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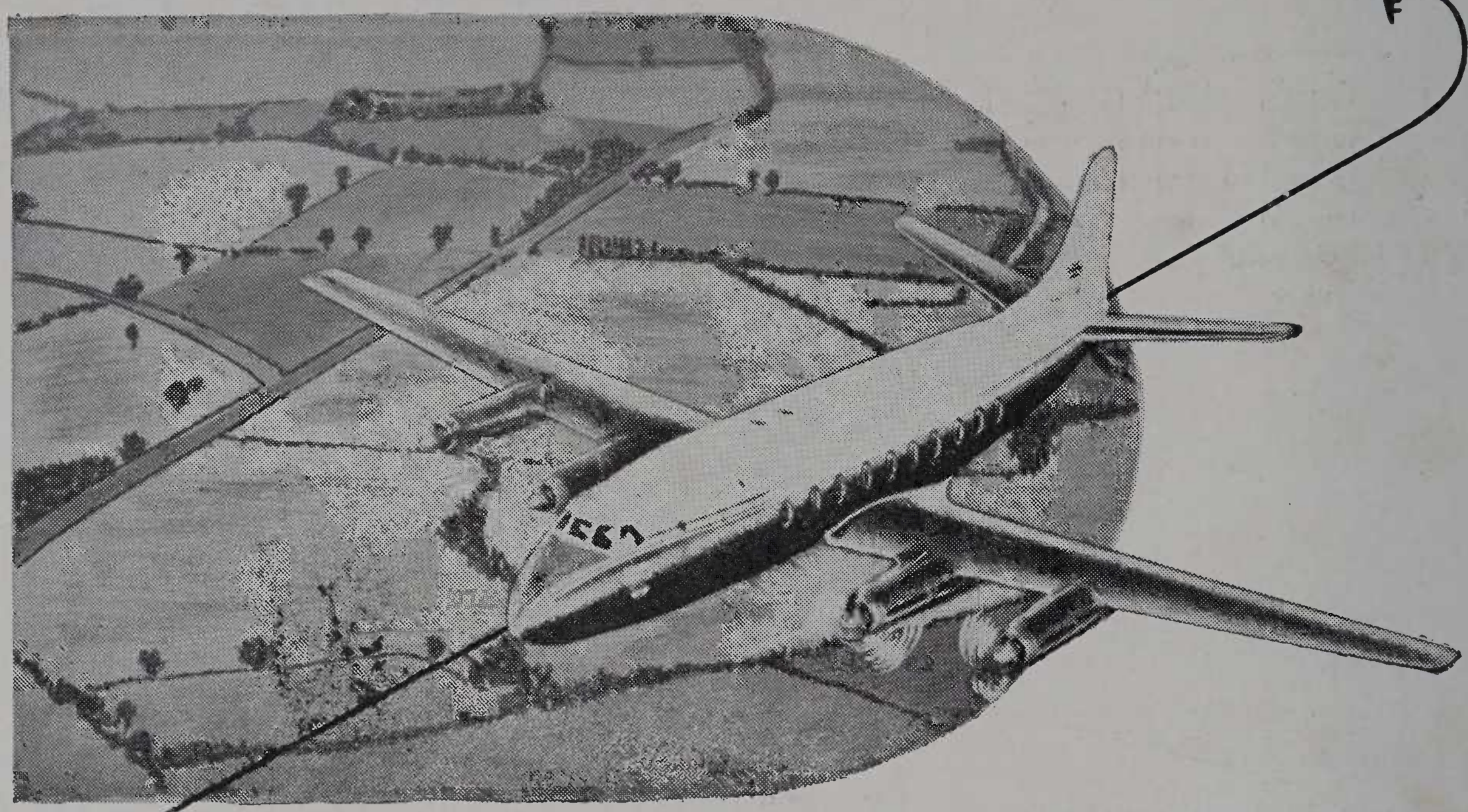
RADIO and ELECTRICAL Review

TELEVISION - COMMUNICATIONS - SERVICE - SOUND

Incorporating "RADIO and ELECTRONICS"

AUGUST 1st, 1956 VOL. 11, NO. 6 PRICE 1/10

TOP PERFORMANCE IN THE AIR



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Radio and Electrical Review

VOL. 11, No. 6 AUGUST 1st, 1956

OUR COVER PICTURE this month depicts an operator winding vertical output transformers at the Rola factory, Richmond, Australia, described on page 44 of the July, 1956, "Radio & Electrical Review."

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The New Zealand Radio and Electrical Traders' Federation.
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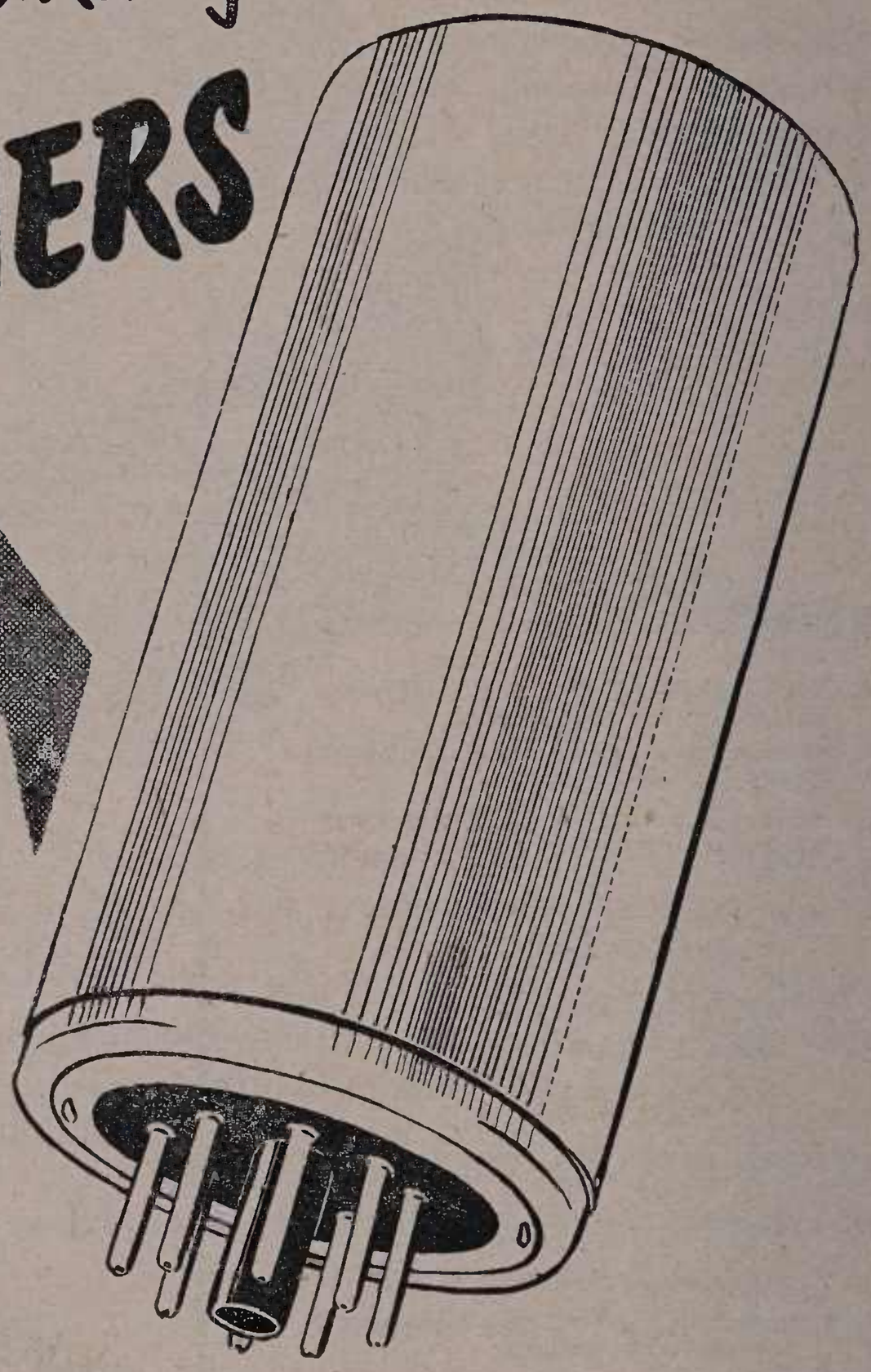
Miniature Wide Range

PLUG-IN

TRANSFORMERS



The transformers are astatically wound on mu-metal cores and are enclosed in a mu-metal shield. The whole is screened by a drawn can of magnetic alloy. A standard octal plug-in base is provided. The windings are made with tough, synthetic-enamel insulated wire. A pure, inert, micro-crystalline wax with high electrical and moisture proofing is used as the can-filling compound. Both primary and secondary windings are centre-tapped. Special input or shunt fed, low-level, output transformers can be wound to order.

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Height from bottom of spigot to top of can	3 in.
Diameter	1 9/16 in.
Height above Chassis	2½ in.
Weight	½ lb.

Frequency Response from 30 c/s. to 15 K/cs.

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The complete enjoyment of the music captured by modern recording technique demands the highest standard of reproduction, and the object of E.A.R. Balanced High Fidelity is to achieve this aim at moderate cost. The specialized experience of many years has been employed in the production of a range of equipment in which every component from pick-up to loudspeaker has been expertly selected and matched. For each unit an E.A.R. amplifier has been specially designed for its specific purpose. In short, E.A.R. Balanced High Fidelity is your guarantee of unsurpassed performance and quite exceptional value. E.A.R. is the trade name of England's foremost producers in this field—Electric Audio Reproducers Ltd.

