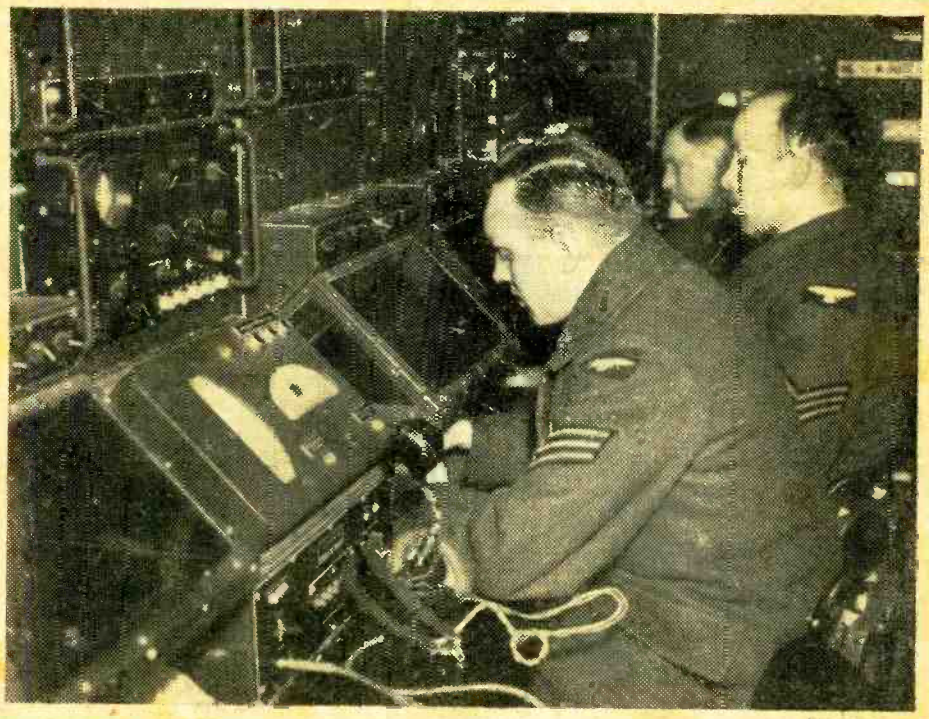
WINDING TUNING COILS

Practical Wireless

9d. EVERY MONTH

Vol. 23. No. 490. || Editor: F. J. CAMM || APRIL, 1947



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PRINCIPAL CONTENTS

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10 × 8 × 2½in.	7/-	10 × 9 × 2½in.	7/6
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0—5 volts	0—25 ,,
0—25 ,,	0—100 ,,
0—100 ,,	0—250 ,,
0—250 ,,	0—500 ,,
0—500 ,,	

D.C. Current	Resistance
0—2.5 milliamps	0—20,000 ohms
0—5 ,,	0—100,000 ,,
0—25 ,,	0—500,000 ,,
0—100 ,,	0—2 megohms
0—500 ,,	0—5 ,,
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Practical Wireless and PRACTICAL TELEVISION
15th YEAR OF ISSUE
EVERY MONTH
VOL. XXIII. No. 490. APRIL, 1947.
Editor F. J. CAMM

COMMENTS OF THE MONTH. BY THE EDITOR

The Passing of 5XX

MOST listeners and certainly all of the early experimenters will regret the passing of 5XX, which has gone into honourable retirement. When the station was built it was the highest-powered broadcasting station in Europe. It radiated the National programme on a wavelength of 1,500 metres and a power of 25 kilowatts. This would be, of course, considered low power to-day, but in the early days such power was considered high, and, bearing in mind the poor selectivity of receivers of the period, it caused a good deal of swamping.

To-day we have a transmitter which will deliver 750 kilowatts, although we do not use all this power.

The station was commenced in 1925, when a number of engineers climbed Borough Hill, Daventry, and commenced operations on the site of a Roman Camp. There were many breakdowns, caused by pigeons flying into the high voltage cables, by field mice seeking warmth, and by grass choking the cooling water filters; a silver thaw on one occasion brought the 500ft. high aerial down with a crash.

Droitwich, operating on much higher power, took over in 1934 the 1,500 metre wave for the National programme, now the Light Programme, and 5XX was quiescent for a period. When the war came and broadcast transmitters were needed for the word war in the World War, 5XX started up again. It radiated propaganda to the German people for long hours each day on a wavelength of 391 metres, as well as radiating the Home programme.

After D-Day it radiated messages for the R.A.F., but now the war needs have ceased, and after 20 years of almost unremitting service 5XX is pensioned off.

It was kept as a standby, of course, for Droitwich, in the by no means unlikely event during the war of a catastrophe at that station. The 500ft. masts at Daventry now support short-wave aerials for the B.B.C.'s overseas services. No other use can be found for 5XX.

There will be keen regret amongst amateurs at the passing of a station which gave them so much fun, a regret possibly only equalled when Writtle (2MT), which preceded 2LO, closed down. Great progress has been made in transmission and reception in those 20 years, but looking back it is certain that those early days were just as enjoyable.

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Dr. Lee de Forest Honoured

IN January, 1907, de Forest, who did so much experimental work in connection with radio, invented the grid of the valve, which made possible radio receivers and broadcasting, television, sound motion pictures, the long-distance telephone service, and Radar. His inventions exceeded 200, and they cover almost every application of radio and electricity. During January he was honoured by technical groups, trade associations, and research societies.

The grid vacuum tube was first known as the audion. We must not, of course, forget the pioneer and basic inventions of Edison, who discovered electronic emission from a filament, nor must we overlook the inventions of Ambrose Fleming, who really can claim to have invented the wireless valve as distinct from improvements in connection with it. There is a tendency in America to presume that de Forest invented the entire valve, and this, of course, is patently untrue.

Unparliamentary Language

THE stupid outburst of stupid Mrs. Mann in the House of Commons has been turned to good account by Itma. There was a time when Parliamentary language was choice and reflected the culture which in a former age was associated with the dignity of the House of Commons. In spite of the efforts of the B.B.C., however, to improve our English it would seem that Members of Parliament will continue to use language more associated with the gutter. Mrs. Mann referred to Tommy Handley as a twerp. In view of the great amount of amusement listeners enjoyed as a result of Handley's handling of the matter we will leave our readers to judge as to who is the twerp.

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ROUND THE WORLD OF WIRELESS

Bat Radar

IT is now believed that bats use a form of radar when flying in order to avoid collisions. They have been found to emit definite pulses of sound waves and it is thought that they pick up the reflected echoes. It has been found that the range at which a bat receives a "danger ahead" signal is about four feet. Allowing a reaction time of 1/10th second, this enables avoiding action to begin at two feet from the obstacle and to be completed with still a foot to go.

Noted Electronics Engineer Joins North American Philips Inc.

ROBERT CHARLES GOODING WILLIAMS, Ph.D., B.Sc., M.I.E.E., has joined the North American Philips Company Inc., of New York, U.S.A.

Dr. Williams went to America for the purpose of gaining experience in American industrial developments in the electrical and allied fields and to become acquainted with their manufacturing methods.

He joins North American Philips as an executive engineer, for which his wide experience in the field of radio and industrial electronics makes him eminently suitable.

Apart from the important executive posts which Dr. Williams occupied while at Murphy Radio, Ltd., he will be remembered by his colleagues in England for his enthusiastic work on industry technical committees and for the interest that he always displayed in the radio section of the Institution of Electrical Engineers.

His many friends, both here and in America, will wish him success in his new sphere of activity.

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended December 31st, 1946.

Region	*Number*
London Postal	2,008,000
Home Counties	1,427,000
Midland	1,548,000
North Eastern	1,655,000
North Western	1,429,000
South Western	911,000
Welsh and Border	611,000
Total England and Wales.. ..	9,589,000
Scotland	1,035,000
N. Ireland	154,000
GRAND TOTAL	10,778,000

P.P.S. to P.M.G.

THE Postmaster-General, the Rt. Hon. the Earl of Listowel, has appointed Mr. A. H. Ridge to be his Principal Private Secretary, Secretary of the Post Office Board and of the Post Office Advisory Council.

Philips' Private Passenger-coach Service

A SERVICE of passenger coaches has been instituted by Philips Lamps, Ltd., between the company's head office at Century House, Shaftesbury Avenue, and two of their factories, one at Mitcham and one at Waddon in Surrey.

These coaches will operate four times daily in each direction from Monday to Friday, with two services each way on Saturday morning.

Two single-decker, utility type coaches, each with a passenger capacity of eight persons, will operate the service. They are licensed as private vehicles and will carry no goods. Mail and business papers will be transported in compartments in the coaches designed especially for the purpose.

The use of the service will be restricted to members of the staff of the Philips group of companies who are engaged on business between the points mentioned above. It will not be used for private purposes.

The coaches are identical in design. Each takes the form of a standard 30cwt. Bedford chassis, carrying a body built to Philips' specification. This body is coloured green and cream, and carries, as a badge, the well-known Philips' emblem. The engine capacity licensed under the new rating, is 3,519 c.c. (approximately 27 h.p.). The length of each coach is 17ft. 2in. from bumper to bumper; the overall width is 6ft. 2in.

Philips' Private Passenger-coach Service.—The start of the first run to Philips Mitcham Works. Mr. S. S. Eriks (looking at camera), Managing Director, Philips Lamps, Ltd., enters the coach. Mr. van der Laan, Financial Controller (nearest coach) stands by.

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Sir R. Watson-Watt

SIR ROBERT WATSON-WATT has relinquished the full-time appointments which he held as Vice Controller of Communications Equipment under the Ministry of Aircraft Production and Scientific Adviser on Telecommunications under the Air Ministry.

Sir Robert is taking up private work, but he will also continue to devote part of his time to consultant work for the Government, and will act as Scientific Adviser on Telecommunications to the Ministry of Supply, Air Ministry, Ministry of Civil Aviation and Ministry of Transport.

Sir Robert has had a distinguished career in the Government service. After serving in the D.S.I.R. he went to the Air Ministry in 1936 and became Director of Communications Development there. During the war he held important Government posts in the radar and telecommunications field.

Government Surplus

LARGE quantities of radio components are among the Government surplus stores for which the Ministry of Supply is responsible. Already £500,000 worth of these stocks has been sold, including 12,000,000 fixed condensers, 800,000 variable condensers, 23,000,000 resistances and 1,000,000 valveholders. In addition, components to the approximate value of £30,000 have been sold to universities, technical schools and other educational establishments.

Making this statement, a Ministry of Supply official said: "The Ministry's policy is to satisfy public demand. But where the surplus is very heavy in relation to current production and requirements it may be against the national interest to release the whole of the surplus stocks, especially if they could be sold only at such low prices as would cause serious harm to the industry concerned and lead to unemployment. Unfortunately, it is not a proposition to hold surpluses for any long period, because of shortage of accommodation and, sometimes, the risk of deterioration in store. For those reasons it is occasionally necessary to scrap goods in serviceable condition, although this seldom happens.

"Certain types of fixed condensers, such as paper tubular, are a case in point. The stocks represent many months' normal production. It has been decided after full inquiry to release for sale another 12,000 000 of these types. The balance will be disposed of by dumping in disused mineshafts, as it is impracticable and uneconomical to break the condensers down to recover raw materials.

"All stocks and future arisings of types still in comparatively short supply, such as electrolytics, will, wherever possible, be segregated for sale."

Radio Interference

AT the invitation of the British Standards Institution, delegates from 11 countries recently met in London to discuss the problems of radio-interference suppression. A brief review of the work and progress made in various countries since the committee's last meeting in 1939 was followed by a discussion on interference at H.F. It was agreed that at the next meeting the technique of measuring the high-frequency interference should be discussed. A further meeting will probably be held in September at Zurich.

A huge valve "trouble shooter" which will speed the development of radio, television, facimile, and industrial electronic equipment has just been built at the General Electric laboratory in America. Water-cooled and forced-air cooled valves having a rating of up to 5,000,000 watts may now be tested in the valve performance analysing equipment shown above.

National Test for Accompanists

THE first examinations to be held in Great Britain for the National Test for Accompanists of Movement, sponsored by the Central Council of Physical Recreation, took place in January at the Sandon Studio, School Lane, Liverpool.

The tests, which covered musical accompaniment to keep fit exercises, skipping, national dancing, tap dancing and ballroom dancing, were judged by Mrs. M. Porter, A.R.C.M. (examiner-in-charge), Mr. Gordon Green, Miss K. Evans, Miss B. Dunmett and Miss H. Stafford-Burrows.

Planned to raise the standard of musical accompaniment to all forms of movement and to secure recognition of the importance of employing competent accompanists, this national test has been inaugurated by the Central Council of Physical Recreation in co-operation with the Incorporated Society of Musicians.

Television Advisory Committee

A FURTHER meeting took place recently between the Television Advisory Committee and the Renters', Exhibitors' and Producers' Joint Committee of the film industry. A certain measure of agreement was arrived at on some aspects of matters of mutual concern. Other important matters remain to be discussed.

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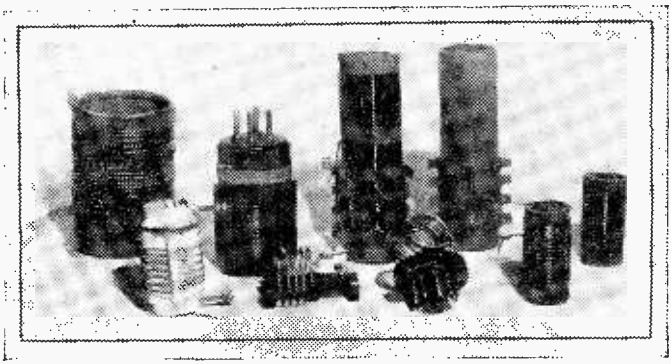
Winding Tuning Coils

Details of Construction of Various Types of Coils for All Ranges

WHEN winding coils for use in a receiver there are a number of points to bear in mind if best results are to be obtained. In this article these are dealt with and data given so that coils for all the usual wave-ranges may be wound. Such coils need be in no way inferior to commercially-made coils, and have the advantage that they may easily be modified to tune any particular frequency range.

Dual-range Coils

Fig. 1 shows the arrangement of windings for an ordinary long- and medium-wave coil. An ebonite or paxolin tube, or a cardboard tube which has been varnished, should be used. All the ends of the windings are secured by passing through small holes in the former and small brackets are used to mount the coil. If a chassis is used it is more convenient to secure the coil above a ¼in. diameter hole and take all the leads down inside the former and through the hole to the appropriate components.



A group of coils made up by the author.

The number of turns for the grid windings will be found from the table. It should be noted the wire gauges are not very critical. Enamelled and single-silk-covered wires may be regarded as similar; when using wires with thicker coverings slightly more turns will be required.

For reaction windings two-thirds the turns of the grid windings (about 60 turns) are required. (See notes on reaction windings later.)

The position of the aerial tapping is a matter for choice. The nearer it is to the bottom of the winding the higher will be selectivity, but some reduction in signal strength will arise. From one-third to one-half the distance from the bottom of the coil is usual.

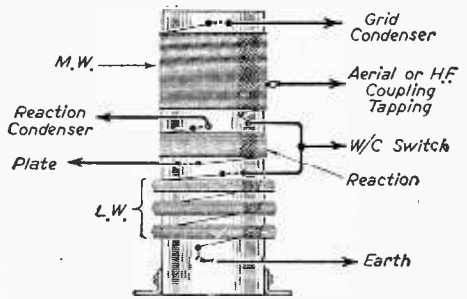


Fig. 1.—A simple dual-range coil.

A typical circuit for a pair of these coils is shown in Fig. 3. Both the .0002 mfd. condensers connected to the grid tappings may be pre-sets to enable selectivity to be adjusted. The coils should be mounted several inches apart, with a metal screen interposed, to avoid instability.

Adding Primary Windings

The addition of primary windings isolates the aerial so that a gang condenser may be used without trimming difficulties arising; it also makes possible H.F. transformer coupling, as shown in Fig. 4.

Fig. 2 shows how the primaries are added. A strip of insulating tape about ½in. wide is placed round the bottom of the medium-wave winding. The coupling winding is placed on top of this, with an additional winding between the lower sections of the long-wave winding to increase the coupling on long waves. About one-third the turns used on the grid coils will be suitable. (See notes on primary windings later.)

Component values in Fig. 4 should be as in Fig. 3. If additional switching is arranged to short-circuit the long-wave section of the primary winding a slight increase in volume will be obtained on medium-wave reception.

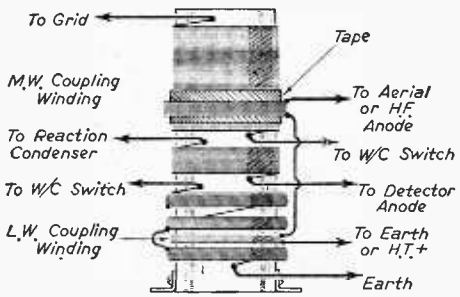


Fig. 2.—A dual-range coil of the H.F. transformer type.

Short-wave Coils

With these, the turns of the grid winding should be spaced. In the table a spacing equal to the diameter of the wire is indicated, although with ribbed formers already threaded spacing may be

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greater. Enamel-covered or tinned-copper wire is most suitable. For reaction and aerial-coupling winding any kind of covered wire of about 26 s.w.g. is suitable.

The coils may be mounted vertically, attached to valve-bases, or mounted horizontally by the method shown in Fig. 5. Unwound, plug-in coil formers may also be used.

The wave-ranges shown in the table assume a .00015 mfd. condenser for the S.W. coils. The figures may be modified slightly by stray wiring, minimum capacitance of tuning condenser, etc.

The first two coils in the table, on 1in. formers, provide two ranges covering from 12-50 metres for an all-wave or similar receiver. The six coils on 1¼in. diameter formers, covering from 11-100 metres, are suitable for plug-in type formers. With plug-in coils the leads are taken down inside to the pins. When a single fixed coil is used, or coils are selected by switching, it is best to take the leads direct from their appropriate windings to avoid unnecessary length in the connections. Fig. 5 shows the disposition and method of connection.

About ¼in. should be left between windings. In some cases the coupling winding is interwound with the lower turns of the grid coil, which provides a similar effect. In this case a very fine wire (about 36 s.w.g.) is used to avoid undue capacitance between turns.

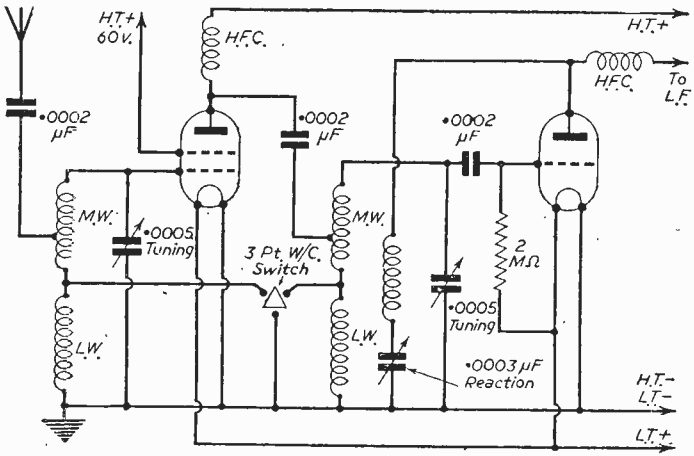

Fig. 3.—Simple circuit incorporating a pair of the coils of Fig. 1.

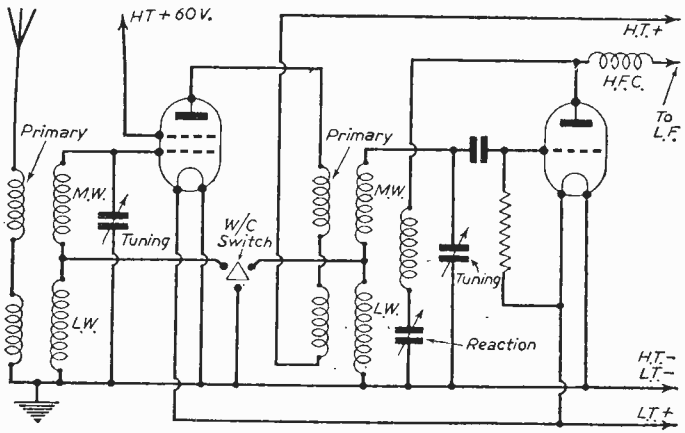

Fig. 4.—This circuit uses two of the coils of Fig. 2.

