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EDITORIAL COMMENT

Inter-Nation Broadcasts

Undesirable at This Time

SUGGESTIONS have recently been put forward that now is the time to utilise broadcasting in Europe to create a better understanding between nations by means of broadcasts from England in various Continental languages. If Britain, it is suggested, were to use the microphone to make statements of Britain's policy in the present European entanglements, much could be done to clear the air and remove suspicion from the mind of the general public in Continental countries.

We have ourselves put forward from time to time a plea that there should be more frequent exchanges of broadcast talks translated into various languages, but we have at the same time made it clear that in our view broadcasts of a political nature should not be encouraged.

What Is Propaganda?

The matter can really be brought down to a simple basis. If the talks are propaganda of a political character they should be banned. If they are an exchange of ideas intended to acquaint nations of each other's point of view, then they might prove very helpful. But the difficulty is that almost any talk of this kind made in Europe at the present time would be regarded by some nationals as in the nature of propaganda.

The League of Nations might be justified in using the microphone for the purpose of putting the League's point of view to various nations in their respective languages, but here again resentment would be bound to be expressed by those countries not in sympathy with the policy of the League. It seems far wiser to keep broadcasting out of the picture so long as a censorship of foreign views is exercised in any country.

If such talks had taken place in normal times much good might have come of it, but to introduce them now, when feelings run high, could not fail to aggravate the situation.

The B.B.C. has acted wisely in closing the microphone to such uses during the present period of international difficulty.

The Variable Selectivity IV.

A Receiver of Unusual Merit

THE aim of every educated listener is to receive broadcasting with quality as near to the original as possible.

Circumstances familiar to all of us, and beyond the control of the receiver designer, make it physically impossible for us to receive programmes with good top reproduction without interference, except on very strong stations. It is possible to try to compromise with a good average of selectivity, but this will still let in interference in the case of weak stations and will yet limit the quality on strong local transmitters.

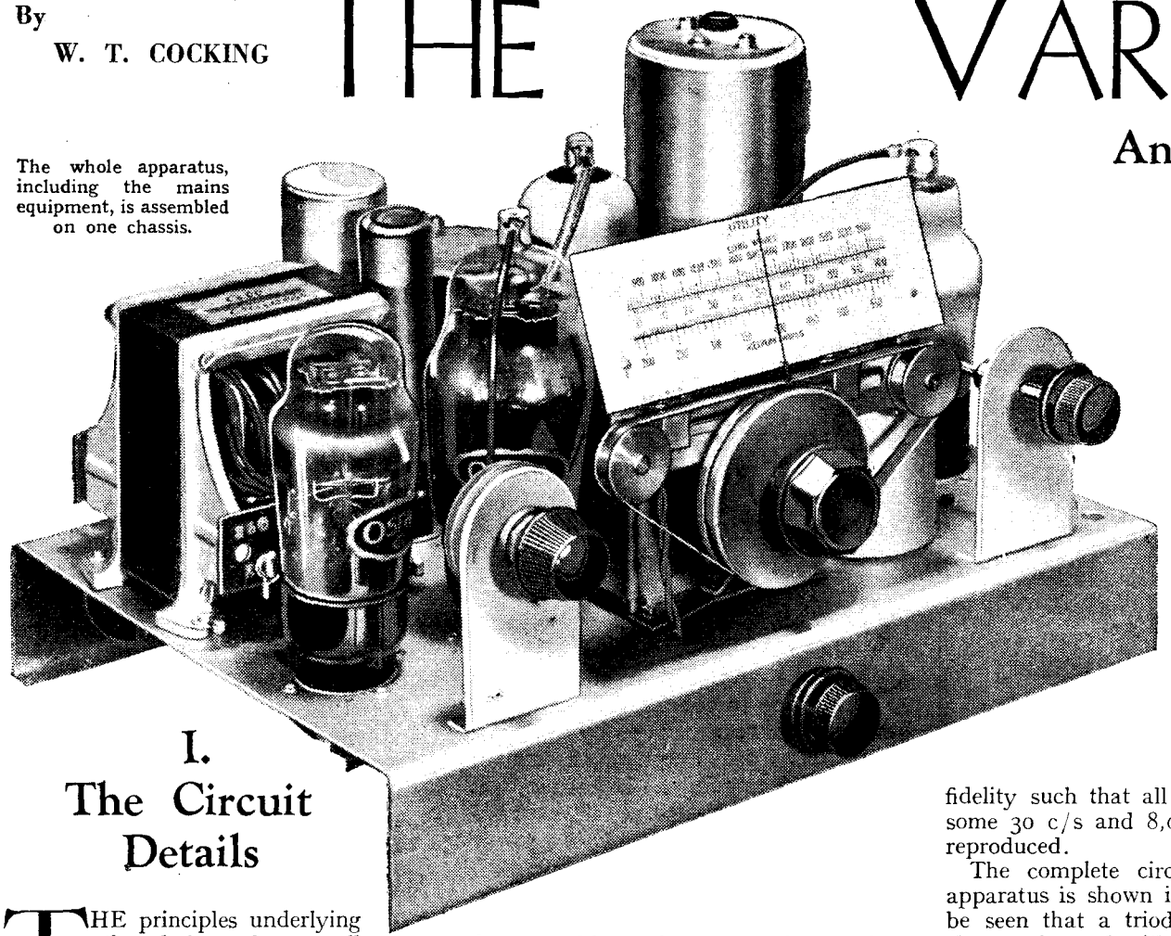
Variable selectivity seems at present to be the only solution to an unsatisfactory compromise.

