A POCKET CRYSTAL SET

Practical Wireless

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Editor F. J. CAMM

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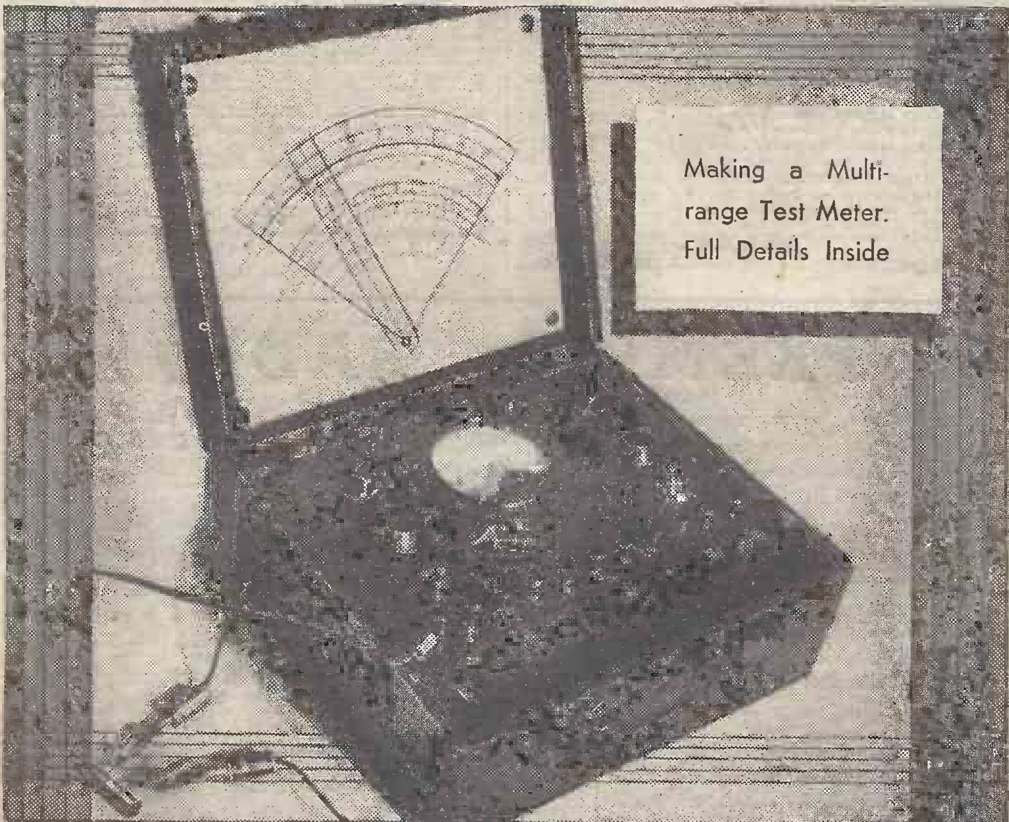

PRINCIPAL CONTENTS

Practical Wireless
and PRACTICAL TELEVISION
14th YEAR OF ISSUE
EVERY MONTH
VOL. XXII. No. 480. JUNE, 1946
Editor F. J. CAMM

COMMENTS OF THE MONTH. BY THE EDITOR

Radio Advertising

RADIO is undoubtedly a public service and it has probably the most important functions to perform, and not only from the point of view of entertainment and education, but in the rapid dissemination of news and views on particular subjects, for and against, so that the public can form its own views. The controversial subject of radio advertising is one on which there is a diversity of opinion. Many of those opinions are not entirely disinterested. It is said on the one hand that serving a symphony to sell peas is bad for all save the peas. That is a nice epigrammatic slogan which trips off the tongue nicely and sounds very convincing, if we do not stop to think about it. But a moment's thought will show that the peas may be used to sell the symphony as well as to serve it. In other words, but for the peas there would not be a symphony and the public might otherwise therefore be denied a mental as well as a gestatory pabulum for their physical as well as their cultural welfare.

It is also said that to reduce broadcasting to the level of the free gift given away with a pound of tea is to blend a twain that should never meet, because they belong to different worlds. Who says so? Apparently a registered practitioner in advertising, who by means of slogans and epigrams endeavours to convince us in a pamphlet dealing with points against radio advertising in any form that radio advertising is bad. Bad for whom? The advertising practitioners, the advertising agents, or the public? It cannot be denied that large numbers of the public listened in to Radio Luxemburg and Radio Normandy before the war in preference to listening on Sundays to the dirgeful montage of mental uplift largely of a religious character put out by the B.B.C. when Reith was the Director-General. Things have changed in the B.B.C. since he left and many things for the better, but we do not think that the programmes put out on Sundays are sufficiently far advanced, nor do they take note of the great change which has taken place in the public outlook, public intelligence and public taste as a result of six years of war. Whilst that condition continues there will still be a demand for the programme which is radiated with the idea of interesting the public in a particular commercial product by wrapping up the publicity in the gilded package of pleasant music, wisecracks and a programme entirely divorced from the British outlook of making Sunday a day of miserable reflection, and of so planning things that people will be driven to church to listen to an interpretation of the Bible.

The registered practitioner in advertising referred to above proceeds to damn radio advertising by a series of advertising slogans, such as "Radio is the potent force in the world and the least understood." Who says it is least understood? Has the registered practitioner taken a survey of public opinions on the matter, and who is to say whether the public understands or not? The registered practitioner? Who was the panel of independent judges?

Similarly: "In time it (radio) can make a nation Christian or pagan, cultured or crazy, alert or drunk. It moulds the national concept of comedy, music, philosophy, morals and life itself." Nice sounding words, but certainly matters for argument and debate.

The managing director of a well-known brand of proprietary medicines stated: "If we do not get a service from the B.B.C. in years to come we are going to make our own arrangements for radio advertisements." Of course, the arguments against radio advertising are well known. No particular section of the community has the right to commandeer, say, half an hour of the programme time in order to push proprietary articles. Equally it could be argued that no artist has the right to use the air to advertise his act.

The B.B.C. did some years ago run sponsored programmes the sponsors were not particularly anxious to repeat the experiment, but that was possibly because the B.B.C. limited the publicity to a mere announcement as to who was sponsoring the programme and did not permit publicity interjections within the programme itself. Because we did not permit radio advertising in this country hundreds of thousands of pounds were spent by British firms abroad in the form of sponsored programmes.

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

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

ROUND THE WORLD OF WIRELESS

F.-M. in Canada

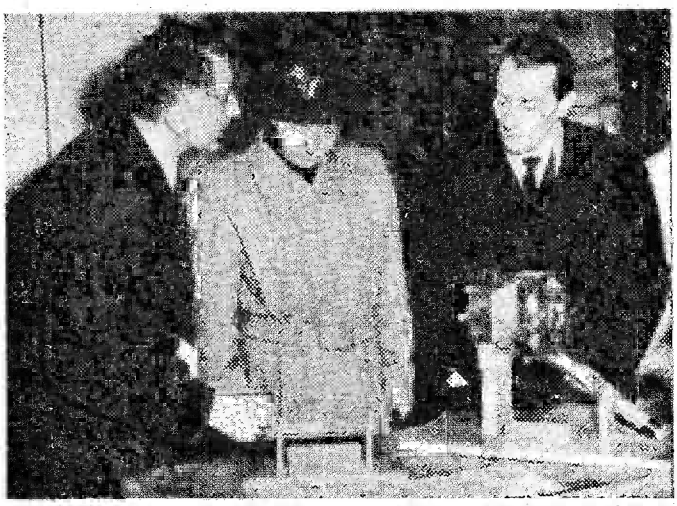
A BROADCAST transmitter using the frequency-modulation system is now in operation at Mount Royal, Montreal. The call sign is VE9CM, frequency 48.8 mc/s, and the power 25 watts.

B.I.R.E. Meetings

"THE Effects of Solar Eclipses on the Ionosphere," was the title of a paper read by Dr. R. L. Smith-Rose (D.S.I.R.), on the 20th March, at the London Section Members' Meeting, and "Receiver Aerial Coupling Circuits for Medium Waves" was the subject of S. W. Amos, B.Sc., at the North-Western Section Members' Meeting on the 26th March, at Manchester.

Cossor and Sylvania

ELECTRONIC TUBES, LTD., have been registered to take over part of the Cossor Valve Co., and the Sylvania Electric Products Company of America. Kingsmead Works, at High Wycombe, the large factory built by the Government for valve manufacture, has been acquired by the new company, and valves manufactured there will benefit by the pooling of the resources and patents of the two companies.



An experimental centre for Television was recently opened in a suburb of Paris. The head of the centre, M. René Barthelemy is seen in the above illustration on the left showing an Iconoscope to Mme. and M. Joliot-Curie, the French scientist. Mme. Joliot-Curie is the daughter of M. and Mme. Pierre Curie, the scientists who discovered radium.

Electronics and the Atom

AT an R.I.C. Luncheon in March, Professor H. S. W. Massey, F.R.S., stated that the release of atomic energy is dependent on valves and electronics. He paid tribute to the important part played by radio devices in the development of the use of atomic energy, and stated that the main difficulty was in the control of the process. Professor Massey was one of the team of British scientists who visited America during the war in connection with the development of the atomic bomb.

Wireless Receiving Licences

THE following statement shows the approximate numbers of receiving licences issued during the year ended February 28th, 1946.

Region	Number.
London Postal	1,955,000
Home Counties	1,294,000
Midland	1,475,000
North-Eastern	1,595,000
North-Western	1,391,000
South-Western	868,000
Welsh and Border	603,000
Total—England and Wales	9,181,000
Scotland	1,012,000
Northern Ireland	152,000
Grand total	10,345,000

Three Hundred at Philco Ball

MORE than 300 employees of the Perivale factory of the Radio & Television Trust, Ltd.—the former Philco Group of Companies—attended a carnival ball at Ealing Town Hall on Tuesday evening March 19th.

For the first time since before the war some of the Philco girls wore evening dress, and paper hats and other carnival gifts were given to the dancers. The hall was gaily decorated and three bars provided refreshments.

Prizes were awarded for a series of unusual competitions.

Al Morgan and his band provided the music, with Miss Jean Jones singing.

Radio Production in Ossett

DETAILS have now been released about the Moorcroft Mill at Ossett, which has been taken over by Airmec, Ltd., manufacturers of the famous Philco brand of products. On the principle of "taking the work to the worker," the Company will manufacture all types of radio and television receivers at Ossett. For export—their programme is a large one—they will make their "Airmec" sets, tropicalised for hot climates, and specially designed to meet the needs of listeners all over the world. For the home market, controlled at present by Board of Trade licences to small quantities, new and better Philco models will be produced.

By a series of corporated changes now just on the point of completion, the former Philco Group of Companies is now named the Radiotel Group, and consists of Radio & Television Trust, Ltd., as the parent company, with the following subsidiaries: Philco Radio & Television Corporation of Great Britain, Ltd., Airmec, Ltd., Airmec International Sales, Ltd., P.R.T. Laboratories, Ltd., Hopkinson Motors and Electric Co., Ltd., Britannic Electric Cable and Construction Co., Ltd., British Mechanical Productions, Ltd., and General Accessories Co., Ltd. These companies together form a well-knit balanced radio electronic and electrical group, with a fine wartime record and a determination to make a real contribution to the arts of peace.

Hams Visit Eddystone Factory

ON Saturday, March 23rd, an interesting visit was paid by the R.S.G.B. Birmingham Convention

A novelty from America. A Chicago radio corporation has developed a pocket 5-valve radio of the superhet type measuring 5in. by 6in. and only ¾in. thick. It weighs 10 ounces, including batteries. A small earpiece with a very fine lead enables the programmes to be heard without annoying fellow travellers.

Post Office resources, were not carried out until 1897. "It would hardly be appropriate, therefore," said Mr. Burke, "to dedicate a memorial to Marconi at Penarth."

Big Industrial Appointment

THE name has now been announced of the managing director of the new Company—E.M.I. Factories, Ltd., which is taking over operation of the great E.M.I. manufacturing plant throughout the world, covering E.M.I., "His Master's Voice," Columbia, Marconiphone, Parlophone and H.M.V. Household Appliances, and the many other production sections of the Group.

This appointment goes to Mr. Henry Wilcox Bowen, O.B.E., who joined The Gramophone Company as production manager in 1940 to organise the tremendous programme of war production which the E.M.I. factories were then about to undertake. Mr. Bowen was awarded the Order of the British Empire in June, 1945, in recognition of his services to the nation during the war.

Extension of Pye, Ltd.

PYE, LTD., the Radio, Television and Electronic Equipment manufacturers of Cambridge, announce the extension of their activities to the scientific instrument field by the acquisition of the business of W. G. Pye & Co., Ltd., "Granta Works," Cambridge, which attains its jubilee this year, having been established by Mr. W. G. Pye in 1896.

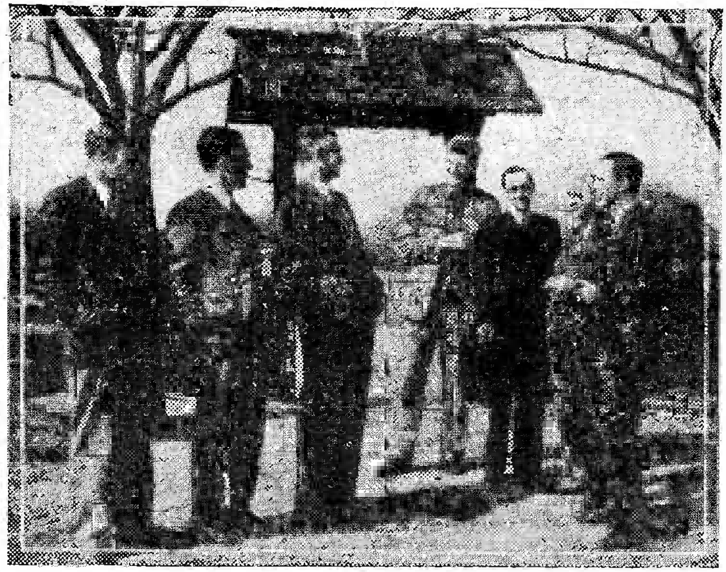
W. G. Pye & Co., Ltd., is in the forefront of scientific instrument makers, and its products have a world-wide reputation, in particular in Government and scientific establishments, and in the Universities. Continuity of management is assured by Mr. Harold J. Pye remaining as managing director of W. G. Pye & Co., Ltd.

The valuable experience which thus becomes available to Pye, Ltd., will add considerably to the already striking position of that Company in radio engineering, while the marketing resources of Pye, Ltd., will aid the distribution of scientific instruments in both the Home and Export markets.

delegates to the Eddystone radio works at West Heath. A motor-coach conveyed the delegates to the factory, where for two and a half hours they examined Eddystone equipment, forthcoming products, and listened (with the co-operation of the Police) to a demonstration of the Eddystone two-way radio telephonic gear as installed in police cars. Keen interest was shown in the exhibition, and after a running buffet and photographs the party boarded the coach for the hotel.

Memorial to Marconi?

THE Socialist Member for Newport recently suggested in the House that an official memorial to Marconi should be erected on the cliffs at Penarth, Glam, "where the first official radio message was transmitted by him to the island of Flatholm, five miles away, forty years ago." The Asst. P.M.G. replied that the first messages by radio between Penarth and Flatholm were sent in 1892 under the auspices of the Post Office by Sir William Preece, its then Engineer-in-Chief. Marconi did not arrive in Britain until 1896, and his experimental transmissions from Penarth, made with the aid of



Two hundred brunettes have been tested at the Alexandra Palace for two posts as television announcers. Experts who supervised the tests enjoy a joke amongst themselves during a rest. Left to Right: George More D'Ferrell, Senior Producer; Douglas C. Birkenshaw, Superintendent Engineer (Tele.); Maurice Gorham, Head of Television Service; Denis Johnston, Programme Director; Roland Price, Studio Manager; A. Oxmond, Asst. Studio Productions Manager; Eric K. Besely, Asst. Studio Productions Manager.

A Multi-range Meter

A Useful and Ingenious All-purpose Meter for the Testing of Components

THE meter described in the following notes is primarily intended for rapid checking of the values and soundness of secondhand components taken from dismantled apparatus, before incorporating them in various receivers and experimental circuits.

The basis of the design is an ultra-wide-range ohmmeter, and, in fact, no less than seven ranges of resistance measurement are readily available at the turn of a switch or two, giving continuous coverage from 0.1 ohms up to 10 megohms. In addition there are three ranges of capacity measurement, reading from 0.0001 to 1.0 mfd., so that there are few components in ordinary radio use which fall outside the scope of the instrument. In particular the low-reading ohms ranges permit the checking of loudspeaker speech coils, tuning coils and the like, and it is a considerable advantage to be able not only to verify the continuity of a winding but to detect a short circuit, which shows up as an unexpectedly low D.C. resistance. The difference between zero and, say, half an ohm on the appropriate range is most marked. Incidentally, this particular test can be made with a current of not more than 10 milliamps, as opposed to at least 100 required in the conventional ohmmeter circuit.

It was thought desirable to combine in the one portable case as wide a range as possible of voltage and current measurements, both A.C. and D.C., to meet ordinary servicing requirements, and with this in view the instrument was built round one of the popular 1-milliamp moving-coil meters, which are now readily obtainable in many quarters. It will be seen that the "universal" shunt has not been employed, and an entirely separate resistor is used for each of the voltage and current ranges: this has been done so as to ensure that the accidental failure of any one, through ageing or other cause, will not put the whole instrument out of action, and, of course, it makes for ease and convenience in any replacements which may be necessary.

The layout provides for the terminals and switches on the right of the panel to be devoted to D.C. measurements, and those on the left to A.C., so that a mistake is practically impossible. Separate potentiometers are provided for setting the meter to zero when making resistance and capacity measurements; and another special feature is a pair of shorting switches on the panel, which enables the operator not only to set his zero conveniently, but also to make sure at any moment that it has not "drifted" owing to a tired battery or to a resistor which has got hot unnoticed.

As will be seen from the circuit diagram, the voltmeter circuits follow conventional lines. The prototype instrument has 10 ranges of D.C. volts, from 1 to 1,000, and 8 ranges on the A.C. side, from 10 to 1,000. Very low readings of A.C. volts are impracticable in an instrument of this type unless a special and rather bulky step-up transformer (as recently described in PRACTICAL WIRELESS) is fitted. All these readings are made at 1,000 ohms per volt, and it is, of course, intended that when the meter is functioning as a voltmeter no shunt should be left in circuit. The return

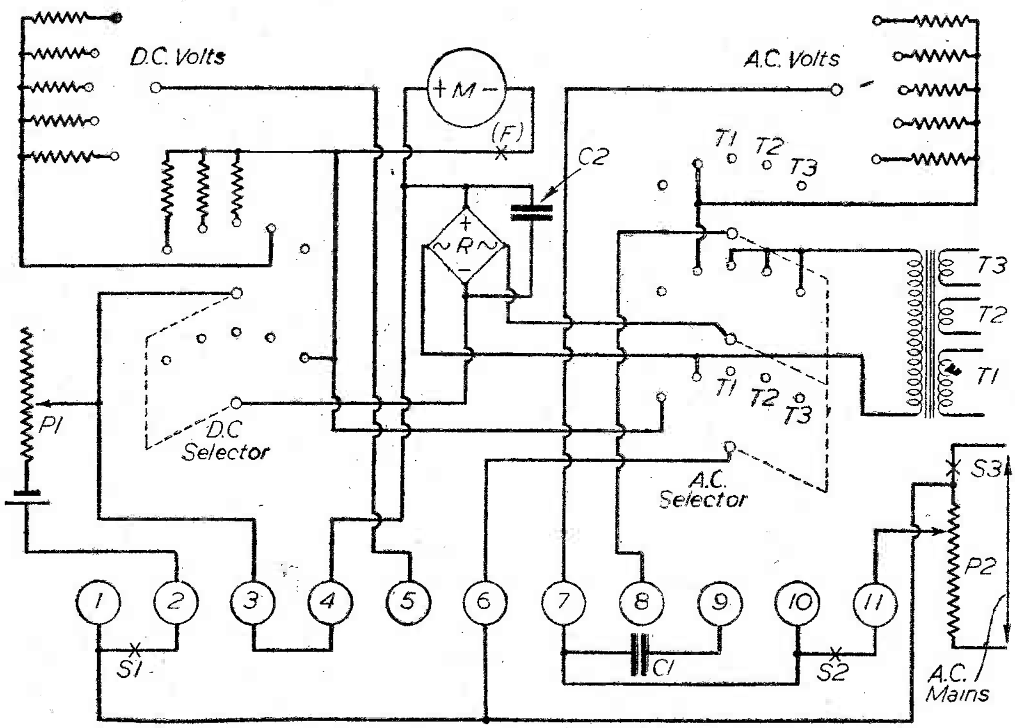


Fig. 1.—Theoretical circuit of the meter.

leads from the bank of voltage series resistors have accordingly been brought down to the 1 mA. contacts on the current selector switches, and not straight through to the "common" terminal.

A word of explanation about the current selector switches may not be out of place: each is, in addition, a master switch, turning over the operation of the whole instrument from D.C. to A.C. or vice versa, as required. Thus, for making A.C. measurements it is necessary first of all to set the right-hand selector on the panel to the position marked "A.C.," and the "A.C." selector to the current range it is desired to use: unless both switches are so placed, no measurements at all can be made from any of the A.C. terminals, and this again means that it is impossible to take A.C. readings with a D.C. shunt accidentally left across the meter. The left-hand selector similarly has a position marked "D.C.," which is the master for the whole of the D.C. side.

The Circuit

Turning now to the circuit diagram the following notes may be helpful:

Between terminals 1 and 2, with the shorting switch S.1 *open*, resistance measurements can be made with the meter set either to 1 mA or 10 mA full-scale deflection (of course, one *could* take readings on the 100 mA or even the 1-amp range, but they would have doubtful value, besides throwing a considerable strain on the battery and the article under test). These two ranges will be found to give accurate ohms readings from 50 to 25,000 on the first mentioned scale, without making use of the extreme range of the pointer's travel, which is notoriously inaccurate; while with the 10 mA shunt in circuit the values are divided by 10, giving dependable readings from 5 to 2,500 ohms. The shorting switch, of course, provides for the zero to be set beforehand by means of the 2,000 ohm wirewound potentiometer P.1, and checked at any moment during the course of a test. The battery, by the way, is a single-cell U-2 type, a large and long-lasting cell, but there is no reason why a two-, or even three-cell, battery should not be employed, and the scales (to be described later) calibrated accordingly.

(Of course, the value of the potentiometer P.1 must be selected to correspond with the voltage of the battery which it is intended to use for this purpose; a figure of 2,000 ohms per cell is suitable.) Between terminals 2 and 3, with the shorting switch *closed*, there are two further ranges of resistance measurement, again using the meter set for 1 mA and 10 mA respectively, zero-setting being carried out by the same potentiometer as before. These will be found to give really reliable readings from 1 to 1,000 ohms on the first range and from 0.1 to 100 on the second. It will be seen from the circuit that the resistance being measured is, in fact, connected as a shunt across the meter itself, and this provides an easy and accurate method of ascertaining low values without the use of excessive current, which is a great drawback of the usual low-reading ohmmeter.

By making contact to terminals 4 and 6 the instrument functions as a D.C. ammeter, with four ranges. Full-scale deflections of 10,000 and 1,000 mA were chosen as the values for the three shunts, more with a view to economising on mental arithmetic than for any other purpose! It will be seen that terminals 3 and 4 are virtually one, but separated on the panel so as to avoid confusion. Nos. 1 and 6, and 7 and 10 are similar pairs.

D.C. volts readings are taken between Nos. 5 and 6. In this, as in the preceding range, No. 6, marked "Common," is always taken as the negative pole.

Coming now to the A.C. ranges (and not forgetting to set the selectors to "A.C.") we come first to: A.C. volts, read between terminals 6 and 7, followed by Nos. 6 and 8, which provide the four ranges of A.C. current, again respectively 1, 10, 100 and 1,000 mA. The first mentioned is, of course, connected straight through to the rectifier, and for the other three a special current transformer has been employed (for full details see article in PRACTICAL WIRELESS, dated October, 1945). The transformer, which has three primary windings, indicated in the circuit diagram by T-1, T-2 and T-3 respectively, takes up surprisingly little room in the case, and is a worth-while addition to any A.C. measuring instrument. The facility for taking current readings up to 1 amp or so is very valuable, particularly in dealing with A.C./D.C. apparatus.