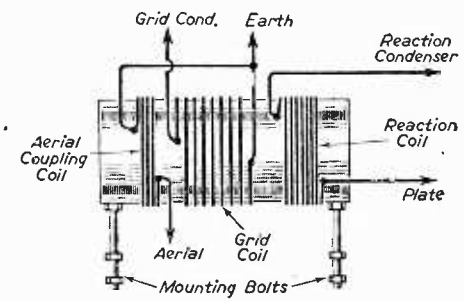

Fig. 5.—A simple short-wave coil.

Ultra-short-wave Coils

With wavelengths of 10 metres and below some increase in efficiency begins to become apparent if the coils are self-supporting. With ultra-short-wave coils this is easy to arrange.

The coils should be wound with 18 or 16 s.w.g. wire upon a former of appropriate size. They are then removed from the former and the turns pulled out to provide the desired spacing. The ends of the coils may then be cut off and soldered directly to tags upon insulated blocks as shown in Fig. 6. These blocks may then be bolted to the chassis of the receiver to provide the required coupling. If the bolts pass through a slot lateral movement will enable the coupling to be adjusted.

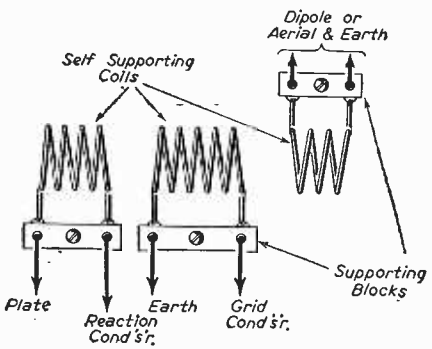

Fig. 6.—Ultra-short-wave coils may be made up as shown here.

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The number of turns will be found in the table, a tuning condenser of about .00005 mfd. being used. Stray capacities will greatly influence the minimum wavelength tunable and this should be remembered when wiring up. If it is impossible to reach the minimum desired then a turn must be removed from the grid coil.

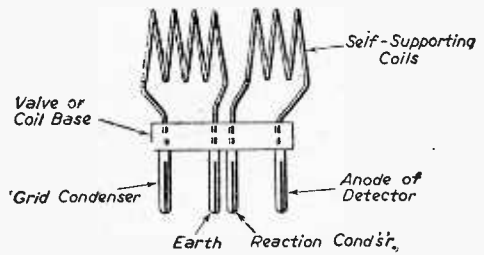

Fig. 7.—Another form of interchangeable U.S.W. coil.

Plug-in Coils

Figs. 7 and 8 show two ways of making these. Coils constructed as shown in Fig. 7 will operate efficiently down to 5 metres and they can have a base similar to the ordinary S.W. coils used in the receiver. If the whole receiver is laid out along ultra-short-wave lines good results will be obtained over all the ranges.

The coils shown in Fig. 8 may be of any diameter and will give good results upon wavelengths of 8 metres upwards. To simplify construction the reaction winding is connected to the grid winding. In consequence the reaction condenser should be operated by an insulated extension spindle to avoid hand-capacity. As with all short-wave coils, ribbed formers are to be preferred if available.

Reaction Windings

Approximately two-thirds the grid winding is usually suitable, but with very small coils the turns may need increasing slightly, four being used for a grid coil of five turns, and so on. The number of turns and the distance from the grid coil controls the degree of coupling. If reaction is insufficient, therefore, the turns should be increased, or the coupling tightened by placing the coils closer together.

Normally a distance of ¼in. between reaction and grid coils will be quite satisfactory. In any case the number of turns on the reaction coil should not exceed those on the grid coil or the natural wavelength of the former may come within the tuning range, giving a marked decrease in sensitivity on that frequency.

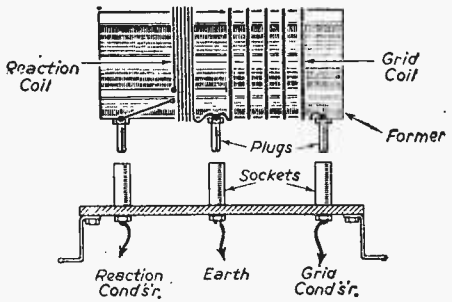

Fig. 8.—Plug-in short-wave coils with reaction windings.

Primary Windings

Although about one-third the number of grid turns is generally suitable the coil may be modified if desired. Decreasing the number of turns, or increasing the spacing between primary and grid windings, will decrease coupling. This will decrease volume but increase selectivity.

Table showing Number of Turns, etc., for the Grid Windings of Coils

Former	Wire gauge	Wavelength	Winding
1in. dia.	20 s.w.g.	12–25 M.	7 turns spaced by diameter of wire.
1in. dia.	20 s.w.g.	21–50 M.	17 turns spaced by diameter of wire.
½in. dia.	18 s.w.g.	5–10 M.	5 turns spaced by diameter of wire.
½in. dia.	18 s.w.g.	9–20 M.	13 turns spaced by diameter of wire.
1¼in. dia.	18 s.w.g.	11–23 M.	5½ turns spaced by diameter of wire.
1¼in. dia.	18 s.w.g.	15–32 M.	8 turns spaced by diameter of wire.
1¼in. dia.	18 s.w.g.	20–42 M.	13 turns spaced by diameter of wire.
1½in. dia. 1½in. dia.	30 enam. 28 d.c.c.	200–550 M. 200–550 M.	74 turns side by side. 94 turns side by side.
1½in. dia.	36 enam.	1,000–2,000 M.	3 piles each of 81 turns.
2in. dia. 2in. dia.	28 d.s.c. 30 d.s.c.	200–550 M. 200–550 M.	58 turns side by side. 54 turns side by side.
2in. dia.	34 enam.	1,000–2,000 M.	4 piles each of 51 turns.
1¼in. dia. 1¼in. dia. 1¼in. dia.	24 s.w.g. 24 s.w.g. 24 s.w.g.	21–48 M. 30–65 M. 45–100 M.	11 turns spaced by diameter of wire. 16½ turns spaced by diameter of wire. 30 turns spaced by diameter of wire.
⅛in. dia. ⅛in. dia. ⅛in. dia.	16 s.w.g. 16 s.w.g. 16 s.w.g.	4–6 M. 6–8 M. 8–10 M.	4 turns spaced ⅛in. 6 turns spaced ⅛in. 10 turns spaced ⅛in.

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The Electronic Organ

Further Details on the Home-construction of Musical Instruments on the Novacord Principle

By W. J. DELANEY (G2FMY)

SINCE we published a photograph of a home-made electric organ in our February issue, we have received dozens of requests for details of construction, or lines of experiment, and we hope at a later date to be able to give the designer's own details in this particular case. In the meantime we have been carrying out a search with a view to finding some details which would be of use to the many readers who are anxious to experiment in the building of this particular type of musical instrument. There seems at the moment to be a singular lack of detail, although the Patent Office files reveal many interesting details to those who are able to call there and spend the time in a search. The most recent and detailed information we can find on the subject appeared in our American contemporary, *Radiocraft*, in 1942, and some of the following details are taken from that publication. We shall be glad, of course, to receive any details from readers who may already have been experimenting on these lines, as it appears to be a very popular subject.

The Main Principle

For the benefit of those who are not familiar with the electronic organ (a term which is now generally adopted in place of the former "electric organ," which is a different thing), it may be mentioned that there are two main types at present in use. One of these operates by virtue of revolving discs in a magnetic field, the discs bearing varying numbers of teeth and thus giving varying impulses in the magnetic field, and the other consisting of oscillating valve circuits. The former is represented by the Hammond, and the latter by the Novacord, and both of these are handled commercially in this country by Messrs. Boosey and Hawkes. For the home constructor the second type seems to offer the most scope, and gives the most varied grounds for experiment in regard to tonal effects. It has the drawback, however, of requiring a very large number of valves—at least one for every note. As the standard piano keyboard has over 80 notes, this gives some idea of the range of stages required. As each note also requires its own filter or oscillating components, it will be seen that it can be quite an expensive instrument to build up. The basic circuit is usually a transformer coupling anode and grid in the same manner as a simple morse practice set, but each transformer must be tuned in some way. Actually, as will be shown later, this is not a difficult proposition.

Constructional Features

It is obvious that to start with we require a keyboard, and this may be home-made, or an old piano keyboard pressed into use. The keys are

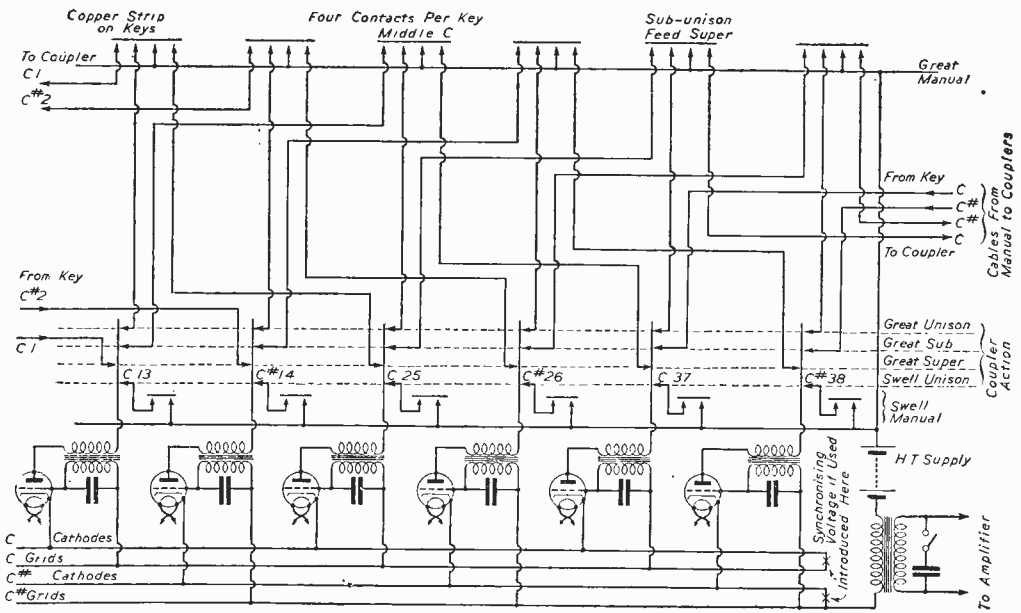

Fig. 1.—General scheme of the organ, illustrated by three octaves of the notes C and C sharp. All other notes are, of course, treated the same.

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merely required to act as switches to bring in each stage (or coupled stages) as required, and this is carried out quite simply by fixing a thin copper strip beneath the key, and placing corresponding contact strips on the main framework beneath the keys. The valves may be arranged in banks, and it is found that improved tonal effects are obtained by arranging these banks so that similar notes are grouped (so that a certain amount of inter-action takes place between the inter-circuit wiring) or even by including certain notes in conjunction with others a fifth of a tone away, etc.

For maximum results it is desirable to be able to add harmonics, and apart from switching by means of keyboard switches, inter-circuit coupling can also be used here. Tonal switches may be mounted at the back of the keyboard in the same manner as organ stops, and may, in fact, be similarly marked, or may be foot operated. A simple organ swell may be placed beneath the keyboard and operated with the knee as in an American organ, and this may be a simple volume control on the amplifier, the actual mechanical movement of the control being quite easy to arrange. Similarly, a coupler action may be placed for the other knee, and can be mechanically made to operate either a single switch to bring into action a batch of circuits, or may be a multi-contact switch suitably coupled into the circuit.

A Simple Circuit

In Fig. 1 is shown the basic circuit for three octaves of the note C and its sharp. This circuit is, incidentally, reproduced from the magazine above referred to with one or two modifications. C1 is the first or lowest C on the keyboard, C2 the next, C3 the next and so on. The terms on the right are standard organ stop terms which may be used as a guide to the tonal effects obtained, and consequently may be used as markings for the "stops" or couplers fitted to the organ. An interesting form of volume control was referred to in the article in question and is known as Gaskell's two-stop, three intensity circuit. Three single-pole change-over switches are used, in conjunction with a bleeder circuit across the H.T. supply. Two of these switches are coupled (or a single double-pole double-throw switch may be used), and the wiring and method of operating for this is shown in Fig. 2.

Components Required

So much for the main outlines of the organ. With regard to the components which are needed, the valves are the most important, and a really good low-impedance triode is best, as this will work with quite a small H.T. supply, and the heater (or filament) may be run at quite a low voltage with consequent lengthening of its life. There is no need for all the valves to be of the same type, provided that oscillation can be obtained with the common L.T. and H.T. supply which is used. Ordinary L.F. transformers may be used for most of the circuits, tuning the secondaries with small presets. For the higher notes the transformer cores may be either removed entirely or laminations stripped out until the desired tone is obtained.

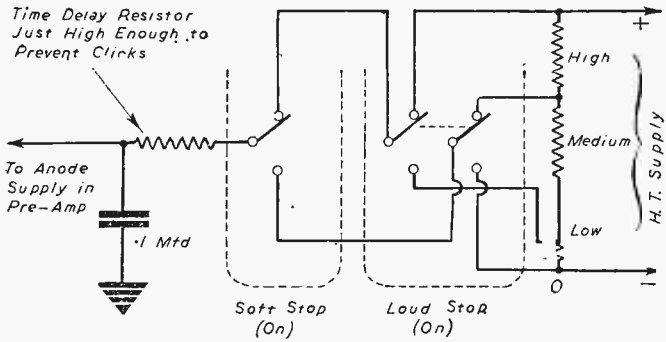

Fig. 2.—Gaskell's two-stop, three intensity circuit. With
Soft off and loud off output is O
" on " " off " " low
" off " " on " " medium
" on " " on " " high

Standard pitch-pipes, obtainable from any good music store, may be used if a piano is not handy for tuning. Large capacity condensers are required at the bass, and small condensers at the top of the scale. The transformer coupling the various circuits to the main amplifier must be a really good and hefty job, as it will carry varying currents as the music is played, and accordingly the output will vary if the core becomes saturated. This fact is actually utilised in one model, the transformer carrying split primaries and secondaries and these being coupled to give additive or opposing effects, and thereby adding second or third harmonics.

It is hoped that sufficient information has been given above to enable those who are interested to start experimenting and, as already stated, we shall be glad to receive details of any results which have been obtained by our readers with this type of instrument.

"New Methods of Radio Production"

THE outstanding paper of the year was read before the British Institution of Radio Engineers recently.

The author, Mr. J. A. Sargrove, entitled it "New Methods of Radio Production."

The technique at present employed in the production of radio receivers and amplifiers is well known. Mr. Sargrove has, however, evolved a method of producing radio and other electronic equipment which not only reduces manual labour to an absolute minimum, but can be applied to the whole range of manufacturing radio products.

The basic principle of the system is the deposition of metal and graphite into grooves and depressions on pre-formed plastic plates. After passing through an electronically controlled production machine, these mouldings emerge complete with inductances, fixed and variable capacitors, resistors and conductors all in continuous relation with one another.

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Recording on New Magnetic Tape

Some Interesting Details of a Modern Recording System

By H. SANDERS

REMARKABLE developments in the recording of sound have been achieved of recent years, and when the writer visited the Research Station of the British Broadcasting Corporation he was given a most instructive account of the numerous advances made, particularly in Germany and the United States, while Great Britain is obviously not in the background. One of the most interesting of these developments is the recording of sound on a tape made of a paper which has been given a coating of metallic suspension possessing a high degree of coercive force. The tape is tough in character and measures about ¼in. in width. It has magnetic properties of permanent type basically dissimilar to those of any other material, and is quite able to receive and reproduce sound recordings of high quality.

Advantages of Tape Recording

The development of recording sound began, of course, with the wax cylinder of the old Edison Bell phonograph, which was succeeded by the vulcanite and shellac disc of the gramophone—still called the phonograph in America. There are, however, obvious disadvantages in either of these two methods, and recording on tape has numerous good points. It is simpler to handle, economises space, is easier to use again, and the maintenance of permanent records is less expensive. Moreover, permanent magnetic tape of the type to be described has the additional advantages that it cuts out metallic-sounding reproduction, can be run at slower working speeds so that a greater length of continuous recording can be obtained at less expense, while it is a simple matter to edit the reproduction by a splicing feature combined with instantaneous erasure.

The way in which these advantages are secured is by co-ordination of the inherent magnetic capacity of the tape material and the specially designed recording head and associated circuits. These employ the high coercive force of the tape to keep up a high ratio of signal to noise. The employment of higher tape speeds enables extremely high fidelity to be attained at extreme temperatures. On the other hand, the higher tape speeds necessary to produce maximum fidelity are not regarded as the normal working range of the tape for the reason that they involve a loss of recording time. The tape will work satisfactorily for the majority of sound recording purposes at frequencies up to 6,000 cycles with a tape speed of 8in. per second. It is probable that in the near future additional improvement may allow of a higher range of frequency or a lower speed of tape, but at the moment the above are regarded as sufficient for most requirements of commercial type.

Metallic Base Powder

The interesting point about this new tape is that it is coated not with a metallic oxide, but with a metallic base powder. The magnetic properties possessed by the powder approximate to those of the nickel-cobalt-aluminium-iron alloy known as Alnico. It should be noted that the possession by this powder of a high coercive force calls for a much different recording technique and erasing technique from that which is employed for wire and materials having a lower coercive force. The final result is that the recording mechanism can be simplified, while the tape is of greater permanency.

The thickness of the tape is 0.002in., which includes the coating, whose individual thickness is 0.0005in. The breaking load of the tape is 6lb. The tape has excellent dimensional stability by reason of the fact that it has a base of paper. The Germans have employed a tape made of plastic material, but the paper tape is regarded as being superior to this.

The production of the tape is already technically established and uniform output ensured. In Table I is seen a comparison between the magnetic properties of the new tape and those of other sound recording materials:

TABLE I

Material	Hp.	Bp.	Br.	Hc.	max./ 10^6	Sp.Gr.
Sintered oxide..	3,000	4,800	1,600	900	0.5	2.77
Magnetite	3,000	3,650	1,600	190	0.09	2.62
Alnico III	2,000	12,000	6,900	475	1.35	6.9
New Tape	3,000	9,800	4,450	435	0.71	4.0
	3,000	11,000	5,000	500	0.85	4.8

The reader should bear in mind that any of the material included in Table I if suspended in a state of fine division would show values considerably lower as regards Br, and in each instance the Hc value would remain unchanged or even a little higher. By regulated variation of the methods of processing, the new tape powder can be obtained with a considerable range of permanent magnet properties.

The powder is manufactured by a method of novel type that produces an extremely uncommon physical structure. It is considered that this may represent the basic factor in its achievement of remarkable magnetic properties. The matter is, at the moment, being rigorously investigated.

Magnetic Recording Tests

The majority of magnetic recording tests can be carried out by means of a continuous loop of adequate length. One of the most essential features in testing the tape is a well-balanced and positive grip driving mechanism. The most satisfactory kind of drive is a correctly chosen flywheel and capstan. A flywheel of this type should be made of steel, and should have a diameter not less than 3in. and a thickness not below ¾in. The driving capstan should for preference be a cylindrical projection on the flywheel, and be perfectly concentric with both the flywheel and its shaft. It is considered that the diameter of this hub or projection

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should be not less than ¾in., and not more than 1in. in diameter. Satisfactory traction is most successfully obtained by means of the pressure of a wheel maintained in firm contact with the capstan by a spring exerting considerable pressure. A metal driving capstan and pressure wheel have been found superior to rubber or composition faced driving members, which seldom retain their concentricity for an adequate period. Flanged wheels should not be employed for other use than as guides before or after the drive capstan. A flanged drive wheel always leads to trouble.

The Recording Amplifier

Testing of the tape can be carried out efficiently by means of any good amplifier. In building a unit of this type, it is essential that there should be minimum hum and thermal noise. Too high a gain is worse than not enough. It has been found that two 6C5 stages and a 6N7 frequency inverter feeding a pair of 6V6s is a satisfactory combination.

Recording and Reproducing Head

Normal practice in simple test set-ups is to employ a combination recording and reproducing head. Separate recording and reproducing heads afford a number of advantages, but present greater difficulty of alignment and location to eliminate interference.

