itself, six months later, was only a tragedy and a humiliation because even then he could not, and never intended, to stand up to us. He only had 13 divisions—one armoured—for the Western Front, and the whole of the Nazi hierarchy were gunning for him had he gone to war over that issue.

The object of the series? Presumably to deter us from a similar policy of appeasement in our present crisis. For we mustn't forget that Mr. Chamberlain had the backing of the vast majority for his policy. Let us hope that if this is so it will succeed. Anyhow, it made an excellent feature.

News from the Clubs

HARROGATE RADIO SOCIETY

Hon. Sec.: A. Wilson, 16, St. George's Road, Harrogate, Yorks.

MEETINGS of the society are held each Wednesday evening at 7.30 at the society's premises at 31, Rear Park Parade, and full constructional facilities are available. The transmitter is now completed and the second contact was 589 with OE. The call sign is G3EDJ/A and the initial power was 9 watts. Interesting lectures and demonstrations are being arranged for the winter session and all branches of radio will be discussed. It has been decided to delete the words "short-wave" from the name of the society in order to encourage members interested in such aspects as broadcast receivers, recording, amplification, model control, etc.

SOLIHULL AMATEUR RADIO SOCIETY

Hon. Sec.: H. C. Holloway, Esq., 20, Danford Lane, Solihull.

FOR the last two meetings Messrs. G. A. C. Mason and G. H. Stanton, members of the society, described the technical details and construction of their automatic sender, using timed relays to send morse characters with correct time intervals.

Meetings are held every alternate Wednesday at the club headquarters, The Old Manor House, Solihull, where prospective members and visitors are given a cordial welcome.

THE HOUNSLOW AND DISTRICT RADIO SOCIETY

Vice-Pres.: E. Hott, 36, Bulstrode Road, Hounslow, Middx.

THE Hounslow and District Radio Society held their quarterly meeting on September 22nd, when the programme of activities for the ensuing session was agreed upon. At the conclusion a junk sale was held, when many pieces of apparatus changed hands. On October 5th Mr. A. Pottle, B.Sc., the hon. secretary, gave a further interesting talk on "Fundamental Radio," this time explaining "Rejector and Acceptor Circuits." On October 19th the society will hold a meeting for open discussion on technical matters, entitled "Your Point of View." Congratulations are due to two members of the society, Messrs. R. S. Parsons and C. H. Sullens, on having passed the City and Guilds Amateur Transmitters' Technical Examination.

THE RADIO SOCIETY OF HARROW

Hon. Sec.: John R. Pikett, 93, Whitmore Road, Harrow, Middx.

THE Radio Society of Harrow continues to grow, and now has members from Ruislip, Eastcote, Wembley, Kenton, Stanmore, Northwood and Pinner, as well as Harrow, new members still being very welcome.

The society now has its own Tx, call G3EFX, and expects to be operating shortly on all bands from 10 to 80 metres.

THE WEST MIDDLESEX AMATEUR RADIO CLUB

Hon. Sec.: C. Alabaster, 34, Lothian Avenue, Hayes, Middlesex.

THE West Middlesex Amateur Radio Club continues to attract a satisfying number of members and fresh faces at each meeting. Future lectures will be about the Electron Microscope, Negative Feedback and the Strobotlash—all given by club members.

The club is still looking for a suitable building as a club and workroom, and to this end a hut fund has been inaugurated for the purchase of a portable building at a reasonable price. This fund has recently received a very welcome donation from the club president, Sir Ernest Fisk, and it is to be hoped that the club will soon be able to operate from a permanent home.

Meetings are held regularly at the Labour Hall, Uxbridge Road, Southall, Middlesex, on the second and fourth Wednesdays of every month at 7.30 p.m.

READING AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: Mr. L. Watts G6WO, 817, Oxford Road, Reading.

THE programme at the meeting of the society, on September 11th, consisted of a film, "They're Everywhere," from Messrs. Nettlefolds, on the production of screws, nuts and bolts. This was followed by a discussion of the R.S.G.B. Band Planning proposals, and counter proposals, representing the views of the majority present, were formulated.