MODEL A750—High Fidelity 3-Control

The A750 is acknowledged to be the finest instrument of its type. Special features: BASS and TREBLE boost controls as well as Volume control.

E.A.R. AMPLIFIER of advanced design matched to the "STUDIO P" pick-up. 10-inch ELLIPTICAL SPEAKER. COLLARO 3-Speed Record Changer plays 9 records, 12 in., 10 in., or 7 in. Automatically. **Price: £36 12s. 6d. Retail.**

A750-T THREE-SPEED

Extended frequency range represents another notable E.A.R. development in record reproduction. An exclusive feature is the automatic LP-78 filter switching. The A750-T is fitted with the High Fidelity STUDIO turnover pick-up cartridge. Size: 8 in. x 15 in. x 16½ in. Weight: 30 lb. (approx.).

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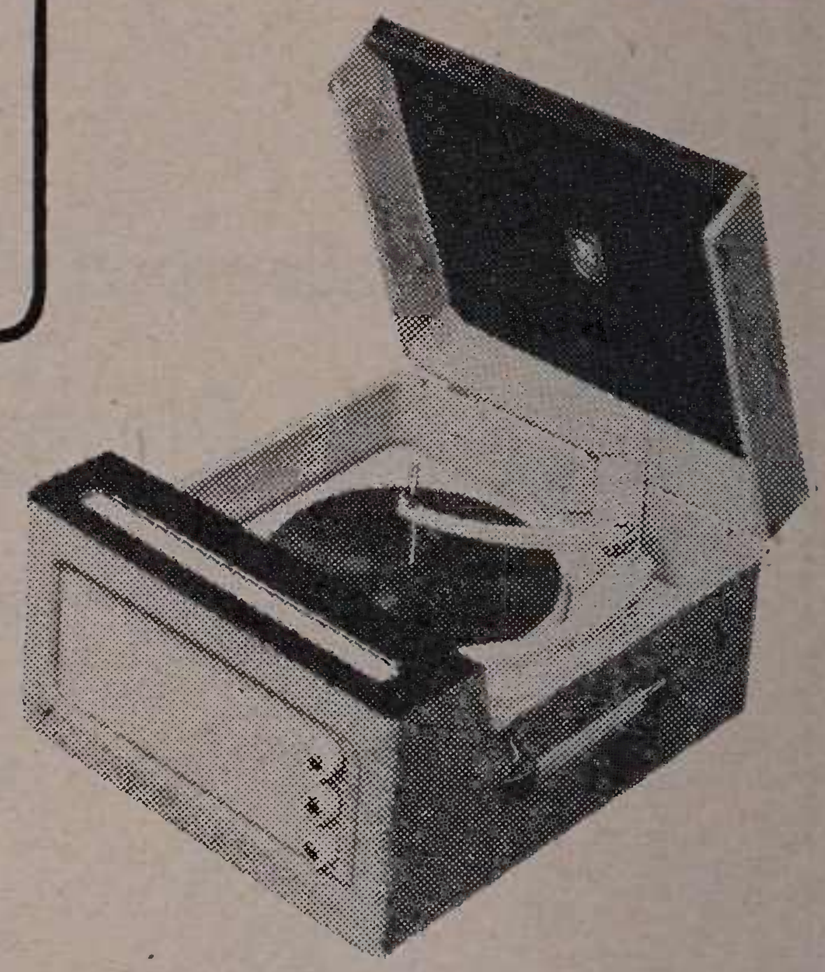

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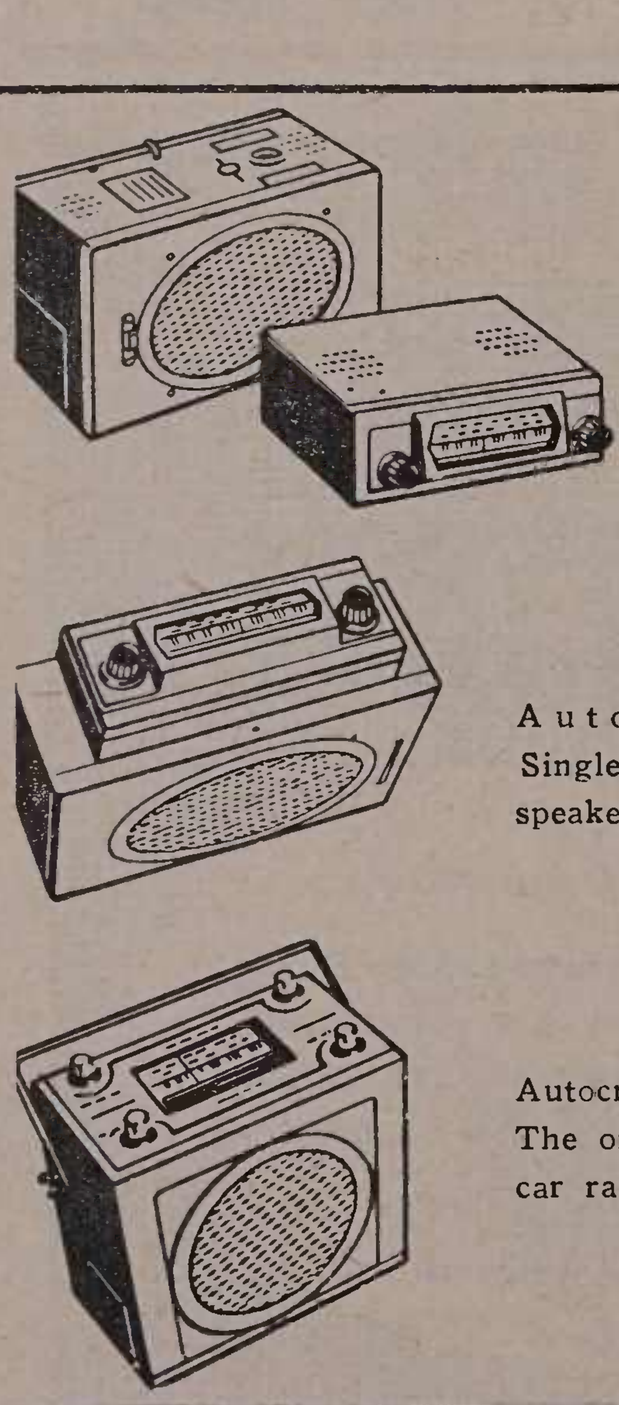