The pattern of recording head found most satisfactory is basically a laminated ring possessing an air gap 0.0005in. to 0.002in. in width, and extending over the entire ¼in. width of the tape. Good coupling between the tape coating and this air gap is essential. Because of this, the greatest possible care must be paid to the construction of a suitable unit. It is suggested that this ring assembly should be approximately 1in. overall diameter and approximately ¾in. internal diameter, and possess a correct taper on the internal diameter under the air gap so as to concentrate the flux to the point of tape contact. A rectangular unit, made in two identical halves, is also satisfactory, and is rather simpler to construct.

A 77 per cent. nickel alloy has been employed with good results and is commercially available. Silicon steel is not satisfactory by virtue of the fact that its original permeability is not high enough for the reproducing function. To reduce eddy currents, the sheet material for laminations should not exceed 0.012in. to 0.006in. in thickness. High permeability material should be subjected to an annealing treatment after punching or shearing.

H.F. Bias Oscillator and Frequency

Because of the high coercive force of the new tape, the normal bias source for wire recording may not suffice. One-half to two watts may be needed, according to the design and dimensions of the recording head, as well as the method of erasure used. Employing a special head and recording circuit, D.C. and permanent magnet erasure have proved entirely satisfactory. By reason of the high power requirement, a frequency higher than 30 kc/s is not advised. When the current bias is applied, either a tapped winding or two separate coils, one for the audio component and one for the bias current, is advised. Mixing the bias frequency in the audio amplifier has usually been found unsatisfactory.

With the type of recording head described, approximately 50 to 75 milliamp. into a coil giving about 15 to 20 amp. turns is characteristic, where the audio component is in the neighbourhood of 10 to 15 milliamp. into a 3 to 5 amp. turn coil. These values are greatly governed, of course, by the dimensions and construction of the head, as well as the magnetic material employed and the characteristics of the gap.

Frequency Response Characteristics

It has been established that the constant current response varies so greatly with individual recording and reproducing head design that curves of this type cannot be given to any advantage here. Such curves as have been made indicate considerably superior high-frequency response than is obtained with wire media under the same conditions of gap and speed.

The new type of magnetic recording tape referred to in this article is made by the Indiana Steel Products Co., of Chicago, Illinois.

G.E.C. Progress in 1946

AMONG the many interesting developments in the G.E.C. laboratories during the past year may be mentioned the following:

V.H.F. Point to Point

Interesting experiments were carried out, involving the use of two transmitters operating on the same frequency and carrying the same modulation, the object being to increase the service area of F.M. transmission to mobile cars. Of several methods the following was considered to be technically the most promising:

At the main station normal circular coverage was obtained working on 100 Mc/s. A second transmitter at the same site, carrying identical modulation, had the carrier frequency raised by multiplier circuits to 250 Mc/s, and this transmission was beamed on to a relay station outside the main service area. Here the signal was frequency-divided, amplified, and retransmitted from an aerial with circular coverage. There were only small areas where interaction was detected, and the effect was not sufficient to reduce the combined service areas of the two stations.

Work was carried out on V.H.F. intercom. between all parties engaged on railway transport and maintenance work, and a study of propagation through tunnels, including "S" bends, was made.

V.H.F. F.M. Broadcast Transmitters

A complete 1 kW. F.M. broadcast transmitter has been designed and one has been supplied to All India Radio.

Two amplifiers and their power supplies, similar to the output stages of the 1 kW. transmitter, have been supplied to the B.B.C.

Television

A table model, 25in. wide by 16in. high by 14½in. deep has been developed. There are three television controls and push button selection of long, short, or medium wave broadcast.

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ON YOUR WAVELENGTH

By THERMION

Radio Contact with the Spirit World

THE *Psychic News*, which is a paper devoted to the spiritualists and spiritualism, recently published an article under the above title. People's religious beliefs are no concern of mine, nor am I an anti-spiritualist, since the whole of Christianity is based upon spiritualism. The *Psychic News*, however, in its article seems to suggest that there is a connection between the spirit world and this mundane sphere which can be established by means of "vibrations." I seem to remember some years ago the B.B.C. testing out this idea. There were a number of people in the studio who were invited to "radiate" their thoughts, and listeners were invited to say whether they had received the messages, which were recorded and sealed in the studio. The result was most disappointing. No one received any of the thought messages.

The paper quoted goes on to tell us that "what we take for a block of concrete or a wooden table is nothing but ether vibrating." Really? This is an entirely new thesis worthy of Dalton; the present one I mean, who has invented a new brand of political economy which I have christened Daltonomy. However, the burden of the article quoted seems to be that it is possible by means of radar to make contact with the spirit world, or that it will be possible a few years hence. Although the article is unsigned we are told that it is written by "a Radar Scientist who is working on cosmic research in Australia." We should like to know the name of this radar scientist and to have some details of his qualifications, for it is only by the possession of this knowledge that we can assess the value of his remarks.

However, I wonder what sort of "vibration" it was which induced the *Psychic News* to inform Lord Horder of his death, when he was very much alive! Perhaps the radar scientist can explain that one. I certainly can explain how so-called spirit photographs are produced, and I could certainly explain a great deal of the clairvoyance (alleged).

I could also give a séance equivalent to some of those which make some spiritualists go goggle-eyed with amazement. Perhaps some of my readers who are interested in this movement can tell me why the guides are nearly always Red Indians! Anyway, I do not advise my readers to take this article in the *Psychic News* too seriously—not that they will, having a greater knowledge of ordinary physical phenomena than seems to be possessed by many.

Here is a fair sample of the article to which I have referred:

"The spirit world vibrations are of too short a wavelength for us to be able to see them or handle with ease. If, then, these high-frequency vibrations are mixed with those of longer wavelength, then the resulting effect should fall within our visible spectrum.

"This, of course, sounds remarkably easy. In theory it is, and if the problem is to be solved this is the way it will be done.

"But in practice it is surprising just how many difficulties confront the investigator. Technical difficulties are, of course, to be expected, but they are never insurmountable. More difficult is the finding out just at what wavelength the spirit world vibrates."

Racketeers

I HAVE received the following letter from "Radiorep" (West Bromwich):

"Re your notes on quacks, racketeers, etc., and a study of Mr. Loveland's correspondence, I find so much in common agreement with the latter gentleman that I wonder I pen these words. People will always put their heads into the lion's mouth; it is very human, but they will also follow a friend's recommendation and go without hesitation to a 'private' service engineer who has turned out a satisfactory job of work even though the receiver had been 'repaired by a dealer only a month ago and he charged me £4 odd, which has never been right since.' This story was told to me quite recently, and in one case particularly the set could not possibly have functioned correctly or otherwise.

"My respects to the genuine 'dealer,' whether he be a radio engineer, radio mechanic or any associated trader or tradesman, who in these times can, and will, turn out a sound job—but to the others, 'racketeers' and 'swindlers,' I join you in hoping for a speedy end to the trouble."

Radio Controlled Models Society

THERE has recently been formed a society for all those interested in the radio control of models. At the inaugural meeting many schemes were discussed for bringing about a closer co-operation between those interested in the radio control of models. It has decided on the title which heads this paragraph. The society will be arranging several lectures in the near future. All types of radio-controlled models—aircraft, speed-boats, locos, race-cars, launches, etc.—will be dealt with. Correspondence regarding this society should be addressed to Mr. R. Lawton, 10, Dalton Avenue, Whitefield, Nr. Manchester.

Closed Shop?

PROPHET of woe I hate to seem,
But I've a premonition
That if you have few friends at court
You may get no audition.
With talent and ability
You may be brimming full,
But better far, to help you on,
Is having strings to pull!

The "old gangs" know their way about,
And feast upon the fruits
Which surely should be fairer shared,
And more saved for recruits.
Of "Dug-in Blue-eyes" we grow bored,
We think this ought to stop,
Or is it that Broadcasting House
Is just one more "closed shop"?—"TORCH."

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An Experimental Oscillograph

Details of an Easy-to-build Cathode-ray Servicing Instrument

By G. W. BROWN

THE practical advantages of the cathode-ray oscillograph, both in general servicing and in experimental work, are sufficiently well known, making a lengthy survey unnecessary here. The practical advantages of this particular circuit, however, may be summarised as follows:

(1) Simplicity of design. The number of components has been cut down to the bare essentials.

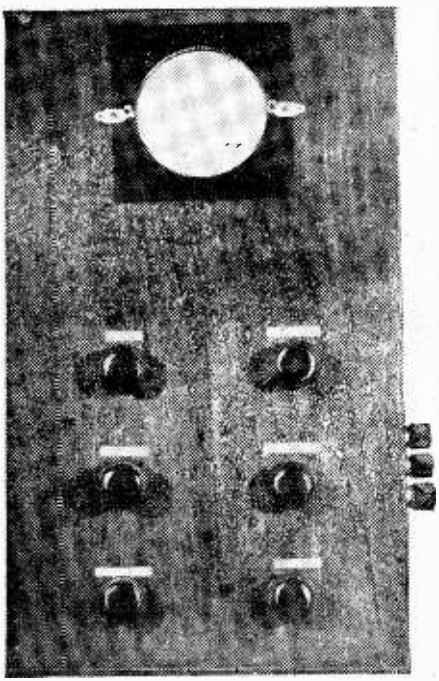

Fig. 1. View of the front of the completed oscillograph.

(2) Low cost. Assuming all components are to be bought new, the total cost is about £7.

(3) Efficiency in operation. None of the above advantages has been obtained at the expense of efficiency. The circuit will be found to be thoroughly reliable, giving a steady, picture of ample brilliance, while the time-base gives a range of frequency smoothly variable up to about 20 kc/s.

Components

The tube is a 2¾in. electrostatic C.R.T., obtained from M.O.S., whose advertisements appear regularly in this journal. It is the equivalent of the Cossor 23D and has a 12-pin base, connections to which are shown in Fig. 4.

The transformer is a standard 400-0-400v. type, with two L.T. heater windings: 4v.-2.5A and 4v.-6A. This latter winding feeds the heaters of the tube, GT1C and W42, whose total consumption is approximately 3.5A. Thus, a 4-amp. winding is theoretically possible, but a 6-amp. winding should be used if available. If the transformer to be used has a third L.T. winding, it should be used to feed the GT1C separately.

It appears to be standard practice to use a half-wave rectifier circuit to obtain the advantage of the higher (H.T.) voltage—in this case it would be 800v.; but the writer is of the opinion that such an advantage is negatived in an instrument of this particular type, for three reasons: (1) the trace shows an A.C. ripple on the lower time-base frequencies unless the smoothing is improved; (2) the working voltage of all condensers must be doubled; (3) the deflection sensitivity is halved. The circuit as shown provides a sharp picture and the sensitivity allows more useful work to be done without the use of a signal pre-amplifier.

The W42 may be replaced by an MVS/PEN/B without affecting the performance if the former should be unavailable.

Construction

The theoretical circuit of the complete instrument is given in two parts (Figs. 2 and 3) because it is felt that the experimenter may desire either to make up a separate chassis for tube and time-base or to assemble the tube circuit first for preliminary tests. A word of warning is necessary here: if a metal chassis is used, remember that it is H.T. *positive* which must be earthed; hence, care is

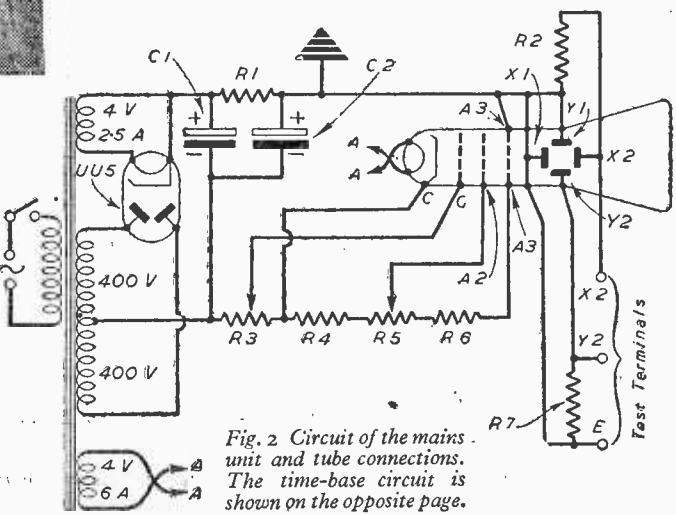

Fig. 2 Circuit of the mains unit and tube connections. The time-base circuit is shown on the opposite page.

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necessary to see that metal electrolytic condensers, with negative casing, are not automatically bolted to an earthed chassis. It is important, too, to notice that electrodes that are normally considered "safe" (valve cathodes, for instance) are now at a high negative voltage with respect to earth.

Wooden clamps with a felt or rubber facing can be made to hold the tube in position. In mounting the tube, the keyway of the holder (spigot type) should be set to point downwards. This locates the tube approximately correctly. Final adjustments cannot be made until the tube is in operation.

The core of the mains transformer should be in line with, but well behind, the tube. A convenient size of chassis is shown in Fig. 5. These are the plan dimensions of the cabinet which the writer has divided into two compartments, with the time-base and space for pre-amplifier (not yet finished) underneath the tube and power-pack.

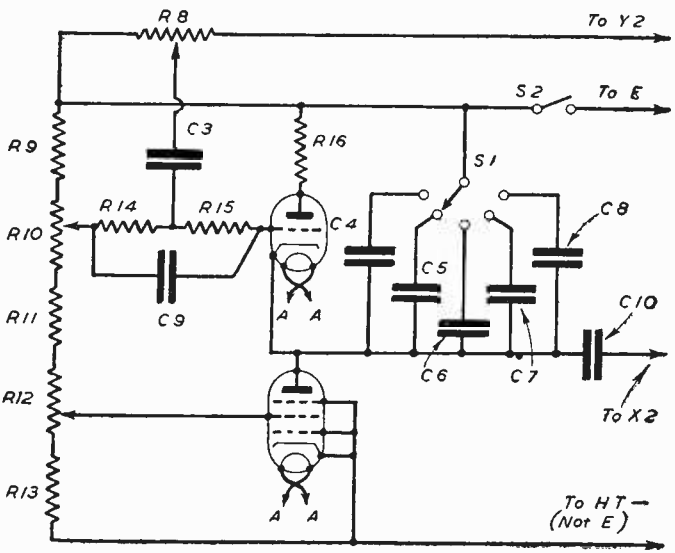

Fig. 3. Details of the time-base.

Mica condensers should be used where possible. In all other cases, the *working voltage* should not be less than 450v.

When the two circuits are built as one unit, the time-base is switched on or off as required by means of S2, which may form part of the 0.5 meg. synch. control.

Operation

Turn all controls anti-clockwise, i.e., "off." Switch on at the mains, leaving S2 open, and allow the instrument to warm up. Slowly advance brilliance control until a fuzzy spot is seen on the screen. Adjust focus control until spot is sharp. It may not be exactly central, but any slight displacement will not affect results. A D.C. voltage applied now between Y2 and E will cause the spot to move up or down (depending on polarity at Y2) a distance proportional to the voltage. An A.C. voltage will produce a vertical line of length proportional to the *peak* voltage.

Remove voltage from terminals, then switch on the time-base. The spot is now drawn out into a horizontal line. (If the line is not truly horizontal, the tube position must be corrected.) Adjust amplitude control until the line nearly covers the diameter of the screen. Apply an A.C. voltage (10 or 12v. will provide a picture of adequate height) between Y2 and E. This will cause the line to ripple vigorously. Adjust frequency controls until the wave slows down and finally stands still. Advance synch. control if the picture is at all unsteady. This will not normally be necessary when examining mains frequencies, but A.F. oscillators usually show a slight frequency drift which makes the use of the synch. control essential. Note that too much synchronising voltage will distort the trace.

Adjust focus and brilliance, taking care not to make the picture too bright in case the screen

LIST OF COMPONENTS FOR TUBE AND POWER-PACK

R1—15,000 ohms, smoothing.
R2—5 megohms.
R3—50,000 ohms variable, brilliance control.
R4—20,000 ohms.
R5—50,000 ohms variable, focus control.
R6—200,000 ohms.
R7—5 megohms.
C1 and C2—8μF electrolytics, smoothing, 450v.w.

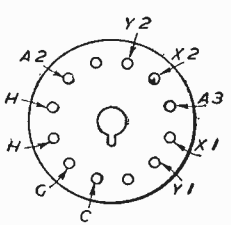

Fig. 4. Connections to the tube base.

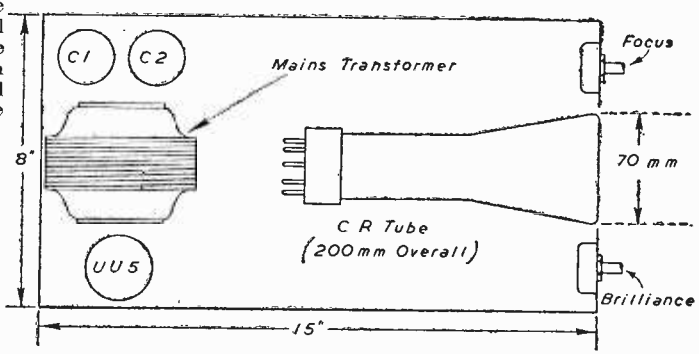

Fig. 5. Layout of the complete instrument.

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should become permanently marked. One complete sine curve (when examining a transformed mains voltage) will denote that the time-base frequency is set at 50 c.p.s. A time-base frequency of 25 c.p.s. will produce two complete sine curves, and so on. When examining the output of a receiver across, say, the output valve, connections to Y2 should be made through a large condenser, otherwise the high potential at the valve anode will deflect the beam right off the screen.

LIST OF COMPONENTS FOR TIME-BASE

R8—0.5 megohms, synchronising control (with switch S2).
R9—25,000 ohms.
R10—50,000 ohms variable, amplitude control.
R11—25,000 ohms.
R12—25,000 ohms variable, frequency (fine) control.
R13—3,000 ohms.
R14—100,000 ohms.
R15—100,000 ohms.
R16—500 ohms.

C3—.025μF.
C4—.25μF.
C5—.1μF.
C6—.01μF.
C7—.002μF.
C8—.0007μF.
C9—.0001μF.
C10—.025μF.
Coarse frequency control; selection by rotary switch S1.

VALVES.
GT1C, gas-filled relay.
W42—(As constant-current pentode.)

Location of B.B.C. Transmitters

BEFORE the fuel cuts in February, which restricted B.B.C. transmissions, the B.B.C. had released some interesting information on the location, power, etc., of transmitters radiating the Home Service and some of the other programmes.

For example, stations transmitting the Home Service are:

Brighton. Bristol. Cardiff. Dundee. Edinburgh. Fareham (Hants). Leeds. Liverpool. London (Balham). Manchester. Middlesbrough. Moorside Edge. Preston (Lancs) Plymouth. Redmoss (nr. Aberdeen). Sheffield.

Wavelength		Station	Service	kW.
kc/s	Metres			
1,384	216.8	Bartley (Hants)	West of England	10
1,384	216.8	Clevedon (Somerset)	West of England	20
1,050	285.7	Lisnagarvey	Northern Ireland	100
1,050	285.7	Londonderry	Northern Ireland	1
1,050	285.7	Stagshaw (Northumberland)	North of England or Northern Ireland	100
1,013	296.2	Droitwich (Worcs)	Midland	60
1,013	296.2	Norwich	Midland	1
977	307.1	Start Point (S. Devon)	West of England	100
877	342.1	Brookman's Park	London	100
804	373.1	Penmon (Anglesey)	Welsh	10
804	373.1	Washford (Somerset)	Welsh	60
804	373.1	Wrexham (Denbigh)	Welsh	1
767	391.1	Burghead (Morayshire)	Scottish	60
767	391.1	Redmoss (nr. Aberdeen)	Scottish	2.5
767	391.1	Westerglen (nr. Falkirk)	Scottish	60
668	449.1	Moorside Edge (nr. Huddersfield)	Northern	100

In addition to the radiation of the Third Programme by the Droitwich station (20 to 25 kW.) on 583 kc/s (514 metres), it is also broadcast by a group of low-power synchronised stations on 1,474 kc/s (203.4 metres). These transmitters, the power of which varies according to the size of the town or area to be served, are situated in:

Belfast. Bournemouth. Hull. Glasgow. Newcastle-on-Tyne.