On September 25th, the president, Dr. Lemon, gave a talk on the design of simple receivers and transmitters, for the new V.H.F. bands.

On Sunday, September 26th, a D/F contest was held on five metres in the Mortimer region. The bearings obtained by most of the competitors were much more accurate than in the previous contest held in July.

Meetings of the society are held in Palmer Hall, West Street, Reading, on the second and last Saturday of each month, at 6.30 p.m.

LOTHIANS RADIO SOCIETY

Hon. Sec.: Ian Mackenzie, 41, Easter Drylow Drive, Edinburgh, 4.

REGULAR monthly meetings have now commenced and they will continue to be held on the last Thursday of each month in the Chamber of Commerce Rooms, Charlotte Square, Edinburgh, at 7.30 p.m.

The date of the next meeting is November 25th, when a talk will be given by Mr. B. Groom, GM6RG.

Arrangements are being made to hold a social evening on the second Thursday of each month.

The society extends a cordial invitation to new members.

Impressions on the Wax

Review of the Latest Gramophone Records

KHACHATURIAN'S ballet "Gayaneh," with its virile rhythms and fascinating blend of oriental melody with western technique, continues to capture public imagination, and its famous number has proved to be the "Sabre Dance." Few things so electrifying have come from a Russian pen since Borodin startled the world with Prince Igor dances. Moiseiwitch has chosen the Sabre Dance for his latest recording on *H.M.V. B*9688, and in complete contrast to this whirlwind, he has chosen Rachmaninoff's own transcriptions of his song "Lilacs."

A delightful new "Sylvia" ballet recording by John Barbirolli conducting the Hallé Orchestra has been made on *H.M.V. C*3797-8. Delibes has been aptly described as the father of modern ballet music, and with good reason, for there is little doubt that Tchaikovsky and many of his successors were inspired by the new method of treating ballet music, which henceforth was regarded as something more than hackwork, and the greatest composers were pleased to write for the ballet stage. "Sylvia" is far above the average score and has been a favourite since the year of its inception, 1876.

The slow, majestic phrases of the Largo have seldom been more impressively handled than they are in Mme. Flagstad's recording of the famous air on *H.M.V. DB*6791. The work from which it comes, an opera dealing with that great King Xerxes of Persia, was produced in 1738. Handel's operatic background was Italian, as indeed almost all European opera was in those years. Mme. Flagstad has made an ideal recording.

Of interest this month is a recording of "Bless This House" and "Smilin' Through" by Gigli on *H.M.V. DA*1894. These two songs are amongst the most popular in existence, and will have an appeal for listeners of all tastes. The great Italian tenor, still one of the finest operatic singers in the world, has been devoting himself more and more to the ballad type of song which benefits by luxurious tone and frankly expressed sentiment. His latest record is sure to be snapped up by the thousands of admirers of the two songs who like to see their favourites in the hands of an artist of international reputation.

Light Music

Justly renowned for his four symphonic poems, his great Third Symphony, his concertos for piano, for violin and for 'cello, and his Samson and Delilah opera, Camile Saint-Saens is nevertheless appreciated by many thousands of music lovers for his delightful witty "Carnival of the Animals." Not the least popular piece from this work is Le Cygne, the theme which Anna Pavlova chose for her celebrated solo dance, "The Dying Swan." Le Cygne was written for harp and massed 'cellos and, in the hands of the Melachrino Orchestra conducted by George Melachrino, received expressive treatment on *H.M.V. B*9692. The reverse side re-introduces the conductor in the role of composer. His Woodland Revel is a composition full of surprising orchestral effects.