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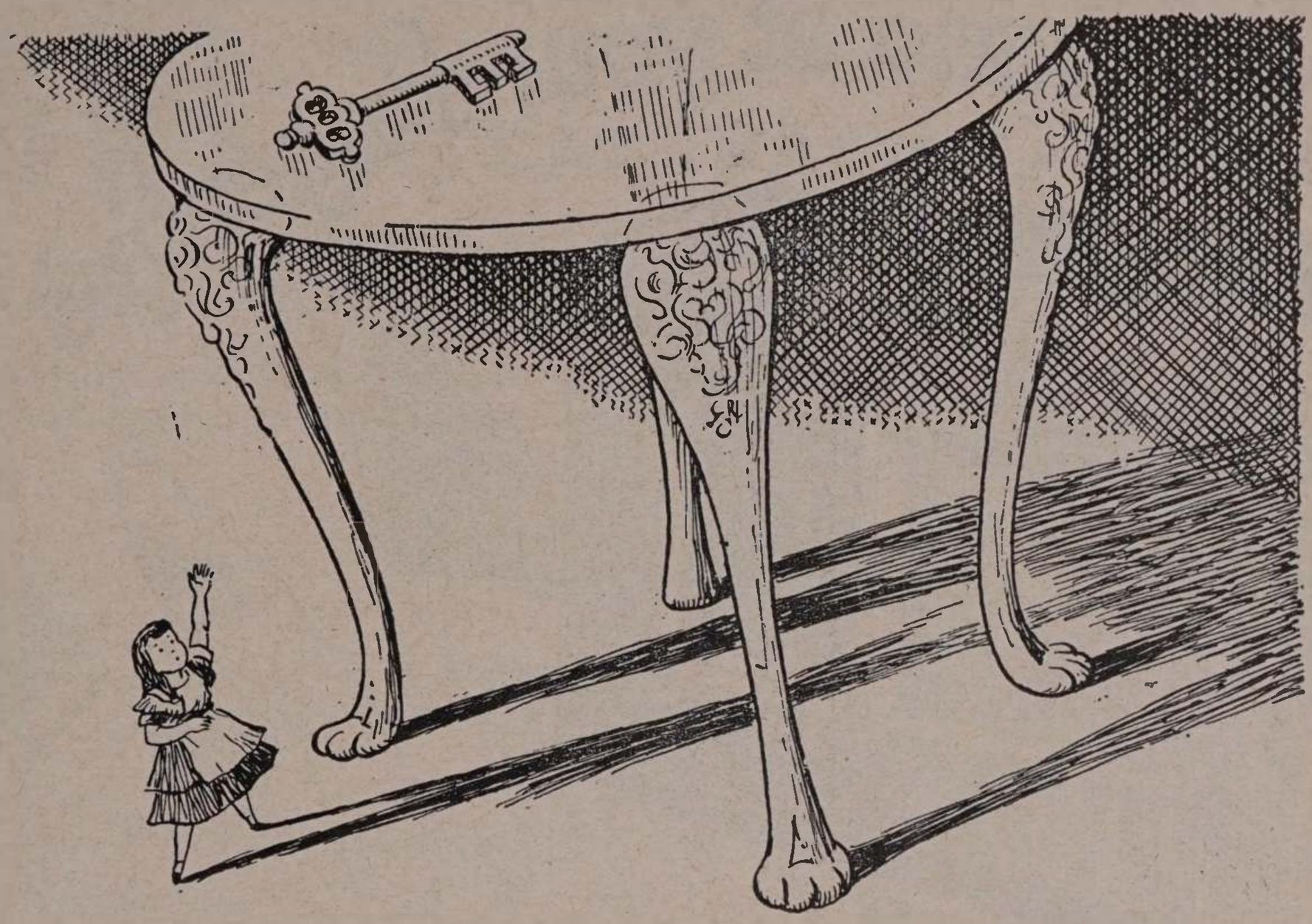
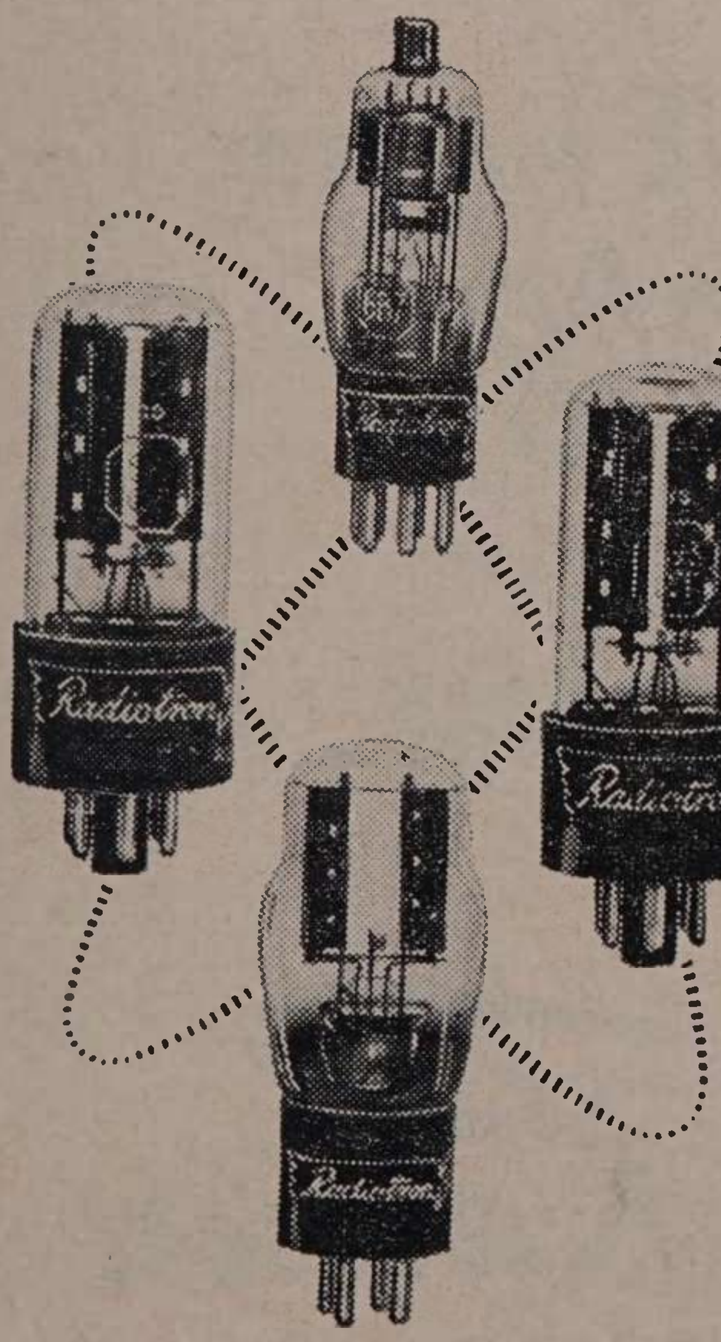


Alice knew what she wanted . . .



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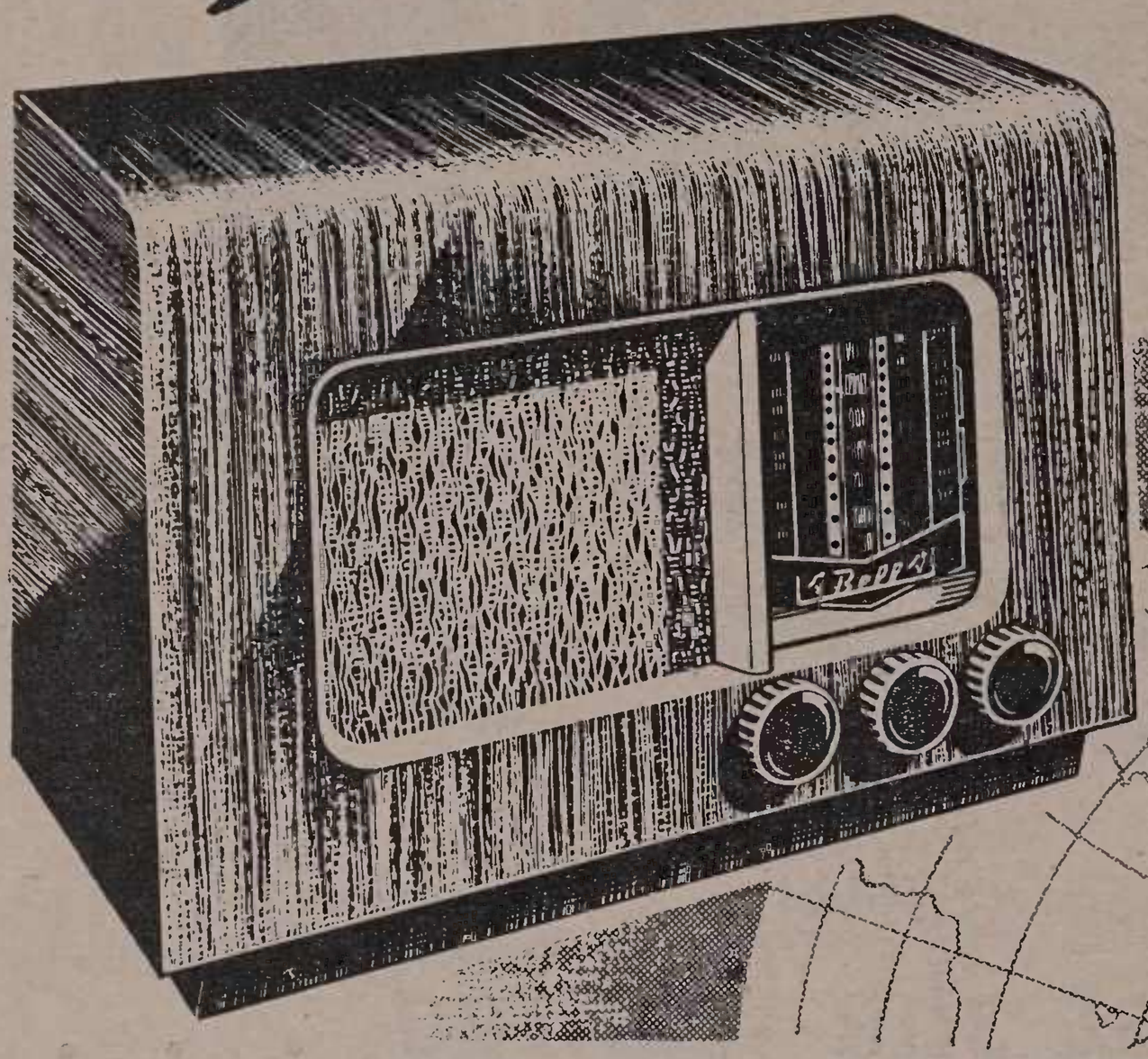

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- Craftsman styled in walnut veneer
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- Built-in aerial
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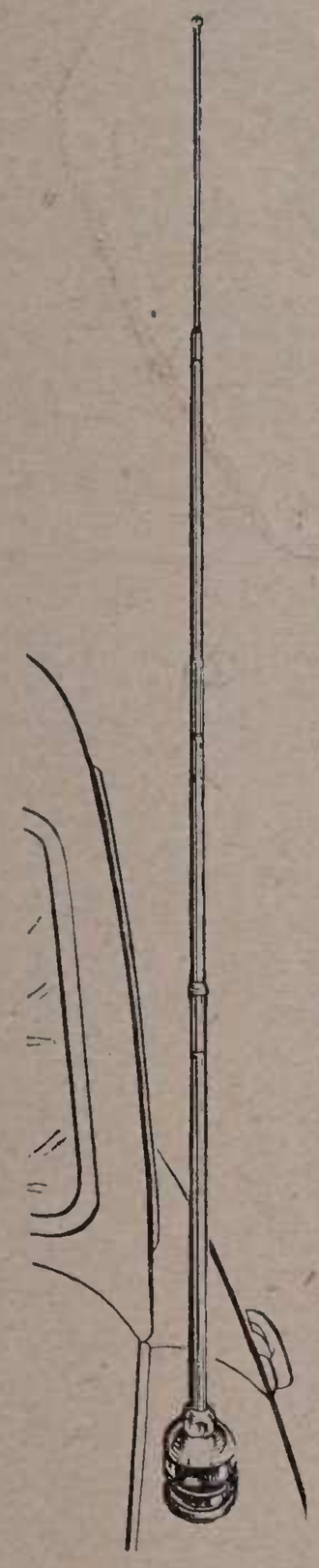
WITH 6 FT OR 8 FT MASTS



AW 903 — 6 ft. extended, 22 in. closed ..... Retail price 47s. 3d.