The Light Programme

Apart from the main Light Programme station, the 150 kW. long-wave Droitwich transmitter on 200 kc/s (1,500 metres), the programme is broadcast by 10 medium-wave stations, all working on 1,149 kc/s (261.1 metres), located as follows:

Brookman's Park (nr. London) .. 60 kW.
Burghead (Morayshire) .. .. 20 kW.

(*Concluded on page* 197)

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Practical Hints

Bench Voltages

WITH this arrangement the jig can be brought right up to the job, which is very useful when working on portable receivers, as the jig will very often go inside the set, if necessary.

The four sockets on the wall panel are wired to intermediate tappings in the H.T. The negative, 110 and 120 volts (or maximum) are wired to the octal socket.

The wander leads, V1 and V2, are also wired to the socket, the corresponding pins in the plug being wired to the sockets V1 and V2 on the jig via the flexible cable. H.T.—, 110 and 120 are, of course, wired to pins corresponding to their respective sockets in the panel.

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."

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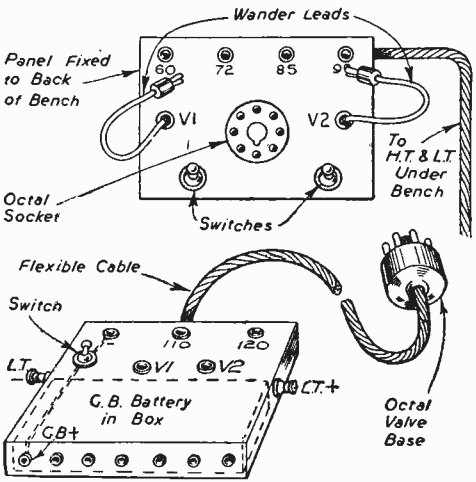


A very useful addition to the workbench.

L.T. terminals are on the side of the jig. The control panel has also switches for trickle charger; the other switch was for H.T. charger, which is not now used. The toggle switch on the jig is to connect H.T.— and G.B.+ if necessary.—ROBERT C. BELL (Ambleside, Westmorland).

Home-made Servicing Torch

BEING short of funds, as I am still a student, I did not wish to purchase a pen-torch for throwing a light on the works of a faulty set.

I pushed a torch bulb into a hole in a cork about ⅜in. thick, and pushed this assembly into a small test-tube. A negative wire is led down the tube and a pen-torch battery inserted.

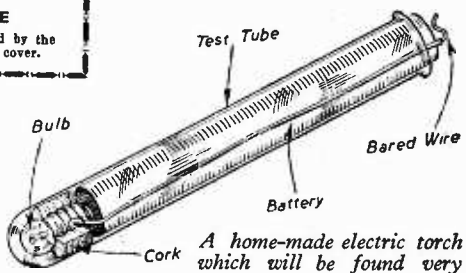
To switch the torch on I just pressed the bared negative wire on to the end of the cell. Hence an efficient small torch was formed.—J. M. WOOD (East Park, Hull).

Shock-proof Socket

THIS is an idea for a plug which cannot be accidentally knocked out of its socket, and which also has four connecting pins.

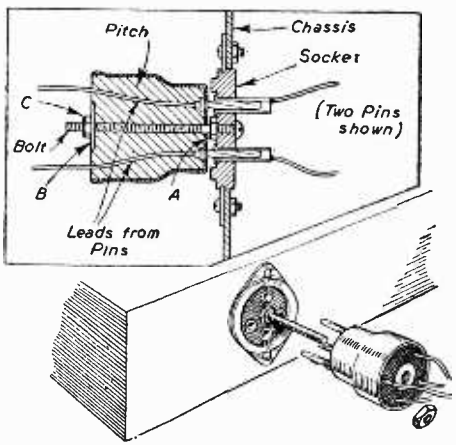
The socket consists of a five-pin valveholder which has had the middle pin removed, and in its place a long thin bolt is fastened by means of nut A (bolt is 1½in. long).

The plug is made out of the base of



A home-made electric torch which will be found very useful for servicing work.

an old five-pin valve; again the middle pin is removed, so that the bolt on the socket may pass through the hole made. Inside, the plug wires are soldered to the remaining pins and allowed to stick out well beyond the back of the plug. The back of the plug is now filled with pitch and the plug forced into its socket while the pitch is still soft. This allows the bolt to stick out of the pitch, and over this bolt press the washer B, and then smartly pull the plug out of its socket, so that it just leaves the washer stuck in the pitch. When pitch has set the



A plug which cannot be knocked out of its socket.

plug can be slipped into its socket and held there by means of the nut marked C, and thus prevent the plug being pulled out.—G. NOLAN (Bradford).

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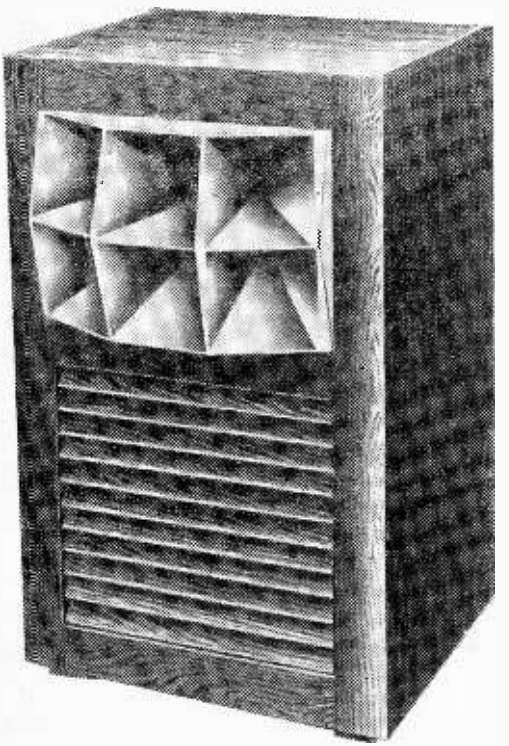
Notes from the Trade

Bitone Reproducers

MESSRS. VITAVOX, LTD., are introducing the new Bitone series of reproducers, specially designed to facilitate high-quality sound reproduction in small halls, cinemas and similar auditoria.

To ensure perfect audibility at higher audio frequencies, the Bitone reproducer has a multi-cellular horn, consisting of a number of small horns, correctly orientated to give adequate coverage, and a moving-coil pressure unit with a lightweight duralumin alloy diaphragm specially designed for high-frequency reproduction. A 12in. moving-coil cone type loudspeaker, operating in a vented enclosure, reproduces low frequencies and reduces amplitude distortion to a minimum.



One of the new Bitone speakers reviewed here.

A dividing network, consisting of a high pass/low pass filter, incorporating high-grade condensers and carefully adjusted air-cored inductances, ensures correct distribution of the frequency spectrum between the two units and has an attenuation of 12 db. per octave either side of the cross-over frequency of 1,000 c.p.s.

There are two types of Bitone reproducer: the 610 (power handling capacity, 10 watts) and the 620 (power handling capacity, 20 watts). Both types have a terminal impedance of 7.5 ohms, a H.F. distribution of approximately 60 deg. horizontal and vertical, and a frequency range of approximately 50-12,000 c.p.s.

The solidly constructed cabinets have closed backs and can be fixed to a wall with no detrimental effect to the performance. The cabinets are 32in. high, 20in. wide, and 21in. deep, and are smartly finished in veneered birch, stained walnut and polished. Alternative cabinets are available, veneered in oak and mahogany. The horns are finished in an attractive bronze lacquer. Full details as to prices, etc., may be obtained from Messrs. Vitavox, Ltd., Westmoreland Road, London, N.W.9.

Woden Amplifiers

THE Woden Transformer Co., Ltd., of Moxley Road, Bilston, Staffordshire, announce that their "Junior" and "Classic" amplifiers have now been redesigned and in consequence give an increased undistorted wattage output.

The "Junior" amplifier, formerly giving 15 watts, now has an undistorted output of 20 watts. The new retail price of this model is £27 10s.

The "Classic" amplifier, formerly a 50-watt model, now has an undistorted output of 60 watts, with a new retail price of £47 10s.

H.A.C. Short-wave Products

WE understand that the above firm is now trading under that title, with a new address at 66, New Bond Street, London, W.1. The business is still under the control of Mr. A. L. Bacchus.

M.O.S. Catalogue

THE Mail Order Supply Co., of 24, New Road, London, E.1, have produced a new catalogue (Issue No. 3), well printed on good paper and running to 16 pages. It carries illustrations and covers electrical equipment in addition to radio components. The catalogue may be obtained by sending 1d. stamp to the above address.

M.O.S. also inform us that they have now been appointed sole distributors for Great Britain of the Burgoyne Aerial Coaxial Connector. This is a form of "T"-piece in aluminium, with steatite insulation, and is equipped with two forged steel eyebolts at either side. It is designed to accommodate ½in. coaxial cable, although smaller cable could be used by wrapping it with insulation tape. The connector is supplied with a bottle of weatherproof cement and a length of ⅜in. outside diameter rubber tubing. It can be used to connect a lead-in to an inverted "L" or similar aerial, or for joining a down-lead to the centre of a dipole. It is weatherproof and highly efficient in use, both for receiving and transmitting aerials. The price is 24s. 6d.

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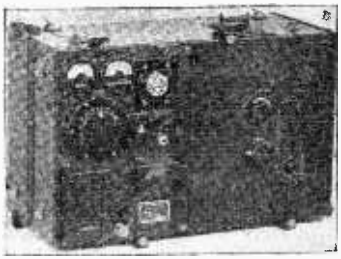

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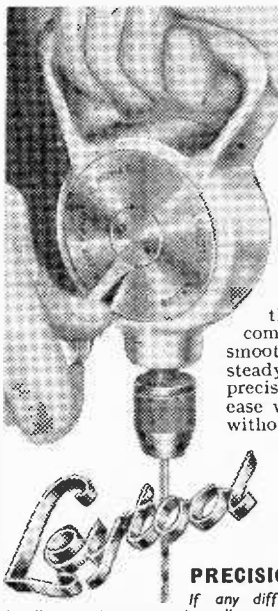

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The Accurate Alignment of a Superhet

Servicing Without a Signal Generator. By J. R. DAVIES

THIS article is written more for the beginner in wireless than for the "old hand." The writer says this now in case some readers may think that he has over emphasised certain points. This article is intended also for those who have, say, a multi-test meter, but are not fortunate enough to possess a signal generator and its associated equipment. It outlines the procedure necessary for the accurate aligning of a set using just a meter, a few simple tools, and a good aerial-earth system.

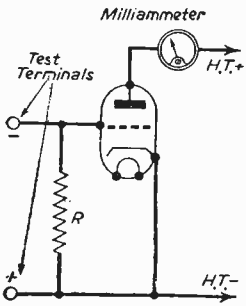

Fig. 1.—Circuit of simplified valve voltmeter which could be used to measure the A.V.C. voltage of a superhet. The resistance R is of a high value and might be omitted in this case.

Accurate alignment of a superhet is very necessary if best results are to be obtained. A badly adjusted set will probably bring in local stations with plenty of volume, but will not be very sensitive to weak signals. Also, a badly lined up set is liable to introduce second channel whistles which spoil the entertainment value of the programmes listened to.

General Procedure

The usual procedure in lining up a superhet accurately is to short the A.V.C. line to earth and use an output meter, the signal being supplied by a signal generator. In the opinion of the writer, shorting the A.V.C. to earth is liable to introduce slight discrepancies in the tuned circuits. As the set will be used finally with the A.V.C. working, it is best to line it up under working conditions, i.e., with the A.V.C. not shorted out.

Now, as the A.V.C. voltage is derived from the signal voltage fed to the double-diode triode (i.e., the second detector), we can measure the signal voltage by measuring the A.V.C. voltage. We then don't need to use an output meter at all (in fact, we are not interested in the A.F. stages, as they make no difference to the R.F. and I.F. circuits in any case).

Measuring the A.V.C. voltage may sound rather difficult to the beginner, but it can be done quite simply by using an adaptation of the valve voltmeter principle.

The valve voltmeter works as follows: We have a valve, whose anode current varies according to the voltage on its grid with respect to its cathode. Fig. 1 gives a simplified circuit. As more negative voltage is applied to the grid (with respect to the cathode), the valve takes less anode current and the meter reading drops, thus giving an indication of the voltage applied to the terminals of the valve voltmeter. But the reader will not have to use a valve voltmeter to line up his superhet, as we already have a valve voltmeter in the set!

Fig. 2 shows an I.F. valve, A.V.C. controlled, in a mains superhet. As the A.V.C. voltage rises,

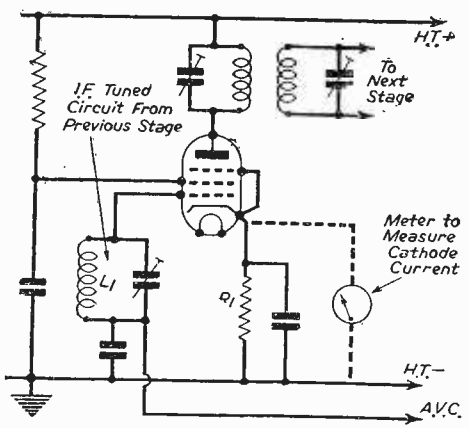

Fig. 2.—Circuit of A.V.C. controlled I.F. stage, A.V.C. being applied to the grid of the valve via coil L1. The "trimming meter" is connected across resistance R1.

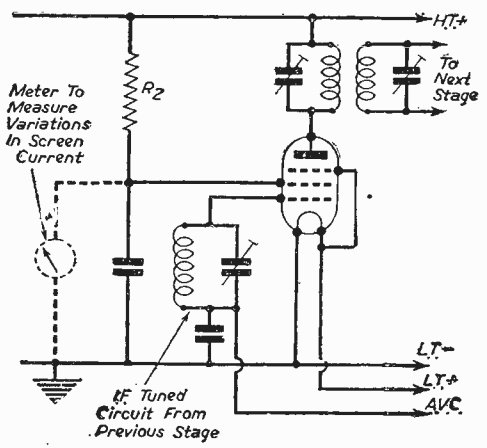

Fig. 3.—Battery version of Fig. 2, showing how "trimming meter" is this time connected between screen grid of the valve and earth.

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the grid of the valve becomes more negative with respect to the cathode, and the valve takes less anode current. Now, as the anode current drops, so does the cathode current, and the voltage dropped across the cathode resistance R_1 becomes lower. So that, if we connect a meter between the cathode of the valve and chassis, the meter reading will drop, as the A.V.C. voltage is increased. In other words, we have an uncalibrated valve voltmeter measuring the A.V.C. voltage of the set by the simple process of connecting two leads from an ordinary testmeter to the set. The meter should be set to a low voltage reading. The long leads to the meter will cause no instability as the cathode is by-passed by its decoupling condenser.

In Fig. 3 we have the battery version of Fig. 2. There is now no cathode resistance to measure across. However, there is a screen supply resistance and that will do quite well. As the A.V.C. increases, the screen-grid current becomes lower, and therefore the voltage dropped across R_2 becomes lower. As the H.T. voltage is fixed, the voltage between screen-grid and earth becomes higher. So, if we connect the meter, switched to a high voltage range this time, between chassis and screen-grid, we can again have a measure of the A.V.C. voltage.

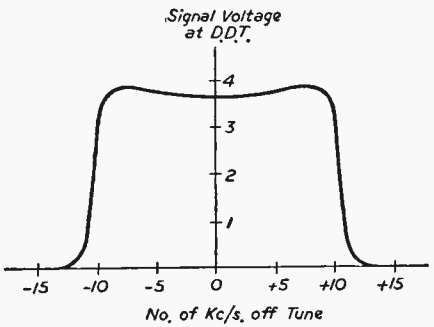

Fig. 4.—Example of "bandwidth curve" of I.F. transformers. The signal cuts off sharply after 10 kc/s off-tune on either side and remains substantially flat for ±7.5 kc/s.

Finally, to make certain that the resistance and leads of the meter make no difference to the circuit being trimmed, it is advisable to connect the meter to an R.F. or frequency-changer valve when trimming the I.F. transformers, and to an I.F. valve when trimming the R.F. stage or stages.

If the set is fitted with a magic eye or some form of tuning indicator operating from the A.V.C., an external meter isn't even necessary at all. It's built into the set!

The I.F.s

When lining up any tuned circuits, it is always advisable to use a weak signal. This is because a strong signal makes the trimming appear flatter, and accurate adjustment is hard to obtain. Sufficient signal just to cause the A.V.C. measuring meter to deflect a few degrees is all that is required.

It is also advisable to have the volume control turned to "full." This is because the control, unless really well decoupled from the diode, is liable to introduce small, stray capacities into the last I.F. coil as the control is turned. And, as the volume will be turned to full when receiving weak signals, it is best to have the coils at their best in this condition. It is a good idea to use a trimming screwdriver made entirely of insulated material, such as ebonite, bakelite, fibre, etc. The blade of such a screwdriver is liable to get broken in use, but a touch with a file soon puts it right. If the trimmers are stiff they can always be adjusted with

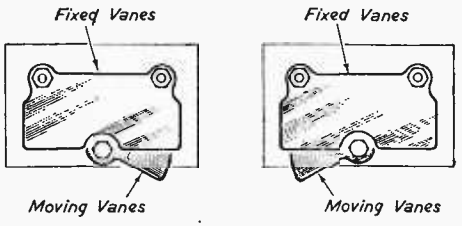

Fig. 5.—This illustrates how two different positions of an air-spaced trimmer will give the same capacity.

a small pocket metal screwdriver, and the final adjustment done with the insulated screwdriver.

The best station, in the writer's opinion, for lining up the I.F.s., is Droitwich in the long-wave band, as this station usually sends out a good, strong signal; its modulation depth isn't so deep as to affect our "A.V.C. trimming meter," even on loud passages of music, and the stability of the frequency-changer valve in the set is at its best on the long-wave band. Of course, if the set has no long-wave band, the medium-wave local will have to be used.

The strength of the signal will probably be too great for our purposes, so the aerial coupling can be reduced by connecting a variable condenser in series with the aerial, or by using a smaller aerial. A few feet of wire laid on the bench will usually suffice as an aerial.

Tune the set until maximum deviation on the trimming-meter is obtained. Reduce this, if necessary, by reducing the aerial input. Remember, we only need a small deviation on the meter for accurate

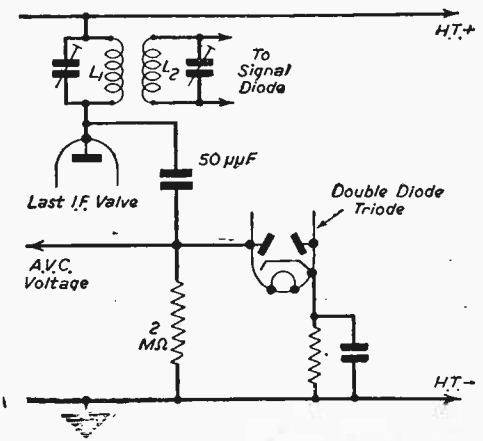

Fig. 6.—Typical circuit showing how the A.V.C. voltage is sometimes obtained from the anode of the last I.F. valve. In this case L2 is not included in the A.V.C. circuit.

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trimming. The volume control should be at full. Then adjust the I.F. transformers, starting at the second detector and working backwards, for maximum deviation in the meter. Go through them again if there was any bad maladjustment.

The I.F.T.s are now lined up for maximum results. With good-quality I.F.T.s, this should automatically ensure that a good symmetrical bandwidth curve is obtained. See Fig. 4. Unfortunately this doesn't always happen. It may be found that as the tuning condenser is turned from the central tuned position, the signal does not fall off similarly either side for the number of kc/s off tune. It will be necessary to increase the aerial input to observe this effect on the meter, and it can be readily observed by ear. To get a nice bandwidth curve, it will probably be necessary to adjust one trimmer slightly, usually one of those of the last I.F. transformer. The trimmer chosen should not be adjusted much, but if this is the case, it should be readjusted to maximum and another chosen. The fall in sensitivity through finding this bandwidth position should be very small indeed.

The Optimum Position of the Trimmer : Its Range.

It is very necessary to see that the optimum position within the range of the trimming condenser is found. This is a point that the writer has rarely seen stressed, but as he has seen quite a few sets out of alignment because of this fault he thinks it is worth a few paragraphs.