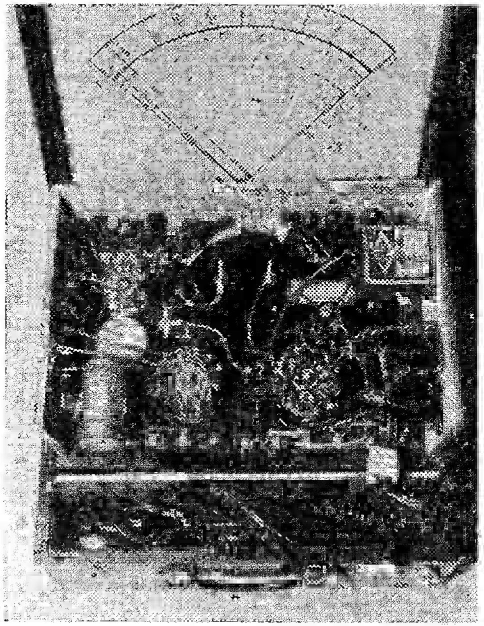


Fig. 2.—A rear view of the completed meter.

It should be noted that the meter scale will not read true alternating current, owing to the fact that this is always expressed as a R.M.S. figure. Scale readings should always be multiplied by 1.11 to give the correct value.

Terminal No. 9, in conjunction with No. 6, is intended for A.C. voltage measurements, where it is known or suspected that a D.C. potential is also present, as, for example, when measuring voltages across the primary of an output transformer. It is connected through to the "A.C. Volts" terminal, No. 7, via a large capacity high-voltage paper condenser.

Terminals Nos. 10 and 11 (marked "Cap") are intended for measuring capacities, and resistances of a high order, say from 20,000 ohms upwards. Use is made of the A.C. mains supply voltage, usually about 230 volts, so, naturally, the figures obtained do not take into account any inductive element which may be present. The circuit is a modified form of that recommended in the "PRACTICAL WIRELESS Service Manual," and it will be seen that the full supply voltage is reduced by means of a potentiometer P.2 (an ordinary carbon-track volume control of 100,000 ohms, provided for safety and convenience with an on-off switch S.3) and fed via the shorting switch S.2, closed for the purpose, through the A.C. voltage measuring network to the rectifier and meter. The method of operation is as follows:

First set the A.C. voltage selector switch to a suitable range, of course, lower than the full voltage of the supply, make sure that the whole meter is correctly set up for A.C. measurements, close S.2 and connect the component to be tested across the two terminals 10 and 11. Plug into the mains, turn the potentiometer knob P.2, which closes the switch S.3, and continue to turn until the meter needle registers exactly full scale. At this point open the switch S.2 and note the new reading on the meter, which will give an indication, on a suitable scale, of the resistance or reactance of the component at 50 cycles A.C. (See below for details *re* calibration.)

Two points should be noted specially. Firstly, the shorting switch S.2 should always be in the closed position when handling the component under test, as otherwise quite a nasty little shock can be had from the terminals. In the second place, when testing fairly large capacitors by this method there is a surge of current in the meter circuit when the shorting switch is thrown open, and unless precautions are taken there is a risk of injury to the rectifier or to the coils of the meter itself, which, of course, are inductive and therefore present a high resistance to such surges. To take care of this the relatively large capacitor C.2 (2 mfd.) is permanently connected across the D.C. terminals of the rectifier, as shown in the circuit diagram, and prevents the building up of excessive voltages in this way.

It will be seen that no fuse has been fitted to protect the meter from accidental overload. The writer was unable to obtain a suitable fuse or cut-out, but if one should be to hand the place for it is in the negative lead to the meter, at the point marked "F." It must be remembered, however, that all such devices have a resistance of their own, and that this must be added to the resistance of the meter and taken into account in making calculations of shunts, etc. Should the fuse "blow" during the making of A.C. measurements, due to an overload, the meter will be cut out of circuit and the rectifier is almost certain to overheat and suffer damage. It is, therefore, open to question whether the fitting of a fuse is worth while.

Constructional Details

The dimensions of the finished job are a matter for individual choice, though it should be noted in passing that it is usually a mistake to cramp oneself by cutting sizes to the minimum. The instrument made by the writer was "tailored" to fit an oak box which happened to be handy, and which had a baize-lined compartment in front suitable for leads, prods, etc. It was built up on a panel some 8in. by 11in., which allowed a neat and symmetrical layout, and gave ample room for the 4½in. diameter meter. It cannot be too strongly emphasised that the meter, which forms the foundation of the whole instrument, should be the very best one can afford, and where there is a choice of sizes it is well worth while paying the few shillings extra for a really large dial with a well-spaced, open scale.

The panel which carries the terminals and switches should be of ebonite or paxolin, or some similar material whose insulating properties are above reproach. These materials, too, can be readily engraved or inscribed as necessary when calibration is proceeded with.

The writer built up with slips of plywood a deep chassis consisting of three sides, which was secured to the panel and slipped neatly into the oak case, being

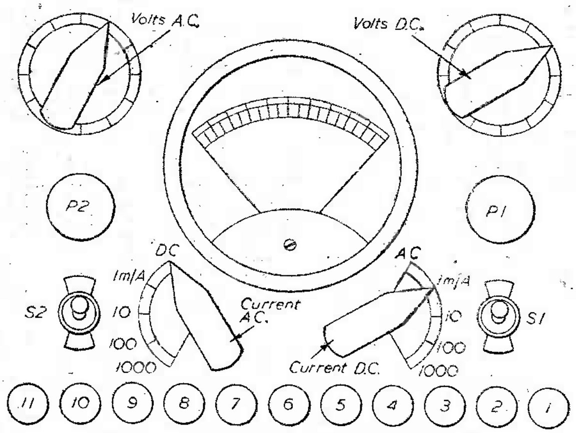


Fig. 3.—Layout of the panel and controls.

secured there by a couple of screws, so allowing the complete "works" to be easily withdrawn at any time for inspection, modification and repair when necessary. The back wall carries the two banks of series resistors for voltage measurements, and the two sides respectively the battery and wire-wound D.C. shunts, and the A.C. transformer and the condenser C.1. A small bracket carries the rectifier and the condenser C.2, which is a cylindrical electrolytic type.

The leads to the potentiometer P.2 are carried out into the baize-lined front compartment, so that when not in use the leads, terminating in a bayonet plug, can be conveniently stored out of the way.

The switches which select the series resistors on the two voltage banks are standard single-pole, eleven-way jobs (leaving a few spare positions which come in useful for experiments and special ranges) with nothing unusual about them, but a note about those which select the current ranges and act as masters may be of interest. In the spares-box was a pair of two-bank wavechange switches of the well-known self-cleaning "Oak" pattern, which on examination proved to be designed for simultaneous five-way switching of no less than six circuits. In actual fact, only two gangs were needed on the D.C. side, and three for A.C. (as can be seen from the circuit diagram), so the opportunity was taken to wire-up as many contacts as possible in parallel, so that at each of the five positions of the switch two, and in some cases three, contacts closed simultaneously, and in no case did efficient and positive low-resistance contact depend on one single pair. This precaution is especially important in that part of the circuit which governs the D.C. shunts, as the resistance of some of these is very low indeed, and a very small "accidental" resistance, introduced by a faulty contact, is quite enough to falsify the readings on a whole range, to say nothing of the risk of destroying an expensive meter movement.

Some of the firms who market the meters can supply shunt and series resistors already adjusted to suit the individual meters, and their purchase will save a good deal of work, but most home constructors will probably wish to make up their own sets, possibly purchasing one or two of the commercially made articles to act as a check.

(To be continued)

COMPONENTS LIST

- Case and panel (see text).
- One milliammeter 0-1 mA. (Premier).
- One Westinghouse rectifier, 1 mA. (Premier).
- Two switches, single-pole 11-way.
- Two switches, two-bank five-way (see text).
- Two on-off toggle switches.
- One carbon volume control, 100,000 ohms, with switch.
- One wirewound potentiometer, 2,000 ohms.
- Eleven large terminals.
- Two capacitors, 2 mfd. or over (one must be paper type, at least 250-volt test).
- One special current transformer (Metropolitan Radio Service Co., see text).
- One dry cell, type U-2.
- Good quality flex for test leads, crocodile clips, prods, etc.
- Flex and bayonet plug adaptor for mains inlet.
- Connecting wire, soldering tags, etc.
- Resistance wire for shunts (see text).
- Carbon-type resistors for multipliers, as required (see text).
- Four pointer-type knobs.
- Two miniature round knobs.

A Pocket Crystal Set

A Novel "Self-contained" Simple Receiver. By "EXPERIMENTALIST"

BY way of a change, here is something for a young beginner to make, or to build for the pleasure of a youngster about 11 to 12 years old.

The set is a self-contained affair, being fitted with a single 'phone unit which can be pressed to the ear for listening; like all crystal sets, the miniature model requires to be connected to a good earth and a 50ft. outdoor aerial for best results.

The Tuning Coil

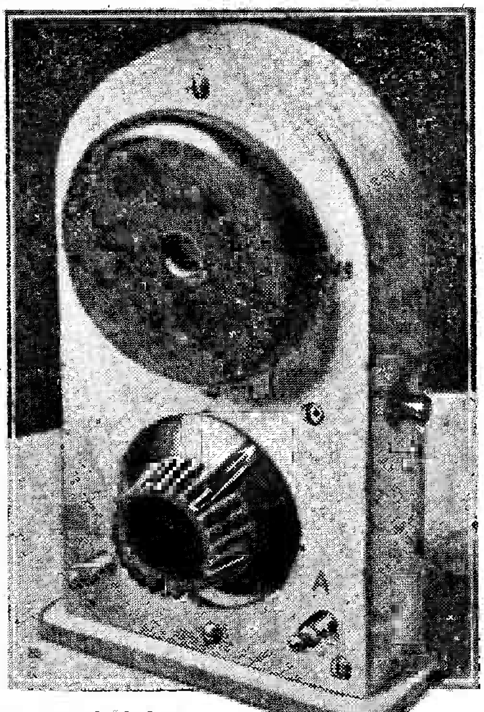
An unusual feature about the set is its tuning coil. This is merely a "ring" made from 28 s.w.g. enamelled wire (the gauge is not critical), it having a diameter of $1\frac{1}{2}$in. and consisting of 36 turns bunched together with thread or $\frac{1}{4}$in. wide strips of gummed paper tape or insulation tape (see Fig. 2).

The coil, despite its size and construction, serves to tune the medium-wave band. The writer, on his experimental model, managed to tune in two frequencies, one of which was rather "drowned" by signals from a powerful local station. When the latter was tuned in properly reception was sufficiently strong to be heard a short distance away from the tiny receiver as it stood on a table. As children's hearing is infinitely keener than the hearing of grown-ups, this miniature "loud-speaker" reception will afford much pleasure, but naturally absolute quietness is essential.

The Front Panel

The front panel (A) shown at Fig. 1 is cut from $\frac{1}{8}$in. thick plywood or fretwood. Before cutting the aperture into which the ear-phone piece fits, the casing of the 'phone unit should be measured to find its exact diameter. Therefore, try and pick up an odd, second-hand 'phone unit, particularly a unit having lead terminals on its back. If an all-bakelite unit is used, it will be necessary to cut a small notch in the edge of the aperture to allow for the leads protruding from one side of the casing.

The casing must be a tight, force fit in its aperture, so it is better to cut the hole slightly smaller and file it (with a half-round file) to suit the diameter of the casing neatly. Having done that, the various other holes shown can be drilled.



The finished set.

The Other Components

The coil, when made, is attached to the aerial and

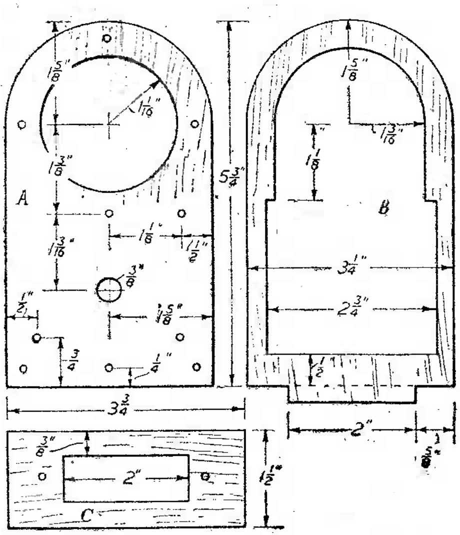


Fig. 1.—Size and shape of front panel, body and base.

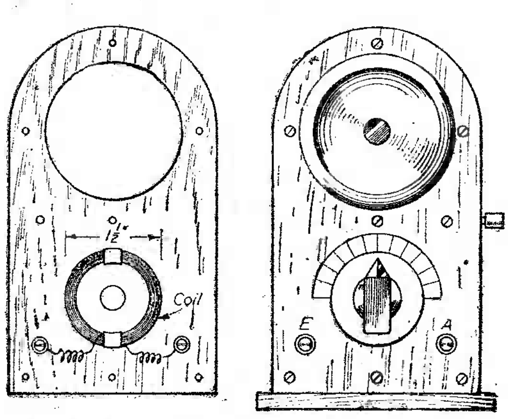


Fig. 2.—How the coil is connected, with front view of the set, showing smaller pointer knob and cardboard dial.

earth terminal screws, as shown at Fig. 2, on the reverse side of the front panel. A .0005 mfd. mica-spaced variable condenser is bolted over the coil, as can be seen at Fig. 3.

The crystal detector, a semi-permanent type, is bolted between the 'phone unit and the tuning condenser. The metal brackets on the writer's detector were only ⅜in. wide and required to be spaced 1in. apart. There is space for a slightly larger detector. If you have to use a larger size, it is imperative that the bracket supporting the handle is kept inwards from the edge of the front panel by ¼in., otherwise you may have difficulty in fitting the panel upon its casing.

The wiring can be easily followed from the back view

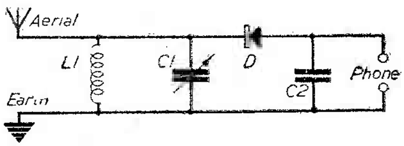


Fig. 4.—Theoretical circuit of the receiver.

at Fig. 3 which, together with the theoretical circuit diagram, explains everything clearly. A .001 mfd. fixed condenser is attached between the 'phone terminals. This component could be omitted from the circuit, but it is better to include it. Note that a flat, oblong condenser is used, and not a tubular type, the latter being too thick. However, if only a tubular type is available, it can be placed alongside the wire running from the earth terminal to the ear-phone terminal.

Back and Casing

Having wired the components and tested the circuit, make the casing. The back is cut to the same shape as the front panel. The case body consists of two shaped layers of wood glued together. Both shapes (B) are cut identical from ⅜in. wood.

When the glue sets, trimming at the inside may be necessary, following which the back is glued and nailed on. Use panel pins, or gimp nails, the heads being punched slightly for concealing with plastic wood or a wax cement. A ⅜in. diameter hole is bored at one side of the casing for the knob on the detector handle. The hole must be directly in line with the detector handle. The latter is inserted in the hole prior to fitting down the front panel on the casing.

The panel is held down (unglued) by means of six ⅜in. by 4 roundhead screws. The work can now be trimmed and glasspapered, and in order to get at the detector handle side properly the front should be removed and the detector handle taken away (this is done by merely unscrewing the bakelite knob and withdrawing the handle rod from its bracket).

The Finish

When glasspapered, make and fit the bottom piece (C), this being cut from ¼in. wood. Attach with glue and a couple of nails, or ⅜in. by No. 4 flathead screws. The tenon may require to be levelled, using coarse glasspaper.

The case can be polished any colour, if birch plywood and deal fretwood has been used. If various kinds of wood have been used, the best finish is ebony black. A couple of coats of black polish should suffice, using a soft-haired brush.

To get at the polishing properly, the components should be removed from the front panel, then the latter re-screwed to the casing. When the polish dries, the parts are reassembled again and the panel attached to the casing.

Small Tuning Dial

A small knob, with a graduated collar, could be attached to the spindle of the tuning condenser. On the other hand, a midget "pointer" knob, together with a marked tuning dial, as shown by the front view at Fig. 2, could be fitted.

The dial can be marked out on thin, stiff white ticket card, using black drawing ink. Cut a ⅜in. diameter spindle hole in the dial. The dial is held against the front panel by means of the spindle nut.

The completed receiver fits into a coat pocket. It

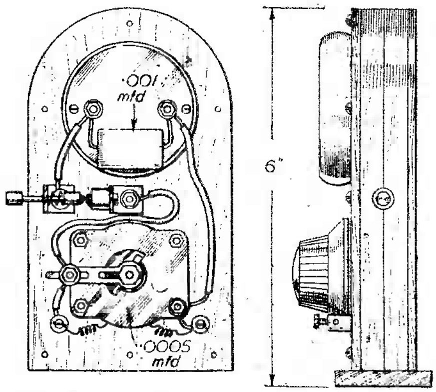


Fig. 3.—Back view showing wiring with side elevation of the completed receiver.

MATERIAL REQUIRED

One front panel, 5¾in. by 3¼in. by ⅛in.
One back piece. Same size as above.
Two casing pieces, 6in. by 3¼in. by ⅜in.
One base piece, 3¾in. by 1½in. by ¼in.
One 'phone unit, with 2⅛in. diameter case.
One variable condenser, .0005 mfd. with knob.
One fixed condenser, .001 mfd.
One semi-permanent double-crystal detector.
Two 'phone terminals.
Six roundhead and flathead screws, ⅜in. by No. 4.
Some 28 s.w.g. coil wire, enamelled.

is just possible that it will operate on a throw-out aerial (meaning a 50ft. coil of flexible wire cord suspended over tree branches) and a short earth wire connected to a metal stake which can be pushed into the ground.

Three-valve All-dry Portable

Details of a Simple Local Station Receiver

MANY readers will no doubt be interested in this small three-valve all-dry portable, designed for local station reception.

Fig. 1 shows the circuit. This consists of a simple leaky-grid detector, L.F. and a parallel-fed transformer-coupled pentode. Automatic bias is included. The value of .0001 mfd. was selected for the tuning condenser

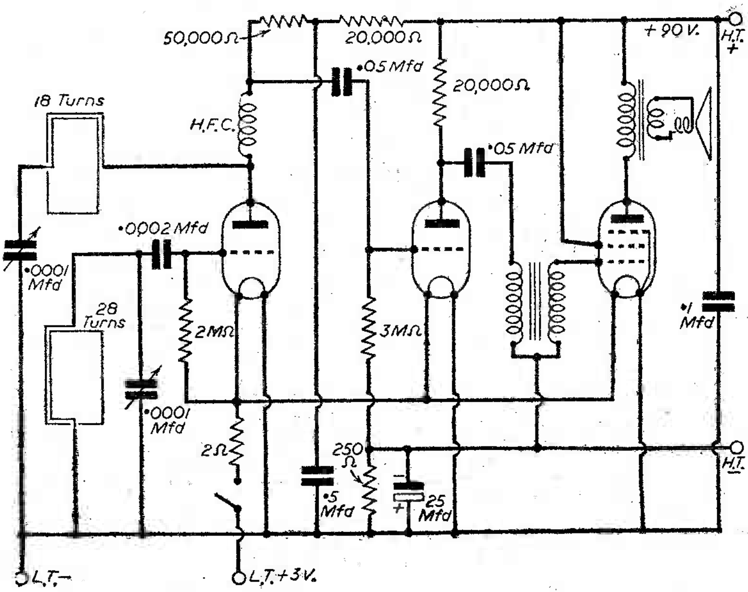


Fig. 1.—Theoretical circuit of the portable.

for ease in accurate tuning. Two-volt filament valves were used in the author's case, no others being available; however, 1.5 volt valves could be used with advantage, the filaments being series-parallel-fed, or the 2 ohm resistor replaced by another of greater resistance. Medium wave tuning only is provided, and the band covered is from 200-450 metres approximately. A few turns could be added or removed from the frame aerial if the desired local was not included.

LIST OF COMPONENTS

Two .0001 variable condensers.
One 25 mfd. fixed condenser (25 volt working).
One .5 mfd. fixed condenser (250 volt working).
One .1 mfd. fixed condenser (250 volt working).
Two .05 mfd. fixed condensers (250 volt working).
One .0002 mfd. fixed condenser.
One H.F.C.
One 2 megohm resistor, ½ watt.
One 3 megohm resistor, ½ watt.
One 2 ohm resistor, 2 watts.
One 50,000 ohm resistor, ½ watt.
Two 20,000 ohm resistors, ½ watt.
One 250 ohm resistor.
Three Amphenol octal valve bases.
One Premier parafeed transformer.
One Premier tapped output transformer.
One Rola 6½in. speaker.
26 s.w.g. enamel covered wire.
Paxolin, sleeving, wire, etc.

Construction

The chassis was made from tinned brass, but the usual alternatives will serve just as well. A piece 8ins. by 6¾ins. is required if the specified components are used. Slight alterations to the chassis dimensions may be necessary depending on the size of valves, inter-stage and output transformers.

The chassis may be drilled from the details in Fig. 3, assuming, of course, that British Amphenol Octal valve bases are used. When the drilling is complete the chassis may be bent up along the marking lines, and the valve-holders and transformers fitted. The inter-stage transformer is mounted under the chassis, alongside the L.F. and pentode valve bases.

Frame Aerial

This is made up of four strips of paxolin, 6in. by 2in. and ⅛in. thick. The corners were fixed by small blocks and countersunk screws, but any suitable method may be used. A hole is drilled and countersunk on each side of the frame to take the bracket which fixes it to the chassis. Starting 3/16in. in on the top of the frame, wind on 18 turns of 26 s.w.g. enamel covered wire to form the reaction winding. This should be finished at the bottom of the frame as near as possible to the anode pin of the detector in order to keep leads short. Now wind on the grid winding in the same direction, starting about ⅛in. from the completed reaction winding. Twenty-eight turns are required and these should be spaced the thickness of the wire from each other, 26 s.w.g. enamel covered wire also being used for this winding. Fixing of ends and starts can be done by the three hole method.

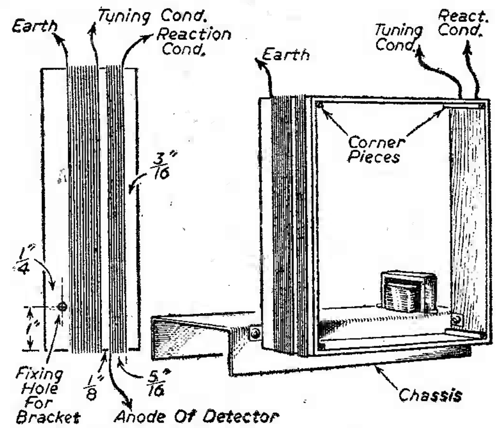


Fig. 2.—Details of the frame aerial.

Wiring

This may now be commenced, starting with the filament circuit, taking care to leave sufficient flex on the L.T.+ lead to reach the on-off switch. All connections should be soldered for durability and efficiency. It is advisable to check the circuit and frame aerial carefully before bolting the frame to the chassis and completing the grid and reaction circuits. The set may now be connected to the battery and speaker and switched on. Rotate the reaction condenser clockwise until a slight plop is heard and search for the station desired by means of the tuning condenser. As soon as the carrier wave is picked up slack off the reaction condenser until oscillation ceases, holding the silent point of the carrier by slightly moving the tuning condenser. The set may now be rotated until maximum volume is obtained.

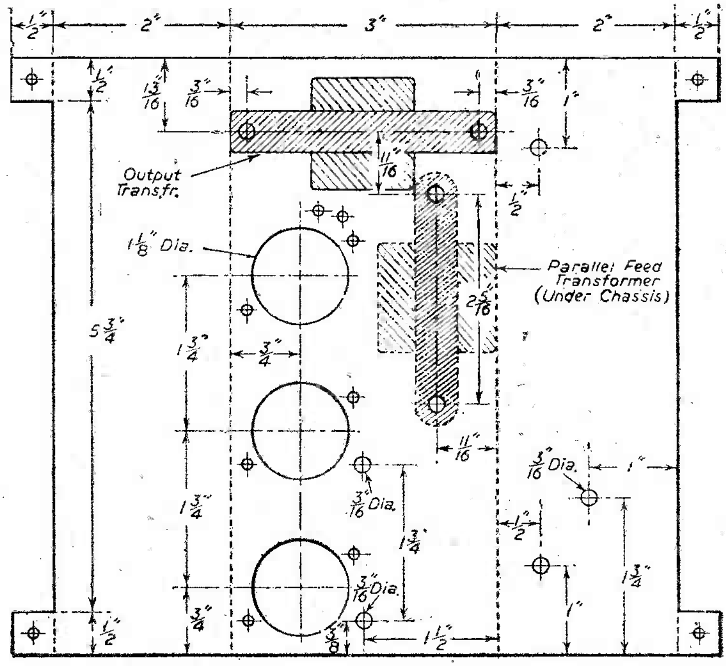


Fig. 3.—Details of the chassis.