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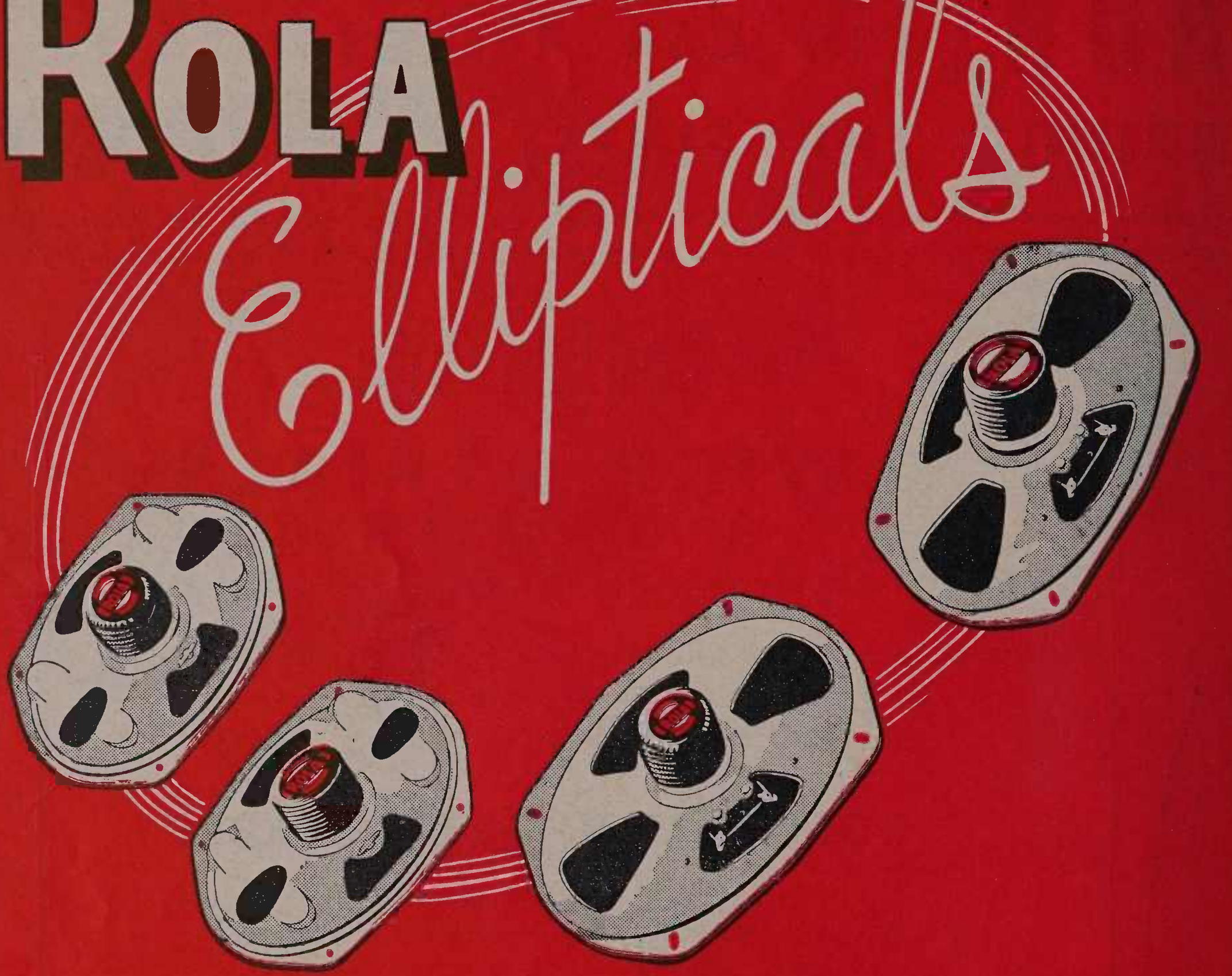

SPECIFICATIONS

MODEL	POWER HANDLING CAPACITY (watts)	CONE	FUNDAMENTAL DIAPHRAGM RESONANCE 5 c.p.s.	FREQUENCY RANGE c.p.s.	VOICE COIL IMPEDANCE Ohms at 400 c.p.s.	PRINCIPLE DIMENSIONS (Inches) Overall	Front to Rear	Baffle Opening
5-7H	4	F86	115	110-6,000	3.5	$7\frac{3}{8}$ x $5\frac{1}{8}$	$2\frac{7}{8}$	$6\frac{3}{4}$ x $4\frac{5}{8}$
5-7L	5	F86	115	110-6,000	3.5	$7\frac{3}{8}$ x $5\frac{1}{8}$	$3\frac{1}{8}$	$6\frac{3}{4}$ x $4\frac{5}{8}$
6-9H	4	F70	115	110-5,500	3.5	$9\frac{7}{32}$ x $6\frac{11}{32}$	$3\frac{5}{16}$	$8\frac{3}{4}$ x $5\frac{3}{4}$
6-9L	5	F70	115	110-5,500	3.5	$9\frac{7}{32}$ x $6\frac{11}{32}$	$3\frac{1}{2}$	$8\frac{3}{4}$ x $5\frac{3}{4}$

TRANSFORMER: Type D, attached, or detached for chassis mounting

EICO TEST INSTRUMENTS & KITSETS

As announced in the last issue we are pleased to introduce to New Zealand EICO Test Instruments either in kitset form or fully wired and factory tested. These instruments are manufactured by THE ELECTRONIC INSTRUMENT CORP., INC., U.S.A.

The Eico Range includes the following instruments:—

221K.	VTVM. 4½ in. Meter Ranges, AC/DC Volts, Ohms, Dbs	£21 0s. 0d.
214K.	VTVM. 7½ in. Meter Electrically same as 221K	£27 12s. 0d.
232K.	VTVM. Peak to Peak 4½ in. Meter Ranges, Peak AC Volts, DC/RMS Volts, Ohms, 7 non-skip ranges for every function. Calibration without removing from cabinet	£23 13s. 6d.
249K.	VTVM. 7½ in. Meter Electrically same as 232K.	£31 11s. 0d.
425K.	5 in. Push-Pull Oscilloscope. P.P. V. & H. Amps, High V. & H. sensitivity, V. & H. response 5 c/s. — 500 kc/s.; useful to 2.5 mc/s.; sweep 15 c/s., 75 kc/s.; Z Axis, intensity modulation; direct connections to CRT plates	£38 10s. 0d.
460K.	5 in. D.C. Wide Band Oscilloscope. Flat from D.C. to 4.5 mc/s, usable to 10 mc/s.; featuring D.C. amplifiers P.P. throughout sweep, freq. 10 c/s. —100 kc/s., low sweep with ext. condenser ..	£63 2s. 6d.
1050	Battery Eliminator for testing and servicing car radios and mobile equipment; 2 D.C. ranges 0—8v. 20 amp. max., 0—16v. 12 amp. max., continuous voltage adjustment	£24 14s. 0d.
VOMs	1,000 ohm/volt 3 in. Meter. 31 ranges	£11 4s. 0d.
	1,000 ohm/volt 4½ in. Meter. 38 ranges	£13 1s. 6d.
	20,000 ohm/volt 5½ in. Meter. 31 ranges	£23 16s. 0d.
495K.	Scope Voltage Calibrator	£10 4s. 6d.
488K.	Electronic Switch	£18 18s. 6d.
625K.	Tube Tester, 4 in. Meter, 10-lever type element switches	£29 8s. 6d.
944K.	Flyback Transformer and Yoke Tester	£18 18s. 6d.
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315K.	De Luxe R.F. Signal Generator, 75 Kc/s—150 Mc/s., in seven ranges; Vernier anti-backlash tuning, VR tube stabilized; modulation and provision for external modulation	£34 4s. 6d.
377K.	Sine and Square Wave Audio Generator. Freq. Range: Sine wave 20 c/s —200 kc/s., square wave 60 c/s.— 50 kc/s.	£25 4s. 6d.
950K.	R.C. Bridge and RCL Comparator, Four Ranges each. Resistance, 0.5 ohms to 500 megohms; Capacitance, 10 pfd. to 5000 mfd., and power factor. Condenser leakage test with internal 0—500v. DC source	£16 6s. 0d.
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360K.	TV/FM Sweep Generator 500 kc/s.—228 mc/s., Crystal marker oscillator. Precision crystals available extra	£27 13s. 0d.
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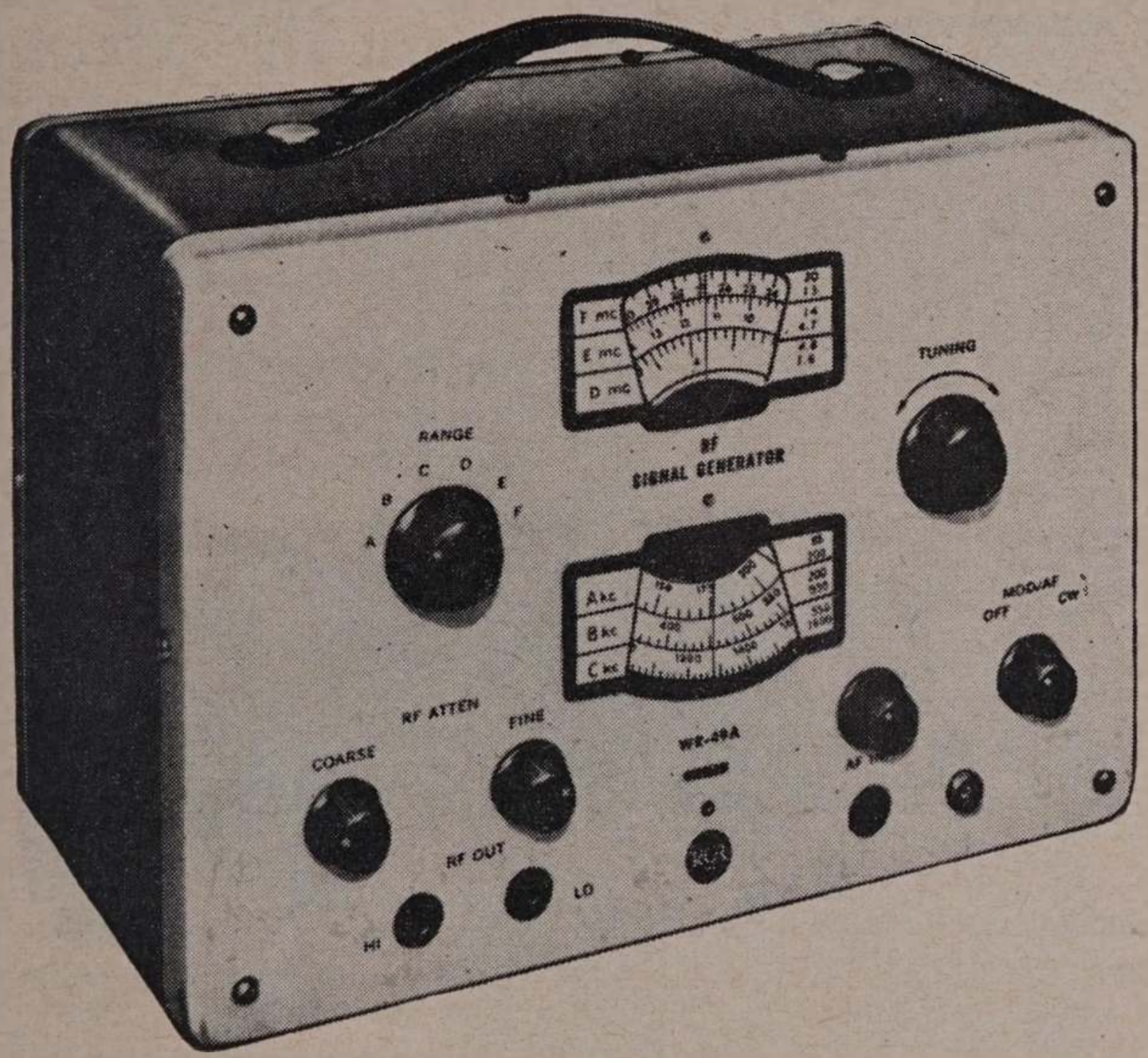