The simplest case of this maladjustment can be illustrated by means of I.F. transformers using the very common compression type of trimmer, wherein the adjusting screw brings the two plates together as it is tightened. Someone lines the I.F.s up and he finds that one of the trimmers has to be screwed up tight for maximum signals. He does not know whether it might be possible to get stronger response by putting more capacity into that particular circuit. Now, as the trimmer is already tightly screwed up, it is obvious that this extra capacity which might be required is beyond the range of the trimmer. Therefore, assuming that the coil and trimmer are serviceable, the I.F. is a little too low. If we raise this slightly, we will probably get the very satisfactory condition when, as we screw in the offending trimmer, the signal strength increases to its maximum and then falls off again. We then know that the "peak" is within the range of the trimmer.

People do not usually make a mistake of this sort with the compression type of trimmer, but they do quite often with air-spaced trimmers and iron dust cores.

The air-spaced trimmer consists of what might be described as a midget variable condenser, with a preset screw for adjustment, which usually swings through 360 degrees. As there is usually no stop for maximum or minimum capacity, and as the condenser vanes are hidden under the I.F. cans, it is impossible to tell what position the trimmer is in. Still, it is quite easy to check whether the optimum position is within the range of the trimmer as this setting will appear twice as the condenser is rotated through 360 degrees. Fig. 5 illustrates how two positions of this condenser give the same capacity.

Something of the same nature may occur with iron-dust cores. These cores usually screw into the centre of the coil and then out again the other side. Thus a similar trouble may occur when the core is in the dead centre of the coil. Here again, two maxima should be obtained, although the core can usually be seen through the adjusting holes

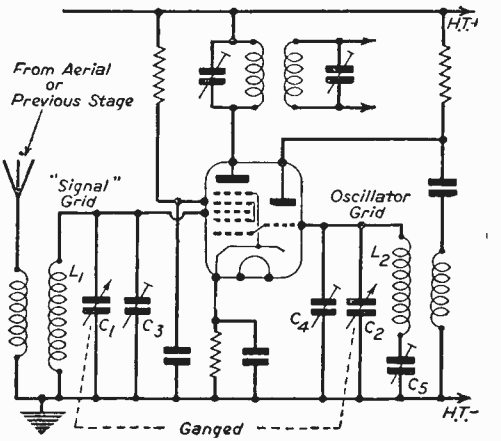

Fig. 7.—Circuit of typical frequency-changer, illustrating various condensers used for tuning, trimming and padding.

in the can. The above does not apply to all iron-cored I.F. transformers as some are designed for the coil to go only half-way through the coil former. Care should be taken in checking this point before looking for non-existent faults!

Raising or lowering the intermediate frequency whilst tuned to a station is carried out by slightly changing the tuning of the set. Tune the set to a higher frequency to raise the I.F., and to a lower frequency to lower the I.F., using the same signal all the time. Only small changes will be necessary. Adjust the tuning until the station is just audible and retrim the I.F. transformers to bring the station up again. This will vary the I.F. by about 5 to 10 kc/s and should be quite sufficient. If the I.F. transformers are very badly out of adjustment (perhaps through someone meddling with the set), a signal generator will be necessary to get them on correct frequency.

(*To be continued*)

LOCATION OF B.B.C. TRANSMITTERS

(*Concluded from page* 190)

Lisnagarvey (N. Ireland)	10 kW.
Londonderry (N. Ireland)	1 kW.
Moorside Edge (nr. Huddersfield) ..	60 kW.
Plymouth (S. Devon)	1 kW.
Redmoss (nr. Aberdeen)	2 kW.
Redruth (Cornwall)	2 kW.
Stagshaw (Northumberland)	10 kW.
Westerglen (Falkirk)	60 kW.

Two of the three transmitters used for the B.B.C. European Service are in this country, at Crowborough (Sussex), 100 kW. on 1,122 kc/s (267.4 metres), and at Ottringham, near Hull, 100 kW. on 167 kc/s (1,796 metres). Both these transmitters have their aerial arrays beamed on Europe, so they cannot be reliably received in Great Britain. The third transmitter for this European Service is in Norden, Germany.

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U.S.W. Tw

A Battery-operated Receiver for Use on 10 M

THIS set may be used with headphones to listen to the television sound programme, or on the 5- and 10-metre bands. The television transmissions cannot be received normally at any great distance (although they have been picked up with one and two valve sets of this kind at 100 miles and more from the transmitter), but for those in areas where reception is good, the receiver will give satisfactory reception. For 10-metre use it will be found to oscillate readily, and for reception on any wavelength the "output" terminals of the set may be taken to an amplifier, for speaker reproduction.

The Circuit

This, as shown in Fig. 1, is built up round two triodes. With a careful layout and suitable components this gives good results with ease of oscillation on wavelengths down to five metres. Provided a good reduction drive is used tuning is not exceptionally critical. If the set were to be used for television reception, or other purposes where curtailed tuning range was unimportant, the tuning condenser may be reduced to .00005 mfd.

A dipole coupling coil is not used, as a *short* single-wire aerial gives reasonable results. Should it be desired to use a dipole, this should be coupled to the grid coil by a small coil of one or two turns situated ¼ to ½in. from the grid coil. The ends of this coil are then taken via the usual feeder to the dipole aerials.

R.C.C. is employed between the valves to lessen the possibility of instability when the receiver is used with an amplifier, and the H.T. positive lead should be taken to about 80 to 100 volts. With two detector valves such as Osram HL2 and 1.5 volts bias used with the L.F. stage quite a useful degree of amplification will be obtained.

Construction

Fig. 2 shows the layout. A baseboard 9½in. by 9½in., covered with foil, is used. By mounting the two variable condensers back from the front of the baseboard, and raising the detector valveholder so that its sockets are level with the soldering tags of the variable condensers, very short wiring will result.

The reaction condenser must be mounted upon an insulated bracket, as the moving plates of this component are not directly earthed. It is also necessary to use insulated rod, or an insulated extension spindle, to couple the condenser to the control knob.

The tuning condenser is fitted with a reduction drive and pointer as shown, and an insulated, flexible coupler is added between drive and condenser to smooth operation and avoid rustling noises due to rubbing metal surfaces in the reduction drive. The panel controls are completed by a rotary on-off switch as shown in Fig. 2.

The set may be wired up before adding the coils. Keep the detector valveholder as near the condensers as possible, and all connections short and direct, as depicted. The connections in the L.F. stage are not so important, but these should be kept clear of the H.F. choke and leads carrying H.F. currents.

For ease of connection when using with an amplifier, or second

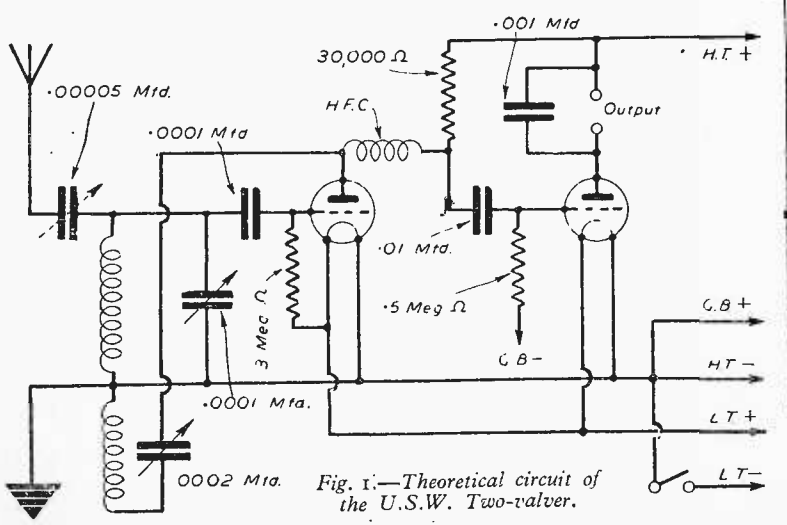

Fig. 1.—Theoretical circuit of the U.S.W. Two-valver.

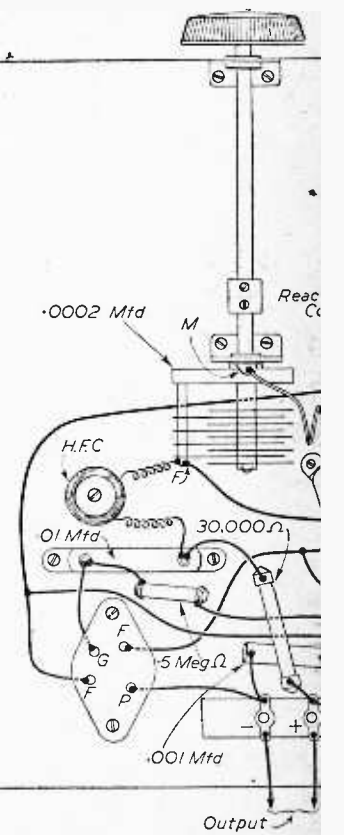

Fig. 2.—

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ɔ-valver

res and Below. By F. G. RAYER

receiver used as amplifier, the battery and output connections are taken to a terminal strip. It is possible to take connections from this to a valve-base, so that when the latter is inserted in a receiver in place of the detector valve necessary battery supplies (excepting Grid Bias, which may be provided by a small cell) are obtained. The receiver is then used as an adapter.

The detector valveholder should be about 2½in. above the base; the L.F. holder is also raised about 1in. to permit connections being taken to the sockets.

The aerial pre-set is supported in the wiring. All leads in the detector circuit should be kept clear of the metal foil, or some loss of efficiency will result.

The H.F. Choke

This may be wound by putting 80 turns of 32 (or similar gauge) enamel wire on a glass tube ⅜in. in diameter. The turns should be divided into five or six sections with ⅛in. between each. The finished choke (suitable for 5 to 10 metres) may be mounted on a cork screwed to the baseboard. The *top* of the winding is taken to the fixed plates of the reaction condenser.

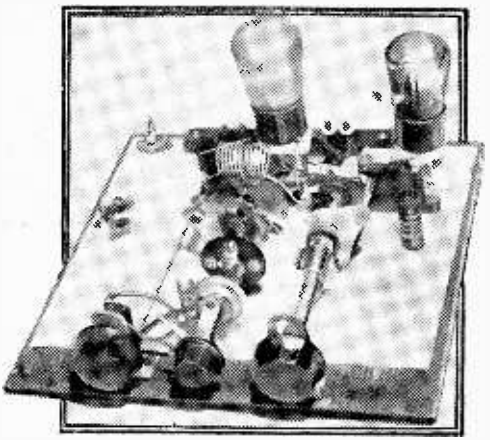
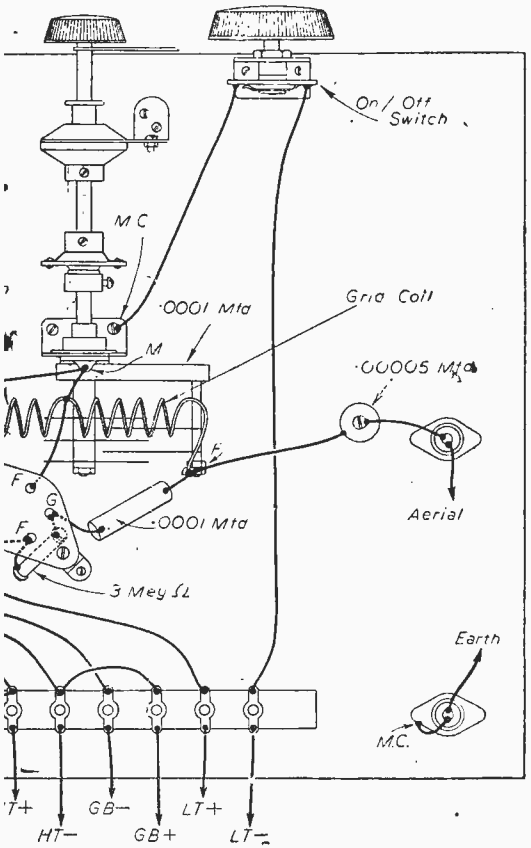


Fig. 3.—This illustration shows the general appearance of the set.



ing diagram of the Two-valver.

The Coils

These are wound with 18 S.W.G. tinned-copper wire. Nine turns, wound on a ½in. diameter former, are used. The winding should then be removed from the former and pulled out so that about ⅛in. space is left between each turn for five turns, and rather less between the remaining four turns. The five turns form the grid coil, the end of the winding being soldered directly to the fixed tag of the tuning condenser. The other end of the winding is then soldered to the moving-plates tag of the reaction condenser, and a short wire from the junction of the fourth and fifth turns to the moving-plates tag of the tuning condenser finishes the coil.

It is easy to solder other coils in place, but if it is expected to change coils frequently then three

COMPONENTS

Two four-pin low-loss valveholders.
Four component-mounting brackets.
Two stand-off insulators.
.0002 mfd. and .0001 mfd. low-loss variable condensers.
Three knobs.
Reduction drive.
Couplers and extension spindles.
.0001 mfd., .001 mfd. and .01 mfd. fixed condensers.
.00005 mfd. pre-set.
Three megohm leak.
.5 megohm, and 30,000 ohm resistors.
Terminal strip, wire for H.F. choke, etc.
On-off switch.

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sockets should be soldered to the reaction and tuning condenser tags, and plugs soldered to the coils so that they may be inserted when changing coils. For 10-metre reception seven turns of slightly greater diameter will be required on the grid coil. For five metres it may be necessary to reduce the grid coil to four turns unless the tuning condenser has a very low minimum capacity.

In all cases, if reaction is weak the reaction turns may be brought slightly closer to the grid turns, or an additional turn added. If reaction is fierce, pull the reaction coil slightly away from the grid coil. It may also be necessary to adjust the .00005 mfd. pre-set if the aerial is at all long for U.S.W. reception, or has a fair capacity to earth.

Operational Notes

Both tuning and reaction controls, although not exceptionally critical, require to be handled with care. To avoid tuning drift, there should be no play on any of the controls or erratic operation will result.

The " output " terminals of the receiver must not be connected to the P.U. sockets of a receiver unless a transformer of about 1 : 2 ratio is interposed. H.T. plus should then be tried in different sockets of the battery to determine which H.T. voltage is most suitable for the detector. If an amplifier with considerable gain is used, it may be necessary to add decoupling in the H.T. plus lead to the U.S.W. receiver to avoid instability.

On the Amateur Bands

A Monthly Report of Results and Conditions Experienced on the Short Waves. By "KAYAK"

More 50 Mc/s DX

ALL existing records for 50 Mc/s DX have been broken. Following G5BY's and G6DH's November record of hearing North American signals on this frequency, comes the news of a 4,100-mile span. This was achieved by KH6DD, Oahu, Hawaiian Islands, and J9AAK, Okinawa, both of whom were in contact on this frequency. Shortly afterwards, J9AAK worked W7ACS/KH6, also at Hawaii. Following on this, KH6DD then worked W6VDG/KW6 on Wake Island. Interest in this frequency is running high in the Pacific Ocean area, and further startling results may be expected. Many schedules have been arranged for daily tests over the Okinawa—Hawaii path. It is considered that conditions in this area will remain good until at least the end of March, and good possibilities exist for two-way working from Australia, New Zealand and the Philippines, to Hawaii as well as Okinawa.

A.R.R.L. DX Contest

Full details of this annual DX event arrived too late for inclusion in last month's notes. This year the contest has been split into four periods, two for CW and two for 'phones. By the time this issue is in your hands the first period of both the CW and the 'phone contest will have been run. The second " legs " take place over the following dates : CW : March 15th, 00.01 hours to March 16th, 23.59 hours ; 'Phones : March 22nd, 00.01 hours to March 23rd, 23.59 hours. Although this contest is primarily for transmitting amateurs, nevertheless short-wave listeners will be well rewarded by close attention to any of the amateur bands over these periods. The contest is a world-wide one and much rare DX will be in evidence.

28 Mc/s Band

Conditions on this frequency have remained consistently good. The band has been " open " daily since the New Year, an occurrence that has not happened since about 1937. All continents were regularly heard, but we ourselves came across little in the way of " outstanding " DX. The most interesting CW station consistently heard was ZC6FP, Jaffa, Palestine. Of the other logs we have received covering this frequency there is little of interest from which to select, most stations listed being those heard daily.

14 Mc/s (CW)

This month we are listing CW and 'phones separately. There is such a rich selection from which to choose that the " weeding-out " is no easy matter ! EP3D, Abadan, Iran, was often heard at good strength early mornings. On several occasions EP3D was heard working SV1RX in Athens and it would appear that they run a daily schedule at 06.30 hours. Cards for the Iran station go c/o R.E.F., Paris. J3AAD, Kyoto, Japan, was frequently heard around 10.00 hours calling " CQ Europe " and making many contacts with this country. Signal strength was normally a solid S7. Eritrea produced 11AHC/I6 and the more well-known W6VKV/I6. The former station is operated by an Italian amateur, and cards should be sent c/o A.R.I., Viale Bianca Maria 24, Milan. W6VKV/I6 was heard to say that he will shortly be changing his call to 16USA.

An unusual one heard was HP2CA/MM. The " MM " denotes " Maritime Mobile " and when heard this station was off the coast of Brazil. HP2CA/MM was working east-coast Americans and he was complaining of difficulty in working DX due to QRM from Argentine and Brazilian 'phone stations. The only other " Maritime Mobile " of which we have knowledge is W3KIF/MM, on board the S.S. *White Falcon.*

On a few occasions the band remained " open " throughout the night and Pacific coast stations were numerous. They were mostly working the eastern seaboard and very few contacts were made with Europe. Best signals were from W6EBG, W7A00, W6CEM and W7AYJ. Alaska produced KL7CZ and KL7AV. (Cards for Alaskan stations may be sent via J. W. McKinley, Box 1538, Juneau.) Others of interest were ZD4AB, Gold

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Coast ; ZC1AN, Transjordania ; CX3GC, Uruguay ; and VQ5JTW, Uganda.

A log from Dennis Tyler includes VO2L, Newfoundland ; PK4KS, Sumatra ; KL7GG, Anchorage, Alaska ; and KA1ZU, Philippines. Dennis remarks upon TF3A, Iceland, who was calling " CQ DX not Europe " and who was answered by a station in this country. We are sorry to say that cases of this kind are only too common. J3AAD, Kyoto, Japan, was answered by a station in the Argentine after J3AAD had called " CQ Europe " while a British station urgently calling " CQ Long Island " was answered by a French station. The last two cases were heard by us during a two-hour listening period.

Robert Brookes, North London, asks us if we can tell him anything about LI2BO and KUFRA. The prefix "LI" is not listed and this station is no doubt a pirate. As regards KUFRA, we too came across this station but failed to extract a QTH from him. The signal was very weak and the note very unstable. There is a possibility that the station is operating from the Libyan oasis of Kufra as the signal gave every indication of being a DX one. Robert also reports the following ; OX3GC, Greenland ; VO6H, Goose Bay, Labrador ; KS6DX, U.S. Samoa ; EL3A, Liberia ; and SU9SV, Egypt. While this latter station is not DX it is of interest because there are very few " SU " stations on the air these days. At one time there were a number of British amateurs working from Egypt but we understand this has been stopped by the Egyptian authorities who are now granting licences to Egyptian nationals only.

14 Mc/s ('Phones)

Several reports include FF8FT, Lagos, French West Africa, on the HF end of the 'phone band. We heard this station on several occasions at strength S8. The operator appears to be an American and most contacts are with the U.S.A. Dennis Tyler lists VP2GB, Grenada, and numerous of the more difficult American Pacific-coast districts. Space prevents our giving the full list. Others from Dennis are XAFN, Trieste ; OX3GC, Greenland ; LU1JC ; and VU2LR. The only outstanding DX 'phone station reported has been W3KIF/MM, mobile maritime, reported as having been heard off the West Indies.