In the receiver described for construction in this issue variable selectivity has been incorporated in a three-valve superheterodyne with most efficient results. The receiver is, moreover, inexpensive for so high a performance as it gives, and we commend this design to our readers with every confidence that they will find its efficiency, both in sensitivity and quality, outstanding. The variable selectivity enables a degree of quality reproduction on the local station to be obtained which is really remarkable and the receiver is essentially easy to construct.

By W. T. COCKING

THE VARIABLE-

An Inexpensive Six-stage Superhet



The whole apparatus, including the mains equipment, is assembled on one chassis.

I. The Circuit Details

THE principles underlying the design of a small superheterodyne were discussed in last week's issue of *The Wireless World*, and it was shown that by careful design a very high standard of performance can be obtained with no more than three receiving valves. These valves perform the functions of first detector, oscillator, IF amplifier, second detector, AVC rectifier, and output pentode, and these without any attempt at reflexing. Although even greater amplification could be secured by such means, it has not been attempted in this case, for experience with reflex circuits shows them to be somewhat unreliable and subject to unexpected variation with quite small changes in circuit constants. That the performance obtainable without such means is adequate for general reception, including both local and distant, is well brought out by the curves which accompanied the article already referred to. An average sensitivity of about 150 μV. with a degree of selectivity capable of discriminating against the adjacent channel by some 400 times represents a very high performance for a small superheterodyne. It is the more outstanding when it is coupled with a degree of fidelity such that all frequencies between some 30 c/s and 8,000 c/s can be well reproduced.

The complete circuit diagram of the apparatus is shown in Fig. 1, and it will be seen that a triode-hexode frequency-changer is used with an HF pentode for the IF amplifier. A duo-diode-output pentode provides detection and AVC, as well as feeding the loud speaker, and the HT supply is obtained with aid of an indirectly heated full-wave rectifier. Only a single signal-frequency tuned circuit is used, and, with the special system of aerial coupling which has been embodied, this has been found to give freedom from second-channel interference and much greater efficiency than the more conven-

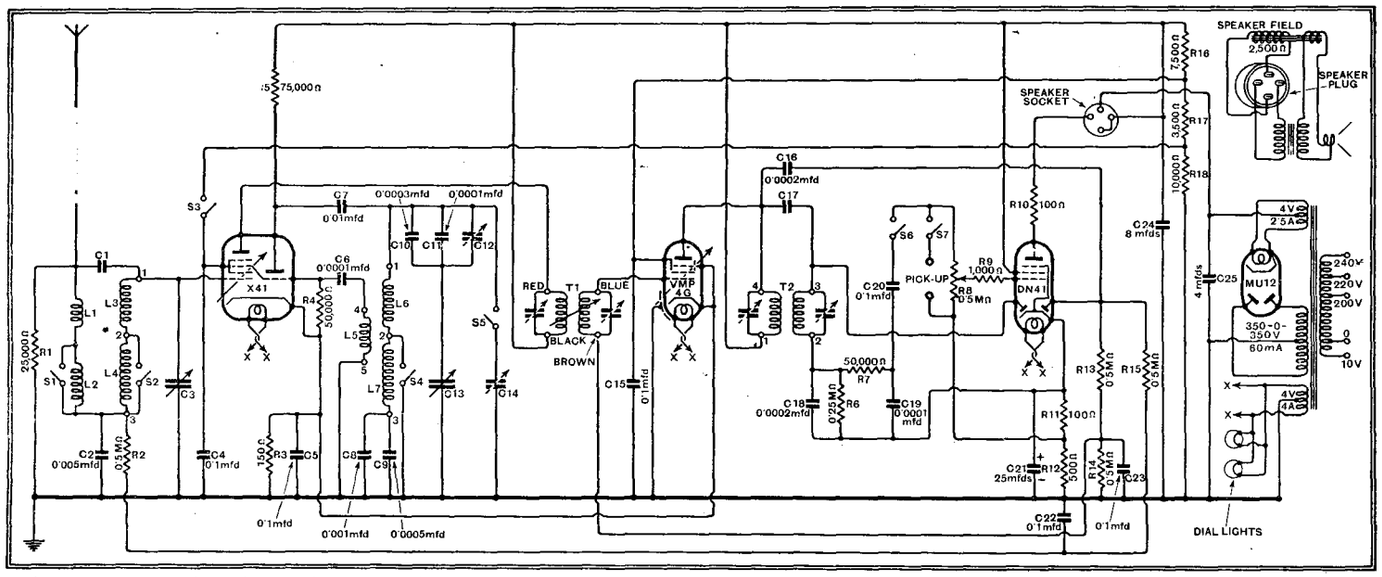


Fig. 1.—The complete circuit diagram of the new receiver shows the novel aerial coupling system. The aerial circuit as a whole is roughly tuned by L1 and L2 and is coupled to the tuned circuit by C1 and C2.