RCA

R.F. SIGNAL GENERATOR

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Compact lightweight, dependable for alignment and signal tracing of AM and FM radio receivers and in TV trouble-shooting.

Built-in D.C. blocking capacitors cut out the messy, time-consuming job of stringing D.C. blocking capacitors to probe tips. RCA WR-49A allows you to inject R.F. signals into plate circuits and other points where D.C. is present without placing a D.C. load on the circuit under test — and with protection from burn-out in both equipment and signal generator. Full length shielded output cable minimizes radiation and hum pick-up. Extremely stable cathode-follower output stage maintains good output waveform, voltage regulation, and frequency stability of the oscillator. Write or ring now for full details.

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"A" Range	85 Kc to 200 Kc
"B" Range	200 Kc to 550 Kc
"C" Range	500 Kc to 1600 Kc
"D" Range	1.6 Mc to 4.8 Mc
"E" Range	4.7 Mc to 14 Mc
"F" Range	13 Mc to 30 Mc

MAXIMUM RF OUTPUT VOLTAGES (all ranges)

At RF OUT HI Connector	at least 0.05 rms volt
At RF OUT LO Connector	at least 0.01 rms volt
Accuracy of Dial Calibration	%1±
Attenuator Range	65 db
Internal Modulating Frequency	approx. 400 cps.
Internal Percentage of Modulation	adjustable up to 70%
Audio Frequency Output	at least 8 rms volts across 15,000-ohm load

EXTERNAL MODULATION

Modulating Frequency	15 Kc max.
Voltage required for 30% Modulation using 400 cps±	10 rms volts
Impedance at AF IN/OUT Connector (400 cps)	approx. 16,000 ohms

OTHER RCA TEST EQUIPMENT NOW AVAILABLE INCLUDES—

7 in. Oscilloscope WO, 56A
5 in. Oscilloscope WO, 88A
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Junior Voltohmyst WV-77A
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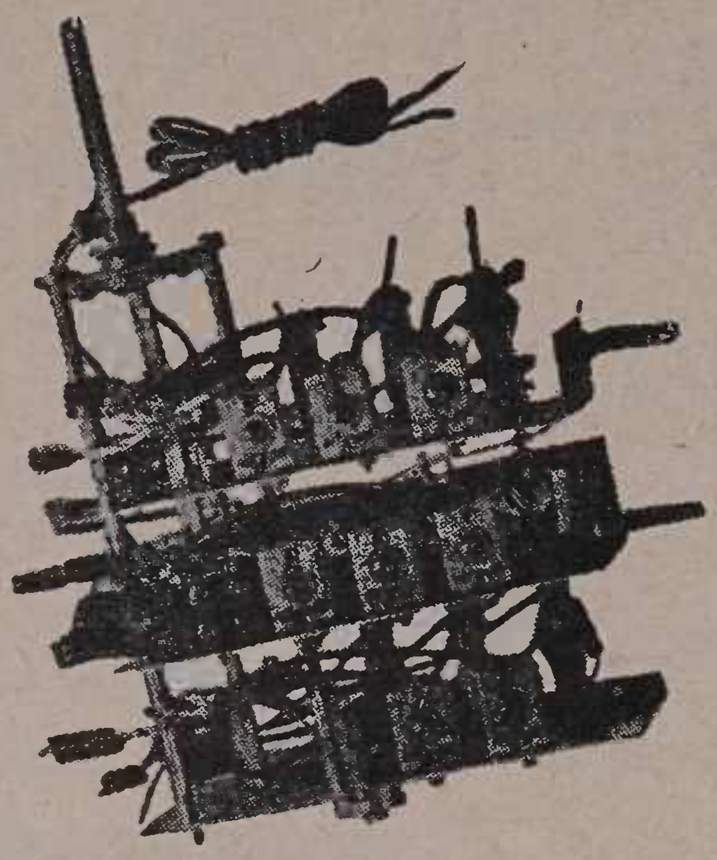

Poly-Q

B-A-N-D S-P-R-E-A-D

BASIC KIT — TYPE 9

Completely assembled, wired, and tested up to converter tube. Fitted to sturdy 8/9 valve, plated steel chassis. Accurately aligned to dial calibation. You merely add I.F. and audio stages. The spread on shortwave makes shortwave tuning easier than broadcast.

IDEAL as base for really high-quality RADIOS, TUNERS, RADIOGRAMS, etc.

Details:
49, 31, 25, and 19-metre bands, plus broadcast. Extremely accurate calibration and frequency stability. Split stator tuning condenser and temperature compensated oscillator. Only three simple adjustments necessary to completely align each bandspread. Handsome floodlit dial scale. Effortless tuning from high ratio 24/1, ball-bearing spin wheel drive. Gang isolated from mechanical and electrical vibration and noise. Bandspread calibration linear and marked in 100 k/c divisions and fractions thereof. A 0–100 logging scale also provided. "BAND", "TONE" and "GRAM." indicators fitted. Special A.V.C. system provides shorter time constant on shortwave to rapidly compensate for fading signal. Polystyrene low-loss adjustable slug coils throughout. Full instructions and suggested I.F. and audio circuits.