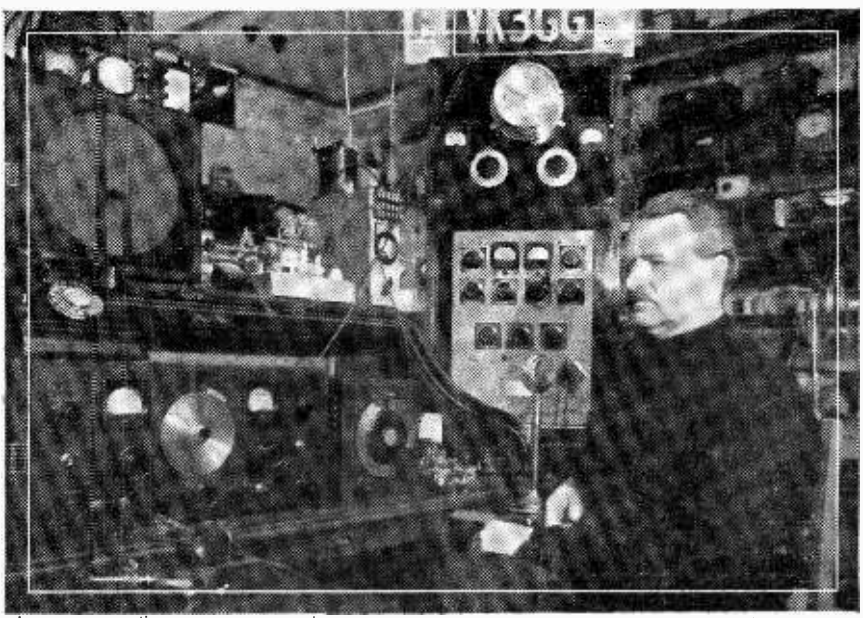
The A.R.R.L. announce that owing to the imminence of the world-wide tele-communications conference (opening May 15th) they are, for the moment, not pressing for a widening of their 14 Mc/s 'phone allocation.

7 Mc/s Band

DX activity on this band is increasing, particularly in the U.S.A. where on this band there are more stations per kc than on 14 Mc/s. DX activity from Europe will continue small until removal of the broadcast stations from the region 7,200/7,300 kc/s. American amateurs have exclusive use of the whole band ; in Europe we are not so fortunate.

Some DX catches from our log : VP4TS, Trinidad ; Cuban CM2BU and CM2LT ; XE1A, Mexico ; ZS6DM, Transvaal ; PY2ADA, Sao Paulo ; W7GRL, Wyoming ; and several from California. Another of interest was W3USA, a station of the U.S. Signal Corps located in the famous Pentagon Building in Washington. G2BAB, using 24 watts, reports many contacts with the U.S.A. He also tells us of having heard ZS6's coming through at S8 around 01.00 hours.

Wireless Coils, Chokes and Transformers
By F. J. CAMM
6/- or 6/6 by post from George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.



The well-known Australian station VK3GG. The main receiver is a Hallicrafter model.

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Hospital Calling System

A Combination Calling System and Radio Unit is One Australian's Answer to the Problem of Hospital Inter-room Communication

By DAVID CAIRNS

THE engineer in Canberra who fitted the plumbers and electricians of Australia's national capital with radio to keep them in touch with their headquarters—the Department of the Interior—has now perfected a new system of inter-room communication for Canberra's £A190,000 free Community Hospital.

He is Mr. R. G. Fowler, a Federal employee. His device has already been installed in the recently-completed isolation ward of the hospital, and it will soon be operating throughout the building.

Each patient in the hospital (which was used during the war by American forces) is in a separate room, and near his bed, sunk flush to the wall, is a small panel which holds a loudspeaker, a red light and two switches. One switch controls the speaker, and allows the patient to choose between two radio programmes, with the extra choice of whether he will have them at full or medium strength. The other switch enables him to call the nurse on duty.

If he presses the second switch down, the radio programme is cut off the monitor speaker in the nurse's room, and she can hear, instead, anything the patient says. At the same time a small red light glows over a number on her master-panel, telling her which patient is calling. If the patient is needing the nurse urgently, he presses his switch upwards and a buzzer also sounds, attracting her attention.

When the patient calls the nurse he also causes a light to glow outside his room, so that should she be in the corridor she will know that she is being called.

Eight Programmes

On the panel in the nurse's room are controls to give a choice of eight radio programmes from several States. Two are made available at any one time for the patients' sets. By a room selector, the nurse may adjust her microphone to the patient she wishes to answer.

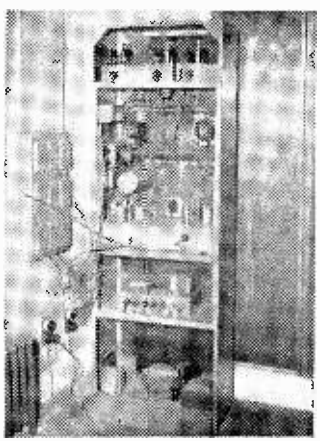
When the nurse is in a position to hear any patient, the small light on the patient's own panel glows, showing him that he can be overheard.

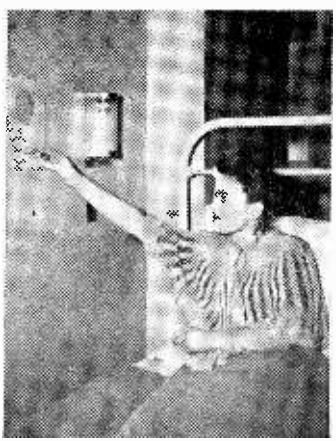
The nurse also has a paging system. By putting a switch on her panel over to "Paging," she cuts off all radio and connects her microphone to all the speakers under her control. She can thus get into instant touch with a doctor or anyone else who is visiting the rooms.

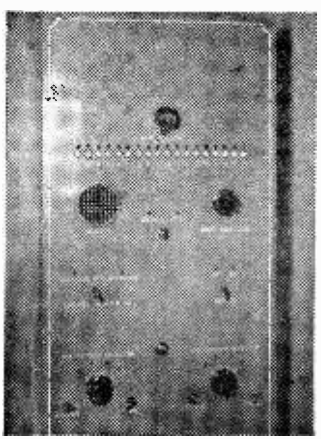
A remarkable point about the installation is its small cost. Although the existing unit covers a ward of eighteen separate rooms, with twelve lines to each and a great amount of wiring, it costs only £A340, and Mr. Fowler thinks that when the whole hospital is fitted the average cost will be even less. Here is his technical description:

"The radio input consists of two separate R.F. units, each containing R.F. stages and 455 kc/s. I.F. stages with A.V.C. on the R.F. and I.F. valves. The tuning is carried out by the use of ceramic variable air-spaced midget condensers, which are preset to the desired stations, selection of the correct combination of capacities in aerial, R.F. and oscillator stages being made with a 4-position, 3-circuit rotary switch.

"There are three amplifiers, each capable of approximately 12 watts output of quite good quality reproduction. This







In the centre picture a patient is seen calling the nurse by the simple process of pressing a switch and speaking. This cuts off the radio programme in the nurse's monitor speaker. On the left is a view of the back of the main unit. The paging switch (centre left) carries out the complicated operation of cutting out all radio lines to speakers and paralleling them with the nurse's mike. It has 96 separate connections. The main panel is seen on the right.

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permits of up to ½ watt being available for each room speaker which, in these circumstances, is much more than is ever likely to be needed. For although the rooms are quite independent of each other, inter-room interference could not, of course, be tolerated.

"Output valves of the amplifiers are 6V6G in push-pull, working 500 ohm lines, two amplifiers feeding the two main radio programmes and the third standing-by for the call system and the paging.

"A power unit at the base of the main rack supplies 500 mA. at 400 volts well filtered D.C. for both radio tuners and the three amplifiers. This unit also supplies 48 volts A.C. for indicator lights, etc. Rectifiers are 866A mercury vapour valves.

"The switching and line-matching of input and output circuits are the factors which have enabled a quite orthodox amplifier system to be used to obtain unorthodox results, and it is here that a certain amount of ingenuity had to be used. For instance, one switch (Paging) has to (1) cut two radio tuners and put them to dummy loads; (2) remove all room speakers from the two 500 ohm radio lines whichever line then may be on; (3) parallel all room speakers to *one* matched line; (4) switch this line to the output of the third amplifier; (5) switch input of the third amplifier to the main rack microphone. All this necessitated the use of a 96 contact switch.

"The patient's bedside speaker is used as a dynamic microphone, the output of which feeds back to the third or 'stand-by' amplifier, thence to the nurse's monitor speaker.

"Speaker attenuators are fitted in the voice coil circuit of each speaker for individual control, the maximum signal being preset."

A 10-watt Quality Amplifier

A Useful Unit Incorporating Flexible Tone Control, Negative Feedback and a Stabilised High Tension Supply.

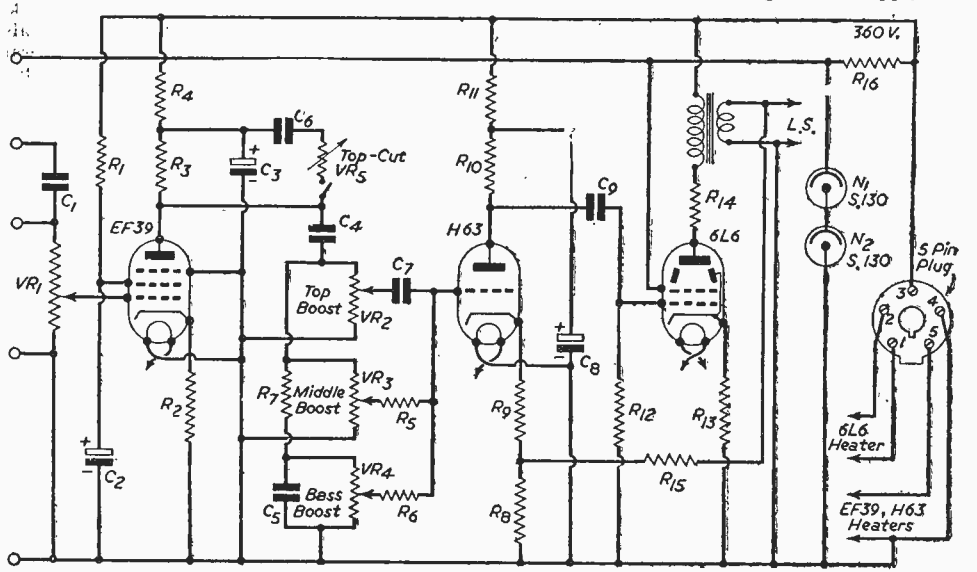
By C. SUMMERFORD

TO the serious experimenter, whether he be interested in radio or television reception, or in gramophone reproduction only, comes the necessity of possessing a high-quality A.F. amplifier; and if he happens to be interested (as many are) in all of these, then a generous power pack with a stabilised H.T. supply also becomes an essential.

Further requirements will be a very flexible tone-control system, adequate sensitivity, and a generous power output with low harmonic distortion.

Reference to the circuit diagrams will show that all of these have been taken care of in this amplifier without making it unduly complicated.

Most amateurs, on using mains supply for the



Theoretical circuit of the 10-watt amplifier.

C1—.01 mfd. (mica).
C2—4 ,, (elec.).
C3—16 ,, (elec.).
C4—.25 ,, (tubular).
C5—.02 ,, (mica).
C6—.1 ,, (tubular).
C7—.0003 mfd. (mica).
C8—8 mfd. (electrolytic).
C9—.06 mfd. (tubular).
R1—.3 megohms.
R2—300 ohms.
R3—50,000 ,,
R4—20,000 ,,
R5—.25 megohms.
R6—.25 megohms.
R7—.25 ,,
R8—100 ohms.
R9—2,000 ohms.
R10—100,000 ohms.
R11—20,000 ,,
R12—.125 megohms.
R13—240 ohms.
R14—50 ,,
R15—60 ,,
R16—1,300 ,,
VR1—.5 megohm.
VR2, 3, 4—.1 megohm.
VR5—50,000 ohms, with switch.

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first time, begin by building a power pack that will just satisfy the needs of the moment and which may be constructed at a reasonably low cost. Before long, however, this original power pack will be found to be inadequate and will either have to be scrapped or reinforced by the building of a second one.

It is clear, then, that the small, cheap pack is really a most uneconomic proposition.

In this design, therefore, a power pack has been chosen to give a smoothed H.T. of 360 volts at 150 milliamperes.

This entails using a mains transformer having a H.T. secondary of 400-0-400 volts.

Rectification is full-wave and an indirectly-heated rectifier is used for this purpose, thus ensuring that voltage surges on the smoothing condensers are kept to a low value.

Twin 20-Henry chokes with three electrolytic condensers totalling 24 mfds. reduce hum ripple to an almost non-existent level.

Avoiding Modulation Hum

Although a transformer with a screened primary is used, there is every possibility that modulation hum will be experienced when short-wave tuners (especially those of the superhet type) are used with the apparatus unless the two condensers (C4-C5) of .01 mfd. capacity are connected between each anode and heater of the rectifier. These are of the 1,000 volt working type.

Over a period of years, during which time the writer has built short- and ultra-short-wave receivers of both the straight and superhet variety, the above method of eliminating modulation hum has always proved most effective.

It is recommended that for ease of handling when servicing, unit construction be adopted. Connection to the amplifier is made by a five-pin plug and socket.

The Circuit

Passing to the amplifier circuit, probably the first thing to catch the reader's eye will be the neon stabilising arrangement N1-N2-R16.

To those who have had no previous experience in the use of these stabilisers, a brief explanation of the way they work would perhaps be helpful.

Each of these valves is a Cossor S130 which, as the type number signifies, keeps the voltage across its two ends almost constant at 130 volts. This is what happens. Until the voltage across the valve reaches 130 it is non-conductive, but as soon as this voltage is reached the valve commences to glow and pass current, the starting current being some 5 to 10 milliamperes. As the voltage from the power pack endeavours to rise, more current will be passed by the valve until it reaches its maximum of 75 milliamperes. This maximum is reached when 180 volts are applied to the valve; but, although this voltage may be *applied*, the actual voltage at the valve terminals will still be within 2 or 3 volts of the original 130.

To sum up, then, the valve may be regarded as an automatic bleeder circuit, the current through which varies as the applied voltage varies. If then, two valves are connected in series, via a suitable resistance across the smoothed H.T. supply, an almost constant voltage supply will be ensured.

As the three-valve amplifier requires approximately 80 mA. the stabilisers will have to bleed away the surplus 70 when using this alone; but when a tuning unit is also used, up to 65 of these 70 mA. become available to supply H.T. to the unit. Those readers who wish to mount the stabilisers on the power pack chassis may do so, but the five-pin plug and socket will then have to be changed for a six-pin one.

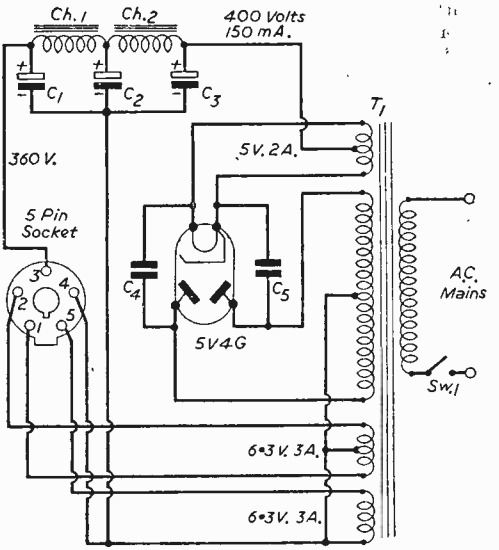
The Output Stage

The 6L6 output valve working under class A conditions with 350 volts on the anode, 250 volts on the screen, and 17 volts grid bias, gives about 10.5 watts output with 15 per cent. total harmonic distortion. This distortion is reduced to an exceedingly low value by applying negative feedback from the secondary of the output transformer via a suitable resistance network to the cathode circuit of the preceding stage.

To prevent the likelihood of core saturation with curtailment of frequency response, a large output transformer is used, and this should have a load impedance of about 4,200 ohms. The writer actually uses one of the multi-ratio variety, having tappings on both primary and secondary, and although this is not absolutely essential, it is very useful for matching up to different loudspeakers.

Voltage for the screening grid of the 6L6 is obtained by connecting it to the 250-volt stabilised H.T. line, and because of the very excellent voltage regulation here, no decoupling is necessary.

Preceding the 6L6 is a Marconi/Osram H63, which is a high-gain triode having an amplification factor of 100; but, as the anode load has been



Theoretical circuit of the mains unit.

C1	8 mfd., 500 volt (electrolytic).	T1—Secs. 400-0-400 v., 150 mA.
C2		
C3		6.3 v., 3 A., C.T.
C4	.01 mfd., 1,000 v. working.	6.3 v., 3 A.
C5		5 v., 2 A.
Ch.1	20 Henries.	Sw.1—Single pole toggle.
Ch.2	150 mA.	

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reduced somewhat in order to maintain a fairly high H.T. voltage, a gain of rather less than two-thirds of the amplification factor (which is usual with correct load under R.C.C. conditions) may be expected.

C9 of .06 mfd. and R12-.125 megohms have been chosen carefully to give the maximum gain at low frequencies and should be adhered to: a further increase in the values would most probably bring about grid blocking, while a decrease would, of course, restrict the bass response.

Biasing

Two hundred mfd. by-pass condensers were tried across cathode resistors of all three valves at first, but were finally dispensed with as no difference could be detected in the case of the latter two valves, while the increase in gain obtained from the tone-control valve was not large enough to warrant the use of a condenser. This tone-control valve—Mullard EF39—is a variable-mu high-frequency pentode of fairly high gain, which has in its anode circuit a load resistor of 50,000 ohms shunted by a variable treble-cut control comprising C6 and VR5. A switch is incorporated in VR5 in order that the filter circuit may be switched in or out as required.

Separate volume controls are provided for treble, middle and bass boost, the degree of contrast obtained at the extremes being dependent on the setting of the middle control.

The treble boost is simply a volume control with a small condenser in the slider circuit, while middle and bass are looked after by suitable filter networks. The resistors R5 and R6 are inserted to prevent mutual short-circuiting.

It should be noted that the anode circuits of all three valves and the screening grid of the EF39 are connected to the 360-volt line. This is done in order to have a reasonably high voltage at these electrodes, thereby ensuring good power-handling capacity.

A four-pin valveholder mounted at the input end of the chassis carries L.T. and stabilised H.T., and a simple three-pin wander plug socket takes care of the input to the grid circuit of the EF39.

If this method is adopted, it is a simple matter to connect a tuning unit to the amplifier.

The Radio Communications Equipment of H.M.S. "Vanguard"

THE radio organisation of a fleet includes many separate communications channels: external ones for transmitting and receiving messages by morse to and from the Admiralty, shore authorities and other fleets; internal, using both morse and telephony, for manœuvring signals, for radar reporting, for gunnery control, for administrative messages, for the direction of aircraft and for many other purposes. A large warship, such as a battleship, must be provided with radio equipment for each of these many channels. And H.M.S. *Vanguard*, as Britain's newest battleship, is not only so equipped but is fitted with all the newest types of apparatus developed as a result of lessons learned during the Second World War.

The majority of the equipment is arranged in five compartments. In the forward superstructure conveniently adjacent to the Command is the Bridge Receiving Room. This contains nearly a dozen receivers covering the low-, medium-, high- and very-high-frequency bands, i.e., from the 16 kc/s used by the Rugby world-wide broadcast morse transmissions up to the 100-150 Mc/s band used for the radio-telephone communication with aircraft. There is also the medium-frequency direction-finding set used for navigational purposes and a 50-watt output high-frequency transmitter principally for emergency use, which, with an associated receiver, can be operated off batteries in the event of a failure of the ship's normal power supplies.

A small compartment at the back of the Bridge itself contains the V.H.F. radio-telephone transmitters. This position is dictated by the need for keeping the length of the aerial feeders to a minimum. The dipole aerials are necessarily mounted high up on the foremast in order to obtain the maximum practicable quasi-optical range for communication with other ships and aircraft.

The remainder of the *Vanguard's* transmitters, covering the medium- and high-frequency bands, are divided, on the principle of not putting all one's eggs in one basket, between two transmitter rooms sited below the mainmast.

The Lower Transmitter Room, sited below decks for protection against bomb hits and shell fire, contains a 400-watt output medium-wave wireless-telegraphy transmitter, a high-frequency set of similar power for either wireless-telegraphy or radio-telephony and two 50-watt dual purpose sets. There is also a crystal wavemeter of high accuracy. The Upper Transmitter Room, sited high up in the after superstructure to avoid the effects of underwater damage, contains a 5 kW. output medium-wave wireless-telegraphy transmitter and four high-frequency sets, of 2 kilowatts, 400 watts and two of 50 watts output respectively, for both morse and telephony working.