Continuing his policy of recording signature tunes from B.B.C. programmes Sidney Torch now presents light orchestra treatment of works that will respectively be very familiar to televiewers and radio listeners. "Shooting Star" comes from the television magazine feature "Kaleidoscope," while "Dance of an Ostracised Imp" comprised the theme tune for part of the popular "Woman's Hour" transmissions. "Shooting Star" a scintillating work, again reveals Sidney Torch to be a writer of exceptional talent. Frederic Curson's Imp is depicted by clarinet and piccolo, and can clearly be heard capering around in the most nonchalant fashion. The record—*Columbia DB*2456—features the Queen's Hall Light Orchestra, conducted by Sidney Torch.

Variety

The dual talents of Dorothy Squires and Billy Reid are once again displayed in a recording of one of Billy's latest tunes coupled with an American number that has latterly become very popular in this country. "So Tired" arrived in Britain with a ready-made reputation and the coupling "Mother's Day," Billy Reid's new sentimental ballad, are both admirably sung by Dorothy Squires on *Columbia DB*2455.

Other popular recordings have been made by Dinah Shore with "Blue Bird of Happiness" and "Say It Every Day" on *Columbia DB*2457, Danny Kaye with "Minnie the Moocher" and "Dinah" on *Columbia DB*2390, Steve Conway with "October Twilight" and "Brother, Can You Spare a Dime?" on *Columbia FB*3416 and Tony Martin with "My Sin" and "If I Had You" on *H.M.V. B*9693.

Dance Music

"Souvenir de Paris" and "Anything I Dream is Possible" are the titles of Geraldo's latest record. The orchestrations of these titles are among the many scored by talented young composer Wally Stott and performed by the Geraldo Dance Orchestra on *Parlophone F*2321. Both the vocals are sung by Geraldo's resident vocalist, Doreen Lundy.

Tchaikovsky's Nutcracker Suite with special lyrics and effects by Foster Carling and Country Washburne has been recorded by Spike Jones and his City Slickers on *H.M.V. BD*1182-4. It is the nuttiest "Nutcracker" suite you ever heard.

Other popular dance bands who have recorded include the Skyrockets Orchestra with "A Blossom Called the Hungry Heart" and "I'll Be Loving You" on *H.M.V. BD*6026, "Souvenir de Paris" and "Love Somebody" played by Joe Loss and his Orchestra on *H.M.V. BD*6025 and "Woody Woodpecker" and "There Ought to be a Society" by Kay Kyser and his Orchestra on *Columbia FB* 3434.

Open to Discussion

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

"Set No. 18, Mk. III"

SIR,—May I through your columns thank those people who supplied me with the data on the English ex-Government valves.

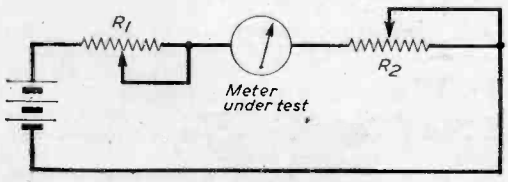
With reference to Mr. Pathmanathan's letter the correct valves for the 18 Mk. III receiver are: First valve, Mazda VP23, Army type ARP12 (or CV 1331 or ZA7023); second valve, Mazda VP23, Army type ARP12; third valve, Mazda VP23, Army type ARP12; fourth valve, Mazda HL23DD, Army type AR8 (or CV1306 or ZA7022). The first three valves have 6-pin Mazda octal base and the last valve has 8-pin Mazda octal base. These valves require 2 volt filament, not 4.5 volt, as you mention, and 150 volt H.T. preferably.

As your set was supplied with 6.3 volt valves it is possible that it is the 18 Mk. II, in which case I think the valves are two 7Q7 and two 7R7. In reference to Mr. Stevens's and Mr. Heason's letters, I, too, have been using the 18 Mk. III without any tuning unit and also the 80 metre version of this set (68T), and in both cases I have found, when using a long wire unmatched aerial, that it is better to omit the untuned R.F. stage and take the aerial straight to the F.C.—J. P. MOORE (Solihull).

Measuring Meter Resistance

SIR,—Mr. G. Bryant will, I feel, be very fortunate if he gets satisfactory results with his method of measuring meter resistances as described in your November issue. By the normal application of Ohms law, it may be seen that there is a correction factor K to be subtracted from the value of R_2 obtained, where $K = \frac{\text{Product of the two halves of } R_1}{\text{Sum of the two halves of } R_1}$

I cannot recall the method described in the June issue, but if no calculations are required I suggest the following circuit.