SELECTIVITY IV.

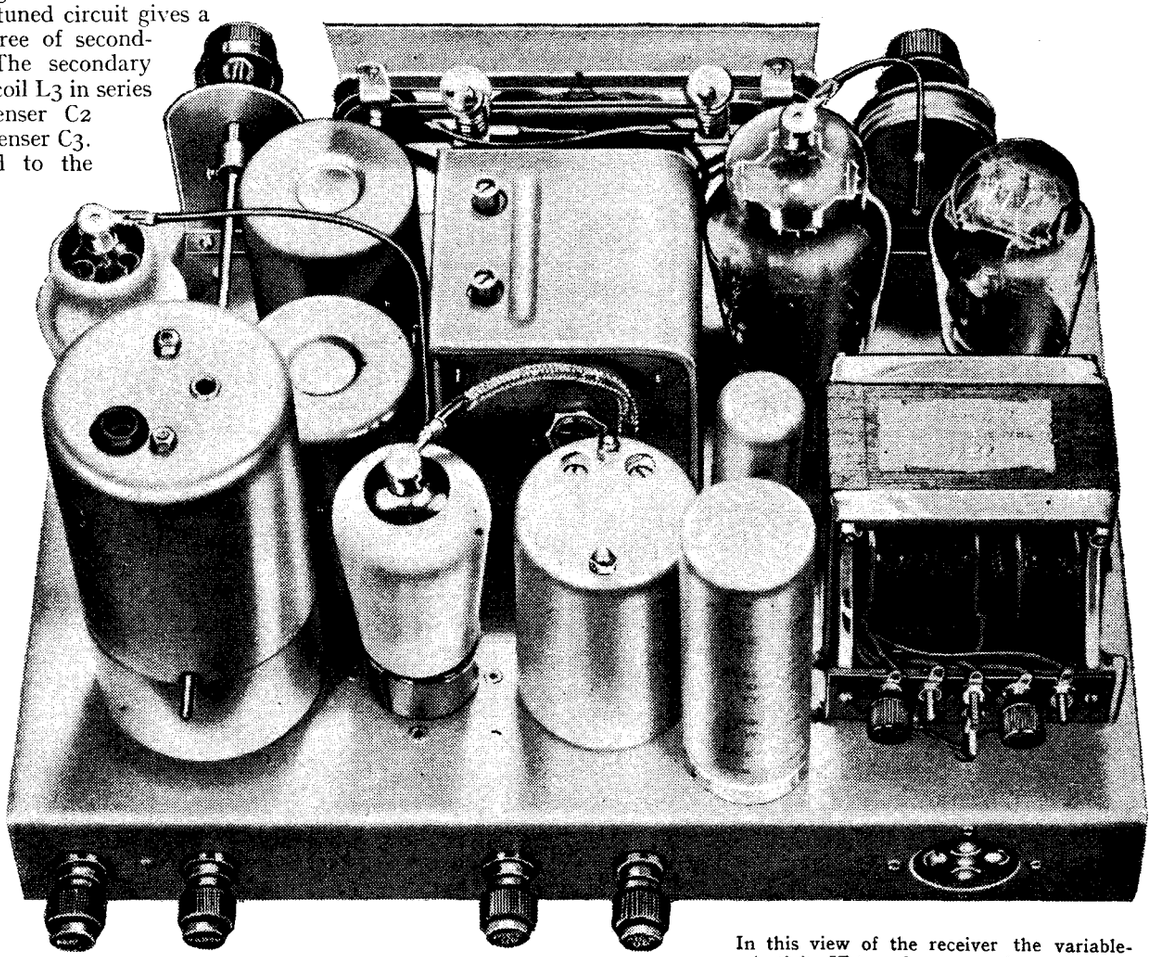
THE small superheterodyne is particularly suited to the needs of the average listener, for it can provide ample sensitivity and selectivity for distant reception, while the inclusion of variable selectivity enables a high standard of reproduction to be obtained for local reception. The performance of the receiver described in this article is exceptionally high, but the total cost of the parts necessary for its construction, including all valves, loud speaker and cabinet, is only some twelve pounds five shillings

tional pair of tuned circuits, coupled in the form of a band-pass filter.