Lower Receiving Room

The fifth compartment, intended as a standby in the event of damage to the Bridge Receiving Room, is the Lower Receiving Room, which is sited aft adjacent to the Lower Transmitter Room. In addition to receivers, this contains the perforators, undulators and relays needed for high-speed morse transmission.

An extensive remote control system is provided to allow the sets in the three transmitter rooms to be controlled from any receiving position in either the Bridge or Lower Receiving Rooms, and from various other places in the ship, such as the Bridge for manœuvring purposes and from the Operations Room for the direction of aircraft.

Power for all the equipment is provided by a 50-cycle three-phase A.C. system giving 400 volts, supplied by three 440 kW. motor alternators widely spaced in the ship.

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News from the Clubs

R.S.G.B. (BRIGHTON & HOVE)

Hon. Sec. : R. J. Donald, 2, Canfield Road, Brighton, 7.

THE Brighton and Hove group is going ahead with its winter programme. Recently, Mr. Crabtree demonstrated the Eddystone 504 Receiver, and Messrs. Aldridge (G5ZQ) and Sharman (5982) opened a debate on the merits of crystals and VFO's.

G3WR and G8AC are active on 20 metres. G3YY is rebuilding for 5 metres.

The following are forthcoming fixtures :

March 10th : Power Supplies (1), Mr. Johnson ; March 24th : Aerials (1), Mr. Crabtree ; April 7th : Radio Quiz, arranged by Mr. Epton ; April 21st : Aerials (2), Mr. Crabtree ; May 5th : Mobile and V.H.F. (2), Five-metre Receivers (speaker to be arranged) ; May 19th : Aerials (3), Mr. Crabtree.

THE STOURBRIDGE AND DISTRICT RADIO SOCIETY

Hon. Sec. : D. Rock, Flat 1, Block 1, Worcester Road, Summerfield, nr. Kidderminster, Worcestershire.

AT a recent meeting of the above-named society (with Mr. S. L. Jacobs (G3AAQ), Kidderminster, in the chair), a discussion on modulators was held. Various types of modulation, including Heising, transformer, grid and suppressor grid were ably discussed. Chief speakers were Mr. J. Timbrell (G6OI), Mr. McLean (G2CLS), Mr. A. Higgins (G8GF), and Mr. Whitehouse (G6WF), the latter also giving some interesting information on microphones.

The January meeting fell on a night when the weather was against travelling, and so the attendance was rather low. The members who did attend held a short discussion on frequency measuring apparatus, followed by a general " get-together."

Further particulars of the society, etc., can be obtained from the secretary.

READING AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec. : L. A. Hensford, B.E.M. (G2BHS), 30, Boston Avenue, Reading, Berks.

AT the January meetings of the above society interesting talks and demonstrations were given by Mr. S. A. Cook (G5XB) on " Economic Power Units," showing the best methods of obtaining high voltages, etc., from small voltage transformers.

At the second meeting, Dr. Lemon (G2GL), who has become an honorary member and accepted the presidentship of the society, gave a most interesting talk and working demonstration of " Hellschreiber," the German teleprinter system using German apparatus.

All meetings at Palmer Hall, West Street, Reading, at 6.30 p.m.

SOUTHAMPTON RADIO CLUB

Hon. Sec. : J. H. Sillence, 80, The Drove, Coxford, Southampton.

WE are informed that Mr. A. Ward, of 50, Onibury Road, Bitterne, Southampton, has now retired from his position as hon. sec. to this club, and Mr. John H. Sillence, of the above address, was duly elected to this position. The club meets each Wednesday evening, and a programme is being drawn up to cover the next three months. Several new members have been enrolled, and continued expansion of the membership is expected.

PROPOSED DERBY AND DISTRICT SHORT-WAVE RADIO CLUB

IN view of the increasing number of short-wave radio enthusiasts in this locality, it is felt that a club for such enthusiasts would be appreciated. Further details regarding proposed radio club may be obtained from J. F. Mathers, 54, Fife Street, Derby.

SLADE RADIO

Hon. Sec. : L. A. Griffiths, 34, Florence Road, Sutton Coldfield.

SLADE Radio are extending their activities, and are now holding meetings fortnightly, and have included an outside event in a visit to the telephone exchange.

New members are invited, and any interested radio enthusiasts should call at the club rooms. The meetings commence at 8 p.m., and are held at Broomfield Road, Erdington.

BRADFORD SHORT WAVE CLUB, G3NN

Hon. Sec. : V. W. Sowen, Rushwood, Grange Park Drive, Cottingley, Bingley, Yorks.

THE club's transmitter has not been on the air for the last few weeks owing to a full programme of lectures, the most interesting of which was given by the makers of G.E.C. Quartz Crystals.

The morse class is continuing, and further lectures are being arranged.

New members may obtain full particulars of the club from the secretary at the above address.

THE WHITEFIELD AND DISTRICT RADIO SOCIETY

Hon. Sec. : E. Fearn, 4, Partington Street, Newton Heath, Manchester, 10.

MEETINGS of the Whitefield and District Radio Society are held every Monday evening at 7.30 p.m. at the Stand Grammar School for Girls, Higher Lane, Whitefield, and all radio amateurs in the Manchester, Prestwich, Whitefield and Bury districts are invited to all meetings.

The S.W.L. section is rapidly expanding, and all members are very keen in obtaining contacts with " all continents." It is hoped to obtain full workshop facilities to enable members to construct their own apparatus on the club premises in the near future.

EXETER AND DISTRICT AMATEUR SHORT-WAVE RADIO SOCIETY

Hon. Sec. : E. G. Wheatcroft, 7, Mount Pleasant Road, Exeter, Devon.

AFTER a postponement due to very bad weather conditions, the inaugural meeting of the above Society has been recently held. Eleven enthusiastic members turned up, including two licensed amateurs—G2DOL and G6JN. A president has not yet been obtained, and the selection of chairman has also been temporarily postponed. The hon. secretary is Mr. E. G. Wheatcroft (member RSGB), hon. treasurer, Mr. A. M. Smith (member RSGB), and two committee members are Mr. C. H. Garroway (G2DOL) and Mr. R. S. Jackson (G6JN). Meetings will be held weekly on Thursday evening at 7 p.m. A series of interesting lectures is already being prepared on almost every branch of radio. Morse classes have begun, following a lecture on a newly designed receiver, by Mr. A. M. Smith. For the morse practice an oscillator has been presented by Mr. R. R. Tiley.

THE STROUD AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec. : K. D. Ayers, Victoria Villas, Whiteshill, Stroud.

THE Stroud and District Amateur Radio Club have now obtained the use of a room in the Labour Club, Cainscross Road, Stroud, and meetings are held there every Tuesday evening commencing at 7.30 p.m.

A programme of forthcoming club activities is being drawn up, and further particulars can be obtained from the hon. secretary.

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Underneath the Dipole

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

THE natural importance of the picture in television tends to relegate to the background its complementary sound. But sound is tremendously conspicuous by its absence on those occasions when it suffers from the "technical hitch," when—usually after a long delay—a printed announcement is ultimately displayed to the viewers. But when picture and sound are both alive, does the sound always do justice to the picture? Not always, I think.

Extended Frequency Range

Consider the great possibilities of sound on this very low television wavelength. Here we have a medium capable of transmitting an extended sound frequency-range as compared with medium and long waves, and on many occasions one is conscious of the improved "top," the richness of the high harmonics and the attack in the transient sounds. Such little noises as the clink of knives and forks or keys are reproduced with uncanny fidelity. When an orchestra is broadcast simultaneously on the television waveband and also on the medium wavelengths, the improved reproduction quality on the former is quite startling.

It is on the straightforward dialogue transmission in television that sound frequently falls below par, particularly during television plays. Here, the extended sound range results in the reproduction of all kinds of peculiar studio noises, clicks, bangs and—worst of all—the low rumble of the ventilation system. Footsteps on the "marble" staircase register as wooden thuds, and the urgent rustle of a telegram being opened reminds one of the crackle of a newly-lit bonfire. Such discrepancies may be partly due to the extended sound-frequency range, but they are also often aggravated by careless or unimaginative handling of the microphone and its controls.

Bass Rumbles

Bass rumble is not difficult to cure, In dialogue recording for films, a considerable reduction of sound pick-up is arranged at the bass end of the scale, at least 15 decibels being cut at 100 cycles per second. Some recording systems cut out entirely (on dialogue) all frequencies below 120 by means of filter circuits. Bass cut is especially important for recording on exterior scenes, when the noise of the wind blowing on the microphone registers as a deep rumble of thunder unless it is electrically "extracted." The amount of bass cut is frequently varied from shot to shot, however, and in this manner the boomy effects of excessive "chest tones" in dialogue of intimate type is reduced—at the same time as the rumbles of feet, the studio ventilation or even camera noise.

This is a point that the boys at the "A. P." should watch a little more carefully. Perhaps they can learn a little from their colleagues in the film studios. It will probably mean the sacrificing of a little off each end of their newly gained sound frequencies, and a more active manipulation of the microphone volume controls; but it will be worth while.

Television Aids to Film Production

In the meantime, and in spite of the declared enmity of the film trade to television, a kind of reverse lend-lease of ideas and processes is going on between these two factions. At least two companies in this country and one (only one!) in the U.S. are playing with the idea of introducing television into the film studios as an aid to film production. The principal aim is the same in each case: a very small television camera fitted (in the viewfinder position) on the sound-proof blimp of the cine camera, which will enable the director of the film to view on a cathode-ray tube a reproduction of the exact scene being photographed on the film. The director need not be close to the cine camera, and if there is more than one camera in use, he can switch his viewing screen from one to the other at will. Actual preliminary trials have already taken place at an independent studio with promising results, and I now hear that similar developments will soon be tried out at one or other of the many Rank-controlled studios.

The Compact Light Source

It is only two or three months ago that I mentioned in these columns the startling development of the "compact light source," the near-white version of the high-pressure mercury street light; but great progress has been made. Private enterprise has been seen at its best in the intense friendly rivalry between the B.T.H. and the G.E.C. companies to produce a "compact" lamp of commercial reliability and consistency for use in the film studios on black-and-white and colour work, and also for television. The B.T.H. company led the field at first, making steady progress after the war with experiments in which various proportions of zinc and cadmium were added to the mercury in the quartz bulb. This had the effect of adding a sharp band of "red" frequencies to the light radiated—very much like adding a bass boost to an amplifier or a loudspeaker. The result was a light which was very nearly white. The G.E.C. neglected the studio "angle" on this type of lamp at first, but, suddenly realising its potentialities, not only developed its own special studio bulb, but designed and produced a special housing and mounting for it. This lamp is now an accomplished fact, seen and approved by the film experts and demonstrated at the Institute of Electrical Engineers. During the reading of a most interesting paper on the high-pressure mercury lamp, the authors, Messrs. V. J. Francis and W. R. Stevens, demonstrated the 2½ kW Compact Light Source lamp of the G.E.C. together with a technicolour test film made with it.

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The "Research Stakes"

I saw the lamp myself at the I.E.E. and can testify as to its remarkable steady white light and the accurate rendering of all colours under its rays. A specially interesting demonstration was the side-by-side comparison of similar colour charts under the isolated rays of the standard high-pressure mercury lamp, and under experimental lamps into which varying amounts of cadmium or zinc had been introduced. The steady improvement in colour rendering was most obvious, and the success of the experiments led to a full technicolour test being shot in which direct comparisons were made with the arc lighting which is normally used. The results were shown on the screen, and amazing they were, too. I have been fortunate in being able to see similar technicolour tests shot by the B.T.H. company, and these were equally successful. So far the B.T.H. company have confined their attention to 5 kW focusing spotlights, while the G.E.C. have perfected a 2½ kW floodlight. Shortly both companies will be producing a range of "Compact" lights from 2½ kW to 20 kW for film and television studios, and within two or three years carbon arc lighting will be a relic of the past. The two great British electric companies thus finish the race for the "Research Stakes" in a dead heat, no other runner, British, American or French, taking part!

In the good old days of Brooklands, it used to be said that any development in car design which proved itself on the track found its way ultimately into the designs of the most conservative family saloon car. Film and television studios are similarly the testing grounds for the latest forms of illumination, and what is successfully adopted in these specialised usages may eventually find its way into general home or industrial use. In this case, the first obvious general use for the new compact light source will be for street lighting. However, lighting efficiency (lumens per watt) is not yet as high as the normal standard high-pressure mercury street lamp, and, of course, the cost at present is a great deal higher. But in the course of time, with the introduction of this new light, complexions in the factories and in the street will acquire a more natural hue, and one more milestone in the progress of the development of electrical illumination will have been passed.

Triode Vectors

Detailed Consideration of the Points Discussed Last Month. By "DYNATRON"

LAST month we published correspondence between a reader, Mr. R. S. Hatch, and myself on this Vector problem.

Mr. Hatch has effectively criticised the vector rules given in my previous articles in so far as they apply to triodes. For pentode circuit the rules are approximately correct, whilst I was aware of certain difficulties in trying to oversimplify the rules for triodes.

As I stated, I considered it better to adhere to an "idealised" picture in the first place and to thresh out difficulties or controversial points afterwards. This had the advantage of giving the reader a good smattering of vector procedure, which was also near enough correct for high internal resistance valves such as pentodes, whilst at the same time doubly emphasising important modifications to the simple theory which would become necessary in the case of triodes.

Those readers who have been following my articles should thank Mr. R. S. Hatch as the only correspondent who took the trouble to help them to get their ideas right and for showing that I was wrong upon one fundamental issue in the case of triode circuits—the relative phase of Eg and Ia.

A great deal has been written in various periodicals on valve vector relations. In no case do they come down to the basic questions which have been elucidated in these articles and correspondence. Assumptions are generally made, without any attempt to justify them, whilst often the whole subject becomes hopelessly complicated by trying to attempt too much in one or two articles.

My correspondent has pointed out that, even with an inductive load having a reactance as much as 10 times the valve ra, the output voltage Vo will still be phase-shifted nearly 180 deg. on Eg, exactly as if the load were a pure resistance, i.e., with triode valve. In pentode circuits, the arguments adduced in previous articles are near enough correct.

With triodes, too, Mr. Hatch proved conclusively that Ia can, and does, become phase-shifted upon Eg.

Taken together, these two principles call for considerable modification in the vector relations which we represented for pentodes. In the present article, I propose to discuss my correspondent's points in detail; see why they apply to triodes and not to pentodes; and, possibly in another article, consider how the vector rules must be modified or enlarged upon to represent triode conditions.

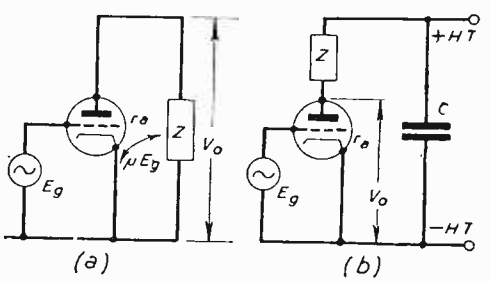

Fig. 1—A simple problem circuit. Are Z and ra in series or parallel?

Valve equivalent circuits will have to be left as a special subject demanding its own articles.

(*Continued on page 211*)

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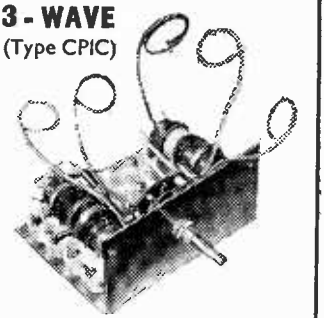

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Triodes and Pentodes

Why did Mr. Hatch emphasise *triodes* in the course of his criticism ? Why should certain vector conventions (or facts ?) be almost true for pentodes, but a long way from the truth if applied to triodes ? Surely it might seem vector conventions applicable to one type of valve are equally applicable to another. If not, why try to represent standard conventions in an "equivalent circuit" ?

Forget equivalent circuits for the time being. Obviously, effects occur in triodes which are absent or negligible in pentodes. Let us look at one or two essential points of difference in the two types.

The first thing which stands out is the extremely high internal resistance of a pentode—the ra. A power triode will have an ra of something like 1,000 or 2,000 ohms. A pentode will, nominally at any rate, have an internal resistance of several hundred thousand ohms, or even megohms.

Secondly—though it really reduces to the same thing as a high internal resistance—a pentode has a "constant current" characteristic. What does that mean ?

Well, if you stick a milliammeter in the H.T. supply circuit and start varying the H.T. volts, you will find, with a triode, the current changes considerably—nearly in the same proportion as the voltage. But, odd as it may seem to those who have never realised the theoretical principles, the current taken by a pentode will change but little over a wide range of H.T. voltages; it will remain nearly constant or independent of the anode voltage —hence the term "constant current."

The explanation is simple. Several "screens" or "grids" are interposed (two, as a rule) between the anode and the control grid. As far as "anode volts" are concerned, these *screens* effectively prevent the electric field from the anode exercising any appreciable effect upon electrons in the vicinity of the cathode.

In a triode we have only one grid, usually a fairly open-meshed one, which means the *anode* potential is going to have a marked effect upon the number of electrons drawn across from the cathode; not so much as the effect of the grid potential (when there is no load impedance in the anode circuit), but the important point is that Ia is then far from being "independent" of the volts on the anode.

In a pentode the extra two grids will screen the anode so much that the anode itself is largely devoid of effect upon the internal space current. It is the same two grids, or screens, which also account for the extremely high internal resistance.

If varying the H.T. quite a lot results in hardly any change in current, that is only another way of stating that a valve has high resistance—or, rather, a high A.C. resistance, since, under D.C. conditions, V/I may give a moderately *low* resistance such as 1,000 or 2,000 ohms.

Shunting Effect of Valve

Of what significance are these facts in vectorising?

Well, in the first place, we must try to understand an aspect of valve circuits which generally causes considerable difficulties. If we omit the H.T. source we observe that ra is virtually *in parallel with the load impedance* $\frac{Z}{1}$ (Fig. 1 (a)); the valve is said to "shunt" the load impedance, from an A.C. point of view.

Thus, in any amplifier such as Fig. 1 (b) the HT+ line is virtually at the same A.C. potential as the HT− line—both are at *cathode* potential. But, of course, if we consider D.C. conditions, one side is 100 v. or 200 v. positive (or negative) with respect to the opposite side. The point is that, to A.C.

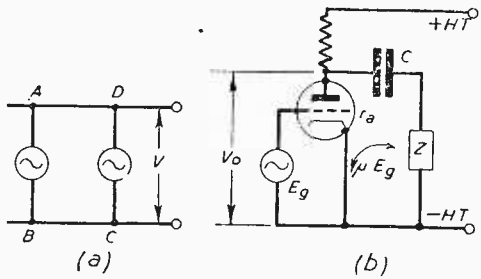

Fig. 2.—The E.M.F.s of two alternators in parallel are virtually in series *opposition in the closed mesh ABCD. In the shunt-fed valve circuit (b), Z and ra are in parallel relative to Vo, but μEg still acts upon Z, ra and C regarded as a closed series mesh.*

potentials, HT+ and HT− are *joined*, either by a large capacitance condenser C or the low internal resistance of the H.T. source.

The main difficulty about this way of regarding things is the fact that Z and ra are also virtually *in series*, for example, when in a constant-voltage equivalent circuit we say that the proportion of μEg developed across Z is Z/(Z+ra).

The total alternating E.M.F. acting in the anode circuit is μ times Eg, or μEg volts. Then:

Alternating current in the series circuit,

$$Ia = \frac{\mu Eg}{Z + ra} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Output voltage across Z =

$$Vo = IaZ$$

$$= \frac{\mu Eg}{Z + ra} \times Z$$

$$= \mu Eg \times \frac{Z}{Z + ra} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The basis of this equation is plainly that of a series circuit—or simple potential-divider principles, if you like. μEg acts upon a circuit comprising (Z+ra), when we get potential division in the ratio Z/(Z+ra), as above. How, therefore, can Z and ra at the same time be said to be in parallel ?

(To be continued)

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Our cover illustration shows a scene inside the G.C.A. unit at the airport, showing members of the R.A.F. crew at work. The dials in foreground, which work in conjunction with the cathode ray tubes, indicate to the controller the height and azimuth position of the aircraft under control.