Price:

£16/19/7 (retail), less valves, plus packing, and postage.
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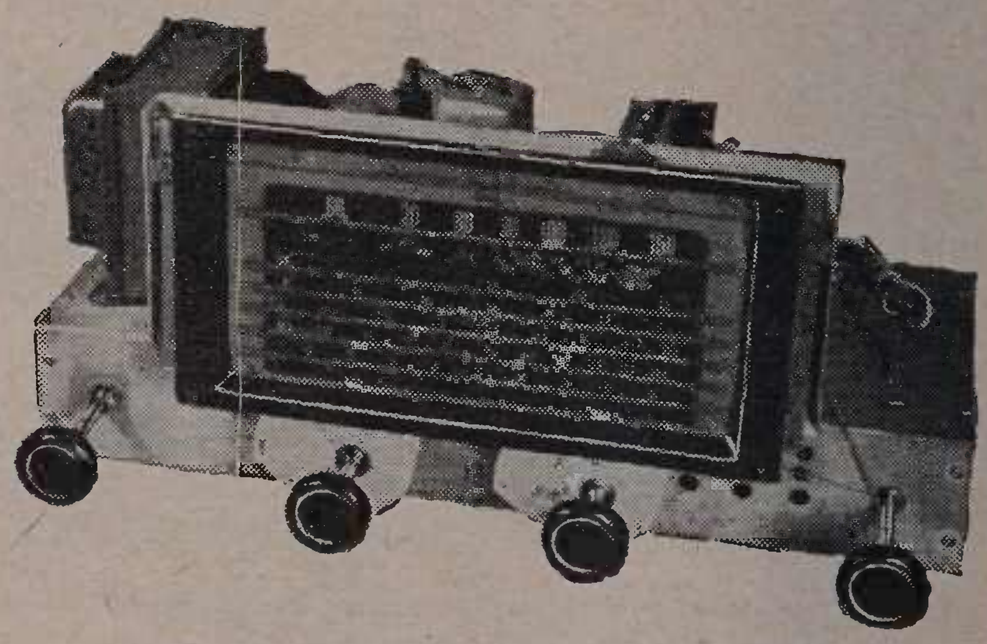

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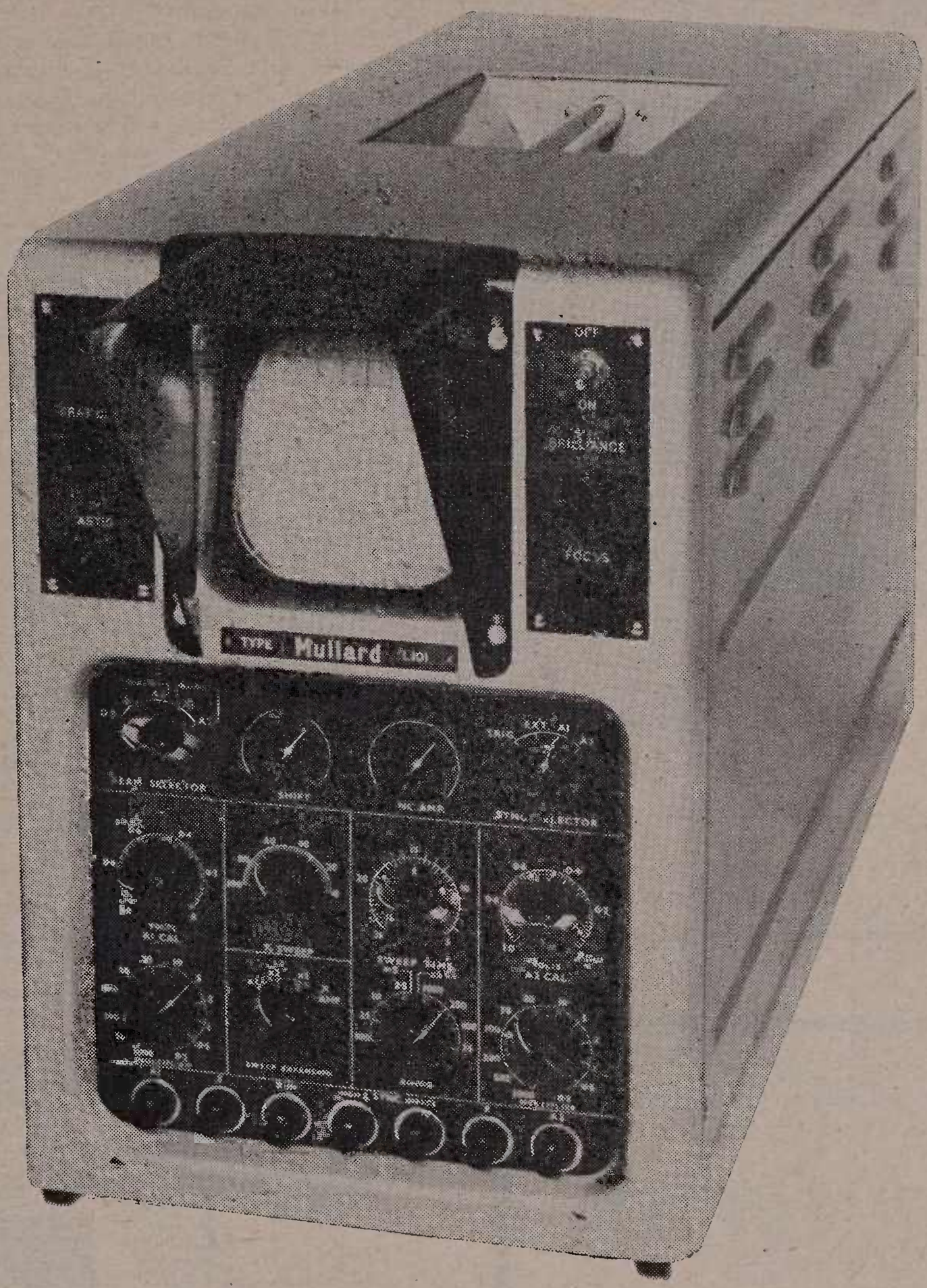

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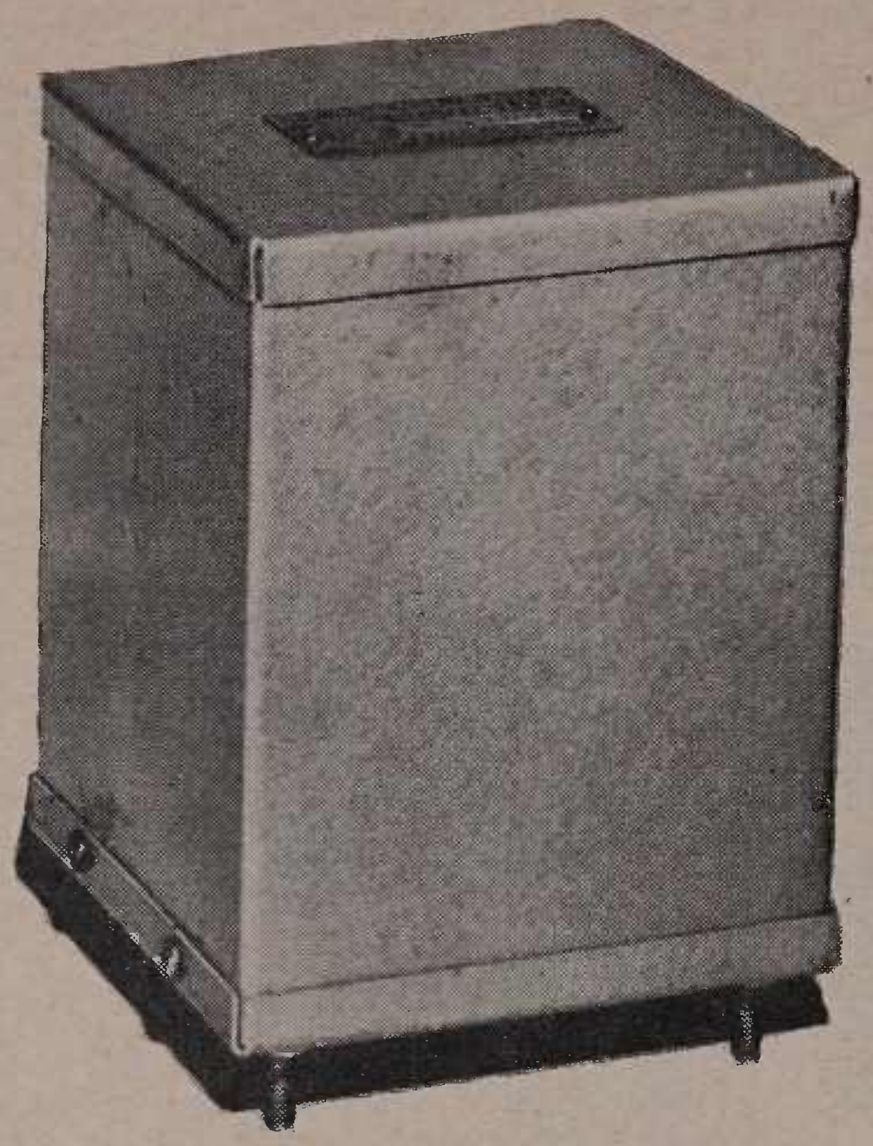

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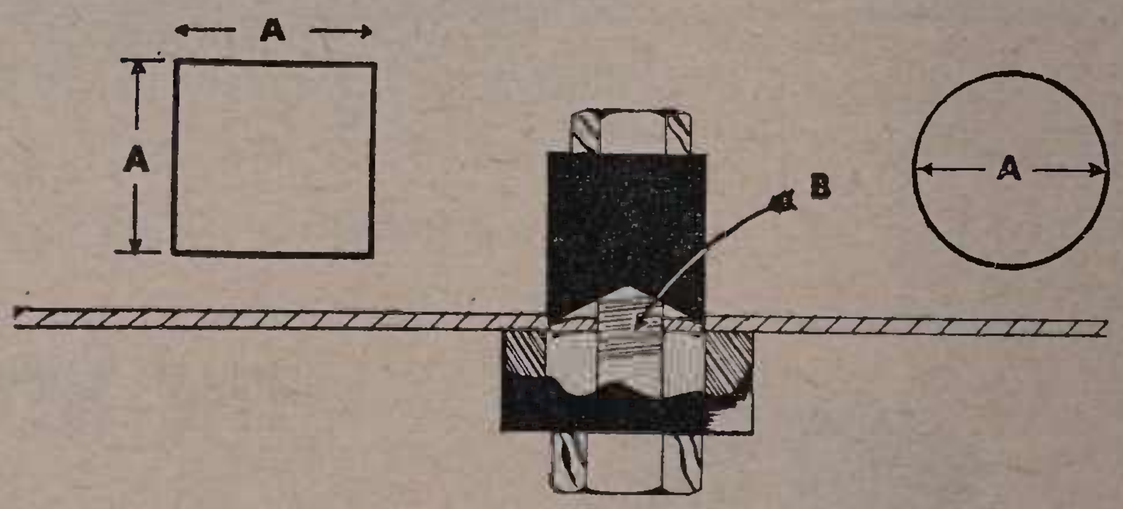