The aerial circuit consists, in fact, of a pair of coupled circuits, but only one is variably tuned. On the medium waveband the switches S1 and S2 are closed, and the primary circuit consists of L1 and C2 in series with the inductance and capacity of the aerial itself. The constants are so chosen that resonance is secured towards the middle of the medium waveband, but an excessive response is prevented by the 25,000 ohms damping resistance R1. A good response over the whole waveband is thus secured; it is greatest in the middle and falls gradually towards the ends of the band. Outside the waveband the response falls, and as this coincides with the range of second-channel frequencies this fixed tuned circuit gives a very appreciable degree of second-channel rejection. The secondary circuit consists of the coil L3 in series with the fixed condenser C2 and the variable condenser C3. This circuit is tuned to the frequency of the wanted station and is responsible for the greater part of the second-channel rejection. It is coupled to the primary in two ways; first by the condenser C2, which is common to both circuits, and secondly by the "top-end" capacity C1. C2 has a value of 0.005 mfd., and as its reactance increases at low frequencies it gives greater coupling at the low frequency end of the waveband than at the high. The effect of the top-end capacity C1 is just the opposite, and this gives greater coupling at high frequencies than at low. The combination of the two couplings consequently tends to produce constant coupling throughout the waveband. Actually, of course, the coupling is not exactly constant, but it is much more nearly so than if any form of single coupling were used. The condenser C1 is of very small capacity, and is not a component in the accepted sense of the word, but is obtained in the wiring by the juxtaposition of certain leads.

On the long waveband the switches S1 and S2 are open, and the primary inductance is augmented by L2 to such a value that resonance now occurs in the middle of the long waveband. Similarly, the secondary inductance is increased by L4. No change in the values of the coupling components has been found necessary, however.

Turning now to the oscillator circuit, the triode section of the triode-hexode is used for generating the local oscillations. The tuned circuit is included in the anode circuit of the valve and is shunt-fed by means of the 75,000 ohms resistance R5 and the 0.01 mfd. condenser C7. On the medium waveband S4 is closed and S5 open so that the inductance is L6 alone, and it is tuned by the variable condenser C13, which has in series with it the padding capacity comprising the condensers C10, C11 and C12. Of these, C12 is the adjustable trimmer and the other two are fixed condensers, giving a total of 0.0004 mfd.



In this view of the receiver the variable-selectivity IF transformer can be seen on the extreme left, and the fixed coupling transformer between the IF valve and the smoothing condenser.

Two condensers are, of course, needed only because 0.0004 mfd. is not a standard capacity.

On the long waveband S4 is open and S5 closed. The inductance then consists of L6 and L7 in series, the stray circuit capacity is augmented by the trimmer

Variable Selectivity IV—

C14, and the padding capacity is reduced by the insertion of the additional series capacity of 0.0015 mfd. obtained by the two condensers C8 and C9. It has been found unnecessary to make this long wave padding capacity variable, for it is not very critical. The reaction coil L5 is connected in the triode grid circuit and is fed through the 0.0001 mfd. condenser C6, the valve being biased by the grid-current flow through the 50,000 ohms resistance R4.

The intermediate frequency output of the hexode section of this valve is fed to the IF valve through the IF transformer T1. This transformer has high-Q coils, and they are variably coupled so that variable selectivity can be obtained. The coupling in the second transformer T2 which feeds the diode detector is fixed, however, and as the mutual inductance between the coils of the standard component is slightly too small for the best results in this receiver, the coupling is augmented by the capacity C17 between the high-potential ends of the two circuits. This capacity is obtained in the wiring in a similar manner to C1, and it materially increases the efficiency.

The Detector and Output Stage

The detector is fed from the secondary, and its load resistance R6 is given a value of 0.25 megohm with a by-pass capacity C18 of 0.0002 mfd. IF filtering is accomplished by means of the 50,000 ohms resistance R7 in conjunction with the 0.0001 mfd. condenser C19. The LF potentials are fed to the pentode section of the valve through the 0.1 mfd. condenser C20 and the 0.5 megohm volume control R8. The pentode is one of the high efficiency type, and anti-parasitic resistances are accordingly included in grid and anode circuits, the grid resistance R9 being given a value of 1,000 ohms and the anode resistance R10 a value of 100 ohms.

The primary of the output transformer is included in the anode circuit of the pentode, and the space-charge grid is fed directly from the main HT line. Grid bias for the pentode is obtained by the voltage drop across the 100 ohms resistance R11. The bias applied to the AVC diode, which is fed with IF potentials from the primary of T2 through the 0.0002 mfd. condenser C16, is obtained by the sum of the voltage drops across R11 and R12, the latter resistance having a value of 500 ohms. The diode load resistance consists of the two 0.5 megohm resistances R13 and R14 in series, the latter being by-passed by the 0.1 mfd. condenser C23. The full AVC bias voltage developed across the load resistance is applied to the frequency-changer through the filter comprising R15 of 0.5 megohm and C22 of 0.1 mfd. and through the 0.5 megohm decoupling resistance R2. One half of the AVC bias only is applied to the IF valve in order to avoid distortion on strong signals, and this is obtained by connecting the earthy side of the secondary of T1 to the junction of R13 and R14.

The frequency-changer and the IF valve have the same initial bias applied to them. The two cathodes are connected together and taken to the earth line through the 150 ohms resistance R3, which is by-passed by the 0.1 mfd. condenser C5. The anodes of all valves are fed from the main HT line without decoupling, since this has been found to be unnecessary, but the screen potentials are taken from a potentiometer connected across the HT supply. This potentiometer comprises the resistances R16, R17, and R18, and potentials of 100 volts for the IF valve, and 70 volts for the frequency-changer are available.