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Programme Pointers

In This Article MAURICE REEVE Discusses the Vexed Question of Announcer's Historical Notes

A GOOD deal of thought and variety of opinion has been exhibited in the interesting question as to whether high-class—alias brow—musical programmes shall be interspersed, or interrupted, some may say, with factual comments relative to the works being played and the composers of those works. It is a knotty problem which must be cleared up soon, one way or the other. Shall a concert of classical music be played without comment of any sort, on the supposition that listeners to it know all about the works—being highbrow third-programme-ites, otherwise they wouldn't be listening—or shall analytical notes of the works plus biographical data be read out, on the premise that there is always some new boy in the class who doesn't know his Bartok, or some old one who has forgotten his Bach ? Something comparable to the programme notes in the concert hall, for which we are mulcted of a shilling.

Broadcasting is Entertainment

Personally, I am very much against the latter system. (In parenthesis I protest most vigorously against any charge being made in a concert hall for the right to know what we have paid to come and hear performed. The American system of free programmes in boxes dotted around the hall is the only fair and logical one.)

Broadcasting is, and must remain first, last and all the time, entertainment. This must apply equally to Bach's Artof Fugue or Bartok's Quartets as to Itma or In Town To-night. It stands to reason that the musical pedagogue, who knows all about the Artof Fugue and how, when, where, why and by whom it was made, will not only listen to it because he wants to, but will do so irrespective of, and deaf to, how it is put over. It is the equally musical but less well-informed listener whom we have to think of.

The greatest work for V music that the Promenade Concerts have done is to rope this type of person into the world of the " satisfied " music lovers without trying to teach him or to play down to him, but letting him feel absolutely equal and at home with the most seasoned symphony concert habitué—which he is not—when rubbing shoulders with the twelve-shilling stallites in those august and olympian assemblages. Although exactly the same music is being played in both places, the atmosphere is entirely different.

Now, I do suggest that when our less scholarly but equally ardent and worthy music lover turns on his radio with a view to spending the next 60 minutes absorbed and entranced in a symphony concert hears something like this, . . . " will now play Symphony No. 6 in F minor, by Schubetfsky. This work was written in 1811, when the composer was at the height of his creative genius. The same year saw the string quartet, the two piano Sonatas of 76 and the Mass in A, together with numerous songs and smaller pieces. The first movement opens with a subject, played by the strings, of a sombre and melancholy character, which is said to depict Schubetfsky's grief at the unhappy termination of a love affair. . . ." etc., etc., followed by similar disquisitious comments on the other three movements. It is rather apt to make our friend feel that he has been taken to school to be not very well taught, instead of to what he had hoped to be taken—the most glorious entertainment in the world—a symphony concert.

A Feeling of Frustration

The feeling created in his breast is one of annoyed frustration, of not being allowed to think for himself, and of always being " taught," " lectured," or, more properly, " nagged." It is like when the harassed housewife, being informed that she cannot have what she asked for, gets her nerves further frayed by having to listen to a diatribe on the virtues of, to her, an inferior substitute.

It annoys me intensely, and I am all in sympathy with those who prefer to listen to good music with their own thoughts, and who intend to " look up " any information they may be ignorant of concerning it after the programme is over. As one who, whilst preferring to listen like this, whilst always seeking new knowledge, I must relate how grateful I was the other night for a piece of such knowledge. It was Brahms's fourth Symphony. The announcer began his little diatribe, in the manner I have just tried to picture. But, just as I was moaning to myself, " Oh, hell, why will the B.B.C. always try to teach one instead of letting one listen in peace and quiet—I've heard this all a hundred times before," he let drop a piece of information—that the theme of the great Passacaglia came from Bach—which was entirely new to me. But I would have been bound to have come across it in the course of my reading sooner or later.

The remedy ? Simple, my dear Watson. Just as we have our programmes at a public concert, with specially written analytical notes, which we can buy or not as we please, so should they either be included in the " Radio Times," with the programmes, for us to peruse or ignore as we wish. They should not obtrude themselves over the air, any more than a person should walk on to the platform at a public concert and read them. Lots of people are fully able to distil all the beauties of great music, and gain the utmost intellectual and ascetic pleasure without any such extraneous aid, whilst many others don't care a dominant seventh, anyway, whether the first subject means this, that or the other, or whether such and such a work was written at the height, or the depth, of its composer's powers. Laissez faire, honi soit, a little knowledge is a bad thing . . . and all that.

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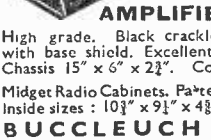

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Impressions on the Wax

Review of the Latest Gramophone Records

RICHARD TAUBER'S successful and charming operetta "Old Chelsea," is replete with tunes which stay in the memory. The story is set in the eighteenth century, when Chelsea was still a pretty village surrounded by green fields, the centre of one of the supreme porcelain factories in England. The gay figures from Chelsea plates and saucers seem to have stepped on Mr. Tauber's stage, and the music suits them to perfection. The production, among other things, emphasises his amazing versatility. This month *Columbia DB*2274 gives us a generous selection from the show, and the delightful melodies are played with the satisfying richness of feeling that one associates with Albert Sandler and the Palm Court Orchestra.

Gaetano Pugnani was born at Turin in 1731, dying in his native place 66 years later. He was a great violinist and composer for strings, of the best eighteenth century stamp. Operas featured largely in his output, in common with most composers of that century. The "Praeludium and Allegro" is the most familiar of his pieces and has long been a favourite with violinists. Now Rawicz and Landauer have taken it into their capable hands and made a brilliant version if it for two pianos on *Columbia DB*2235.

The selections played this month by Andre Kostelanetz and his Orchestra are "Poinciana" (Song of the Tree) by Simon and "Song of India," by Rimsky-Korsakov which have been recorded on *Columbia DX*1348. These new contributions should be widely acceptable. An old favourite makes a welcome return this month in the "Yeoman of the Guard" Overture played by the Liverpool Philharmonic Orchestra conducted by Dr. Malcolm Sargent. It is coupled with another of Sullivan's works—"Patience" Overture. The number of this recording is *Columbia DX*1339.

"Sonata No. 2 for Violin and Piano, Op. 31" on *H.M.V. C*3547-8 by Albert Sammons (violin) and Gerald Moore (piano) has been recorded this month under the auspices of the British Council. These records are certainly worth hearing as also is "The Banks of Green Willow," played by the Philharmonia Orchestra conducted by Maurice Miles on *H.M.V. C*3491.

Bach Concerto Recorded

THE compelling rhythm inherent in Bach's music is nowhere more striking than in his orchestral works, and especially in the piano concertos. This month a recording has been made of his "Concerto in D Minor for Pianoforte and Orchestra" on *Columbia DX*1312-4. The steady driving power of Bach's inspiration is felt in the two flanking movements of this impressive triptych, while the adagio is more reflective in character. All concertos of Bach's time, whether for single instruments, as here, or for a group of soloists, are constructed on much the same plan of a slow movement between two quick ones. The internal plan of the individual movements differs from that of the later eighteenth century concerto, in that sonata form is not employed; indeed, it was not developed until after Bach's death. The themes in the older type, to which the D Minor Concerto belongs, are treated in counterpoint and modulated strikingly to, sometimes, remote keys. It is fortunate that Harriet Cohen has been engaged for these records. She is particularly happy with Bach, and this recording shows her complete command of the spirit of Bach performance. Walter Susskind with the Philharmonia Orchestra supports the soloist brilliantly.

The work of Delius is again featured in this month's recordings with his Concerto for Violin and Orchestra played by Jean Pougnet (violin) ably supported by the Royal Philharmonic Orchestra conducted by Sir Thomas Beecham, Bart., on *H.M.V. DB*6369-71. These recordings have been made under the auspices of the Delius Trust. For a long time the work of this composer remained something of an enigma to the larger musical public, though there has always been a steady band of admirers who have stoutly maintained their devotion to him. The high individualism of his feeling, style and idiom—especially his harmonic idiom, which is characterised by a subtle chromaticism — took some time to impinge on the consciousness of music-lovers nurtured on the great Viennese classics. In 1929, a festival of the composer's works was organised in London, at which Delius himself, blinded and crippled as he was then, managed to be present. These records reveal every subtlety of a composer whose orchestration is one of the finest features of his style.

Vocal Recordings

OUTSTANDING among the vocal recordings this month is a record by that famous Italian tenor Beniamino Gigli. He sings two songs—"Vainement, Ma Bien Aimee" (In Vain, Oh Well Beloved) and "Rachel! Quand du Seigneur" (Rachel! When the Grace of the Lord) on *H.M.V. DB*6366. He is admirably supported by the Royal Opera House Orchestra, Covent Garden, conducted by Rainaldo Zamboni.

Other interesting recordings include the lovely aria from "Samson and Delilah," "Softly Awakes My Heart," which is sung in Italian by Ebe Stignani, mezzo soprano, accompanied by the Orchestra of the Opera House, Rome, under the baton of Luigi Ricci on *Columbia LX*976. Another talented singer is Gladys Ripley who has recorded "The Holy City" and "Largo (Xerxes)" on *H.M.V. C*3549. She is accompanied by Herbert Dawson on the organ. Finally Robert Wilson, tenor, sings "My Life is Yours" and "Lassie O' Mine" with orchestra conducted by Henry Geehl on *H.M.V. BD*1159.

Light Music

"CONCERTO in Jazz" is the latest recording by Charles Shadwell and his Orchestra on *H.M.V. B*9506. The young British composer

(*Concluded on page* 218).

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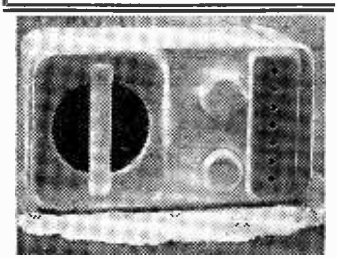

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Open to Discussion

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).

Ex-Service Equipment

SIR,—I quite agree with your correspondent regarding ex-Army 19 sets. A letter to his local M.P. might get matters cleared up a bit. Whilst there must have been a considerable number of ex-R.A.F. R.1155 sets sold, I have yet to see any letters published giving details as to the results obtained on the short-wave bands. These sets are undoubtedly value for money, but some idea as to ease of tuning, signal-to-noise ratio, performance on the short-wave broadcast bands, also amateur bands, would assist those who are considering purchase. I note that some firms are supplying service data. This is a wise move, and one that I suggested before these sets were made available. In closing I have not yet seen any of the pre-war type Hivac special short-wave battery type valves advertised yet. Now then, advertisers, if you have any, we should be glad to see about them in your adverts.—A. W. MANN (Middlesbrough).

SIR,—Your correspondent, Sigm. P. Barnes (Paris), is under a slight misapprehension about the No. 19 sets listed in the U.S. magazines. These sets were made by Emerson and Zenith and were lend-lease to Britain and Russia. He, however, raises a very interesting point in the release of the service's electronic equipment. It would seem, from articles in the U.S. magazines, etc., that the U.S. Government has released most of their surplus, while here in Britain one can only conclude from the various articles which have appeared in the daily Press it is used mostly for filling disused pit shafts instead of being sold and thereby reducing taxation.

Another interesting point. Do wholesalers obtain the present U.S. equipment available here at the same rates as the wholesalers in the U.S.A. ? If they do there must be some colossal profits being made out of this surplus. For the benefit of readers who do not take the U.S. magazines, I will quote a few current prices of new surplus equipment.

U.S. valves : 954, 955, 956, 3S4, 3s. 6d. each ; 9001, 9002, 9003, 6J6, 6L6, etc., 4s. to 5s. U.S. sets : 9-valve Horsie Talkies, £4 7s. 6d. ; 5-valve Emerson midget pocket superhets. with 'phones, batteries, valves, etc., £3 15s. (similar £12 here); 14-valve U.H.F. 158-210 mc/s. RX. A.C. mains (not ex. radar), £10 ; 15-valve ditto, 6 acorns, used a few hours, £5 10s.

Also, most U.S. distributors usually supply a circuit and instructions for converting to normal amateur wavebands with every surplus set sold. Readers should demand this here when purchasing surplus sets.—A. W. J. MARSH (Newport, Isle of Wight).

SIR,—With regard to the letter sent in by Sigm. P. Barnes (Paris), I would like to inform him that if he wants a low-powered trans-receiver, he can get one from either the Stamford Radio Co. or "Raymart." These instruments are ex-R.A.F. and consist of a separate 6-valve receiver and a 3-valve transmitter using C.O., P.A. and Mod. They should have a pretty good range under suitable conditions. Hoping that this information will be found of interest to Mr. Barnes and other readers.—G. CLUGSTON (Co. Antrim, N.I.).

Service Engineers

SIR,—May I endorse the remarks of R. A. Loveland (Addlestone) regarding service engineers, in "Open to Discussion," February issue of PRACTICAL WIRELESS. I am a spare-time service engineer of some 15 years' standing, and during that time have handled almost every class of receiver. I do not canvass or advertise but rely only on recommendations and I get more work than I can really cope with. I have at times had to turn work away. I endeavour to, and do in many cases, give 24-hour service. Like R. A. Loveland I have handled many receivers that have been "repaired" by local professional service engineers—my conscience wouldn't let me turn out some of the work they do. To quote a few instances : badly-soldered and often high-resistance joints ; huge blobs of solder when just a spot would do, this by a recognised service agent. On one occasion, an 8 mfd. smoothing condenser just loosely wired in and *not* soldered ! I leave readers to guess the queer noises that emitted from the speaker due to arcing. Repairs charged for but obviously not carried out—one can generally tell by examination of the chassis what actually has been done. I could quote many repairs that I have been called in to rectify due to just bad workmanship. In many cases simple things for which the set owner has paid the dealer an exorbitant sum. I quite often carry out small repairs free, replace small things like resistors, small condensers, etc., for only the cost of the component —and it is my proud boast that I have never yet turned out a "dud" repair. I pray my conscience never lets me. I could list many other "rackets," but our old friend "Thermion" has exposed most of them in the February issue.

May I add in closing that I have been a reader of PRACTICAL WIRELESS for many years and wish the journal every success in the future. To other private service engineers I say, "Keep up the good work ! "—B. G. WRIGHT (North Harrow).

SIR,—May I through your columns reply to a letter from R. A. Loveland (Addlestone) which appeared under the heading "Service Engineers" in your February issue.

Surely this should have read "Dabblers," and not "Service Engineers" ?

Your writer appears to be doing a very good job of work, in his *spare* time, one job not being

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enough for him. He talks of doing work after it has been vetted by an expert, or at least by a dealer. I wonder!

After some 20 years of full-time work in the radio trade I would venture to suggest that the boot is on the other foot; I myself would like to have a pound for every set I have had to put in good order after "an expert friend has had a look at it"!

It would appear that R. A. Loveland, on his own admission, is an expert at simple faults, not a very good recommendation surely for such a clever chap. Not saying a lot for the dealer who went before him!

No, R. A. L., I am very sorry to say that your letter does not cut much ice these days, and I think the majority, like myself, agree with "Thermion." Most *good* dealers to-day employ an engineer who usually knows his job; he has to! By dealers I mean those who hold good agencies such as Murphy, Bush, Pye, H.M.V., etc.; these firms expect and insist that the dealer keeps an efficient and expensive service department.

The solution is in the hands of the public these days. By going to a dealer who keeps a good shop, well stocked, and has good agencies, and although perhaps the price for the repair will be higher than R. A. L. would charge, the customer can always go back to the dealer in the event of it not coming up to his expectations. After all, a set can be repaired one day and still refuse to work the next. Most sets to-day are old, and have had a lot of work during the past six years.

May I, on behalf of my fellow radio men, full timers that is, thank you for keeping up publication, and for a very interesting and informative book. —THOMAS SMITH (Service Dept., Murdoch's, Biggin Street, Dover).

German People's Receiver

SIR,—As an owner of a "German People's Receiver," I was extremely interested in your article of this set in your November issue of "P.W." and it is being kept as a service sheet in case of trouble in future.

The set is in perfect order and functions equally well on A.C. or D.C. mains, although it is rather too "tricky" to tune for the everyday listener. It will, when finally tuned, hold the stations without fading providing it has an efficient earth which it seems to like.

With regard to Mr. Neale's letter in your February issue, I would like to state that it is totally out of proportion to try to compare it with the British Utility, the approximate price of which was £12, compared with 28/- of the German set.

May I take this opportunity of thanking you and your staff for the most enlightening book on the market, and may you soon be granted more paper. —R. H. NEWMAN (Hove).

QTH of W2CZO

SIR,—In answer to K. Beasant's request for W2CZO's QTH, I submit the following details. W2CZO's QTH is—Amateur Radio W2CZO, 39, 9th St., North Arlington, N.J., U.S.A. His power is 950 watts fone and he uses a three element rotary-beam.

He verifies with a very attractive card against a good report, over a reasonable period, and an I.R.C.

Like K. Beasant, I am also 14 years old and have a 0-V-1 T.R.F. RX. I have a choice of two aerials, a 20 metre $\frac{1}{2}\lambda$. doublet or a 40 metre $\frac{1}{2}\lambda$. doublet, beamed respectively to the U.S.A. and the East Indies.

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I should like very much to contact a reader of my own age either in Great Britain or abroad.—JAS. NEILSON(32, Ardgavan St.,Greenock, Scotland).

Unauthorised G5BU

The following notification has been received from Messrs. Bulgin, owners of Amateur Station G5BU:

"It has been drawn to our attention by the Post Office that operating is taking place on certain frequencies (these not even in the allotted amateur bands) by some station using our call sign G5BU and we desire to notify you that at the present time we are not emitting at all.

"We shall be pleased to give notification, at a later date, when tests are likely to recommence from our station."

Correspondent Wanted

SIR,—I should like to correspond with two or three amateurs about my own age, and perhaps exchange ideas. I am an amateur radio operator.—M. SCHAW, R.M.D., Waipawa, H. Bay, New Zealand, N.I.

IMPRESSIONS ON THE WAX

(*concluded from page* 215)

Donald Phillips, born in London, has evolved in "Concerto in Jazz," a symphonic style embodying the best characteristics of jazz music, appealing to the increasing number of listeners who have a taste for both jazz and serious music. The work is in one movement and contains three principal sections varied in style and rhythm. It was first broadcast by Charles Shadwell and the B.B.C. Variety Orchestra, and has been consistently featured by Shadwell's own orchestra since he gave it at his first stage show.

This month Rita Williams makes her first recording for the Columbia Company with "It's All Over Now" and "Goodnight Darling" on *Columbia FB*3269, with orchestra directed by Peter Yorke. She has appeared in many broadcast shows, including "Monday Night at Eight," "Here's Wishing You Well Again" and "Accent on Rhythm."

Dance Music

ALL the latest tunes have been recorded this month by many well-known bands. To name a few there are two records by Geraldo and his Orchestra "Zip-a-dee Doo-dah" and "The Old Lamplighter" on *Parlophone F*2200, and "September Song" and "Ole Buttermilk Sky" on *Parlophone F*2201; "All by Myself" and "Five Minutes More," by the Skyrockets Orchestra, directed by Paul Fenoulhet on *H.M.V. BD*5955; and finally "Ole Buttermilk Sky" and "Anniversary Song," played by Joe Loss and his Orchestra on *H.M.V. BD*5958..

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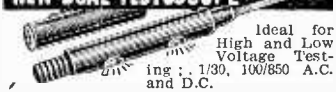

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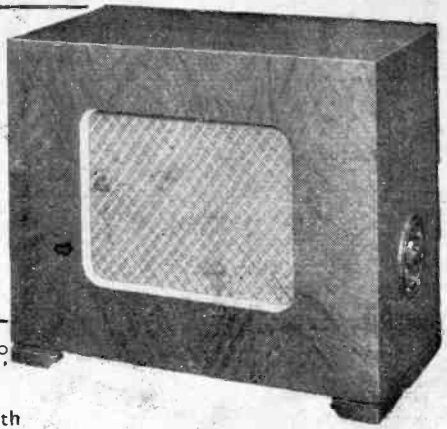

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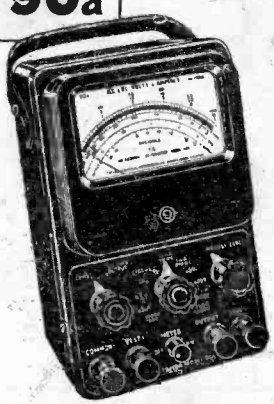

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