The Cabinet

Should everything prove satisfactory the set may be fitted in a cabinet. The size will depend on the type of battery and the diameter of speaker used. In the author's case the cabinet measured 10in. by 8in. by 6½in., the dry-battery standing on end at the right side of the cabinet and the speaker mounted in front of the frame aerial. The on-off switch may be mounted between the variable condensers.

Volume and quality were all that could be desired from a set of this type, good matching of output transformer and the large diameter speaker helping a lot to this end. Range is adequate for any part of England, though a certain amount of knack may be needed to tune in the Forces network from some parts of the British zone.

Weymouth 3-wave Coil Pack

ONE of the main difficulties for the home constructor is the building up of the heart of the tuning section. Compactness is one of the most important considerations, and there are now available some ready-assembled coil packs comprising coils and switching. One of these is the Weymouth, illustrated herewith. It is intended for a superhet circuit, and the illustration shows the five connecting leads and the place they take in the circuit. The unit is built on a stiff mild-steel plate, tinned.

A high-grade switch is used which gives four positions, namely:

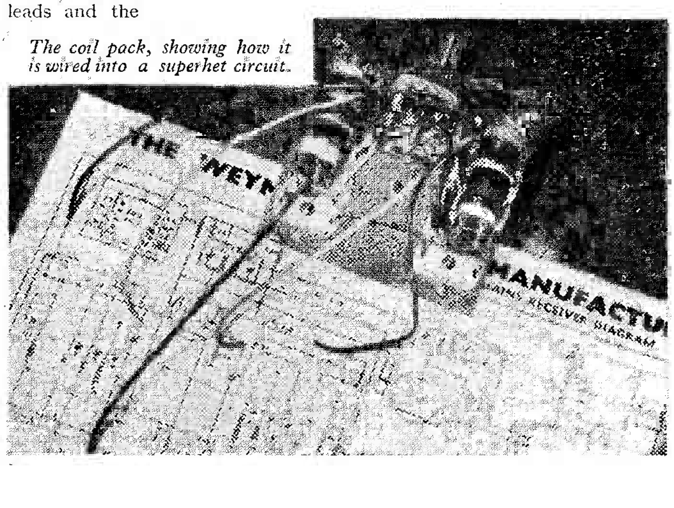
Long wave .. 800–2,000 metres.
Medium wave .. 200–550 „
Short wave and Gram. 19–50 „

The coils are wound on an impregnated bakelite paper former, the long and medium wave coils are wound with art. silk covered copper wire, the short wave coils are wound with enamelled copper wire, the completed coils are then baked to drive out any moisture (the cause of many breakdowns) and then dipped in a damp proof varnish to prevent moisture re-entering the coils. The coils are then tested for continuity and are ready for assembly.

High grade trimmers are used, and are easily adjusted through the holes provided.

The trimmers and coils are assembled, and all the joints are soundly soldered, resin cored, anti-corrosive solder being used.

The five different coloured leads are then soldered to their respective tags, as shown on the circuit.



The coil pack, showing how it is wired into a superhet circuit.

ON YOUR WAVELENGTH

By THERMION

The Views of a Bus-driver !

I SEE that one of the radio-critics attached to one of our daily papers has been sufficiently intrigued as to publish a letter from a bus-driver, expressing the views of the latter on what is wrong with the B.B.C. According to this bus-driver, the B.B.C. should plan its programme to suit bus-drivers. Insufficient time, he says, is given to programmes suitable for bus-drivers. Everyone in this democratic country is entitled to his views, but it is the function of a critic to exercise his critical faculties and this is a case where space should not have been devoted to a matter which quite rightly ought to have found its way into the nearest waste-paper basket. After all, the plumbers, the roadsweepers, the engineers, the tailors and the hairdressers have views on programmes, and great as is my respect for bus-drivers I do not conceive for one moment that their views on programmes should be adopted in priority to those others who also work for their living.

I am only a brain labourer but my reasonable desires are entitled to be listened to, and I for one should strongly resent a programme designed to appeal only to bus-drivers. I think, on the other hand, that a certain amount of programme time could usefully be devoted to instructing conductors in the gentle art of giving the soft answer which turneth away wrath, and this programme could also be extended to appeal to ticket collectors, conductresses and clippies. There have been complaints right through the war concerning their impertinent and boorish treatment of the oppressed public.

Odious Comparisons

MR. J. T. SMITH, a member of the R.A.F. (who incidentally might listen in to the broadcast suggested in my previous paragraph) writes in reference to "Torch's" verse on page 143 of the March issue. He says that the B.B.C. compiles, arranges and produces practically the whole of its broadcast matter whilst the C.B.S. deals with only 9 per cent. approx. Mr. Smith is quite wrong and I should be glad if he would justify these fantastic figures. The B.B.C. does not arrange and compile practically the whole of its broadcast matter. It buys a very high percentage of its script outside. I agree that the C.B.S. employs many programmes produced by private concerns, but the only difference is that the C.B.S. receives money for its scripts from outside sources while the B.B.C. pays for theirs. I also agree that the C.B.S. receives money for broadcasting the programmes and that the large figures quoted by "Torch" are sometimes paid by the sponsoring advertiser. One has to take into consideration the relative revenues, and the revenue of the B.B.C. is very comparable to that of the C.B.S. in terms of revenue per listener. Regarding American news bulletins, I agree that they confuse news with views, and the listening public is left to decide which is which. Our own news bulletins are strictly impartial.

Speeding Television

RECENTLY about four hundred radio dealers in the service area of the Alexandra Palace transmitter met in conference in London to hear from the B.B.C. and the manufacturers what their plans are and to lay their own plans to bring television home to the public. This was the first shot in the British Radio Industries campaign to put television over as a nation-wide service in this country. The principal speakers were Sir Noel Ashbridge, Mr. Maurice Gorham and Mr. C. O. Stanley. Trade test signals have been transmitted from Alexandra Palace for some months past and arrangements for the reopening of the public entertainment service have been completed.

The manufacturers are far advanced with the restoration of pre-war television receivers and with the development of new models which are now nearing completion. Many of them, indeed, are now in production. The expansion of the service to the provinces is being planned by the Television Advisory Committee in accordance with the recommendations of the Hankey Report, and the plans of manufacturers and dealers will run in parallel. Progress will thus rapidly gather momentum. Britain led the world in television in 1939, and this conference was an earnest of the determination of all sections of the industry to maintain this lead both at home and in the export market.

Television, however, still has a long way to go. No-one has yet discovered a means of recording the programme, which means that every programme will have to be a live one, with stage sets and the artists in costume every time the programme is repeated. The artists cannot turn up in sweaters and slacks, swig tea and read a few lines of script when the producer feels like it. The broadcasters now will have to appear before the public eye and as many of them who were successful as readers of scripts will be quite unsuitable as artists who may be seen, I suppose that as with the talking films a new generation of broadcasters will be brought into being.

The variety stage folk are already nervous concerning the advent of the television era, but they have no need to be. The newspapers and the gramophone record companies were just as nervous when broadcasting started but the sales of both have benefited as a result of it. I think that television will encourage people to go to the music-halls and the theatres more than they ever did before.

Official Competition

PRESS ITEM.—Fulham Town Council is proposing to deal in radio and television sets. Where would this end ? We might soon have town councils selling furniture, coal, cigarettes, or whatever else they decided upon, thus competing with their own ratepayers and bringing many of these to ruin.

Shall town councils supply us
With all that we need ?
A horrible fate
To arrive at indeed,
With bureaucrats bossing
Whatever we spend !
Once let them commence,
And it never will end,
And the poor private trader
Can then shut his shop,
Tie a brick round his neck
And jump into the dock !

Town councils are servants,
Not masters ! Oh, no !
Some need kicks in their pants
To remind them it's so !
That *we* put them in power,
And can still kick them *out* !
A fate they're inviting,
Without any doubt !
Shall we have council trading
To ratepayers ruin ?
Let our answer to this be :
SCRAM ! NOTHING DOING !

"TORCH."

The Radio Range—2

Further Details of this Radio Navigational Aid

The Aerial System

MORE interest attaches to the aerial and keying circuits than to the transmitter itself, because these are probably different from the circuits of any other type of installation. It has been stated already that it is customary to use two crossed loops for the aerial system. These may be either triangular, in the normal Bellini-Tosi system, or rectangular; the first arrangement is shown in Fig. 5, where it will be seen that the triangular loops are arranged around a 70ft. mast, with small anchor supports at the corners. When using crossed rectangular loops, it becomes necessary to employ four tall masts. From this it will be understood that the former arrangement is more suitable for use with a mobile installation. With one version, use is made of a tubular mast which can be mounted on the side of the trailer housing the equipment, and raised in a short time by two or three men. The mast, although relatively light and slender, is quite safe due to the fact that the aerials themselves act as good guying stays.

In yet another system, suitable only for fixed and permanent stations, an Adcock array is used. This consists of four vertical aerials arranged at the corners of a square and fed by buried co-axial feeders. The system will probably be remembered as that widely used with ground direction-finding stations of both the medium-frequency and high-frequency type.

The Radio-goniometer

No matter which of these aerial systems is used, the aerials feed into a radio-goniometer which consists of two stator and two rotor coils. The two stator and the two rotor coils are mounted at right angles to each other, and the complete rotor is arranged to rotate inside the stator. Control is by means of a knob and pointer, the latter moving over a 360 deg. scale. The pointer is so mounted that a reading of zero is shown at one of the four positions at which the stator and rotor windings are parallel to each other; in other words, when there is maximum coupling between rotor and stator.

The two rotors are connected to the two loop aerials or to diametrically-opposite pairs of the Adcock array, while the rotors are connected in turn through a relay to the output circuit of the transmitter. Provision is made for tuning and balancing the aerial and goniometer circuits, but the tuning circuits are omitted from the diagram shown in Fig. 6, in the interests of simplicity.

Orienting the Beams

By turning the goniometer rotor it is possible to alter the courses of the four equi-signal beams. This is explained in Figs. 7 and 8. The radiation pattern shown in Fig. 7 is that obtained when the goniometer windings are parallel, and that shown in Fig. 8 is produced by turning the rotor through 45 deg. It will be clear that intermediate settings of the rotor would produce different degrees of orientation of the beams. Further rotation of the rotor would have the effect of reversing the directions of the A and N sectors.

When it is necessary to alter the right-angle spacing of the equi-signal beams use must be made of a fixed, open aerial in addition to the directional aerials. Here again, the practice corresponds with that followed in

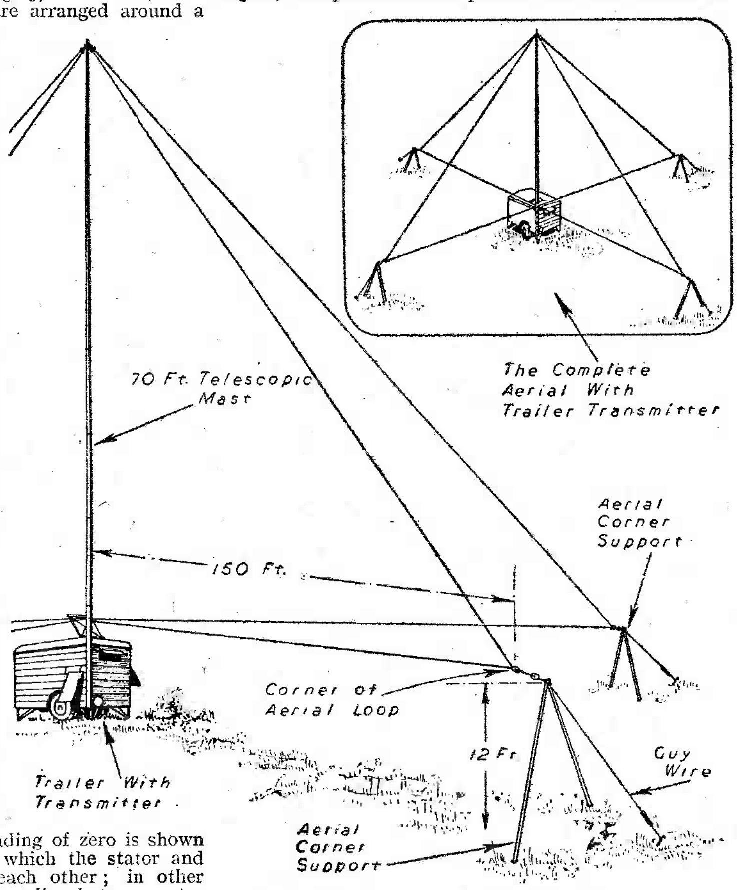


Fig. 5.—This sketch gives an impression of the appearance and set-up of a mobile radio range installation. When a mains supply is not available there is a second trailer which houses a petrol-electric set.

ground direction-finding, where an open aerial is used for "sensing." The open aerial is most readily employed in conjunction with an Adcock array, when it would be mounted vertically in the centre of the square formed by the Adcock aerials. By combining the open aerial with one pair of directional aerials it is possible to distort the polar diagram in various ways and thus to alter the courses of the beams. One polar diagram representing the combination of open and directional aerials is shown in Fig. 9. In this case, the open aerial is combined with the N radiators. By suitable phasing of the open aerial it is possible to obtain any required re-orientation of any of the beams.

A-N Keying

Fig. 6 shows only a simple relay for switching the transmitter output from one to the other of the aerials. Obviously it is necessary to provide a cam mechanism to give suitable timing of the relay. One method is shown in Fig. 10. Here, a cam operates a pair of contacts which close and open the solenoid circuit of a biassed relay; the arm of the relay is biassed toward one of the two contacts by means of a spring, so that the R.F. is applied to one aerial when the contacts are open and to the other when they are closed. This ensures that one aerial is always energised and therefore that there is no break in signal along the equi-signal beams.

A somewhat different system is employed for keying the transmitter with characters of the two-letter call sign. In this case, the keying is effected by using the buffer valve as an opening and closing "gate." The method is quite simple, and is illustrated in Fig. 11. A potentiometer across the H.T. supply is designed to apply a positive voltage of, say, 50 volts to the cathode of this valve. This is equivalent to applying a similar negative bias to the grid, and the voltage is such that the valve is biassed to cut-off. Another cam, with a pair of contacts, is provided and arranged so that when the contacts are closed the cathode bias is short-circuited, so "opening the gate" and allowing the output from the master oscillator to be applied to the power amplifier.

During the A and N keying periods these contacts are kept closed and therefore the transmitter is fully operative. But when the call-sign is to be sent, a third cam-and-contact assembly comes into operation and causes the "gate" to be opened and closed in accordance with the Morse characters comprising the identification or call-sign. While keying is being effected by the so-called identification cam, the interval cam shown in Fig. 12 rotates, at half the speed of the keying cam, and connects the transmitter output first to one aerial and then to the other for the period during which the two-letter identification signal is being sent twice.

In practice, all three cams are driven together through various forms of reduction gearing, and multiple contacts operated by the various cams are wired in series. It is not proposed to describe the complete keying system in detail, for it is a purely electro-mechanical device, and it

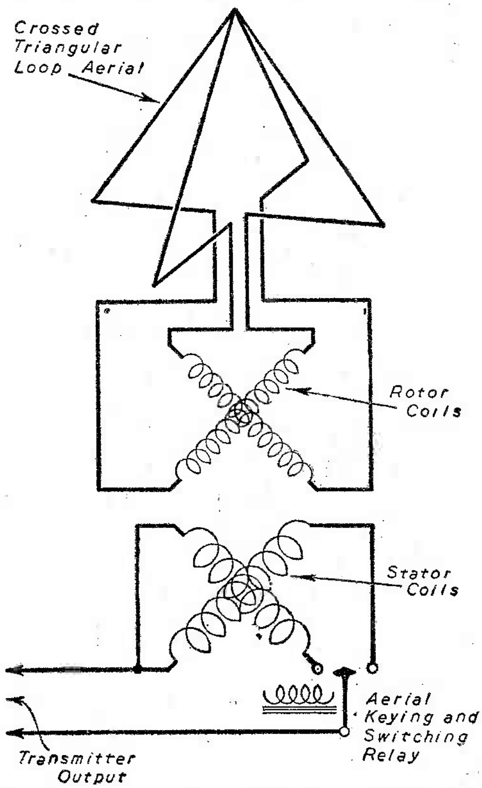
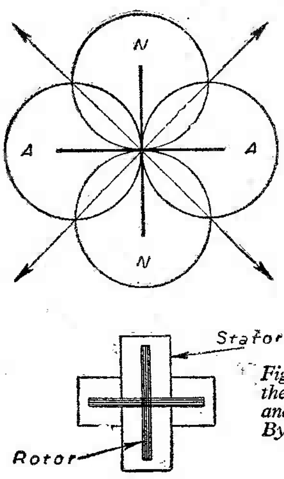
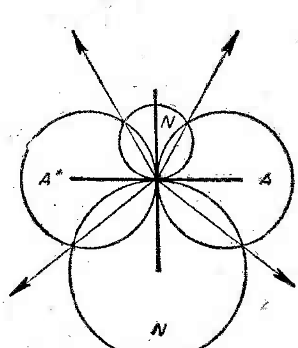


Fig. 6.—The arrangement of a Bellini-Tosi loop aerial system and associated radio-goniometer. The pair of stator and the pair of rotor coils are rigidly mounted at right-angles, while the rotor is free to rotate within the stator; a 360 degree scale is provided to indicate the position of the rotor.





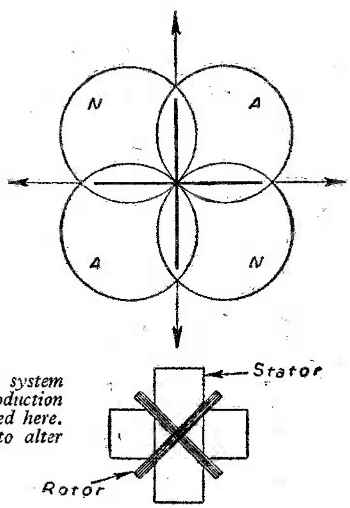


Fig. 9. (above)—When using an Adcock aerial system the polar diagram can be distorted by the introduction and suitable phasing of a fixed aerial, as indicated here. By distorting the polar diagram it is possible to alter the angles between the equi-signal "legs."

Fig. 7.—The theoretical radiation pattern from the crossed aerial loops when the stator and rotor windings of the goniometer are parallel to each other (gonio scale reading 360—0 degrees).

Fig. 8.—The changed polar diagram obtained by turning the gonio rotor through 45 degrees.

is sufficient for the purpose of this article to explain what combinations of keying are adopted and how they operate from the radio aspect.

Power Output and Range

It will be of some interest to know the order of the power output of radio range transmitters and to have an idea of the distances over which they can be operated. Most ranges have a maximum output into the aerials of about 800 watts, but in many cases this is reduced to a figure between 50 and 100 watts in order to avoid interference between different ranges operating on adjacent frequency channels. This is particularly true in this small country, but would not generally apply in a large continent such as the Americas, Africa, Australia, and India.

As with all transmitters, it is quite impossible to give any accurate details regarding the distance over which signals can be received. So much depends upon the geography of the country around the transmitter, as well as at other points between the transmitter and the aircraft. It can be stated, however, that distances up to 500 miles have proved possible, especially when a fair proportion of this has been over the sea. In hilly country it would be more reasonable to expect a range up to between 300 and 400 miles to an aircraft flying at, say, 12,000ft. When the power is reduced to about 100 watts it is often possible to fly a range for a distance of 150 to 200 miles, but when the power is reduced as much as possible, the distance would fall to something in the region of 100 miles.

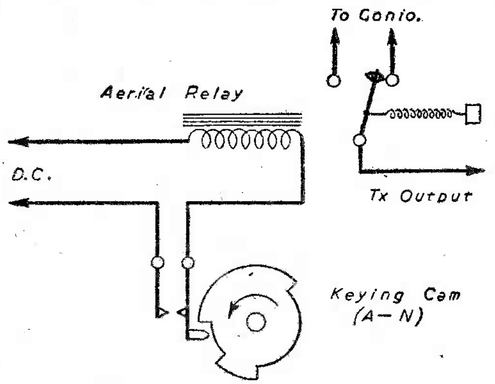


Fig. 10.—Diagrammatic representation of the action of the A N keying cam, which is used to operate a biassed relay. This relay transfers the transmitter output from one aerial to the other, through the goniometer.

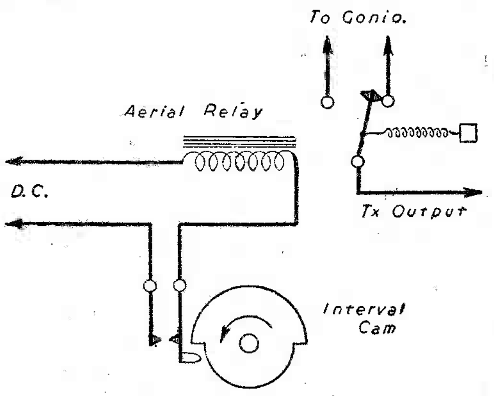


Fig. 12.—The interval cam runs at half the speed of the identification cam, connecting the transmitter output first to one aerial and then to the other while the two-letter identification is sent out. In practice, the contacts of all three cams are interconnected and the cams are operated through a somewhat complex system of gears.

Snags

There are one or two small disadvantages of the radio range as a reliable navigational aid. These are concerned with the splitting and bending of the beams in certain conditions. For example, it is sometimes found that if a beam passes over very hilly country it splits up into two or more narrower beams. This is not very serious when the aircraft is flying toward the transmitter, provided that the pilot keeps his aircraft sufficiently high to ensure that he is above the level of any hills, but can be misleading when flying away from the transmitter. A pilot experienced in flying a range would probably recognise a split beam due to its narrowness.

Occasionally it happens that a beam is bent, although not necessarily split, by high mountains in its path. In fact, kinks up to as much as 45 deg. have been recorded, but such severe bending is very unusual. When it does occur, the possibility remains of slightly re-orienting one of the beams so that the mountainous obstruction responsible for the bending is avoided. Alternatively, the other three beams could be used and information given to pilots that the fourth was unreliable and should either not be used or used only with the utmost care.

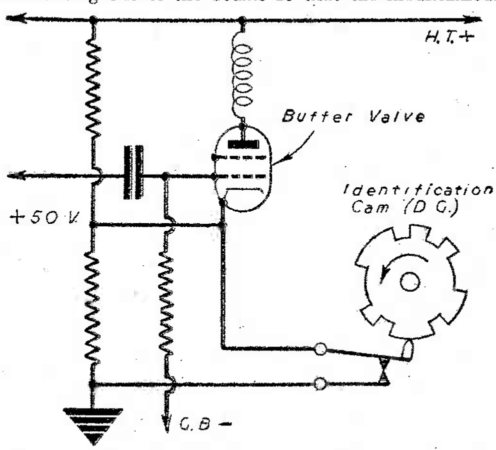


Fig. 11.—The identification cam, which automatically keys the transmitter with a two-letter call sign, operates a pair of contacts which open and close the bias circuit to the buffer valve connected between the R.F. oscillator and the intermediate amplifier stage.

It was mentioned earlier that the radio range differs from an S.B.A. installation, in that it is not normally used with a marker beacon transmitter. At the same time, it should be stated that a marker transmitter, operating on 75 mc/s, is sometimes provided, this feeding into an upward-pointing aerial array mounted on, or in, the roof of the transmitter hut.

Another refinement sometimes introduced is that of provision for speech-modulating the radio range transmitter, so that instructions can be passed to aircraft on the range frequency if necessary.

At the present rate it would not be surprising to find radio ranges installed on every aircraft trunk route throughout the world during the next few years. They have the advantages over most other radio navigational systems of being very simple to use and of giving the required assistance directly to the pilot. Up to the present, the production of the equipment has been principally in American hands.