The mains equipment is of simple type, but is adequate for the needs of the receiver. The mains transformer has windings giving 4 volts at 4 amperes for the receiving valves and the dial lights, 4 volts at 2.5 amperes for the rectifier, and 350-0-350 volts at 60 mA. for the HT supply. An indirectly heated rectifier is used, and a 4 mfd. electrolytic condenser C25 is employed for the reservoir condenser. Smoothing is effected by the field winding of the moving-coil loud speaker in conjunction with the 8 mfd. electrolytic condenser C24, and after smoothing a supply of some 200 volts is available. The field winding has a resistance of 2,500 ohms, and is, of course, energised by the current which it smooths. In order to avoid hum being generated in the speaker itself from the ripple on the current through its field a hum-bucking coil is fitted.

A list of the components required for this receiver appears below, and it should be remarked that in certain cases, such as the coils and IF transformers, it is important to employ the specified parts. Fixed condensers and resistances can be of any good quality make, of course, and this applies also to such components as the mains transformer, provided that the physical dimensions are such as to permit their being mounted on the chassis.

(To be concluded.)

THE LIST OF PARTS

1 Two-gang condenser, 0.0005 mfd., **C3, C13** — **Utility "Mite" W347/2**
1 Dial — **Utility "Straight Line" W346**
2 Bulbs for above, 4 volts 0.1 amp. — **Bulgin 410**
1 Aerial coil, L3, L4 — **Bulgin C6**
1 Oscillator coil, 465 kc/s, **L5, L6, L7** — **Bulgin C59**
1 Aerial loading coil, L1, L2 — **Bulgin C42**
1 IF transformer, 465 kc/s, **T2** — **Bulgin C50**
1 IF transformer, 465 kc/s, **T1** — **Sound Sales IF465**
1 Mains transformer, Primary: 200/250 volts 50 c/s. Secondaries; 350-0-350 volts 60 mA., 4 volts 2.5 amps. C.T., 4 volts 4 amps. C.T. — **All-Power PT/BP**
2 Trimmers, 0.0003 mfd., **C12, C14** — **Sound Sales 3VC**

Fixed Condensers.

3 0.0001 mfd., **C6, C11, C19** — **Bulgin PC301**
2 0.0002 mfd., **C16, C18** — **Bulgin PC302**
1 0.0003 mfd., **C10** — **Bulgin PC303**
1 0.0005 mfd., **C9** — **Bulgin PC305**
1 0.001 mfd., **C8** — **Bulgin PC201**
1 0.005 mfd., **C2** — **Bulgin PC205**
1 0.01 mfd., **C7** — **Bulgin PC101**
6 0.1 mfd., **C4, C5, C15, C20, C22, C23** — **Bulgin PCP1**
1 4 mfds., electrolytic, **C25** — **Dubilier 0283**
1 8 mfds., electrolytic, **C24** — **Dubilier 0281**
1 25 mfds., 25 volts, electrolytic, **C21** — **Dubilier 3013**

Resistances.

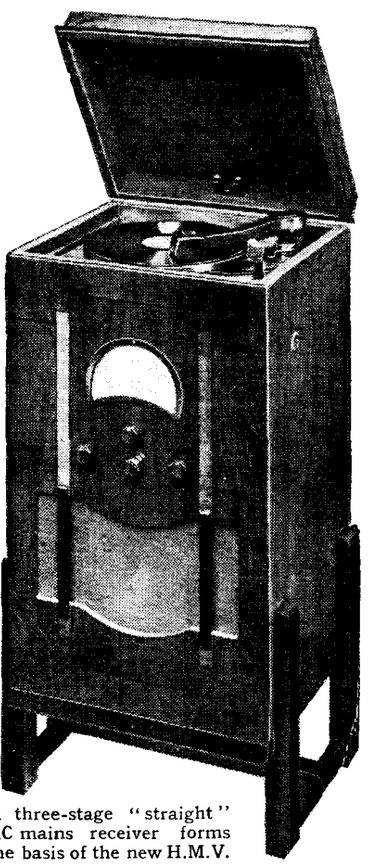
2 100 ohms, ½ watt, **R10, R11** — **Ferranti G.5**
1 150 ohms, ½ watt, **R3** — **Ferranti G.5**
1 500 ohms, ½ watt, **R12** — **Ferranti G.5**
1 1,000 ohms, ½ watt, **R9** — **Ferranti G.5**
1 25,000 ohms, ½ watt, **R1** — **Ferranti G.5**
2 50,000 ohms, ½ watt, **R4, R7** — **Ferranti G.5**
1 75,000 ohms, ½ watt, **R5** — **Ferranti G.5**
1 250,000 ohms, ½ watt, **R6** — **Ferranti G.5**
4 500,000 ohms, ½ watt, **R2, R13, R14, R15** — **Bulgin HW31**
1 3,500 ohms, 1 watt, **R17** — **Erie**
1 10,000 ohms, 1 watt, **R18** — **Erie**
1 7,500 ohms, 2 watts, **R16** — **Erie**