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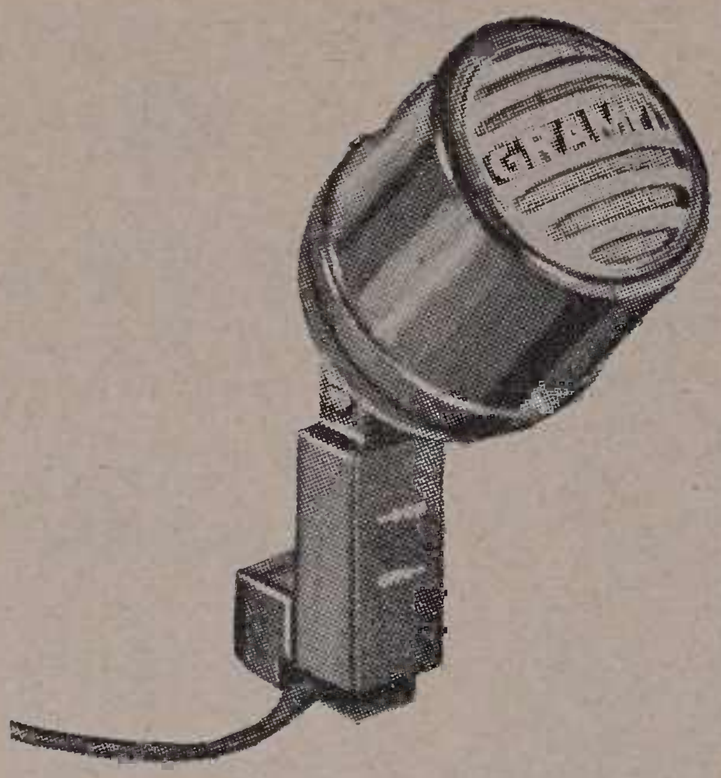

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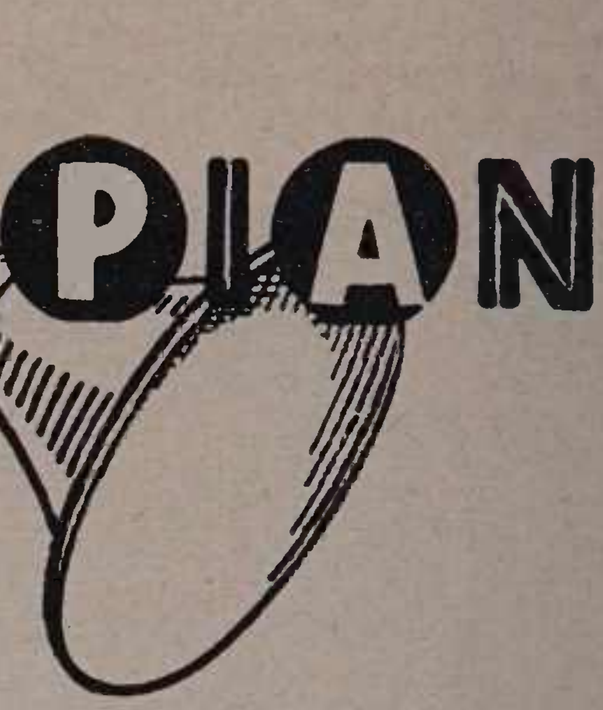

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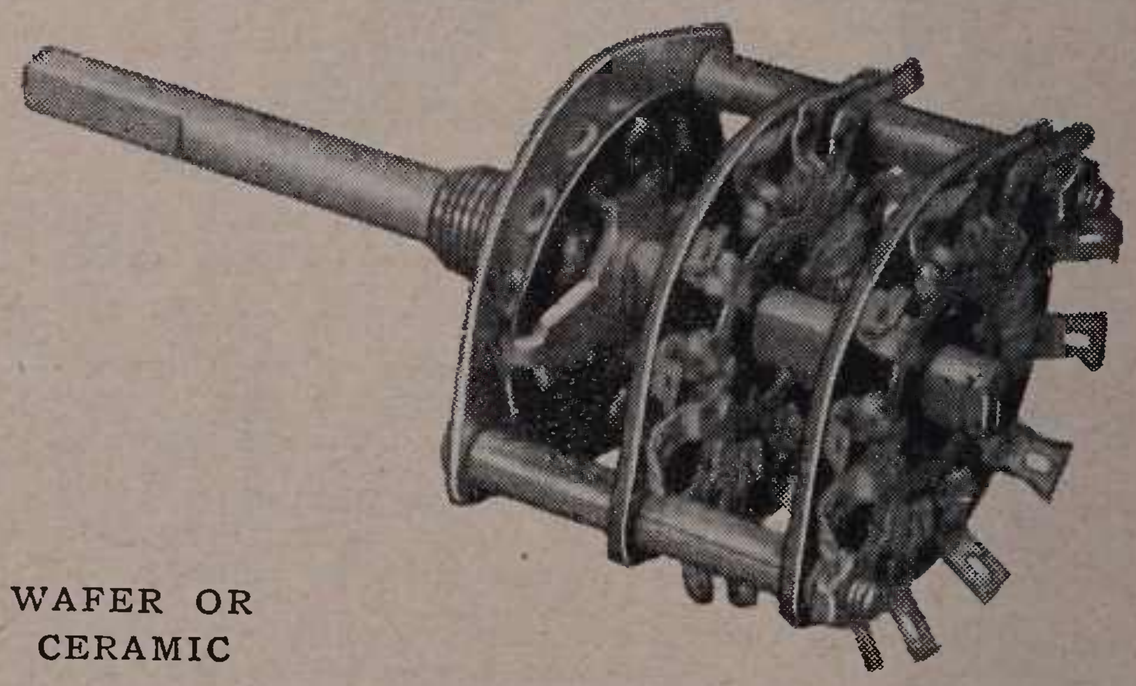

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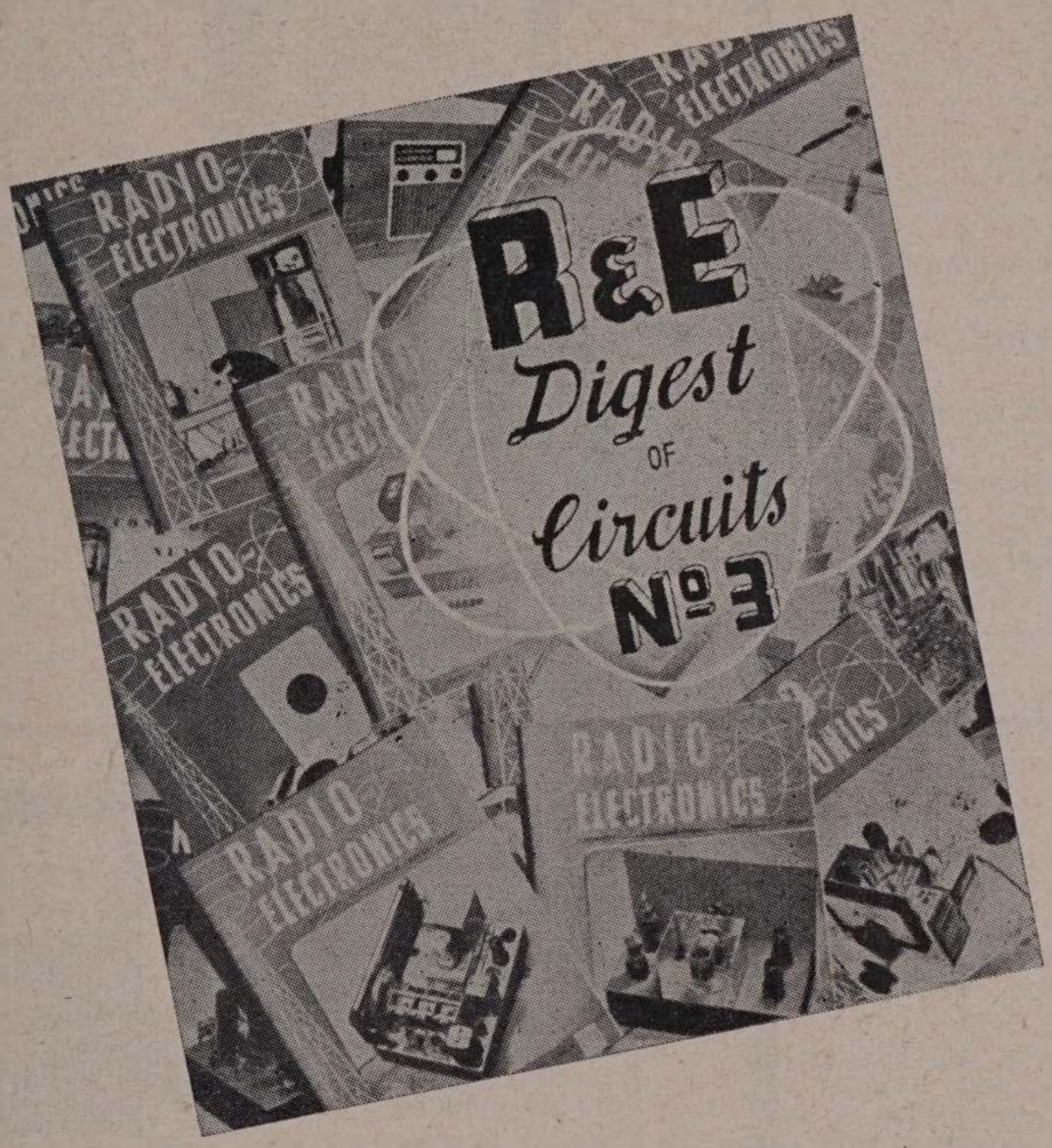

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NOTE: None of the material in "Digest No. 3" has appeared in the two previous Digests.