Obscure Background Noises

Details of the Cause and Cure of Reproduction Troubles

Described by C. A. QUARRINGTON

A TRAINED ear can detect pick-up rumble in a serious percentage of radiograms, among which may quite often be found relatively new instruments bearing the names of famous manufacturers. This re-entrant interference, although not new, has never become the object of a standard nomenclature, but is known as pick-up rumble, pick-up microphony, re-entrant microphony, etc. The presence of rumble is most easily detected by the use of a blank gramophone record, or as a substitute a record having a worth-while section of normal grooves which do not carry any recording. If such a blank record or appropriate portion of a normal record is "played" in the ordinary way, needle scratch alone should be heard. The presence of a continuous or semi-continuous noise, reminiscent of heavy traffic in the distance, denotes rumble. The least sign of this trouble should be regarded seriously as it will reach greater proportions when the instrument is reproducing heavy orchestration although not so easily identified.

Unless some experience of pick-up rumble has been obtained, it may be mistaken for pick-up vibration caused by worn motor bearings. It is, however, normally possible to detect the latter by listening carefully to the motor with the pick-up removed from the record.

The first and most obvious steps in preventing pick-up rumble is to ensure that the lid of the radiogram is a reasonable fit and lined with sound-absorbing material to prevent, as far as possible, the direct entry of sound. As a general rule, however, the trouble is not caused by direct entry but by vibration of the cabinet, excited by the loudspeaker, reaching the pick-up via the motor, turntable, record and needle, and the first step, therefore, is to break this connecting "chain" at some convenient point. In practice, the convenient point is almost

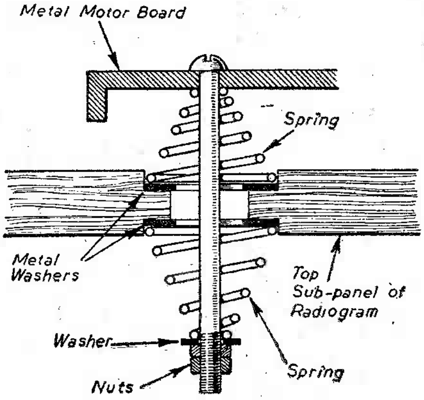


Fig. 1.—A sectional drawing showing a convenient method of spring mounting a gramophone motor assembly.

invariably found to be acoustic insulation of the motor assembly from the cabinet. In most types of radiogram, the motor is already rubber mounted on its brackets and this particular point does not offer any opportunity, and in this case the best solution is to suspend the entire motor-board from the wooden platform on which it lies. The two types of motor-board in general use are square and approximately pear-shaped; the former may be screwed at 4 or 8 points, while the latter is normally screwed at 6 points. Provided that rubber of correct resilience or springs of correct strength are used, three or more suspension points can be used; the number is immaterial. In the case of the pear-shaped assembly, however, it is convenient to use three points on the pick-up side and two on the other side, as the weight distribution is uneven, and reasonable compensation is obtained by this method, making possible the use of a standard type of rubber buffer or spring at all points.

It might seem that really resilient rubber would be ideal for this purpose, but in actual practice springs give every indication of being more satisfactory. A convenient method of arranging spring suspension of the metal motor-board is shown diagrammatically at Fig. 1; it is important that the main securing bolt does not touch the wooden sub-panel and consequently it is necessary to devise some means of keeping the bolt central. In the method suggested at Fig. 1, blind holes are used strengthened by metal washers; as small washers with relatively large holes are not readily obtainable, it is necessary to enlarge the centre holes as much as possible without danger of the spring slipping through. It will be observed that two washers are sunk into the wooden panel back to back, there being no need for them to be sunk deeply if the thickness of the wood does not permit. It will also be observed that the springs are spiral wound and therefore require no locating at the end remote from the washers. Spiral springs of this type are obtainable from spring manufacturers in a variety of sizes and gauges; those which the author has found satisfactory and which are used by certain radiogram manufacturers are of 18 gauge and approximately ⅞in. long. About ¼in. of the spring is hidden by the turned-over edge of the pear-shaped type assembly; ⅛in. can be sunk into the wooden panel, leaving 3/16in. clearance between metal motor-board and the wooden platform; the rest of the length of spring is lost in compression. If necessary, the upper washer can be sunk to a greater depth at the expense of the underneath washer, which is, of course, out of sight. In the case of the square motor-board without turn-down edges,

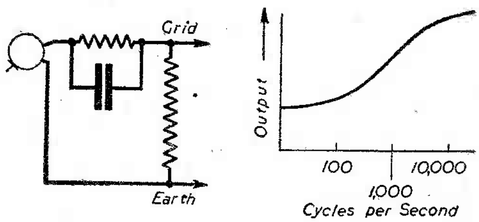


Fig. 2.—A bass cut filter, which has the advantage of setting a minimum limit of attenuation.

the spring must be somewhat shorter for the sake of appearance, unless the wooden platform is thick enough to take a deep recess. In the interests of neatness, however, the top washer should be sunk as deeply as possible consistent with optimum clearance.

If in a particular instance all forms of springing, of which the method suggested above is typical, fail to bring about a cure, one of four courses is left open: To use a more substantial cabinet less prone to vibration; to remove the loudspeaker to a separate cabinet; to reduce the bass response which is causing the initial vibration, or put up with the trouble. Of these alternatives three are obvious, but some remarks may be useful on the most convenient method of cutting the bass response; some readers may view this suggestion as a very retrograde step, which it is where the balance of bass middle and treble is correct. So many radiograms, however, have an unnaturally boosted bass response which can advantageously be cut down to more reasonable proportions. Fig. 2 shows a convenient circuit for reducing bass response, while at the same time limiting attenuation regardless of frequency; the values of the components must be selected to suit the prevailing conditions, but should not be so low that overall output is unduly affected. If a more violent type of bass attenuation is required, the circuit shown at Fig. 3 is suggested. Here, again, values should be chosen to give a reasonable output level.

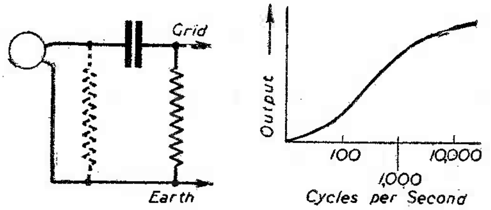


Fig. 3.—An alternative bass cut filter which is more drastic than the arrangement at Fig. 2. If it is desired to provide the pick-up with a D.C. circuit, e.g., when using a crystal pick-up, the resistance shown dotted may be inserted, but must have a high value.

I.F. Microphony

A form of background noise is sometimes met with in superhet receivers which, in some ways, resembles pick-up rumble in character, although higher pitched. This phenomenon is usually termed intermediate-frequency microphony and is almost always caused by incorrect alignment of the intermediate-frequency amplifier. Consider Fig. 4, which shows the frequency response curve of a misaligned I.F. transformer. It will be observed that the shape is far from that considered desirable due to the primary and secondary being tuned to incorrect and dissimilar frequencies, resulting in the true intermediate frequency "resting" on the side of a curve of abnormal steepness, a condition which results in a very large change of gain resulting from a very small change in frequency; thus, if the frequency characteristic is prone to be unstable and can be made to wobble by vibration from the loudspeaker, reproduction will be mutilated by a rapid change of volume that gives the impression of a continuous note which, reproduced by the loudspeaker, feeds back to the I.F. amplifier and persists unless varied from time to time at moments of deep modulation. The actual cause of the frequency variation is usually vibration of a trimmer condenser or a coil can, or the coil itself, or, in a short-wave superhet where the intermediate frequency is high, by a wire or wires under tension.

Fortunately it is not necessary to track down the offending component, as the trouble is eliminated by correctly retrimming the intermediate - frequency amplifier. Admittedly, a tendency for the loudspeaker to wobble the intermediate-frequency tuning cannot be regarded as desirable, but without the favourable condition produced by misalignment it is doubtful if even the most trained ear could detect it.

Parasitic Oscillation

Notes on unusual background noise would scarcely be complete without some mention of parasitic oscillation, which takes the form of an objectionable continuous hiss at volume level quite disproportional to the normal hissing noise which is unavoidable when receiving weak signals. Parasitic oscillation can arise in any stage of any type of receiver, but is more common in those of the superhet class where the frequency-changer will most often be found responsible, presumably because that circuit is expressly designed to oscillate and the conditions for parasitic oscillation are therefore propitious.

Parasitic oscillation is particularly difficult to trace, and it is not always possible to use elimination methods because cutting out a stage will often stop it though it is not present in the stage eliminated. Perhaps the best way of checking for its presence is to insert a sensitive milliammeter, say 0-1 full scale, in series with the A.V.C. diode load resistance at the earth end, and gently rock the tuning control through one or more selected stations. If the meter exhibits signs of jitter or violent changes of reading, which are not accountable by the nature of the

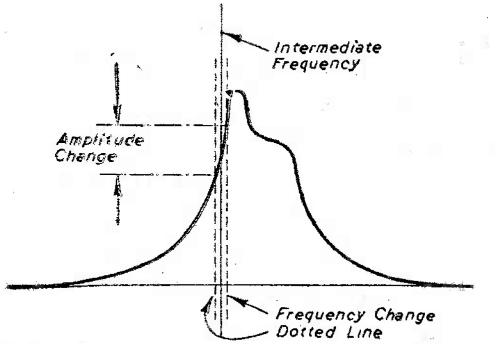


Fig. 4.—A diagrammatic representation showing how a misaligned I.F. transformer can produce a condition whereby a small change of frequency can cause a big change in amplitude.

signal being received, parasitic oscillation is almost certain to be present. To apply this test to the oscillator stage alone, the meter should be inserted in series with the oscillator grid leak at the earth end, and the main tuning control rotated through the entire wave-band with aerial disconnected; slight changes will be recorded on the meter, due to the output of the oscillator varying slightly with frequency, but any sudden change of relatively big magnitude indicates parasitic oscillation beyond doubt.

The cure for parasitic oscillation when located is often fairly straightforward, the first approach being the insertion of low value, non-inductive resistances in the anode and grid leads. It is important that the distance between the actual resistance and the point of connection to the valve-holder or top cap is as short as possible (a skilled mechanic can reduce this distance to less than ¼in.); suitable values are 50-500 ohms. In the case of the oscillator grid it may be preferable to put a similar resistance in series with the oscillator grid coil between coil and grid condenser instead of, or in addition to, the one close to the actual grid terminal. If parasitic instability is present in two or more stages that are symmetrical in their arrangement, e.g., two I.F. stages, it is desirable to employ different values of resistances in each stage to break up the symmetry.

Quite remarkable examples of parasitic oscillation are sometimes met with which do not manifest themselves until started off by some outside influence, and once started can only be stopped by switching the receiver off and on again. Some years ago the writer personally investigated a receiver where parasitic oscillation of this type was started off by switching on either of two electric light switches in the house, but the receiver was quite unaffected when other switches were operated.

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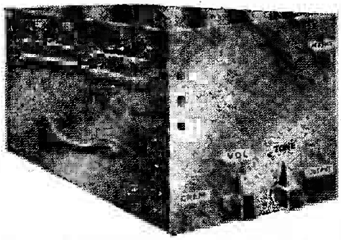

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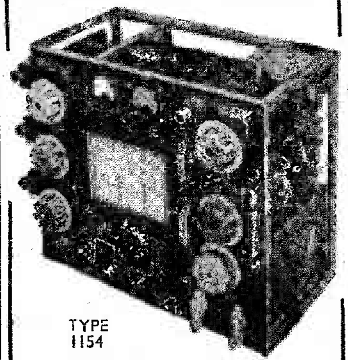

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Modern Transmitter Design

Hints for the Amateur Constructor Who Wishes to Build a Transmitter

By W. J. DELANEY (G2FMY)

MANY amateurs who have now left the Services are anticipating the grant of an amateur transmitting licence as their service activities may qualify them to hold a licence under the present G.P.O. regulations. (Full details of these regulations will be found on page 284.) At the moment only three wavebands are available, but it is hoped that later, when Service requirements have been fully considered and certain frequencies given up, other bands will become available, and thus one of the main difficulties confronting the amateur is how to build a transmitter so that full advantage may later be taken of all the bands available.

It is well known that by using a crystal oscillator and having a crystal with a low frequency, multipliers or frequency doublers may be fitted so that various harmonics of the crystal frequency may be selected. This, then, is obviously the basis of a modern transmitter. In the interests of simplicity and construction, the majority of amateurs prefer the Tritet circuit, as this enables a single valve stage to be used and any harmonic of the crystal selected. It is important to remember, however, that all harmonics will not be selected at the same strength of output. This type of circuit can also be used as a straight crystal oscillator. In order to use the higher harmonics of the crystal it is preferable to employ a frequency doubler stage immediately after the Tritet.

Frequency Doublers

The efficiency of the harmonic selection falls off progressively as the multiple increases, as has already been mentioned, and this applies also to the frequency multiplier or frequency doubler circuit. Therefore, if we use a crystal in the grid circuit of the Tritet and wish to operate on the eighth or higher harmonic, then we must interpose a multiplier between the C.O. stage and the P.A. This means then, that for normal use over a wide band of frequencies we need as a minimum a Tritet stage, one multiplier stage and the P.A. So far so good.

The next point concerns our aerial coupling arrangement. Again, for maximum efficiency on any particular band we must consider the actual frequency in use, and it is not desirable to couple the anode circuit of the P.A. direct to the aerial. As, in many cases, the aerial will be erected in a back garden, and the transmitter may be situated in a spare room which is usually in the front of the modern house, we must provide some form of coupling which will not introduce losses in transferring the energy from the P.A. stage to the aerial. Undoubtedly the best form of arranging this is to use a link-coupled arrangement, and as this lends itself to so many changes with little difficulty, it is recommended that it be employed also between the separate stages of the transmitter.

The Final Design

This leads us then to consider the final arrangement of the transmitter. We need three separate stages of the transmitter proper, plus a power unit and an aerial-coupling unit. As there may be various new types of components and valves appearing on the market at a later date, it is desirable that we should build our transmitter in such a manner that we can take advantage of any change without having to rebuild the complete apparatus, and, therefore we should build each of the stages above-mentioned as a separate unit. To house these in the most convenient manner, and without taking up too much room, the well-known rack-assembly will undoubtedly be used. A suitable rack could be built from ordinary timber, using lengths of 1in. by 1in. material for the framework and supports for the various sections, and building each section on the old-fashioned flat baseboard and metal panel scheme. Chassis design is hardly needed as it will tend to obscure certain parts of the wiring and components and will not lend itself so easily to changes.

In building up the panel or rack assembly the power unit should be placed at the bottom, with the aerial coupling unit at the top. The link coupling between the three stages may be ordinary twin flex of the 5 amp. type, but between the aerial unit and the aerial proper the specially-designed transmission line should be used. To avoid any loss due to this latter line radiating, or forming any part of the aerial circuit proper, it is

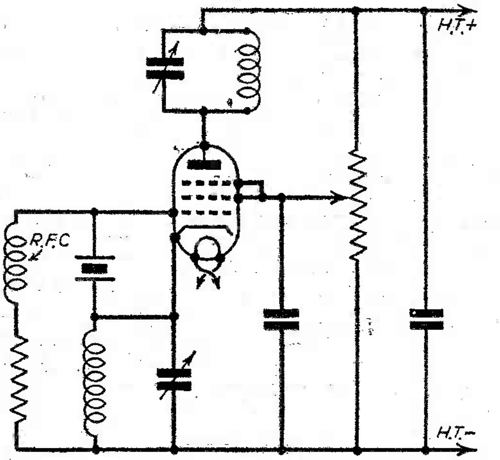


Fig. 1.—The Tritet circuit in bare outline.

also worth while to build another small coupling unit and to mount this immediately inside the house where the aerial feeders are brought in. The only drawback with this arrangement is that it is difficult to carry out an adjustment of the unit and at the same time observe the aerial current meter which will be mounted on the panel of the aerial unit on the rack assembly. However, this difficulty may be overcome quite satisfactorily by fitting an ordinary pocket-lamp bulb in a closed loop coupled not too tightly to the aerial coupling coil, and as the aerial is brought correctly into resonance the lamp will glow. A small cover round the lamp to exclude normal daylight will enable the glow to be seen and the coupling unit should be tuned for maximum brilliancy after the main aerial unit has been tuned.

Precautions in Link Coupling

There is really nothing critical so far as length of the link coupling is concerned, but there is one very important point which should receive attention. The coupling must be purely inductive and not a combination of capacitative and inductive, and for this reason the arrangement of the link-coupling coil should be the subject of experiment. In general, a thinner gauge of wire than the coil to which it is coupled should be used, and the coupling coil should be placed at the low-potential or "cold" ends of single-ended circuits or in the centre of push-pull circuits. In both cases, whether the coupling coil should be inside the main coil or outside it, or whether it should be interwound, is a matter for experiment, as it has been found by the writer that on some frequencies the outside coupling gave better results, whilst on others the inter-wound scheme was best. It is not proposed to give full constructional details and diagrams for this type of construction as the details are intended only for those who already have an A.A. Licence and wish to start the building of their post-war transmitter, and they will have sufficient knowledge to be able to incorporate any of the above ideas in their equipment. At a later date we shall be giving full constructional data for the beginner, but it must again be emphasised that no transmitting apparatus must be built or experiments in transmitting carried out until a licence has been obtained.

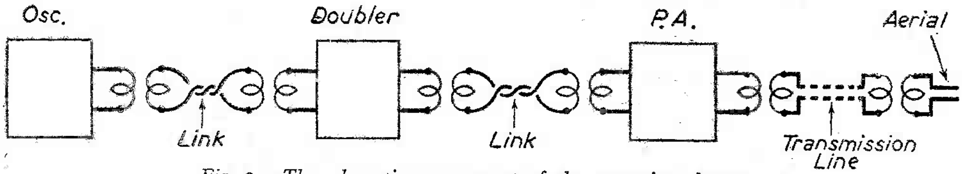


Fig. 2.—The schematic arrangement of the transmitter layout.

G.P.O. Amateur Transmitting Licence

APPLICANTS for a licence to establish an amateur wireless station who have not previously held a licence to install wireless transmitting apparatus will be required to furnish evidence of British nationality and proof that their technical knowledge and operating ability reaches a certain minimum standard. The proof normally required will be a "pass".

(a) in a test, conducted by the Post Office, in sending and receiving morse signals at the rate of 12 words a minute, and

(b) in the City and Guilds of London Institute's "Radio Amateurs' Examination."

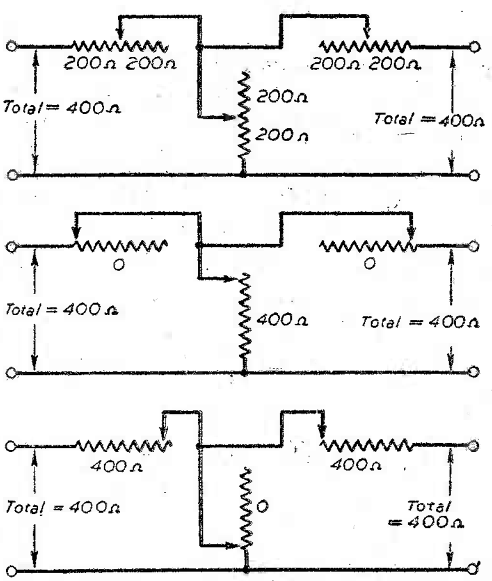
Exemptions from one or both of these examinations will be allowed where applicants can produce proof of equivalent or better qualifications. A leaflet will shortly be obtainable from the Engineer-in-Chief (W5/5) G.P.O. London, E.C.1 setting out particulars of such exemptions. These particulars will include a list of grades in the Forces, service in which will be regarded as qualifying for exemption.

The first City and Guilds of London Institute's "Radio Amateurs' Examination" will be held on 8th May, 1946, between the hours of 7 p.m. and 10 p.m. at Technical Institutes throughout the country; the last day of entering for the examination was the 31st March, 1946. The fee for the examination is 10/-, in addition to which the examination centre may make a small charge for accommodation. Intending candidates who may experience difficulty in finding a suitable examination centre should write to the Superintendent, City and Guilds of London Institute, Department of Technology, 31, Brechin Road, London, S.W.7, who will also supply particulars of the "Radio Amateurs' Examination" on demand. Examinations will be held annually in the future, or more frequently if there is sufficient demand for them; it is possible that a further examination may be held before the end of the present year.

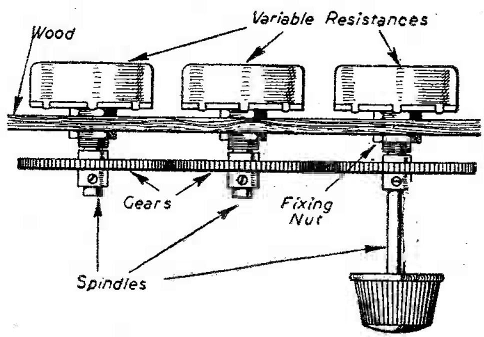
Novel Volume Control

BEING unable to obtain a constant impedance volume control, I constructed one in the following way. First, three 1⅝in. dia. gears are drilled to take a ¼in. spindle. Next, drill a piece of plywood with three 2/5in. dia. holes, the distance between them depends on the depth of the teeth of the gears used. Bolt the three variable resistances to the panel. The gears are now soldered to their respective spindles. Finally, the wiring is carried out—this is made clear in the theoretical diagram.

This method of volume control gives good quality reproduction in conjunction with a microphone or pick-up, as the impedance is constant at all volumes.—T. N. DOBBS (Bath).



The circuit of the control at "full volume," "half volume" and "off."



Details of the complete assembly.

Frame Aerials for Portables—1

The Design and Efficient Working of Frame Aerials as used in Portable Radio Sets

By M. D. H. WHITEHEAD, B.Eng.(Hons.)

WITH the war over and an increasing amount of midget components coming on to the market, many people are beginning to think of constructing portable sets. The compact, all-dry, midget set with good selectivity and volume is what most amateurs aspire to build. Many of them construct such sets but very often the possibilities of a frame aerial are neglected or an inefficient one is used as very little information is available on their construction. The writer has seen several portables which were really neat except for unsightly and inconvenient throw-out aerials and earth clips for fixing on pipes, etc. Results which are in most cases superior to those from a throw-out aerial can be obtained from a good frame aerial.

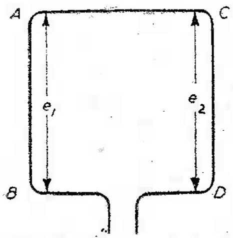


Fig. 1.—*The simple loop aerial.*

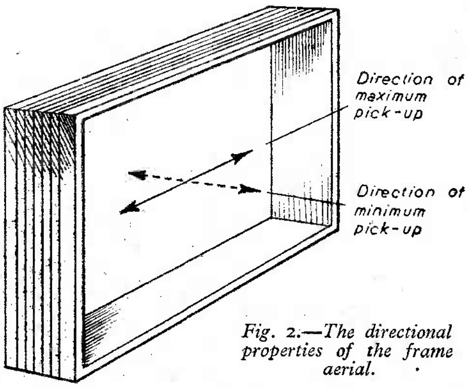


Fig. 2.—*The directional properties of the frame aerial.*

Theory of the Frame Aerial

Before going on to discuss the construction of aerials of this type it is necessary to have a brief idea of the theory of their working.

The voltage output of a simple vertical aerial is given by $V = Fh$ where V is the induced E.M.F. in volts and F the field strength in volts/metre, h is the effective height of the aerial in metres and is usually taken as about half the physical height.

Considering the simple loop as shown in Fig. 1, it is seen that when the field cuts a loop of this type E.M.F.'s e_1 and e_2 will be induced in AB and CD respectively, but will be in opposition round the loop. If the field is at 90 deg. to the plane of the aerial, these E.M.F.s, being equal, cancel one another out. If the loop is rotated so that the plane ABDC is in line with the transmitter there will be a difference in phase between e_1 and e_2. An E.M.F. round the loop is therefore produced equal to the difference of e_1 and e_2.

It can be proved that in this case the induced E.M.F. E will be given by

$$E = \frac{2\pi FA}{\lambda} \text{ volts}$$

where A is the area of the loop in square metres and λ the wavelength in metres.

Frame aerials used in portable receivers are a development of the simple loop and consist of several turns (Fig. 2). The formula for the induced E.M.F. then becomes

$$E = \frac{2\pi FAN}{\lambda} \text{ volts}$$

where N is the number of turns on the frame.

The effective height of a frame aerial is given by

$$h = \frac{2\pi AN}{\lambda} \text{ metres.}$$

Suppose a transmission on 300 metres is being received on a frame of 30 turns with an area of 1/10 of a square metre, the effective height is

$$h = \frac{2\pi 0.1.30}{300} = 0.063 \text{ metres.}$$

This is very much less than the effective height of an outdoor aerial or even a throw-out one, but with careful construction very good results can be obtained. There is also the advantage that they are directional, which in these days of overcrowding on the air very often eliminates unwanted transmissions.