1 Tapered volume control, 500,000 ohms, **R8** — **Ferranti PG**
1 Multi-contact switch, S1, S2, S3, S4, S5, S6, S7 — **Magnum WW7**
4 Ebonite shrouded terminals, A, E, and Pick-up (2) — **Belling-Lee "B"**
1 4-pin plug — **Bulgin P9**
3 Valve top connectors — **Belling-Lee 1175**
2 Knobs — **Bulgin K26**
1 Length screened sleeving — **Coltone**
2ozs. No. 20 tinned copper wire, 12 lengths systoflex, etc.
Chassis, complete with three 7-pin and two 5-pin Clix chassis-mounting valve holders, screws, nuts and washers. — **C.A.C.**
Valves.
1 X41, 1 VMP4G, 1 DN41, 1 MU12 — **Osram or Marconi**
Loud speaker, 2,500 ohms field resistance and pentode transformer — Rola ST603/2500
Cabinet — **C.A.C.**
Approximate cost including valves and cabinet, £12 5s.

Two New H.M.V. Products

"Popular" Radio-gramophone and a Record-filing Cabinet

THE Model 370 has been introduced to meet the demand for a radio-gramophone at the price of a good table-model receiver. A "straight" circuit, with variable-mu HF amplifier, detector, and resistance-coupled high-efficiency output pentode, has been adopted, and the gramophone pick-up has a high output suitable for feeding the output valve direct. The turntable is driven by a constant-speed squirrel-cage motor, and an interesting feature of the gramophone side is the new method of "flock-spraying" the inside of the lid to localise acoustic radiation from the needle and pick-up. The price of the Model 370 is 16 guineas.

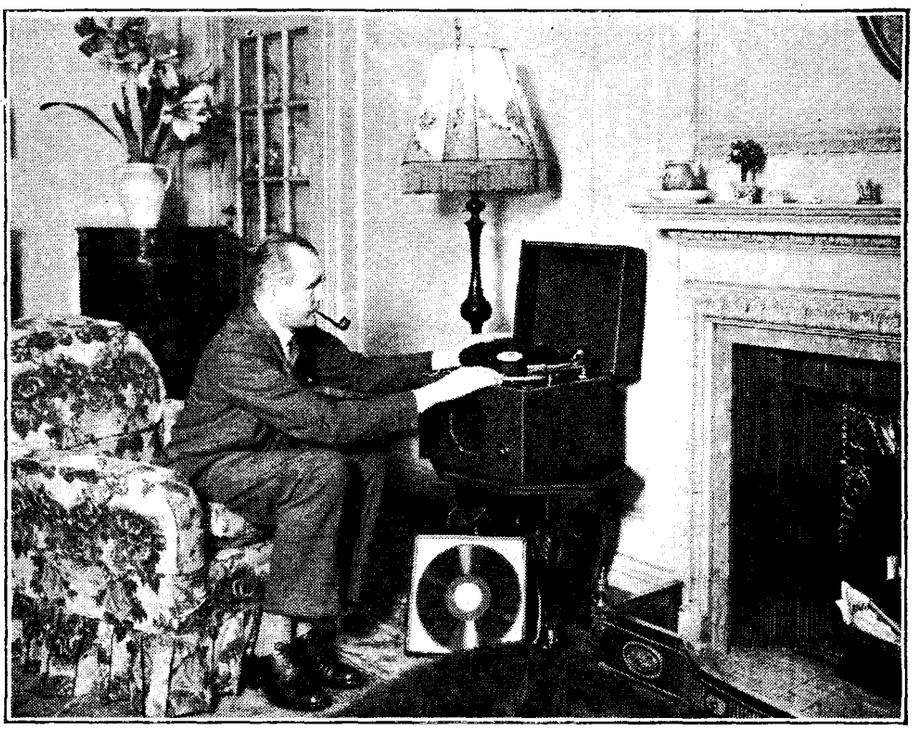


A three-stage "straight" AC mains receiver forms the basis of the new H.M.V. "Popular" radio-gramophone.

The new H.M.V. record cabinet at 5 guineas should make a strong appeal to all gramophone enthusiasts. It holds 400 ten- or twelve-inch records, either individually or in albums, and is finished in figured walnut.

Talking Books

A NEW DEVELOPMENT TO HELP THE BLIND



Sir Ian Fraser using the new machine and long-playing records. The box specially designed for posting is shown on the floor.

ONE of the greatest handicaps of those who have lost their sight is undoubtedly the inability to read. Braille has, of course, been of inestimable service, especially to those who have been able to learn to read it in early years, but it is not nearly so easy to acquire speed in Braille reading for those who have been deprived of their sight as adults.

It is for this reason that Captain Sir Ian Fraser, the well-known blind Member of Parliament, has for a long while devoted a great deal of attention to the problem of a suitable means of recording speech and reproducing with records suitable for distribution amongst blind persons.

The talking film may eventually prove to be the ideal means of reading aloud to the blind man in his home, as it has the advantage that it can be run for long periods at a time, but at present the film still has the considerable disadvantage that it requires elaborate equipment to play from it, and the various processes, such as rolling the reels and adjusting the apparatus, introduce added difficulties for the blind user.