Another meter measurement circuit.

With R_2 set at zero resistance and R_1 at maximum, decrease R_1 until the meter reads a convenient figure. Adjust R_2 until the meter reading is reduced to half the previous value; the meter resistance is now indicated by the difference in value between R_2 and R_1.—L. M. (Slough).

Television Reception in Egypt

SIR,—Using the circuit of your VHF adapter (July, 1948), I have built a small (two valve) receiver, using a 6V6 as detector, followed by a 6V6 A.F. amplifier feeding a single earpiece. The aerial is a 10-ft. indoor end-on type. Power is supplied by dry batteries for H.T. and heaters. After some minor adjustments it is now completed, and this morning (October 27th, 1948), I was amazed on tuning in a station to hear the announcer mention television. It turned out to be B.B.C. television sound. I listened to the programme from 12.10 until 12.50 (local time); it was perfectly readable throughout, but leaving the set for a few minutes I found on returning that the programme had disappeared. I am situated near the Bitter Lakes in Egypt. Your magazine is read *and* digested here.—R. A. COLEY (M.E.L.F., Egypt).

C.-R. Tube Voltages

SIR,—With reference to the controversial letters appearing in recent issues of PRACTICAL WIRELESS regarding cathode-ray tubes, may I attempt to clarify some of the much-debated problems?

Starting with the VCR97: Mr. G. A. Winckle, in the December issue, asks why the VCR97 is operated at 2,000 volts in its original equipment if 800 volts are sufficient to produce a visible beam.

The tube at 2,000 volts has a higher velocity beam and better focusing properties than when operating at a lower voltage. Also it must be recognised that the trace brilliance is reduced in intensity as the sweep frequency is increased. It will be realised, therefore, that with the high frequencies met with in radar technique the tube must have a sufficiently brilliant trace to be used without undue loss in efficiency at these higher frequencies. The improved focusing is essential in equipment used for range finding, etc., as accurate calibration could not be obtained with a large or blurred spot.

However, for normal oscillographic work, where the sweep frequency does not often exceed, say 20 kc/s., a potential of approximately 1,000 volts is sufficient.

The reduced EHT voltage in this case results in an increased sensitivity on the deflection plates, with a corresponding sacrifice in spot intensity and a loss in the tube's focusing properties, which, however, is not too serious for amateur work.

All the correspondents so far, in mentioning the EHT voltage, have omitted to state whether or not the potential was the R.M.S. output of the transformer or the actual D.C. voltage in the tube. If the 800 volts so often referred to is the R.M.S. output from the transformer, then the actual D.C. voltage on the tube will be in the order of 1,100 volts, due to the condensers in the smoothing circuit raising the output voltage nearer to the peak of the A.C. from the transformer.

In conclusion, may I add that I have working a very satisfactory C-R. unit, utilising either a VCR97 or VCR517, the two tubes being identical except for their different afterglows, and if anyone requires circuits, etc., I will gladly supply them on receipt of a stamped, addressed envelope.—G. F. CRAVEN (14, Mannheim Road, Toller Lane, Bradford).

"Better Listening"

SIR,—With reference to Thermion's remarks in PRACTICAL WIRELESS, under the heading, "Better Listening Campaign" and "Seven Million Old Sets," I feel that there are many of us who just won't buy new sets because we have still to hear one which we think better in tone than the one we possess.

In my case I am still using a straight three-valve battery set which gives the Home, Light and Third programmes at good quality and strength, without interference. What more does an ordinary listener want?

For those stations the reaction condenser remains at zero (as indeed it has done practically all the time I have used this circuit), so why buy a superhet. just because it's the thing to do?

My view of a superhet. is that it may be regarded as the battery manufacturers' friend, also that it can never give such good quality as a "straight" set. Even rediffusion and relay speakers which I have heard at friends' fail to impress me as being any better than mine in quality of reproduction.