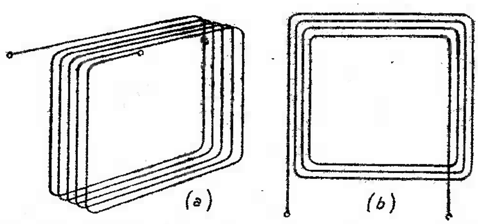


Fig. 3.—*The box type (left) and pancake type aerials.*

Types and Inductances of Frame Aerials

There are two main types of frame aerials used in portable receivers, (a) box type, (b) pancake type. These are shown in Fig. 3. There are, of course, variations in the construction of these two basic types but these are discussed later.

The frame aerial in portable receivers is tuned and forms the first H.F. circuit. Therefore, consideration must be given here to its inductance. Most readers will be familiar with the formula for the inductance of a single-layer coil

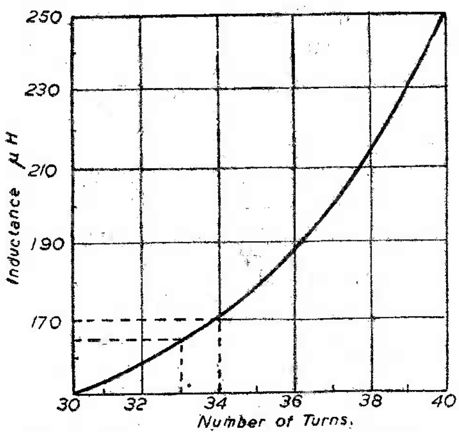


Fig. 5.—*An example of inductance calculation.*

$$L=\pi^2d^2n^2lk\times10^{-3}\ \mu H$$

where d is the diameter of the coil in cms.
n is the turns/cm.
l is the length of the coil in cms.
k is a factor which depends on the ratio of the diameter to the length of the coil. The value of k can be determined from sets of curves or tables which are contained in most radio handbooks.

This formula applies to coils or frame aerials of circular cross section. It is usual in a portable set to have a frame aerial of either square or rectangular cross section. In the case of a square frame with a single layer winding the formula for the inductance is

$$L=8an^2\left[\log\frac{a}{b}+0.726+0.223\frac{b}{a}\right]-8an\ [A+B]\times10^{-3}\mu H$$

where a is the side of the square (to centre of wire) in cms.
n is the number of turns on the frame.
D is the winding pitch (distance between adjacent turns of wire from centre to centre).
b is the length of the coil $=(n-1)D$ in cms.
A and B are constants and can be determined from either tables or curves. A set of curves for obtaining these constants is shown in outline, Fig. 4. These should be reproduced on squared "graph" paper.
d is the diameter of the wire in cms.

For a flat or pancake type aerial the formula must be modified. Since the side of the square is not the same for every turn, a mean value must be obtained. This is most readily applied in the formula by writing $a_1-(n-1)D$ instead of a, where a_1 is the side of the square formed by the outer wire.

So far only square aerials have been considered. As the frame aerial is often built round the set it is most unlikely that it will be square but rectangular. The greater the difference between the sides of the rectangle, the smaller the inductance becomes. Consequently the square aerial has the greatest inductance. Suppose the frame has depth a and width c. Then if the ratio a/c is 2 the inductance is decreased 2.3 per cent. and if a/c is 5 it is decreased 17 per cent. In any actual set it is most unlikely that the ratio a/c will ever exceed 2 and in many cases it will be practically unity and can therefore almost always be neglected.

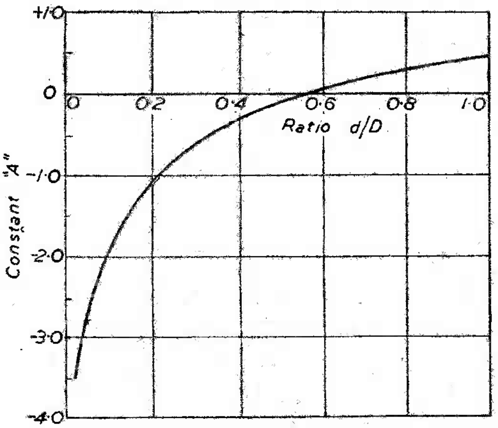
Design

The actual dimensions of the frame will be decided upon by the size of the cabinet if it is a box type aerial that s to be used or upon the space available if it is a pancake type. The above formula is somewhat complicated and may prove difficult to those not used to handling figures. It is not actually necessary to use this formula but it simplifies construction if a rough idea of the number of turns can be obtained first. In the use of the formula trial and error methods have to be reverted to. When the dimensions of the frame, gauge of wire and winding pitch have been chosen it will be seen that in order to determine the values of A and B the number of turns must be known. The number of turns will have to be chosen and the corresponding inductance calculated. For medium waves 200-560 metres the inductance should be about 170μH and for long waves 700-2,000 metres 2,200μH when tuned by a 0.0005 mfd. condenser. An example of the calculation is now given for those not familiar with the trial and error method of calculation. Suppose with 40 turns as the medium wave winding the inductance is found to be 250μH. This is obviously too high and so the corresponding inductance to 30 turns is calculated. This may be 150μH. The required value lies between these two. Calculating the inductance for 33 turns a value very near to 170μH will be obtained, say 165μH. The exact answer is obtained by drawing a rough graph of turns and inductance (Fig. 5). It is seen from this graph that the correct value for the number of turns is 34.

So far all our considerations have been almost purely theoretical. There are, of course, various factors which affect the inductance of the aerial and it may require a few more or a few less turns than those calculated.

The construction of the box type and pancake type are not quite the same and so they will be dealt with separately.

(To be continued)



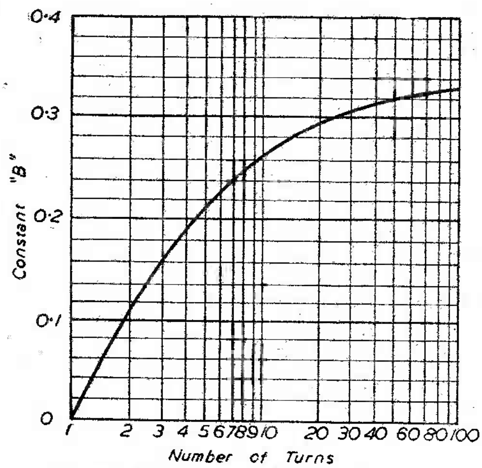


Fig. 4.—Graphs for the determination of the constants A and B as referred to on this page.

Practical Hints

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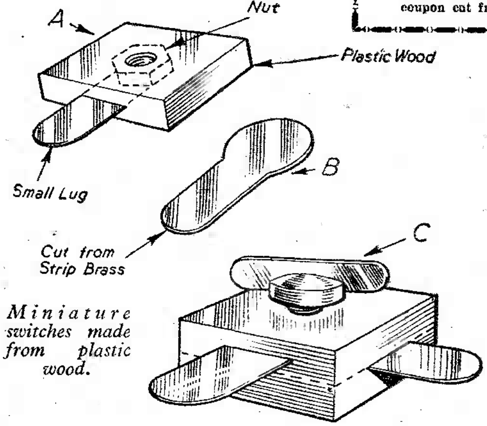
SPECIAL NOTICE

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

Switches for Miniature Sets

WITH the aid of plastic wood and small brass nuts and bolts it is easy to make simple shorting-switches of great efficiency for radio frequencies and battery voltages. They can be made to any size or shape required, and can also be made in the form of a solid strip or bank of independent switches. It should be noted that they are unsuitable for A.C. or high tensions.

A single switch is built up as follows. A small square of plastic wood, say ¼in. thick, is moulded in the fingers. Great accuracy is not needed as it can be filed true when set. Through the centre is mounted a brass nut and bolt; the nut must have had a small lug soldered to it, to project from the side of the switch as a soldering tag. When the nut is in place inside the plastic, with the lug showing at one side, the bolt may be carefully unscrewed and withdrawn: this is to prevent it getting stuck when the plastic dries. The tablet is now allowed to set hard, when its surfaces may be filed neatly. It now appears as in A.



Miniature switches made from plastic wood.

A piece of strip brass is now cut to the shape B. One side of the plastic square is smeared lightly all over with Durofix, and the brass contact is placed so that the round end covers the bolt-hole and the lug projects conveniently. With this in position, a piece of plastic wood is quickly pressed over it and squared off to form the base of the switch. When set, it may have its final smoothing.

The bolt is now fitted with a small wing for ease in turning, and is screwed lightly home. It will be realised that the nut is now one pole of the switch, and that when the bolt is screwed home it contacts the brass B which forms the other pole. A quarter turn suffices to operate the switch either way. C shows the completed article; the base may be drilled for fixing as required.—D. A. PICKFORD (Stonehouse, Glos).

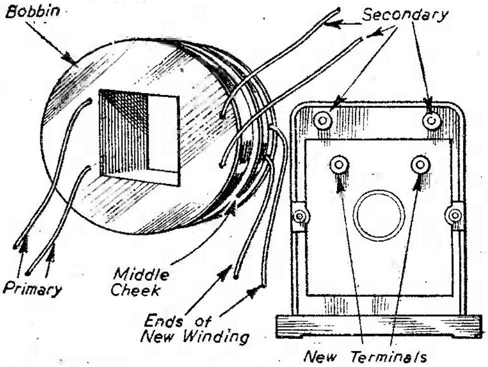
Easily Made Microphone Transformer

I HAD on hand an old B.T.H. 2 : 1 ratio L.F. transformer, and hit upon the following idea of making a twin-ratio "mike" transformer.

I removed the clamping bolts and bakelite end pieces of the transformer, after first unscrewing the terminals, and then pulled out all the laminations, which left the bobbin as shown. I then took some No. 30 s.w.g. d.c.c. wire and wound on about 200 turns, anchored the ends on the side cheek, and covered the winding with a layer of insulating tape.

I bored two small holes in one of the bakelite end pieces and fitted two terminals. The ends of the new winding were then soldered to the back of the terminals, on the inside of the end piece. I then reassembled the transformer, which appeared as shown in the other sketch.

The ratio, using the original primary as the new secondary, would be about 50 : 1, and using the normal secondary about 100 : 1.—G. ALLONBY (Windermere).

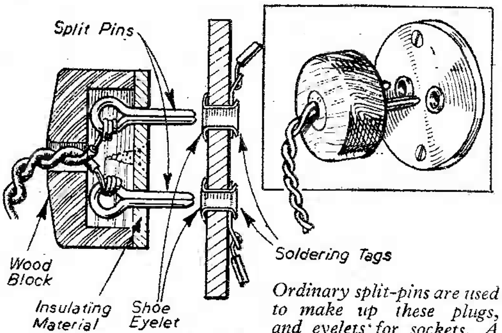


Mr. Allonby's suggestion for making a microphone transformer.

Home-made Plugs and Sockets

SMALL two-pin plugs and sockets are not readily available, but contribute largely to the adaptability of miniature equipment. The employment of eyelets for sockets and split pins for plugs has met this disability with some measure of success.

For the sockets the base for the eyelets is any junk insulating material, cut to suit existing requirements. The method of connection is by means of soldering tags on the protruding portion of the eyelet or alternatively riveting over as illustrated.



Ordinary split-pins are used to make up these plugs, and eyelets for sockets. A suggestion from Mr. G. C. Willis.

The plug consists of a small block of wood, slotted to take the heads of the split pins, and drilled through the centre for the wire.

To keep the pins in position a piece of bakelite or fibre is drilled and screwed on the wooden block.

It will be readily understood that the slot prevents turning of the pins.—G. C. WILLIS (Monkseaton).

German Flying-bomb Transmitter

Details of the Apparatus and Circuits Employed in this Novel Equipment

THIS article gives the details and circuit diagram of the transmitter which was carried on some of the German flying bombs, and which was used in conjunction with ground stations to give D.F. bearings.

A specimen of the S.23a was received in sufficiently good condition to enable reconstruction of its circuit to be made and its characteristics to be determined. Later, another version, the S.23b, was obtained. The modifications observed in these transmitters are enumerated later.

C.W. signals in the frequency band 340-450 kc/s. are given by this transmitter which has been found in a certain number of the flying bombs. Signals have been heard in this band and identified as originating from a bomb. The radio equipment of the S.23a includes a relay to switch on the H.T. and L.T. batteries, the latter supplying the heater and the motor which drives a coding wheel to provide frequency-change keying.

General Arrangement

The transmitter is housed in a plywood box 8½in. × 6in. × 6in. and weighs 6lb. (Fig. 1). The workmanship is sufficiently good for the equipment to fulfil its purpose although not of the normal high standard met with in other German equipment.

The components are mounted on the lid (Figs. 2 and 5) with the exception of the relay which is secured by means of a bracket to one side of the box (Fig. 3). This relay is reset by a spring-loaded button, marked *D*, which is mounted in the adjacent side.

The supplies are brought into the unit by three plugs fastened to the outside of the lid with metal straps (Fig. 1). Plug I is the H.T. lead, the metal sheath of which is earthed although the cable itself is rubber-covered, and has no metal braiding. Plug II feeds the relay coil while plug III supplies the valve heater and the coding motor.

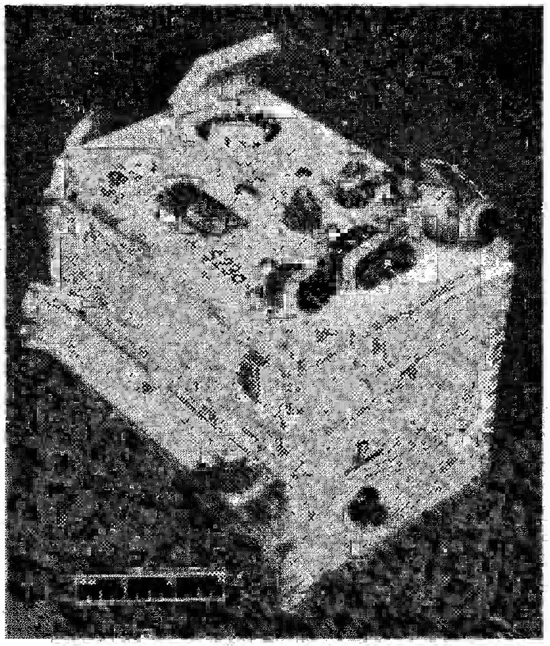


Fig. 1.—The transmitter in its wooden case.

The aerial and earth terminals are two bolts fixed in the lid, the aerial feeder connection to the aerial being made in the coaxial tube described below. A cardboard cover is fixed to the top of the box and protects the connections of a bank of condensers.

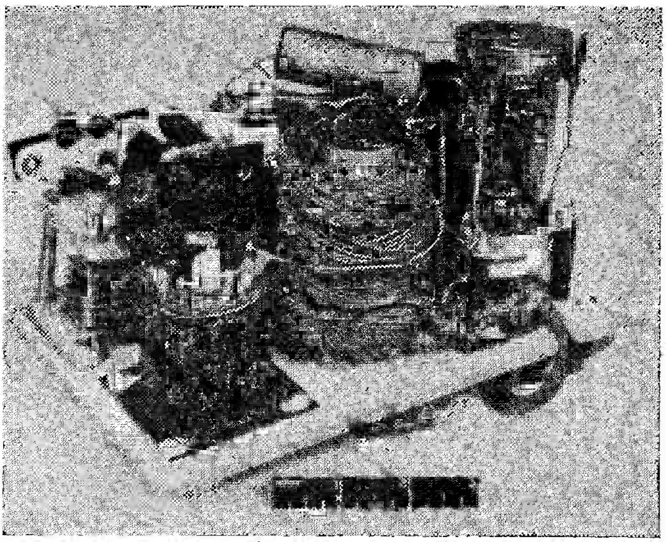


Fig. 2.—Showing some of the components inside the box.

Circuit

The transmitter is a simple C.W. self-oscillator using a tapped inductance which is tuned by the aerial capacity, a trimmer condenser and two banks of fixed condensers. The trimmer and both banks of condensers are all connected in parallel giving a capacity range of 1807 to 2256 $\mu\mu F$.

The feed-back coil in the grid circuit appears to give too much coupling as there is another winding of two turns, which is wound in antiphase and was obviously added at a later date. The grid and screen of the valve were strapped together, giving it the characteristics of a high-impedance triode.

When the relay (Fig. 6) is operated it closes the contacts in the H.T. and L.T. lines, while at the same time a latch holds the armature in the closed position and an associated pair of contacts opens the operating coil circuit. Resetting is by means of the push-button mentioned above.

The code wheel operates a switch

in the grid circuit, its function being to sort out the grid-leak resistance and by-pass condenser, and so produce a rise in frequency of 340 cycles/sec., with very little effect on the power output.

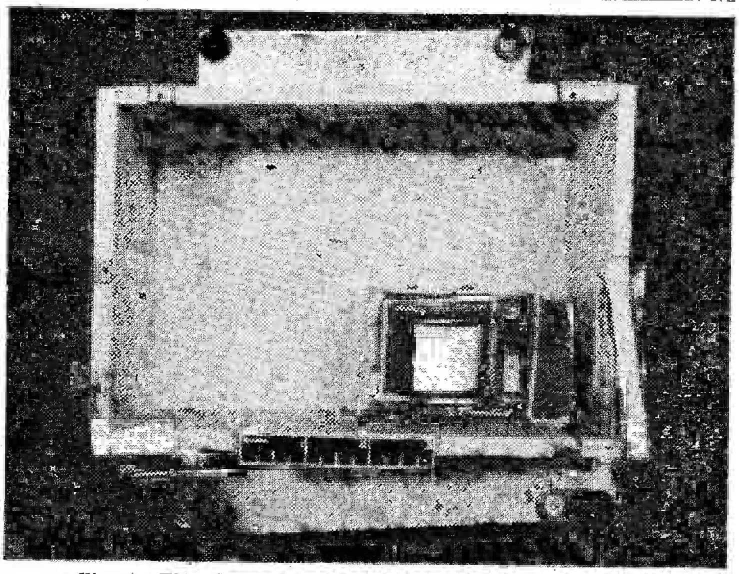


Fig. 3.—The relay of the transmitter fitted to the side of the box.

Components

The valve used is the L.S.50—a pressed-glass base pentode of familiar design. It is generally used with 400—800 volts on the anode but from an examination of the batteries and a complete lack of volt-dropping resistors it appears to be working at 1,200 v. The valve is rated to dissipate 50 watts and has a 13.6 v. 0.9 a. heater.

Dry batteries are used as the sources for both H.T. and L.T. and the estimated capacities as follows:—

H.T. battery 1,200 v. 100 mA. for ½ hour.

L.T. battery 15 v. 1.0 A. for ½ hour.

The aerial loading coil is wave-wound in four sections on an impregnated paper tube

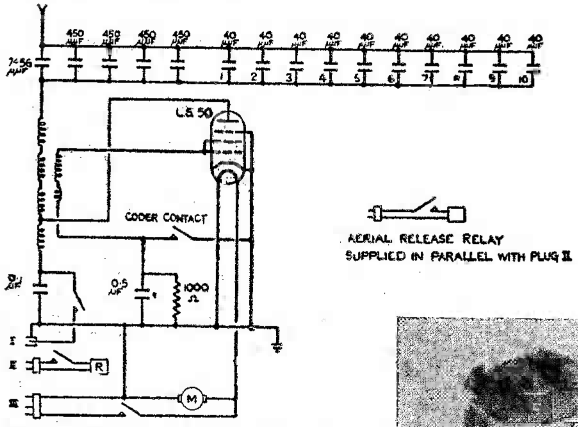


Fig. 4.—Circuit of the S.23a transmitter.

1½in. diameter with a coil depth of 7/16in. Multiple-stranded, enamelled wire is used with a green rayon covering, of overall diameter 0.05in. The measured inductance is 1 mH. Cotton-covered, enamelled, copper wire of about 36 s.w.g. is used for the feed-back coil, while the decoupling coil is double cotton-covered wire of 22 s.w.g.

The 7–56 µµF air-spaced trimmer is of the double-bearing, semi-circular plate type with ceramic insulation. Variation of its capacity seems to have very little effect upon the frequency of the unit.

Two banks of fixed ceramic condensers were found in the set, one bank of ten 40 µµF. condensers connected in parallel being mounted in the top of the housing and readily accessible under the cardboard cover. In the specimen examined No. 7 to 10 had been disconnected by simply releasing the cover and severing the connection as shown in Figs. 1 and 4. The condensers in the second bank are also connected in parallel.

One bore the value of 450 µµF. and if it is reasonable to assume by comparison that the other three were of the same value:

Minimum possible tuning capacity = (4 × 450) + 7 = 1807 µµF.

Maximum possible tuning capacity = (4 × 450) + (10 × 40) + 56 = 2256 µµF.

The 0.1 µF anode decoupling condenser is an oil-filled Ducati type with a voltage rating of 2,000 v. A 0.5 µF. tabular paper condenser is used to by-pass the grid leak and is rated at 1,500 v.

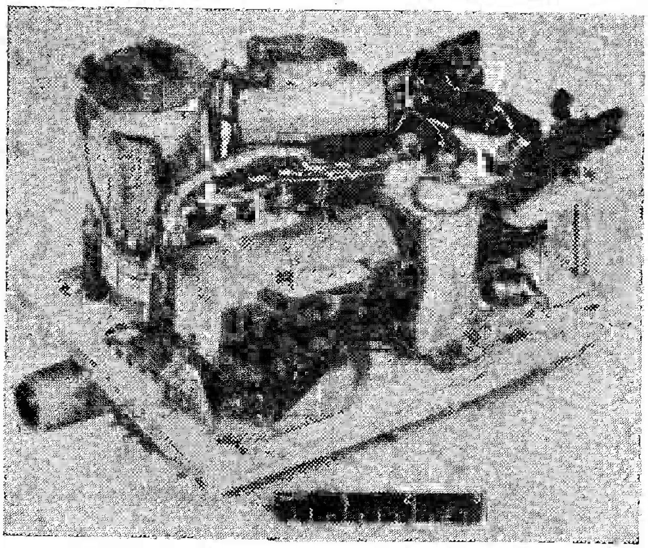


Fig. 5.—Another view of the inside of the apparatus.

The keying unit is a permanent-magnet motor driving the coding disc through a two-stage worm gear which gives a reduction ratio of 3,000 : 1. The paxolin disc is 2in. in diameter and has a single set of projections, which occupy 171° on its circumference.

The relay is a D.C. type with a circular section core, the coil being marked 100—4,000—0.27. This means it is a 100 ohm winding of 4,000 turns and enamelled copper wire 0.27 mm. in diameter.

The trailing aerial which is wound on a spool projecting from a coaxial tube (Fig. 7) is of stranded steel (believed to be zinc-coated), 0.07in. overall diameter and 450ft. long. The spool is of a non-rotating type and consists of a horizontal thick-walled tube 9.5in. long, 1in. diameter, while the coaxial tube is 2.3in. outer and 2in. inner diameter. The whole unit is of low-grade, resin-bonded paper. An electromagnetic release, operated simultaneously with the relay (R) in the transmitter unit, is fitted in the tube, and a circular disc is attached to the end of the aerial to provide sufficient drag to unwind the aerial.

Performance

Frequency checks were carried out with various aerial capacities and the current into a 15-ohms load was measured. These tests were carried out with 1,200 v. on the anode and a fixed series capacity of 2,240 $\mu\mu$F.

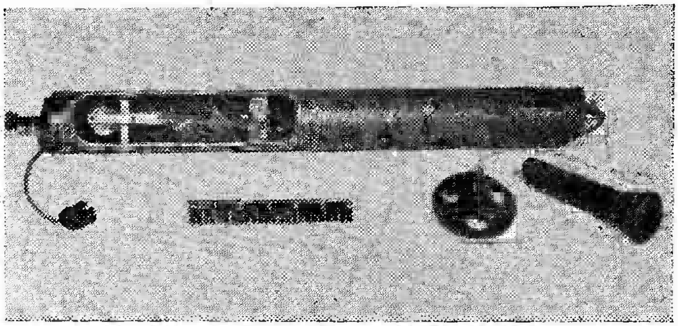


Fig. 7.—The trailing aerial and its holder.