The Choice

Influenced by these considerations, and with a thorough acquaintance of other possible solutions of the problem, Sir Ian Fraser, in co-operation with the National Institute for the Blind and St. Dunstan's, set to work, and set others to work, to develop a suitable long-playing record, which has now been brought to a practical stage where about four thousand words can be put on to one side of a 12in. record, the record playing for about twenty-five minutes.

The ordinary gramophone turntable revolves at 78 r.p.m., whereas in the slow-playing record the speed is only 24 r.p.m. Instead of about a hundred cuts to the inch the long-playing record has 200 grooves.

As might be expected, all kinds of technical difficulties were met with, and had to be surmounted in developing the recording side at these slow speeds. In cutting on the wax, where the adjacent grooves were so close, speech would often cause an impression through the wall of the groove already cut, with the result that a kind of echo of the speech was produced. It was found that this took place mostly on low frequencies, where the greatest amplitude occurred, and consequently it was found necessary to filter out some of these low frequencies.

Although the records may be played through a loud speaker, great volume is not required, and it is more agreeable to have the reproducing machine quite near the listener, within three or four feet, perhaps, where it simulates a person sitting in the chair next to him and reading directly to him.

In these circumstances, with quiet volume, the bass cut is not noticeable, and the speech sounds fairly normal.

A special Garrard turntable has been constructed which gives the varying speed from 24 to 78 r.p.m., and is supplied ready mounted on a base-plate with a crystal pick-up. For the sake of economy, a one-valve amplifier is used, and it is found that a crystal pick-up and a high-magnification pentode valve give sufficiently loud volume for all reading purposes, and even enough for a small room should a machine be used for dance music.

Naturally, for institutes or large groups of blind listeners, a power amplifier would have to be employed, but it is thought that the principal use of the Talking Book will be the more intimate personal reading aloud to the individual blind man in his own home.

Building up a Library

The technical difficulties having been overcome, the next step was to start to produce a library of "record books." Several complete books are now ready, and it is hoped to go on adding to the library, even at the outset, at the rate of two new books every month.

A special committee has been set up to choose the books so as to keep a proper balance and ensure that all tastes will be met as far as possible.

There are to be three types of reproducing machine, and although the records will be loaned to blind persons free of charge, they will be required to purchase their own machines at cost price. The concession of a lower postage rate on the records has been obtained from the Postmaster-General, and a special posting case has been designed for their safe transit. One of these cases is shown in the photograph resting against the leg of the table.

The machines will consist of an electrically driven reproducer with a crystal pick-up; for those who have not got electricity available but want the best reproduction they can get, there will be a type with a clockwork motor, crystal pick-up and earphones, for use to listen direct, or a length of flexible lead and a plug will be available to connect the pick-up output to the L.F. side of an existing wireless set; the third machine is similar in motor construction to the last, but has an ordinary sound box and tonearm and a built-in horn.

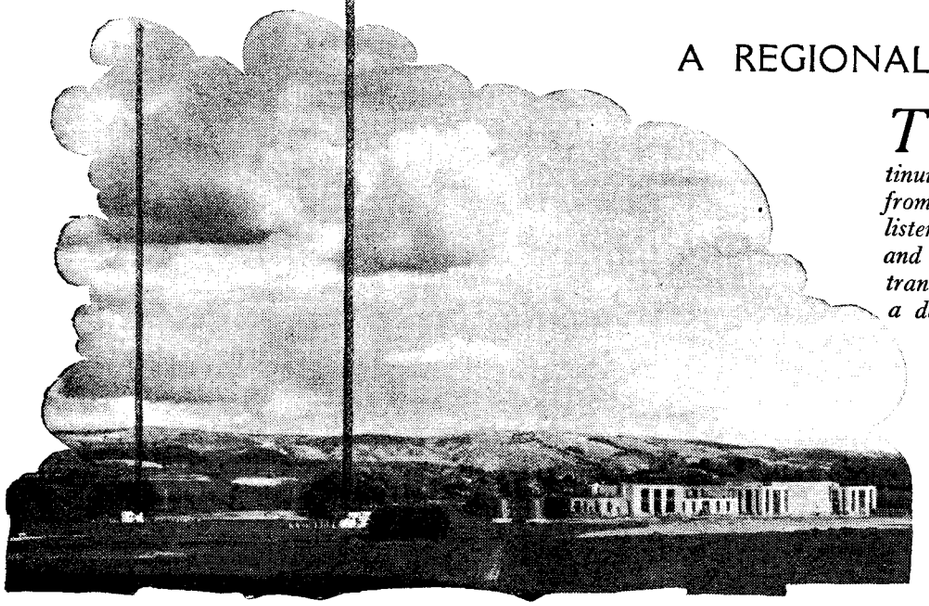
Demonstrations of these machines can be given to interested blind persons at the Talking Book Library, 204, Great Portland Street, W.1, between 9.30 a.m. and 1 p.m., or 2 p.m. and 5.30 p.m. on any weekday.