I made up this receiver in March, 1932, from the articles published in a magazine.

Although still possessing its blueprint, the articles were unfortunately destroyed by enemy action whilst on loan to relatives. I doubt if spare coils, etc., could now be obtained.

Its only drawback is its rather large layout, as baseboards were still in use at that time.

And so here is a receiver with a past life of 16 years, which *never* had a valve replacement (I had these tested a short while ago, and found O.K.), and which will work an extension speaker in another room.

I have failed to notice any lowering of quality whatever (excluding exhausted batteries).

My point is, for the ordinary listeners, this means a receiver cheaper to purchase and to run—with batteries. There are *thousands* of houses in London's gas-ridden neighbourhoods which will have no electricity owing to connection costs, and must continue with batteries. (Hence the growth of the local relay systems, which manufacturers might consider a possible threat.)

I have enough funds to buy a new set any time, but will never do it while my three-valver functions as well as it always has. I know it and it has no mysterious processes.—JAMES T. CLARK (Greenwich).

Another Viewpoint

SIR,—May I comment on your remarks re the five and half million 10-year-old radio sets in use at the present time. Has it never occurred to the manufacturers that there are thousands of people like myself using a 10-year and older radiogram, who, whilst they are not willing to replace the complete job, would be only too glad to have a new chassis, and speaker if necessary, if these items were readily available? I mean a chassis by the original manufacturers, not the home-constructor type of chassis.—A. E. GREEN (Hornchurch).

Correspondent Wanted

SIR,—I shall be glad if you could kindly put me in contact with radio enthusiasts. I am specially interested in reception on short waves. All letters shall be answered.—Sudhangshu Dev Raye, P.O. Satgaon (Sylhet), East Pakistan.

Television Test Gear

SIR,—There seems a scarcity of test equipment suitable for television set servicing. I have built my own set and experienced considerable difficulty in finding suitable equipment with which to set up the time bases, etc., and after some trouble built the pattern generator described in your March issue. This is very good, but I still need something in the nature of a tuned generator which would give me some idea of the response of the tuned circuits. Could you say whether there are such things on the market or whether they can be built?—G. C. W. (Hendon).

(*A wobbulator or television signal generator which is swept through the tuning range is now on the market, but we think it is beyond the constructional scope of the average amateur. A review of such equipment will be given as it becomes available.*—ED.)

Preset Tuning

SIR,—I am building a TRF set and would like to include preset tuning for the B.B.C. 342.1 metre and 261.1 metre programmes. The coils in the set are Wearite PA2 and PHF2. Could you tell me the value of the condensers required for this purpose?—R. R. (Kingsbury, N.W.9).

(*The formula connecting inductance, capacity and frequency is:*

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f is the resonant frequency in cycles,
L is the inductance in henrys,
C is the capacity in farads.

The Wearite PA2 and PHF2 coils have the same inductance—170 microhenrys, and will tune over 200 to 557 metres with a 450 pF swing. Using the above formula we get the following results:

Wavelength in metres, 342.1, 261.1.
Frequency, 877 kc/s, 1,149 kc/s.
Capacity required, 193 *pF*, 112 *pF*.

These figures are slide-rule calculations, accurate enough for this purpose since the final adjustments will be manual. The 193 pF value can be got by wiring a fixed 150 pF capacity in parallel with a 50 or 60 pF trimmer, and the 112 pF from a fixed 100 pF with a similar small trimmer. Adjust for optimum performance by working back from the detector stage, whether using an oscillator or tuning on the programme itself.—ED.)

Ex-Service Equipment

SIR,—Thank you for printing my letter in the December issue of PRACTICAL WIRELESS. I should now like to inform all who have written to me that I will answer their letters as speedily as possible. The number received is now just over 100, so you can visualise the job I have in hand.

I am asking you to do this, as one reader seems to think I am employed on this job full time, and wrote a very sarcastic second letter to me.—K. HEASON (S.E.15).

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