Aerial Capacity $\mu\mu$F	Frequency Kc/sec.	Aerial Current into 15 ohm load		Power Output	
		With grid leak	Grid leak shorted	With grid leak (watts)	Grid leak shorted (watts)
50	545	0.37	0.34	2.05	1.74
100	445	0.6	0.56	5.4	4.7
150	377	0.735	0.67	8.1	6.7
200	340	0.82	0.775	10.1	9.0
250	312	0.92	0.885	12.7	11.75
300	290	1.3	1.18	25.0	20.9

It should be noted that under the given conditions and with an aerial capacity greater than 250 $\mu\mu$F, the coil became seriously overheated. The frequency change due to shorting out the grid leak was found to be 340 c/s.

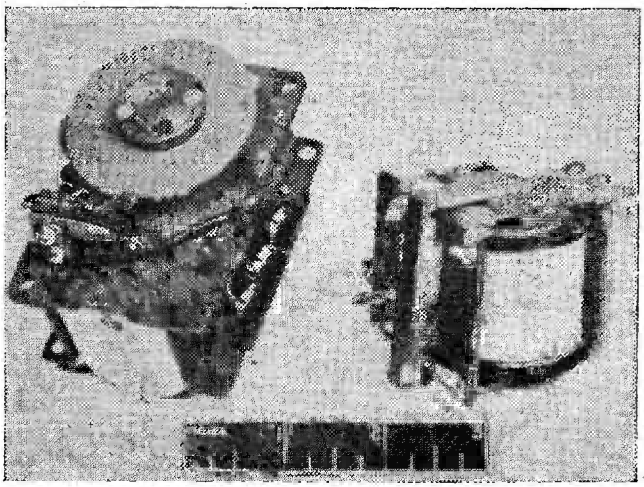


Fig. 6.—Details of the relay mechanism.

Modifications on S.23b

Two essential differences from S.23a have been observed in the transmitters examined.

The 1,000 ohm grid-leak resistor and 0.5 μF condenser have not been traced in this version. Furthermore, there is no evidence that they were ever connected. A keyed C.W. signal therefore is given by this modified unit, since the valve ceases to oscillate when the coder key is open. The two-turn anti-phase winding mentioned on page 288 has not been found on the S.23b.

As may be expected, the code wheel causes the key to remain closed for the greater part of each revolution. There are two coding sequences on the circumference, so that the signal is heard twice per minute. The code has been different on each disc examined.

Each specimen has a different series capacity, one having only 40 $\mu\mu$F condensers and the other eight connected in the circuit.

Since the aerial capacity is the governing factor, and the change of tuning capacity obtained by taking 40 $\mu\mu$F condensers out of the circuit produces a frequency change of only 4 kc/s approximately with a 150$\mu\mu$F aerial, it is probable that several lengths of aerial are used.

Considering the results given earlier, a frequency range of this transmitter of 340-450 kc/s is reasonable. An output of 5 to 10 watts will be obtained over this band.

Old Circuits Reviewed–3

The Crystadyne, Unidyne, Low-voltage, Crystachoke and other Circuits are Reviewed in this Article

THE Crystadyne is a simple but effective circuit, the original being shown in Fig. 18. When a crystal is used for rectifying in the ordinary way, no reaction effects are possible, and therefore the range of the set is limited to that of a crystal receiver. However, with the arrangement shown, the crystal performs the job of rectifier, and the valve is not just an L.F. amplifier: it gives regeneration effects as well.

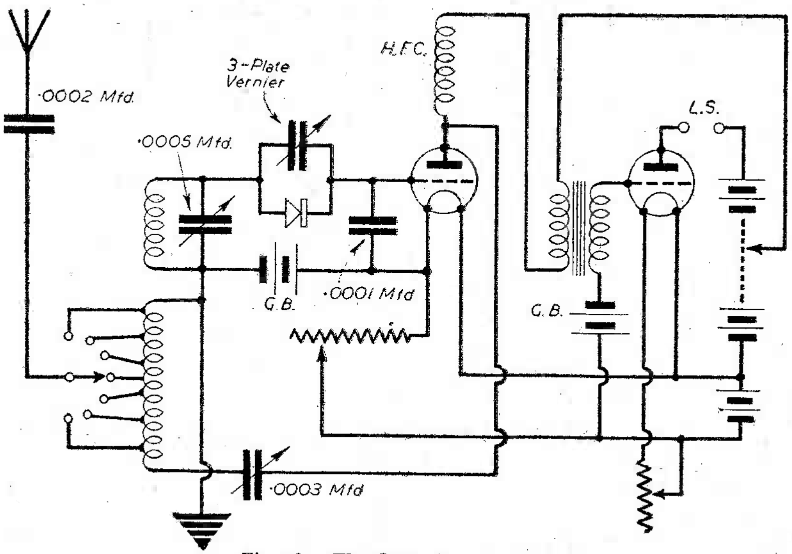


Fig. 18.—The Crystadyne circuit.

It will be seen that the crystal is shunted by a small variable condenser (given the designation of a three-plate vernier) and this serves to by-pass a small amount of the H.F. component to the grid circuit. The amplified H.F. current in the anode circuit is fed back via the usual Reinartz condenser control system to give the reaction effect.

Since the circuit is not so dependent on the crystal being set for maximum sensitivity, there being an ample power in reserve, a stable double crystal combination works well. A semi-permanent detector can be relied on to deliver the goods from the local station at almost any setting, and it is only for the reception of weak stations that it calls for any special setting. To achieve this it is essential that a setting of the crystals be obtained which has a small damping effect on the grid, and unless this is achieved, the circuit cannot be brought to its most sensitive condition, just off oscillation point. Either setting, however, has no effect on the local station, which can always be got at excellent strength.

A more-up-to-date version of the Crystadyne is given in Fig. 19. This employs a duel-range coil, decoupling of the reaction-cum-L.F. valve, and a pentode output. With this, the power is considerably greater than that given by a standard Det.-L.F. set used on the same aerial and earth. Reaction is finely controllable, but in use the small variable condenser shunting the crystal should be kept at as low a value as possible.

Another modification of the Crystadyne is given in Fig. 20. This differs mainly in the application of grid-bias which, as will be seen, is obtained through a grid-leak, a condenser being inserted to keep the voltage confined to the grid.

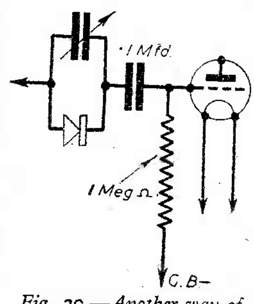


Fig. 20.—Another way of supplying grid-bias to the Crystadyne.

The Unidyne Circuits

Next we come to the Unidyne series—a class of receiver designed to work without H.T., or with only a very small H.T. battery, usually 9 volts. The one-valve and two-valve circuits of the Unidyne series are depicted in Figs. 21 and 22. It is claimed that the two-valve circuit will work a loudspeaker.

The main feature of the Unidyne is that the innermost grid is connected to L.T. positive, or is given a small positive charge. This has the effect of dispelling the space-charge, and permits a reasonable current through the valve at these low anode voltages. When the anode circuit is returned to L.T. positive, it is positive by an amount equal to the L.T. battery polarity, and this is doubtless why the Unidyne fell in popular favour. For to get a reasonable current through the valve, a six-volt accumulator was desirable, with a corresponding valve. It was then possible, with a suitable valve, to work the detector fairly efficiently, oscillation being easily attained from the filament battery alone.

When the two-volters came in, however, there was not quite sufficient driving power. There is as much

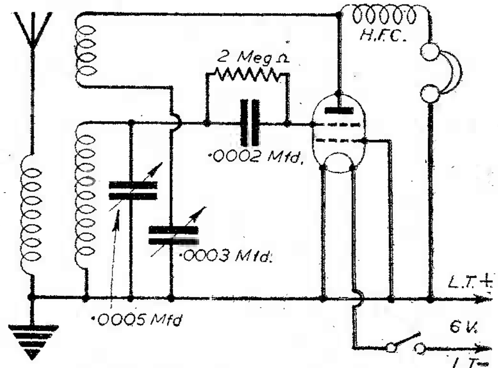


Fig. 21.—A one-valve Unidyne circuit.

difference between two and six volts as there is between 50 and 150. Consequently the Unidyne dropped in favour.

It is possible to supply the extra voltage by a small battery, however. A nine-volt grid-bias battery is suitable. It will be seen that a tetrode or four-electrode valve is used, and unsatisfactory results with the Unidyne are due to a wrong choice of valve.

The modern beam tetrode is useless in this circuit. Best results are obtained by using the special "double-grid" valves, of which there are a number on the market, notably those made by Osram. The Lissen PT225, if you have one available, is excellent, oscillating with only six volts on the anode and grid. Since Lissen's closed this valve was made by Ever Ready, and is known as type K70B. The Mullard PM22A (a pentode) is a fairly good substitute, though not quite so efficient.

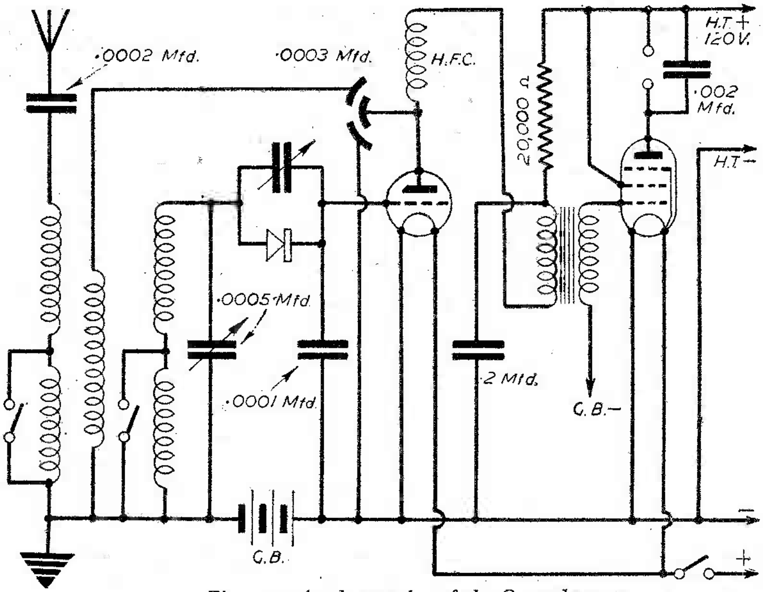


Fig. 19.—Another version of the Crystadyne.

The Unidyne lends itself readily to the designing of a very small portable set. Only the valve, grid condensers and grid-leak, tuning and reaction condensers (small bakelite models) are necessary, the frame aerial being wound round the case. Such a set can be made no larger than a camera, including the grid-bias battery for H.T. The circuit is shown in Fig. 23, which reveals how simple the whole thing is. The L.T. can be a small 2 amp. hour unspillable accumulator.

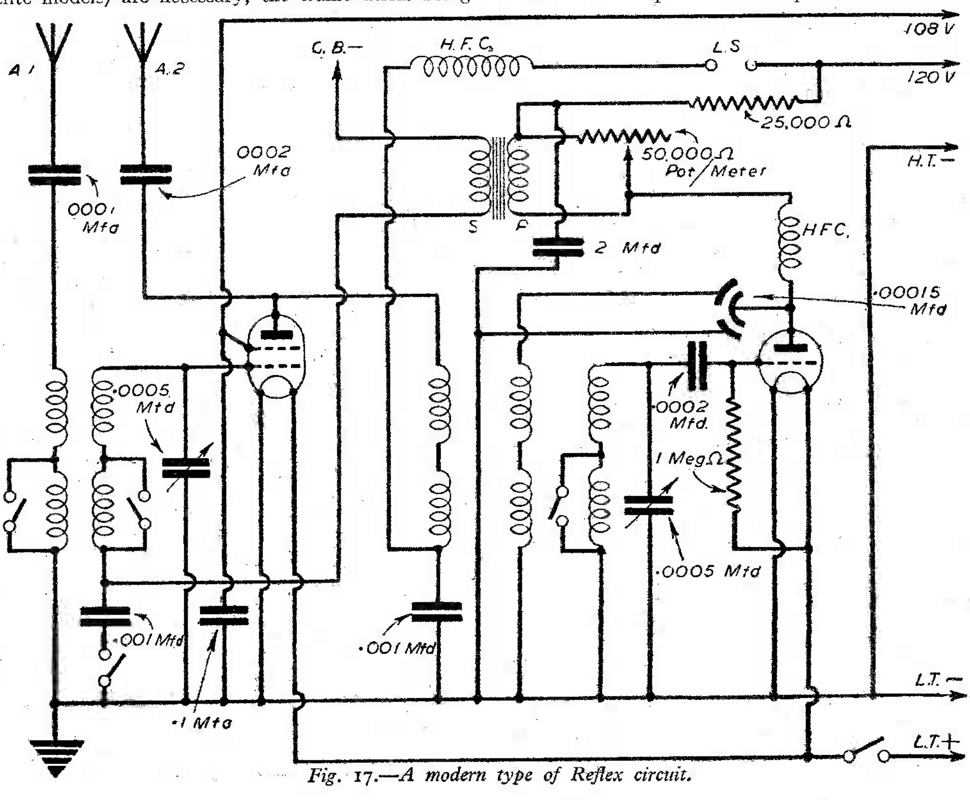


Fig. 17.—A modern type of Reflex circuit.

A more ambitious type of portable set, based on the Unidyne series, in indicated in Fig. 24. The first valve functions as a detector, using the auxiliary grid of the K70B *as the control grid.* This is the central pin, or in the case of some valves, the side terminal. The control

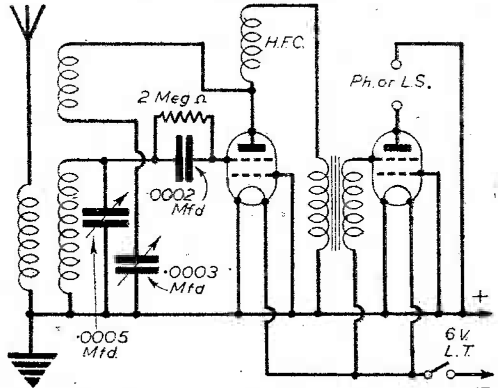


Fig. 22.—A two-valve Unidyne circuit.

grid proper is connected to H.T. positive. More H.T. can be applied than in the case of the one-valve circuit, and up to 21 volts can be applied with safety to the anodes. The priming grids require less. Two or three

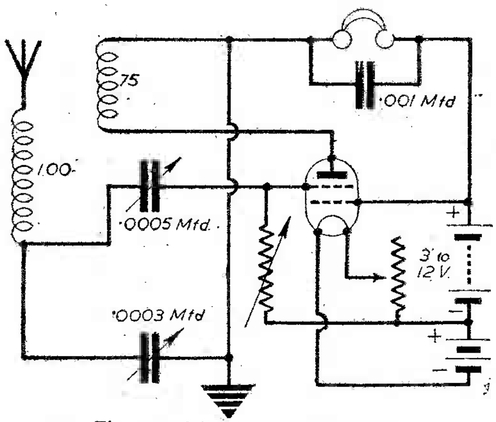


Fig. 25.—The Flewelling Unidyne.

G.B. batteries are all that is needed in the way of high-tension.

The completed receiver (Fig. 24) can be assembled in a case measuring about 9in. long, 7in. wide, and 6in. deep. It will be seen, therefore, that it is really portable, and weighs from four to five pounds, including batteries

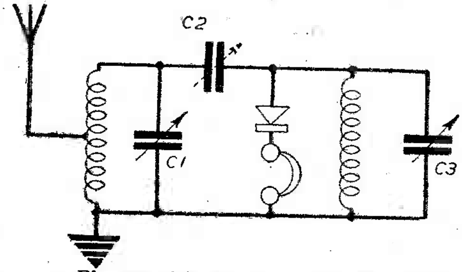


Fig. 27.—The Crystachoke circuit.

Unidyne Modifications

I give two circuits for those who are interested in the Unidyne. These are classed as combinations of the Unidyne with some other circuit. Thus Fig. 26 is described as a Chitos Unidyne. This is similar to the

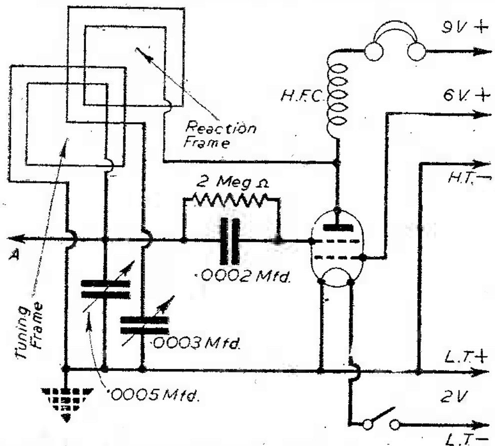


Fig. 23.—A Unidyne circuit adapted as a one-valve portable.

original Chitos, as described in the first part of this series, except that the three-electrode valve is replaced with a four-electrode, and the same precautions taken

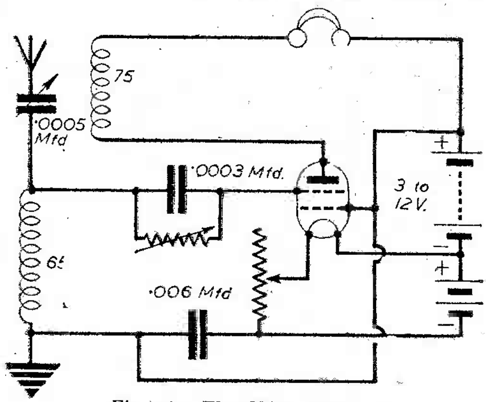


Fig. 26.—The Chitos Unidyne.

with regard to the control grid, auxiliary grid, etc., as with the Unidyne. From 3 to 12 volts positive is applied to the anode and auxiliary grid.

The other circuit, Fig. 25, is described as a Flewelling Unidyne. For DX work, 3 volts H.T. is best, but for loudest results from the local station, up to 12 volts

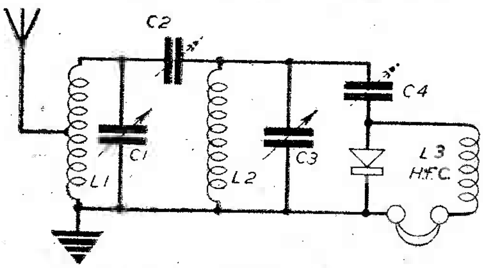


Fig. 28.—Another Crystachoke circuit.

may be used. The swinging coil reaction can be modified by inserting an H.F. choke in the plate lead, and returning the reaction coil to earth through a variable condenser, after the style of the Reinartz reaction arrangement. Also, parallel tuning might be tried, in place of the series tuning in the diagram. These two circuits (Figs. 25 and 26) are given for the sake of diversity.

Crystal Circuits

I feel I could not close without offering a circuit to the crystal enthusiast. One of the leading objections to crystal circuits is that they are not selective, and this is quite true of the crystal circuit of conventional type. When such a circuit is used on a full-size aerial a short distance from a station, it is practically impossible to cut the station out.

This leads us to the Crystachoke circuit. In the original Crystachoke circuit, a choke coil was connected across the crystal detector and headphones. Now there is clearly no reason why a tuned circuit should not be connected instead of an untuned choke coil, and it would be expected that this would lead to an increase in selectivity, owing to the use of two tuned circuits.

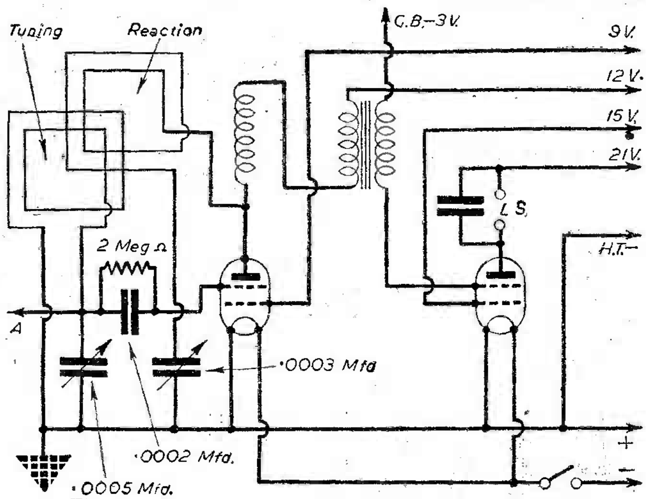


Fig. 24.—A two-valve portable using low values of H.T.

A Crystachoke circuit with this modification was put to practical test, and the diagram is given in Fig. 27. The condensers C_1 and C_3 are normal .0005 mfd. variables, whilst the condenser C_2 is a small preset with a maximum capacity of .0001 mfd. A distinct increase in selectivity was noted with this arrangement.

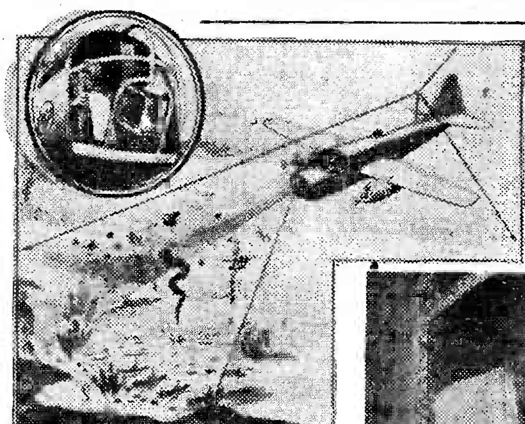
Still greater selectivity can be achieved by the use of Fig. 28. In this circuit two preset condensers, C_2 and C_4, are employed, each with a maximum capacity of .0001 mfd., though in normal use only about 20 or 30 micro-microfarads are in use. The function of C_2 is to couple together the two tuned circuits, L_1 C_1, and L_2 C_3. C_4 is in the nature of a "tapping" condenser, reducing the crystal damping. L_3 is an H.F. choke connected in series with the headphones across the crystal detector, as is common in all Crystachoke circuits.

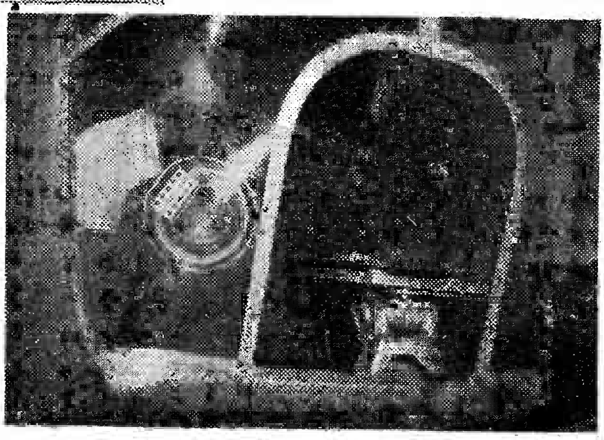
In practical test the preset condenser C_2 could be set to a very small value of capacity without affecting the signal strength. The other preset, C_4, had to be set to about 50 m.mfd. for best results.

By reducing the capacities of C_2 and C_4, still greater selectivity could be obtained, but at the sacrifice of some signal strength. In all cases, the two coils should be set in positions of zero coupling, that is with their axes at right angles to each other.

Television from the Air

FOR the first time, satisfactory television transmissions have been made from the air. At a demonstration at the Anacostia Naval Air Station in America, a 'plane carrying a television camera and transmitting equipment flashed back scenes as it passed over the countryside. It is claimed that the transmission is satisfactory up to a distance of 200 miles. During a bombing attack, ground commanders back at base could follow the effectiveness of an attack.





Above is seen a diagrammatic representation of the television transmission, and on the right the actual equipment used in the demonstration fitted in the nose of the aircraft. The camera and equipment weighs only 100 lb.

Remote Control

Simple Station-selection and On/off Switching

SOME time ago it was necessary to make a receiver controllable from two rooms—the one in which it was situated and another in a different part of the house. In fitting up the system, the following points were taken into account, to act as a guide to the method employed:

(1) The number of wires connecting the set to the remote controlling point to be as few as possible—in this case there were two wires, plus the earth from the house-wiring system. This includes the speaker extension leads.

(2) Battery drain of the system to be as low as possible.

(3) When not in use, no current was to be drawn.