By LESLIE BAILY

Does Broadcasting

A REGIONAL TOUR OF INVESTIGATION

THAT the B.B.C. should establish a South Region is the considered opinion of our author after continuing his tour of investigation along the South Coast from Brighton to Plymouth. Fortunately, perhaps, for listeners in this area, Fécamp "comes in like a local!" and largely atones for the absence of a reliable B.B.C. transmission. Mr. Baily concludes this article with a description of what he saw at Washford Cross.



The future "Welsh Regional" at Washford Cross, where the West National and Regional transmitters are situated.

II.—Along the South Coast

AFTER returning to London from the Midland Region I set out along the South Coast, which is no Region at all. It is No Man's Land. Technically, this extensive and lovely country, from Margate right along to Bournemouth, is in the London Region; actually there is no Regional programme-organising staff. No London Regional Director exists to develop programme resources here, to send his staff scouring the district as they do (for instance) in the Midlands. So the London Regional programme is just a secondary National programme; it lacks local character.

That is the first of two contributory causes of the incomplete service given by the B.B.C. to this southern strip of England. The second may be given in the words of a Brighton wireless dealer: "We get Droitwich National very well," he told me, "but the Regional fades. People with modern AVC sets don't mind so much, but many people haven't AVC. Fécamp comes through like a 'local.' Most people use Fécamp as their favourite alternative to Droitwich. In early B.B.C. days Bournemouth was our local station; we could receive it well, and we took an interest in its programmes, but now we can't get it."

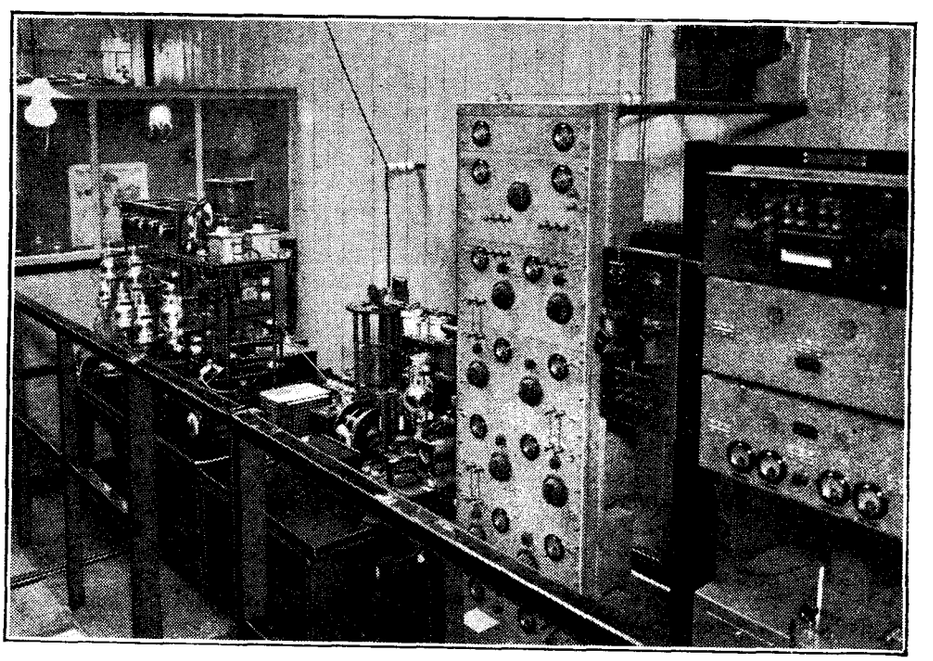
At Chichester and at Southampton I was told the same story. Bournemouth transmitter has a range nowadays of only, I suppose, ten miles, owing to its synchronisation with Plymouth on a very low wave. It relays the London Regional programme. Thus faded are the glories of 6BM! I noticed the old call-sign still adorning the brass plate outside the wooden hut in which 6BM first went into action on October 17th, 1923. The same old "Q"- type transmitter is there, plus tuning-fork control. Eight engineers man this B.B.C. antique; all the programme men have been withdrawn.

Going farther west I found similar Regional fading at Dorchester, though here we are getting into the West Region, which transmitter gives quite a satisfactory signal in day-time. As I motored into this ancient town the thought recurred that the life and the history of the South might be exploited to good effect by a South Regional Director based at Bournemouth or Southampton.

"Yes," retorted a Dorchester trader, "but I don't suppose people round here would thank the B.B.C. for that! They haven't much local pride; they'd rather hear some dance music from Fécamp."

Is the Southerner as lacking in character as that? Or does he simply need a lead from the B.B.C.? It is hardly satisfactory to the B.B.C.'s standing that Fécamp is, in actuality, the "South Regional"! Before long 6BM must be replaced by a modern transmitter. Surely this is an opportunity to establish a thorough-going South Region, with a sufficiently powerful transmitter to give "quality" reception throughout the area, accompanied by a programme drive to awaken the Southerner to his own heritage.

In striking contrast, I stumbled across



OLD AND NEW are curiously blended at Plymouth. Side by side with the original transmitter is the modern tuning fork and frequency doubling apparatus.