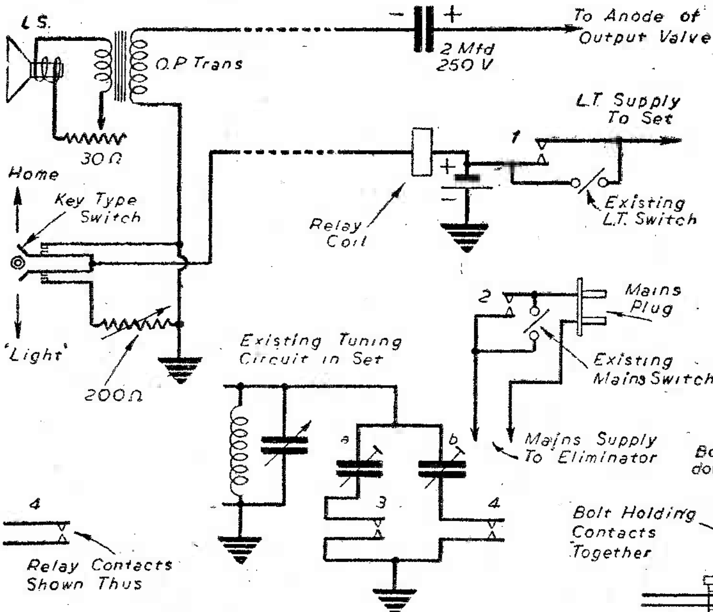


Fig. 1. (above)—The wiring for the complete remote-control arrangement.

The circuit arrangement used enabled all these points to be met, and the control obtainable at the remote point was as follows:

(a) Set switched completely "off."
(b) Set "on" and tuned to the Light programme.
(c) Set "on" and tuned to the Home programme.

In addition, volume was controllable as well.

The principles of the method are simple—a relay is used to switch the power to the set "on," but it is used in an unorthodox way, so as to give a two-step action, and enable either programme to be selected. The relay used was a Post Office 3,000 type; suitable ones are advertised each week in our advertisement pages for a few shillings. The modifications necessary are described in detail below.

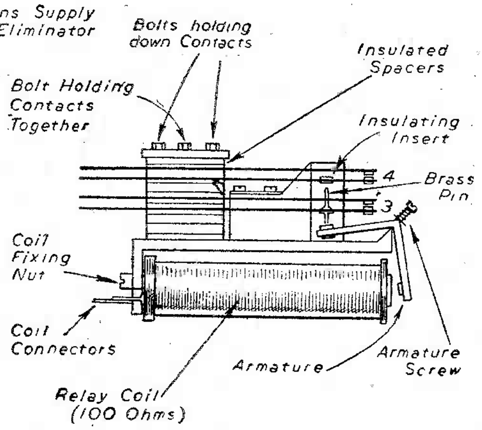
The Relay

The modified relay is shown on the right (Fig. 2), and for ease of reference, the contact pairs are numbered 1 to 4. The pairs 1, 2 and 3 are perfectly normal "make" contacts, but pair 4 are so arranged that they only make as the relay closes fully. As purchased, my relay had four single-pole change-over contacts; all these were stripped off and reassembled in the order shown, both sides being identical. The contacts are almost self-aligning, and this operation is very easy. Each "pile up" of blades is held together by the centre of the three screws running through their bases, and secured to the relay yoke by the outer two screws. By undoing these two latter, the whole assembly of blades comes away complete.

The blades are then separated by taking out the remaining screw, rearranged and bolted together, and finally bolted to the relay frame. When taking superfluous blades out, always replace all the spacing-pieces, or the assembly will not bolt down securely.

Having replaced all the blades, they are adjusted so that the pins affixed to the bottom blades on each side just touch the armature in its unattracted state. This operation is performed by gently bending the blades with a small pair of pliers. It will be found that projections on the second and top blades on each side rest on ledges of the central porcelain spacing block, and so these blades only require a little setting to ensure that they rest snugly in position. The remaining blades (third from the bottom) are then adjusted so that they rest without undue pressure on the top of the pin affixed to blade No. 1.

Finally, about 1/16th in. is filed off the top of this brass pin on one side, to give the appearance as shown in Fig. 2, i.e., a small



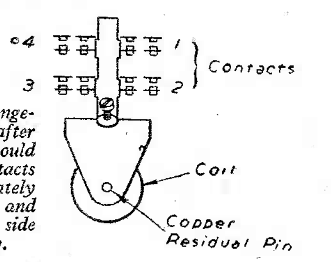


Fig. 2.—The arrangement of the relay, after modification. It should be noted that contacts 1 and 2 are immediately behind contacts 3 and 4, shown in the side view of the relay.

gap between the insulating insert on the third blade up, and the brass pin.

When all adjustments have been properly made, it will be found that on operating the armature by hand, contact pairs 1, 2 and 3 close together first, and on further pressure being applied to overcome these springs, contact 4 closes just as the armature reaches the limit of its travel.

Considerably more pressure is needed for this final step, and on this fact depends the successful working of the selector system.

The Relay Coil

The blades having been adjusted, the next step is to see that the relay coil is suitable for the job. As the relay is to be operated from a 2-volt accumulator, a coil resistance of about 100 ohms will be found about right. If the relay coil to be used is greatly different from this, it will be necessary to rewind it, but only a few hundred turns of wire are needed.

The coil is removed by first undoing the small armature screw (the spring and washer are fixed, and should not come off), and removing the armature. The slotted nut at the heel end of the relay is next removed, when it will be found that the coil is then free. The old winding is taken off, and the former wound to about 100 Ω D.C. resistance with 34 or 36 gauge enamelled copper wire. The coil connections are brought out to the two tags at one end of the former. These tags are hollow, and the ends of the windings are pushed through from the inside and then soldered. The relay is then finally reassembled.

Fixing the Relay into the Circuit

A 2 volt accumulator connected across the coil of the relay will energise it sufficiently to pull the armature right up against the pole piece. By including a variable resistor in the circuit, of about 200 ohms maximum, it will be found possible to set it so that the armature does not pull right up, but only sufficiently to make the contact pairs 1, 2 and 3. This is the two-step action aimed at.

The relay should now be fixed to the chassis of the set; the best position is probably near to the tuning condenser. A small bracket is all that is necessary, unless a hole is cut for the relay tags, and it is mounted vertically. Two trimming condensers, each of about 220 mmfd., are next fixed to the top of the chassis, and one side of each connected directly to "grid." The other side of one trimmer (a) is taken to one of the relay contacts 3, and the free side of the other trimmer (b) is taken to one of the relay contacts 4. The unconnected blades on pairs 3 and 4 are then strapped together, and connected with as short and straight a piece of wire as possible to the unearthed side of the main tuning condenser.

The remaining wiring to the relay is very simple. The contact pair 1 is wired across the L.T. switch in the set, and the contact pair 2 across the mains switch feeding the eliminator. Use reliable flex for this last connection. If an H.T. battery is used, this last connection need not, of course, be made.

One side of the relay coil is joined to the accumulator positive directly (i.e., not through the switch), and the other side of the relay coil is joined to the lead to the remote controlling point.

Extension Speaker

The anode of the output valve is connected to a 2 mfd. condenser, the other side of which is taken to the output transformer at the remote point—the other side of this transformer is earthed. All these connections are clearly shown in Fig. 1.

The Equipment at the Remote Controlling Point

The apparatus used here is very simple, and may all be housed in the extension speaker cabinet. The extension speaker is fitted with a volume control (about 30 ohms) in the secondary of the O.P. transformer, as shown.

The controlling switch used in the original lay-out was a telephone key-type switch, but any single-pole changeover, with a central "off" position, will do here. It is wired up as shown, and in one position connects the relay coil lead directly to earth, and in the other position connects it to earth through a variable resistor of about 200 ohms maximum. In its central, off, position the relay is unoperated and drawing no current.

Setting-up and Adjusting

Once all the wiring has been completed, the trimmers can be adjusted to the stations desired. The arrangement as described is for a battery set, with only one tuned circuit. If the set has two tuned circuits, a further two pairs of contacts will have to be added to the relay, with another two trimmer condensers. However, the adjustment of the relay and trimmers is very simple.

First set the variable resistance at the remote point to its full value, then throw the key-switch to the position marked "Light" (see circuit) and advance the variable resistor until the relay picks up and turns the set on. Next, with the main tuning condenser at minimum, adjust trimmer (a) to tune to the Light programme. Having done this, the key switch is put to "Home" and the trimmer (b) adjusted to tune in the Home service.

All that has to be done now is to leave the volume control on the set turned to a comfortable level, and remember to leave the dial at minimum wavelength when it is desired to operate the wireless from the remote point.

PARTS LIST

- 1 P.O. type 3,000 relay.
- 1 P.O. type key switch, double locking.
- 1 30 Ω volume control.
- 1 200 Ω volume control.
- 1 Extension speaker with output transformer.
- 2 Trimming condensers, 220 mmfd. (as used in I.F. transformers).
- 1 2 mfd. 250 volt condenser.
- Wire, etc.

NEWS FROM THE CLUBS

Grafton Radio Society

THE above society is being formed at Grafton L.C.C. School, Eburne Road, Holloway, London, N.7 (immediately by Nag's Head junction) and will meet on Thursdays and Fridays, 7.30 p.m.—9.30 p.m. Mr. W. H. C. Jennings, A.M.I.R.E., is instructor and organiser. Amateur transmitting facilities will be provided, and regular weekly morse classes will be held. Radio theory and practical work will be a feature. A section for short-wave listeners will provide excellent opportunity for members engaged in this popular hobby, to "get together." The society is fortunate in having secured first-class premises, and arrangements are being entered into for a canteen to provide light refreshments at cost price. The membership fee is very moderate, namely one shilling per term, or three shillings per annum.

Readers of PRACTICAL WIRELESS may be assured of a sincere welcome. Write to Mr. W. H. C. Jennings, A.M.I.R.E., 82, Craven Park Road, London, N.15.

The Liverpool and District Short-wave Club

MEETINGS are held every Wednesday night at St. Barnabus Hall, Penny Lane, Liverpool, opening at 8 p.m. The morse class is now in full swing with two classes, one for beginners and the other for the more advanced. A survey of conditions on 10 metres has just been completed and a similar survey for 20 metres is in progress at the time of writing. At a recent meeting Mr. Peerless gave a talk on a German army receiver which he has, and on April 3rd C5MQ gave a talk on 5- and 10-metre receivers.

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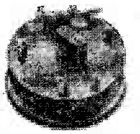

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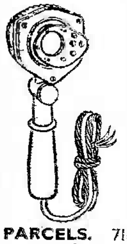

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Programme Pointers

This Month the Works of Liszt and Rimsky-Korsakow are discussed by MAURICE REEVE

TWO works which I recommended for broadcasting revival a few months back, have recently been given: the piano concertos of Liszt and Rimsky-Korsakow. The former's No. 1 was done twice; both are down for further performances in the near future.

Liszt's, once as hackneyed and overdone as Tschaikowsky's now is, caused one to meditate on one of music's most glamorous, fantastic, exotic and bizarre personalities. With Berlioz—who conducted the composer in the first performance of the E flat concerto in 1857—and Paganini, who alone could vie with him in extravagance of poise and personality, he was the prototype of a school that has now passed from the scene.

As a pianist, Liszt is still ranked as the greatest the world has ever known, though we cannot be quite sure how much of this opinion is the worship of his disciples and how much scientific truth. But if great piano playing is to get at the soul of the instrument and veritably to make it talk, then none have ever excelled the great Hungarian. Rubinstein, Tausig, Paderewski, and to-day, Horowitz, form the royal line of succession. Of to-day's pianists, Horowitz is probably the only one to incorporate anything of the Liszt tradition in his playing, so much has style and tuition changed. But as he is so easily the greatest of all living pianists, it does say something for the virtues of that school of playing.

The Works of Liszt

Liszt's career as a concert pianist was a comparatively brief one, and was practically over by the time he reached his middle forties. After that he devoted himself almost entirely to composing, though some of his most brilliant, if superficial, works belong to this period. In spite of the fact that the gold mines of America were not yet working, his career on the concert platforms of Europe was dazzling in the extreme.

Of an astounding personality, with long dark hair growing to well below his collar, and classical features, he knew well how to exploit nature's gifts and play upon the romantic susceptibilities of those exotic, emotional days. He was the first pianist to sit with his profile outlined to the audience. Hitherto, concert artists had invariably sat with their backs turned towards the "house," evidently believing they were best heard and not seen.

Frequently, and more especially in his native land, he would be met at the boundaries of a town where the horses of his carriage would be unharnessed for youths to take their places in the shafts. Maidens would decorate the vehicle with seasonable flowers.

A Wide Range of Work

Few more daring or original spirits have ever worked in music, or influenced generations to come, than Liszt the composer. Bequeathing an enormous output, his work ranges from the sublime to the ridiculous. But forgetting his weaker moments—some of which bordered on the unforgettable and the unforgivable—his best is good indeed. Products of the hothouse and the conservatory rather than the fields and the mountains, they repel some by their very headiness and sensuality. No one till Debussy challenged him as the master of "programme music" in his own sphere. His son-in-law, Wagner, a far greater genius than Liszt though powerfully influenced by him, need not, for our purposes, be considered a rival as the two masters worked in entirely different media.

To name just a few of his major works—the sonata, études, Years of Pilgrimage, Legends, Mazeppa, Mephisto Valse, Totentanz, etc., etc., they are gorgeous feasts of sound and colour, awaking images of far-off scenes and persons which live and breathe as only great music can. Needless to say, they are incomparable piano music.

Liszt was born in 1810 and died in 1886.

Rimsky-Korsakow

As a musician, Rimsky-Korsakow (1844-1908) would have been a very different writer than he was but for his musical ancestry. (By the way, his piano concerto is dedicated "to the memory of Francois Liszt.")

Born of aristocratic parents, young Rimsky's first acquaintance with music was made by fraternising with a four-piece band—two violins, cymbals and a tambourine—which used to play on the estate as well as frequently at his mother's parties and functions. But as the son of an aristocrat he joined the navy, serving in the Imperial Naval College for seven years and not finally leaving the service till 1873.

The decisive event in his musical life was his meeting with Balakirew, the leader of the Russian nationalist school, in 1861. He filled several posts of distinction during his career, as well as numbering many subsequently famous Russian musicians among his pupils.

An even finer and more original craftsman than Tschaikowsky, Rimsky-Korsakow's most famous works include the symphonic poems, Scheherezade, Sadko, Antar; operas, "The Golden Cockerel," "The Snow Maiden," "The Maid of Pskow," "A Night in May," and "Sadko"—in which themes from the symphonic poem are used. All these are now very familiar and well loved by concert goers.

The Influence of Liszt

Although quickly gaining his musical independence owing to his strong individuality and nationalist temperament, Rimsky-Korsakow's early years were greatly influenced by Liszt. Both were masters of descriptive programme music of which Weber and Berlioz, in their different ways, may be said to have been the pioneers with Wagner the chief glory of the century. Strauss, Debussy and Ravel belong to the present age.

The Russian's mastery of tone painting, his command of the orchestral palette, and his gift for luscious melodies and exotic backgrounds, were marvellous. Like Liszt, he was saturated with the folk music and rhythm of his native country and more or less eschewed classical form and traditions. In this trait he was of the school which comprised Moussorgsky, Balakirew and Glinka. Tschaikowsky, on the other hand, was deeply influenced by Mozart, Beethoven and the classic symphonic masters, though he did also resort to folk music and influences in the latter half of his life.

Rimsky-Korsakow's piano concerto, like Liszt's two examples, is a one movement, symphonic poem affair, and not a concerto in the classical form of Mozart and Beethoven. The form was invented by Liszt—evolved might be an apter word. The movements are there, but instead of being separate entities, drawn to a close and with pauses between, as in the classical concerto, they are run into one another, and are fused and fashioned together to form an uninterrupted whole. It is a fascinating form, though almost all subsequent writers, from Brahms to Rachmaninow, have reverted to the classical, separate movement pattern.

A Musician's Reminiscences

Nat. D. Ayer, whose Popular Airs are Frequently Heard on the Radio, Tells of the Birth of One of His Greatest Successes

MANY people are under the impression that my most popular song, "Oh! You Beautiful Doll," was inspired by my wife. Although she is a beautiful woman, the song was not written for her. It was this way. While playing at the Columbia Theatre in St. Louis, Mo., in a very hot July, 1911, I was standing in front of the theatre with my partner, A. Seymour Brown, and the manager of the theatre. The matinee had finished and we were simply chatting and watching the crowd pass by. St. Louis is noted for its attractive women.

As we three were chatting there, one of the St. Louis girls passed by. Brownie remarked: "Say, there's a beautiful doll." I looked at the "doll," mentally agreed with him, then looked at the manager, smiled, then we both looked at Brownie, and we all smiled and immediately went back stage. I got at the piano, Brownie got out his pad of paper and pencil, and between the matinee and evening performance "Oh! You Beautiful Doll" was written.

We all now have heard it. I remember what a devastating success it was at the time. But it wasn't an immediate success for Brownie and myself. Try as we could, we simply could not make a go of it. Here was a song that we both felt was a winner—was there something wrong in its construction? We altered it—tried it one way, then another—then went back to the original. No use, the public simply wouldn't have it—from us, at any rate. Our publisher got it out, but didn't "go after it." One or two acts tried it, but with no success, and soon dropped it from their repertoire. Still, Brown and I insisted that it was a good song. We finally gave it up and resigned it to the wastepaper basket.

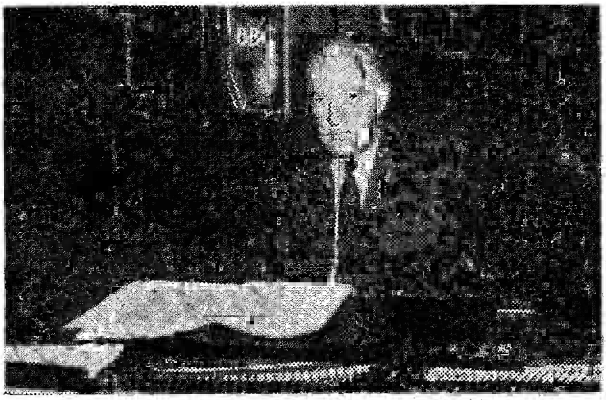
A Year Later

Charles B. Dillingham was putting on a musical comedy at the Globe Theatre, just around the corner from my office at Jerome H. Remick's. A. Baldwin Sloane had written the score and Valeska Suratt was the star. The show was called "The Red Rose." At the Lamb's Club one afternoon "Baldy" Sloane and I were playing pool and were discussing his new show between shots. Baldy asked me if I had any number that might suit Flavia Arcaro. She had made a huge success in the "Chocolate Soldier" and had a glorious voice. No one with a voice like hers had ever sung a song of mine up till then. We stopped the pool game and went over to the theatre. I had sent for Brownie, and there we met Dillingham and his producer.

"Have you got any song we can slide in here as a stop-gap? I have got a four-minute wait between the last two scenes and I can't write or seem to find anything," Baldy said. "Something that might suit Flavia Arcaro," he added.

The mere mention of the name "Flavia Arcaro" was enough to put the wind up me and Brown, and I suggested all sorts of songs, but none was suitable. Finally, out of sheer desperation, I suggested "Beautiful Doll." I will never forget the look on Brownie's face. He half smiled and said "No, no—that's no good for Arcaro." I suppose it was the fact that two partners in song writing started to argue about their wares that made Dillingham interested, for he said, "Well, Nat, let's hear it." I sat down at the piano. Brownie had a fine high baritone voice, but he had become all husky when asked to sing it. If ever I demonstrated a song in my life, I certainly made a mess of it that time. I watched their faces as they listened. A perfect blank came over the three of them. Then, after we had finished a verse and chorus, Brownie stopped and looked at Dillingham. He started to say something when Baldy Sloane interrupted with: "That's a sure winner, Brownie, but it doesn't fit in with the show. It's not in keeping with my score, and besides, how could Arcaro sing it with the chorus? Still, it's the best of the lot, anyhow."

I suddenly felt courageous and jumped up from the piano. "Well, let's try and figure it out. How many girls do you want to use in this number?"



Nat. D. Ayer, the well-known composer, at the keyboard in a B.B.C. studio.

By this time the dance producer had joined in as he volunteered the information: "Twelve—but all show girls."

The Effect of the Legs

Show girls don't dance, and the tune was really a dancing one. Dillingham had by this time walked away, and Baldy said to Brownie and myself, "Well, go ahead, you two, and if you can fix up some business for the number, in it goes. We open in Boston next Monday night, and it's too late to look anywhere else for a song."

"Are the girls here?" I asked. "Yes," Baldy said.

"Well, get them on the stage," I said, and the call boy went off to fetch them. The four of us went into the stalls, sat in the front row and watched the parade come on to the stage. These girls were beautiful, tall and stately as they were in those days, all magnificently dressed—how they did it on their 18 per a week, I don't know—perhaps they all saved their money in those days—and I sent over to Remicks for a pianist and a piano copy of the number.

Miss Arcaro arrived—we discussed the song—Dillingham came down the aisle and sat with us just as the 12 beautiful ladies came to the footlights. One of them rested her foot over the footlights as she bent over to speak to "Charlie" Dillingham. Everyone called him "Charlie." For no reason whatsoever, the electrician threw on the footlight switch and the effect was startling. The lights, shining up from the floor, threw a perfect silhouette of the girl's leg as she stretched across the footlights. I, and Brownie, jumped up—the same thought must have been in both our minds. "Hold it," Brownie yelled. The girl must have thought we were crazy.

With the aid of the electrician, the offices of the dress designer, the dance producer, the girls appeared in the final chorus of the number and straddled the footlights with the result that the extraordinary effect of the light effect on their legs proved a sensation, and the song became a terrific success. As many as 10 encores were taken nightly and the entire success was solely due to the effects worked in this number.

I always insisted that it was a good song, but the "legs" did the trick. After all, why argue the point? If she's a beautiful doll, she MUST have beautiful legs. And, believe me, they WERE beautiful.

The success of the song was phenomenal and Brown and I put it back in our act. We repeated some of the towns where we had used the song before, when it flopped, but this time it was a "riot." It boosted our salary 50 per cent. and "Oh! You Beautiful Doll" became a world-wide success. It went well over a million in sales and I bought my first automobile out of my first royalty cheque for gramophone royalties. I even get royalties from it to-day, and it has been used in many films. Funny how this song sold so many copies when another one of mine, "If you were the Only Girl in the World" didn't seem to sell at all. But there you are—perhaps I should have used the legs.

Prison Camp News Service

Interesting Details of a P.O.W. Radio Installation.

By W. H. CHEEVERS

ONE'S natural desire after the first bewilderment of captivity is to obtain information of what is taking place in the world outside. Naturally, the German supplied us with an abundance of information, especially in 1941 and 1942 during some of their spectacular military successes; however, as Britishers this information was hardly calculated to sustain our morale or give us much hope for the future. Apart from radio broadcasts, newspapers in German and English, by which the Germans hoped to convince us of their invincibility, the only news we could obtain not subject to Nazi control was obtained from foreign workers, particularly Frenchmen whom men from our camp managed to contact during the course of their day's work. Naturally, second or third hand and contaminated with rumour as this source of news was bound to be, it was difficult to gather a true impression of what was really happening outside our small barbed wire compound, although our whole future and perhaps our very existence depended upon the result of those gigantic happenings.

This innocuous-looking cleaning pail was all the German guards could see. But it housed the prisoners' radio—as shown on the next page.

Several of us therefore decided that for the benefit of ourselves and the camp as a whole some means must be found whereby we could supply the whole camp with frequent and accurate accounts of the war news.

We then made efforts to obtain radio parts or at the best a complete radio.

This necessarily entailed long and arduous enquiries as to making the correct contacts and in what manner we should pay for the obvious risks that had to be taken. After some time we managed to contact one of the Frenchmen who came into the camp to remove the refuse two or three times during the week. He, in turn, was able to make contact with one of his fellow countrymen who was working in a radio manufacturer's. All these arrangements had, of course, to be made with the utmost care, as any intercourse between French and English was strictly forbidden and the Germans enforced this rule with guards.

About this time, September, 1942, inflation was already beginning to grow rapidly and foreign workers, together with the German population, were unwilling to accept the mark in exchange for even ordinary commonplace articles such as razor blades, which they sometimes obtained for working parties with whom they came in contact.

Valves and 'Phones

About four weeks after making this arrangement with the Frenchman he managed to smuggle into the camp two radio valves and a pair of headphones for which we paid 5,000 cigarettes which we had received in parcels from home. Having spent all our available resources, we attempted to construct a makeshift radio by using electric light lamps as resistances, and condensers made out of silver paper.

All this work, of course, had to be conducted with the utmost secrecy, as the Germans frequently searched the camp and anyone in possession of forbidden articles was severely punished.

As luck would have it, however, we finally completed our receiver without being discovered and made ready for a first try-out about 2 a.m. on a day early in September, 1942. The whole affair looked rather weird and was difficult to recognise as a radio. Those of us who were there were wishfully optimistic and just before 2 a.m. we managed to get the set to operate. After many crackles and general background noise we at last picked up a weak signal on which bagpipes were playing. This was followed in a few minutes by the news in English from London.

Imagine our joy to hear of the great successes of Stalingrad and the Desert after having been subject to enemy propaganda in all forms for nearly two years. Our morale rose over-night and next day we could barely control ourselves from shouting the good news to our comrades.

Underground Listening Room

Good as all this was, however, the German searches were becoming an increasing menace and we had already undergone one or two lucky escapes. We therefore worked on a plan whereby we could operate the receiver without fear of discovery.

This plan involved digging an underground room in one of the buildings—an old stable in which we were accommodated. We decided that everything must be completed in 24 hours. We commenced work at 5 p.m. and quickly removed the brick floor by means of metal brackets taken off our bunks, with the aid of fire shovels and working in half-hour shifts, we dug a shaft 12ft. deep sufficiently wide for a man to enter. We then struck out horizontally, all the earth being removed by the rather primitive method of a bucket attached to a piece of string. We finally, by 10 a.m. next morning, had dug out a room 8ft. long by 4ft. wide by 6ft. high, the ceiling being 4 to 5ft. thick.

Our next job was to remove the earth which we had piled up in the room, without being detected by the German sentries. We accomplished this by filling empty Red Cross boxes and distributing the contents over the gardens and loose patches of earth that existed in various parts of the camp. All was cleared by 4 p.m.

The bricks were then set back around the hole, and a small trap into which bricks were set was made to fit over the top of the shaft itself; by brushing the loose dust over it, its outline could not be detected by the naked eye. By carefully pulling out a wooden lath of which the wall was constructed, we were able to run our electric power cable behind it down into the underground room.

Printed News Bulletins

Everything was now working fine, and we were able to make copies of two news bulletins each day. These were distributed among the various companies into which the camp was divided, signed for and returned. They were then destroyed for security reasons. Somebody had a bright idea to save laboriously copying out each bulletin several times. They obtained two or three jellies via Red Cross parcels, melted them and poured the contents into a tray—thus forming an ideal duplicating pad, which in the harder times we were greatly tempted to eat.

All this time the morale of the camp was steadily maintained, and German propaganda was countered and ridiculed. The battles of Africa and Russia were followed with intense interest, and great enthusiasm at the results that ensued.

Later, about August, 1943, the German morale had already commenced to crumble, and it became far easier to obtain forbidden articles than had previously been the case. We managed to obtain a second complete midget receiver and the accompanying illustrations (cameras were also, of course, strictly forbidden) indicate the manner of hiding it from German searches. I think that the best use to which the radio was ever put as far as we were concerned was during the last month of the war.

After the Allies crossed the Rhine, the Germans decided to move our complete camp south of the Danube into Austria. About 5,000 were marched away, the remaining 800 being either too sick to march or having hidden themselves while the others were being marched away. Three of us had concealed ourselves in the roof and hearing many rumours as to Gestapo searches, setting fire to the building, and machine-gunning the roof, we were anxious as to our future. Fortunately, we had already taken the precaution of extending the electric power to our hiding-place and so were able to have our radio in operation.

This shows how the prisoners had doctored the cleaning pail so that they could hide their radio.

Anxiously we listened to each bulletin to see how near the liberating forces were getting. On the morning after the 5,000 had been marched away, we heard that the Americans had taken Nuremburg, only 40 miles distant. American fighter 'planes were already operating in our area, and we could also hear the heavy artillery. It was, I think, our happiest hour—the materialisation of years of waiting.

B.B.C. Television Service

It is now officially announced that the Television Service will be resumed on June 7th. This date was given officially by Sir Noel Ashbridge at a luncheon in London recently, when it was also announced that the programmes would be almost on the same lines as those obtaining when the service was suspended due to the war. There will be a programme in the afternoon from 3 until 4.30 approximately, and in the evening from 8.30 till 10. These will be essentially television programmes, or items in the normal sound programmes which are suitable for television. In addition to these there will be special broadcasts from time to time, such as the Victory Parade on the morning of June 8th. All the O.B. equipment is being reconditioned and important national events will be broadcast wherever possible.

It was announced at the same time that developments will proceed, both in the technique of broadcasting the television programmes, and in the general technique of television. But it was emphasised by Sir Noel that if any drastic improvement should take place, the programmes will be televised on the existing system at the same time, so that anyone possessing a television receiver will not be in the position of having to dispose of it in order to get a new set so as to see the programmes. New television receivers will not be generally available until the early autumn, so that the programmes will only be available to those with pre-war sets or home-made equipment.

Provincial centres will not have the benefit of local programmes until some time, although it should be remembered that although television is supposed to have only optical range, good results were received before the war at Manchester and Brighton, to mention only two places. The official normal reception area, that is the area over which guaranteed reception is obtainable, is roughly within a radius of 30 to 50 miles of the transmitter, which is situated at Alexandra Palace, in North London.

Impressions on the Wax

Review of the Latest Gramophone Records

WITHOUT wishing to add any fuel to the ever-smouldering fire of dissension, which bursts forth far too often into a fiery and heated argument, about swing *v.* dance *v.* light *v.* classical music, I had intended to try and satisfy some of the requests I receive, by giving more space to the dance and lighter works this month. However, as so often happens with many good intentions, unexpected factors suddenly arise which force ideas and plans to be modified. Perhaps next month swing and dance enthusiasts will be more fortunate, but this month—well, it is simply a matter of the releases available and the classical section have the lead.

I cannot agree with some correspondents, that the releases by the various record companies should be viewed in the same light as compiling a programme. Admitted that one could build up a very satisfactory entertainment from the general releases, which would include something for all tastes, but I do not think that that could possibly be the policy of the record companies when preparing their monthly lists. They certainly endeavour to satisfy everybody, and, personally, I think they have made a wonderful job of it, especially during the years of war, when production problems must have been a severe headache for all concerned. I think it is reasonable to suggest that the type of records released is a very good indication of public demand or, in other words, musical views, and I should not be a bit surprised to see the classical releases gradually increase in proportion to the dance records. For example, this month I have before me thirteen 12in. and two 10in. records which would certainly come under the heading of classical, against two 10in., one of which is light, and the other very light. This may, of course, be an exception, but it will be interesting to see what happens in the months to come, especially now that Purchase Tax is to be reduced from 100 per cent. to 33⅓ per cent. on records.

H.M.V.

SERGE KOUSSEVITZKY and the Boston Symphony Orchestra offer a first-class performance of Richard Strauss's "Till Eulenspiegels Lustige Streiche" (Till's Merry Pranks), Op. 28. This has been recorded in four parts on *H.M.V. DB*6268-69, and I strongly recommend it for your hearing. It is a delightful work, considerably enhanced by the fine performance of those concerned, and, incidentally, the recording technicians.

In the H.M.V. 10in. Red Labels, I suggest *DA*1854 to all who appreciate the true beauties of Elisabeth Schumann's technique and charming soprano voice. She is accompanied by Gerald Moore on the piano, and the two pieces she has selected this month are "Das Veilchen" (The Violet), K.476 (Goethe-Mozart) and "Dass Sie Hier Gewesen" (That She Has Been Here), Op. 59, No. 2 (Ruckert-Schubert).

Another first-class vocal, this time by a tenor of exceptional quality, is to be heard on *H.M.V. DA*1837. The titles are "Di Tu Se Fedele, Il Flutto In Aspetta" (Declare if to meet Storm or Calm) from the first act of Verdi's opera "Un Ballo in Maschera," and the ever-popular "Questa O Quella" (The One is as Fair as the Other) from Act 1 of Verdi's "Rigoletto." These are sung in Italian by Jussi Bjorling, accompanied by orchestra conducted by Nils Grevillius. As one would expect, the performance is of a high standard, and the recording should meet with wide approval from every lover of a tenor voice possessing such fine qualities combined with perfect expression and control.

My weakness for pianoforte solos is well satisfied this month, and I do not think I shall be alone in this respect. There are two good records, one in the H.M.V. list, and the other in the Columbia. The former is on *H.M.V. C*3485, and it is of two recordings by none other than that great artist Benno Moiseiwitsch. He has selected "Clair de Lune" (Moonlight) (No. 3 from "Suite Bergamasque"), by Debussy, and Chopin's "Polonaise No. 9 in B Flat," Op. 71, No. 2. His superb performance needs no comment from me, other than my strong recommendation to all lovers of pianoforte music to make a point of hearing it, and that also goes for the one in the Columbia list which is mentioned below.

Joan Hammond—soprano—records two works from Verdi's "Traviata," on *H.M.V. C*3486. "Oh Folly, Oh Folly" (Sempre Libera) is from Act 1, as is her second piece, "How Wondrous, How Wondrous" (Ah Fors' è lui). She is accompanied by the Philharmonia Orchestra, under the baton of Walter Susskind. Two most pleasing recordings.

Denis Noble—baritone—has some fine material, which he utilises to the full, in "The Yeomen of England", from "Merrie England" (Hood—German). There is something very stirring about this song, especially when it is sung with the understanding, expression and quality which Denis Noble does provide. The support of the Light Opera Chorus and the Light Opera Orchestra make the whole performance delightful. On the other side of the record Gladys Ripley, with the above-mentioned supporting cast, gives a rich contralto rendering of "O Peaceful England," thus making *H.M.V. C*3490 a most pleasing record which should be included in the vocal section of your record library.

On *H.M.V. B*9463 Jean Cavall—with orchestra—has made a nice recording of those two popular numbers "The Kiss of Romance" and "Chez Moi," both being sung in French and English.

Turner Layton, on *H.M.V. FB*3201, has selected two current film features, namely, "I'm Always Chasing Rainbows" from the "Dolly Sisters," and "The Bells of St. Mary's" from the film of the same name. As usual, Layton puts these numbers over in his own particularly pleasing style.

Columbia

THE first five 12in. Columbias form an outstanding recording by the Philharmonic Symphony Orchestra of New York, conducted by Artur Rodzinski, of Wagner's great work "Tristan and Isolde." The records consist of 10 parts—*Columbia LX*941-45—and the recording is arranged in the following manner: Parts 1, 2 and 3 "Prelude," Part 4 "Isolde's Narrative" (Act 1, Scene 3), which is continued on Parts 5 and 6. These three parts cover "Erfuhrst du meine Schmach," "Die Morold schlug, die Wunde" and "O Blinde Augen." Parts 7 and 8 are the "Prelude" to Act 3, while Parts 9 and 10 record "Liebestod" (Isolde's Love Death), Act 3, Scene 4 (a) "Mild und leise wie er lachett," and (b) "Hore ich nur diese Weise?" The singer is Helen Traubel—soprano—who gives, in German, a brilliant performance of a work which calls for thorough understanding of the material and a technique of no mean order. From Wagner let us turn to something a shade or two lighter, and in this mood I found the "Italian Serenade" (two parts) a delightful change and most pleasing listening. It is recorded on *Columbia DX*1236, by the Philharmonia Orchestra, conducted by Walter Susskind. It consists of works by Hugo Wolf edited by Reger, and provides ample scope for some splendid work by Max Gilbert—viola—a delightful instrument in such capable hands. Louis Kentner—piano—has two recordings this month on *Columbia DX* 1237. They are "Mazurka No. 6 in A Flat" and "Reverie," both being compositions by Balakirev. These recordings provide another example of the skill of this outstanding artist, and, personally, I obtain great pleasure in listening to his flawless performances.

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).

A Reader's Suggestion

SIR,—I was interested in Mr. C. J. Borwell's letter in the April issue of PRACTICAL WIRELESS, and I heartily approve his suggestion for a short (or possibly full) list of published features to be inserted in each issue of the magazine.

I should also like to point out that I am in complete agreement with Thermion's remarks re the price of wireless and television licences, and I think your correspondent Mr. K. T. Hardman is talking through a very large hole in the crown of his hat when he brings up his "cart before the horse" arguments to support his views. His attempts to turn the correspondence page into a political forum is not, to my mind, very pleasant reading.—S. A. KNIGHT (Wellingboro').

An Amateur's Progress

SIR,—I am an ardent radio enthusiast, and I think my progress may be of interest to other readers.

About six years ago I started making crystal sets, which I did until I was about 13, when I began to make valve sets. Since then I have made many battery and mains sets.

Some of my "milestones" include a five-valve superhet portable using 1.4 v. valves; a three-valve signal generator, and a ten-valve mains superhet radiogram, all of which are my own design.

The radiogram operates on short and medium waves, and on short waves I have logged at good strength Switzerland, Australia, Turkey, Bulgaria, Brazzaville, Moscow, India, 10 American stations, Lublin, France, Spain, Sweden and Canada, and many others. I have had a secondary school education, and was best with mathematics. I am nearly 17.

In spite of the above I am unable to get any suitable employment, only factory work available; in fact, I find my knowledge and education a disadvantage, as nobody seems to want it.—A. R. CALTHORPE (St. Albans).

Programmes from Australia

SIR,—I would like to make a few additions and corrections to my last list of Melbourne stations. I have received the following stations one time or another:

08.20—VLC8, beamed to British Isles, 41.2 m.; 09.00—VLC6 (31.2), VLA6 (19.74), VLG3 (25.62), Pacific service; 12.30—VLC6, (31.2), Asiatic service; 14.00—VLC6 (31.2), VLC8 (41.2), Asiatic service; 14.15—VLG, 31.32, Asiatic service (here I would like to inform Mr. R. Aldridge, of Amersham, that the station on 30.99 m. is VLA3, not VLG, although they both carry the same programme at 15.15); 14.35—VLC6 (31.2), VLG (31.32), VLA (till 14.45) (41.18), 15.15—VLA3 (30.99), VLG (31.32), VLC8 (41.2), British Isles Beam; 16.00—VLC6 (31.2), VLG4 (25.4 (?)), doubtful—very faint, American beam.

VLR3 on 25.25 m. used to carry the Asiatic beam at 14.00, but I have not heard it lately. I apologise for referring to it incorrectly as VLA3 in a previous letter, and to VLA on 41.18 m. as VL14.

I would very much like to know whether any of your readers have heard the experimental transmission of the beam to Britain at 08.20-08.50 on VLC9, 16.82 m., which was tried on March 4-8th inclusive. I received it R6, slow but not deep fading, and no flutter.

On January 14th VLC6 and VLR3 at 14.00 were much above average strength on the Asiatic beam. I believe this was due to sunspot activity, as was VLC6, about R8-9 on November 4th.—M. PANTIN (Marlboro').

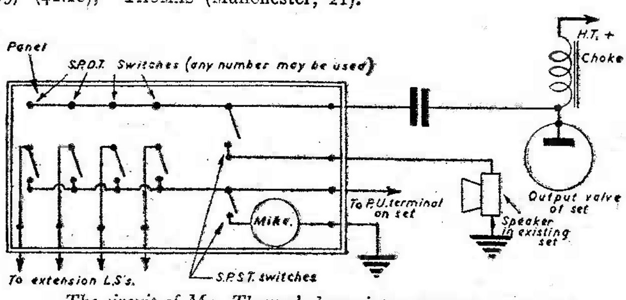
SIR,—The following is a schedule of English programmes from Australia, which may be of interest to some of your readers. I can't say whether they are receivable in this country or not, as I have only just returned from Egypt, but I have logged them all out there. The Department of Information, Melbourne, gives the times as follows. All times G.M.T.

21.15-23.00 and 02.00-05.00 on 15.2 mc/s.; 02.00-04.00 on 15.23 and 15.315 mc/s.; 07.00-07.30 on 15.2 and 11.88 mc/s.; 14.00-14.30 and 14.45-15.00 on 9.615, 9.58 and 7.28 mc/s.; 15.15-15.45 on 11.88, 9.68 and 7.28 mc/s.

Some of the above are beamed to the Pacific, but might be receivable over here. Anyone wanting fuller information should write to the following address: Department of Information, Short Wave Division, 375, Collins Street, Melbourne, C1, Australia. I hope the above times will be of interest to some of your readers.—F. JARVIS (Mirfield).

Home Inter-comm.

SIR,—I read with interest the communication system described by N. D. Ford in PRACTICAL WIRELESS (August, 1945), and thought that some readers might be interested in the system that I have had in use for some time which has given no trouble. As shown, it consists of a number of single-pole double-throw switches, 2 S.P.S.T. switches, and a mike or single headphone (I actually used the latter). These are connected up as shown, on a small panel. Single bell wire was then run from the panel to each external speaker, the other wire from the speaker was then taken to the nearest earth point, such as a water-pipe, etc. Three leads were run to the wireless set itself, as shown. It is important to note, however, that the set must have choke-capacity output; if not, a choke and condenser should be connected across the present speaker terminals on the set, as shown, the actual speaker itself being transferred to the panel. The method of operation is the same as N. D. Ford's. This system has a number of advantages, only about half the quantity of wire is required, which is quite a saving financially; likewise, only S.P. switches are required, which I found easier to obtain than D.P.; I actually used aerial switches. Of course, if the set has not got choke-capacity output, this will increase the cost, but my particular set had this form of output.—PAUL A. V. THOMAS (Manchester, 21).



The circuit of Mr. Thomas's home inter-comm. arrangement.

Component Values

SIR,—I would like to endorse Mr. Borwell's remarks (" Open to Discussion, April, 1946) concerning the values of L., R. and C. in formulæ.

Take the simplest case : Ohms Law $R=\frac{E}{I}$. For most radio circuits I is in milliamps ; therefore the formula becomes $R=\frac{1{,}000E}{I}$ where R is in ohms, E in volts, and I in milliamps. Another case : the reactance of a condenser is $\frac{1}{2\pi F.C.}$ C is obviously in farads, although few writers state this. $\pi = 3.1415926535$ correct to 10 places of decimals.

A great help in giving the values of components in circuits would be to (1) give the D.C. voltage working of the condenser ; (2) give the wattage of resistances, and (3) give the makers of the valves.

A tip that may interest some readers : When measuring the output of a power pack with a high-resistance meter, the peak volts will be indicated. Therefore, to find the true output or R.M.S. value, divide the peak voltage by 707.

The tester for centring L.S. cones described by Mr. Potts (" Practical Hints," P.W., February, 1946) can be used as an insulation tester, but use insulated test-prods, otherwise the operator will release his hold with considerable rapidity.—P. Foster (Southall).

R.1155—R.A.F. Communications Receiver

SIR,—It has come to my notice that several of your readers are purchasing the above receiver, which is sold as a 10-valve receiver. This is not strictly true, as three of the valves are only used in the electronic D./F. system of the set, viz., V.1, V.2, and V.9, and they can be removed entirely from the receiver without in any way impairing the reception of radio signals. It is quickly and easily adaptable for working from A.C. mains from an external power unit, the whole, plus loudspeaker leads and aerial, being fed in through the extreme right-hand socket marked " From Transmitter," the other two sockets being entirely discarded.

If, through the medium of your columns, this will assist any of your readers, I have full data available, and would assist anyone having difficulty.—G. Fryer Tuck, 12, Glendevon Gardens, Murrayfield, Edinburgh, 12.

Increased Licence Fee

SIR,—After reading Thermion's arguments in favour of the proposed increase I agree that he has made out a strong case, but in justification of the contrary opinion I expressed in a recent issue I would like to say that it is not so much what we will have to pay that I object to, but what we are likely to get for it. I fear that, in spite of the increase, the programmes will show little if any improvement, and that the additional £5,000,000 which the 20s. fee will produce will not be expended on much improved programmes but in increased " rake-offs " for the Post Office and National Exchequer, and for the salaries of the present unduly large B.B.C. staffs. If all these expenditures can be drastically cut down and the B.B.C. give us better but fewer broadcasts, and by well-known and popular artists in place of so many tenth-rate " discoveries " and adenoidal crooners, I don't think many licence-holders would object to the increase.

In reference to Mr. Reginald J. G. Dutton's letter on International Radio Language, he fails to realise how almost universal the English language has already become, and the rate at which its general use is progressing. There are few countries where it is not made use of for trade and commerce, and this fact alone is sufficient to assure it becoming the best and most useful radio language, and it is by reason of this fact that the English language is included in the school curriculums of so many other countries already. So, with all respect to Mr. Dutton, I still think that there is little if any need for an artificially created radio language.—K. T. Hardman (Birkenhead).

Service v. Civilian Mechs.

SIR,—I have been a reader of Practical Wireless for some time prior to being posted overseas, and still take the opportunity to read it when I can get hold of a copy.

I have just been reading the August, 1945, issue, and note that the discussion on Service radio mechs. versus Civilian radio mechs. is/was still going on. There are one or two comments I should like to make with reference to your footnote of J. P. Coyle's letter.

Primarily, I think your comments were rather too generalised ; there are Servicemen, I admit, who would be lost when it came to servicing a commercial receiver, but, on the other hand, there are a goodly number who would turn out a satisfactory job.

I don't propose to deal with that aspect as I consider that that argument has gone on quite long enough and the subject should be closed, but rather with your statements that Servicemen do not know much about radio and that they are unskilled persons.

It would be rather interesting to know what your conception of a short course is, if it is between nine and twelve months I will agree with you. The first five or six months of this course is devoted entirely to basic radio theory, which, I think you will agree, is applicable to all types of radio equipment. I wonder how many civilian radio men have taken the equivalent of such a course. The latter part of the course is spent on gaining knowledge on the various types of equipment we are likely to come up against.

Admittedly, this only gives us the theoretical side and the majority of personnel passing out from such a course have no illusions as to their ability to successfully service radio receivers and transmitters. This ability is only gained later when they are posted to units and gain experience in their various sections working under experienced personnel.

As to your statement that unskilled persons are permitted to carry out Service servicing, this hardly bears out the reputation Service mechanics have built up during the war for keeping equipment serviceable under all conditions. Surely such people must have a knowledge of what they are doing ?

Next we have " The average Serviceman might be 'lost' with a commercial receiver of different layout, but employing the same circuit as a Service receiver." If this were true then a Serviceman would be equally lost on a Service receiver of a different layout, and I can assure you this is not the case. The occasion often arises when a radar mechanic is confronted with a piece of equipment he has never seen before, but with the aid of a circuit diagram this *very unskilled person* (?) always manages to get to the root of the trouble.—W. Percival (R.A.F., India).

The " Economy DX3 "

SIR,—I have recently constructed the " Economy DX3," and have had very good results. I built the set on a metal chassis and inserted an Osram kT2 for output.

Some of the stations that I have received on it are : CHOL, 25.60 ; PRL8, 25.60 ; CKLO, 31.15 ; LRY, 31.12 ; EAQ, 32.20 ; TAP, 31.70 ; VLA3, 30.99 ; ULG, 31.32 ; WOOW, etc. ; TPB24, 25.62 ; CNR, 33.00 ; LKJ, 31.45 ; SBP, 25.63 ; HVJ, 31.06 ; ICDJ, 31 ; YUA, 48.60 ; SUW, 24 ; SUV, 31 ; JHKD, OPL, 30.66 ; FZI, 25.06 ; VUM, 31 ; also Sofia, Algiers, Prague, Warsaw, Milan, Andorra, Moscow, Athens, ZXY8, 31.23 ; YV4RQ, 86.21 ; YUSRD, 90.91 ; all wavelengths are in metres.

So far I have received a QSL from TAP, Ankara, and a letter-veri from CNR, Rabat. I have also received 115 home stations, many of which were in South America.

I must take this opportunity of congratulating you on a very fine paper.—John A. Lambert, B.S.W.L. 2125 (Catford).

CLASSIFIED ADVERTISEMENTS

LITERATURE, MAPS, etc.

RADIO SOCIETY OF GREAT BRITAIN invites all keen experimenters to apply for membership. Current issue "R.S.G.B. Bulletin" and details, 1/- below.

AMATEUR RADIO HANDBOOK (300 pages), paper cover, 4/- ; cloth, 6/6. Radio Handbook Supplement (140 pages), paper cover, 2/9 ; cloth, 5/-.—R.S.G.B., 28-30, Little Russell Street, London, W.C.1.

BRITISH SHORT-WAVE LEAGUE.—S.A.E. for membership details and sample "Review." "Amateur Radio Simply Explained," 1/6 post free. Write NOW to H.Q., 17, Bedford Road, London, N.22.

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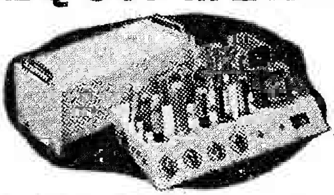

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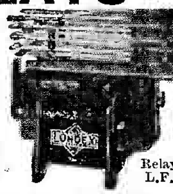

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