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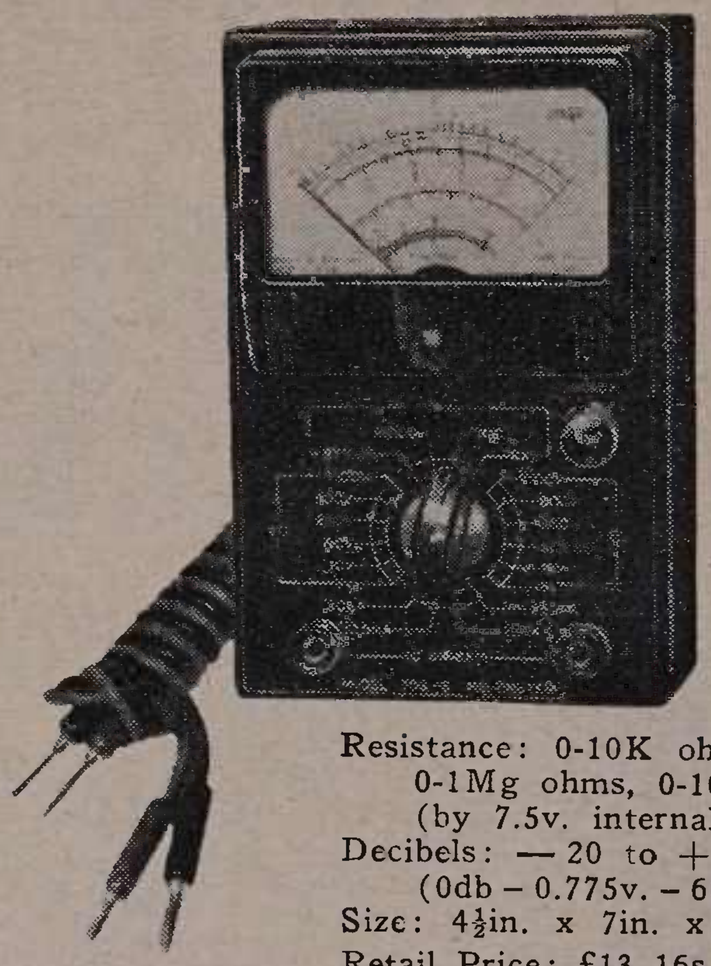

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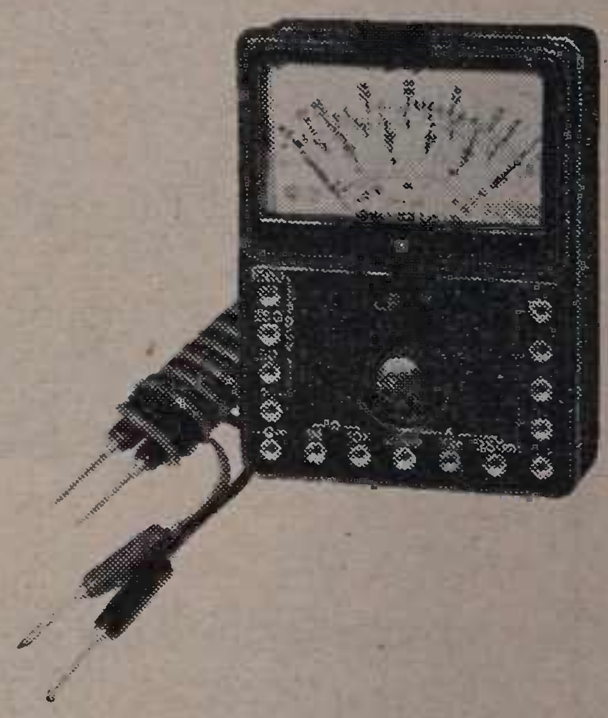

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TELEVISION IN SWEDEN

The following article is an interesting account of the television situation in a country which in many ways can be compared with New Zealand. This article was supplied to us by the Swedish Industrial Press Agency, to whom we have pleasure in acknowledging our indebtedness. We hope that some readers in appropriate positions in the right places will "mark, learn, and inwardly digest," even if the parallel between the two countries is not exact.

An interesting project has just been submitted to the Swedish Government, which, it is hoped, will put an end to the stalemate in which Sweden—a country with remarkable technical possibilities at its disposal—has reached in the television field.

Paradoxically, the Swedes have television, and yet they do not have it. Several thousands of them in the southern part of the country follow Danish programmes. Others, in and around the capital, must be content with the experimental programmes sent out by the State Radio, which at the moment holds an exclusive monopoly, which it exploits with relatively small State subsidies.

The last step taken by the authorities towards anything like national TV is a 213-page official report issued in November, 1954, in which all aspects of television at home and abroad are reviewed, and in which an ambitious plan is given for the building of a nationwide network within nine or fourteen years.

The report was to have been discussed in Parliament in 1955, but the discussion did not take place. Ten important Swedish commercial and industrial organizations have now come forward with a plan, which provides a remarkable solution to the problem of commercial television in a country which, though it undoubtedly possesses extensive resources, has a relatively small population (less than 8,000,000) spread unevenly over an area of about 174,000 square miles.

The new project offers an interesting compromise. Its main features are as follows:

(1) The cost of setting up television would be shared equally by the State and private commercial and industrial interests, each contributing one-half of the initial capital, a further sum being furnished by credits obtained jointly from the State and the private interests concerned.

(2) The first step of this proposed TV organization would be to make television accessible within one year to the three largest centres of population in Sweden—Stockholm, Göteborg, and Malmö, with a public of more than 2,100,000 viewers. Within one more year another 2,000,000 viewers would be provided for. Later, less populated areas and regions in distant parts of the country would be served.

(3) The financing of the scheme would be based on two chief sources of income, one being the licence fees collected by the Board of Tele-communications, the other being the funds derived from advertising time bought by special programme companies. This would make it possible to put the licence fee nearly 40 per cent. less than that suggested by the State.

(4) Strict rules would apply to the commercial programmes; close supervision would ensure high standard and quality. In no case shall the actual advertising in these programmes exceed one-tenth of the time; advertising would have to come at the beginning or at the end of the programme and would never be "mixed" with it.

(5) The relatively important place made for the State Radio in the organization is an interesting feature of the project. The State Radio would benefit from the increased number of licences for the financing of its growing share in the programmes and its technical development. The State Radio would also be responsible for handling the essential links of Swedish TV on the international level.

(6) The TV Corporation is asking for a 15-year concession.

The project is backed up by an interesting and carefully worked out development plan in which the Swedish industrial organizations have taken full advantage of the technical experience of the considerable Swedish radio and television industry, which has been suffering from the slow progress of television in that country and from the Government's restrictive policy. But the hesitation of the authorities has not prevented the Swedish radio and television industry from making good use of its capacities for production and research.

Careful investigations conducted by the Swedish Institute for Economic and Social Research show that regular television in Sweden organized on the lines suggested in the project would start moving rapidly. The building up of a proper network, which would be accomplished in two years' time, and the transmission of regular programmes totalling 900 hours for the first year and reaching a maximum of 1650 hours in the third year would increase the number of sets in Sweden from fewer than 8,000 today to 220,000 within five years, with corresponding income for the Television Corporation and the State.

This is a far cry from the present state of quasi-inertia, in which the State Radio works exclusively on the State subsidy feeding the Stockholm TV experimental transmitter.

Since this plan was presented, the Swedish Minister of Communications initiated a Bill in Parliament on February 9. The Bill (1) rejects commercial television, (2) gives the Swedish Broadcasting Company—the State Radio—a monopoly on programme production, (3) limits telecasting to the Stockholm area and pushes a national network into the unknown future, (4) sets licence fees at £5 per receiver. The Minister of Communications commented that the plan outlined by Swedish trade and industry is "based on too much optimism."

Immediately after the Government placed its Bill before Parliament, a group of M.P.s from the four major parties (including members of the dominating Government party, the Social Democrats) entered a separate Bill. This Bill was a compromise between the Government's Bill and the plan worked out by business interests. Its chief point was the provision of a delay regarding the final decision on commercial or non-commercial programmes and regarding the question of having a free or a monopolized TV.

The final decision was reached in the Parliament on May 22, when the Government Bill was passed in both chambers. This means that Sweden for the moment has decided to have a non-commercial monopolized State television.

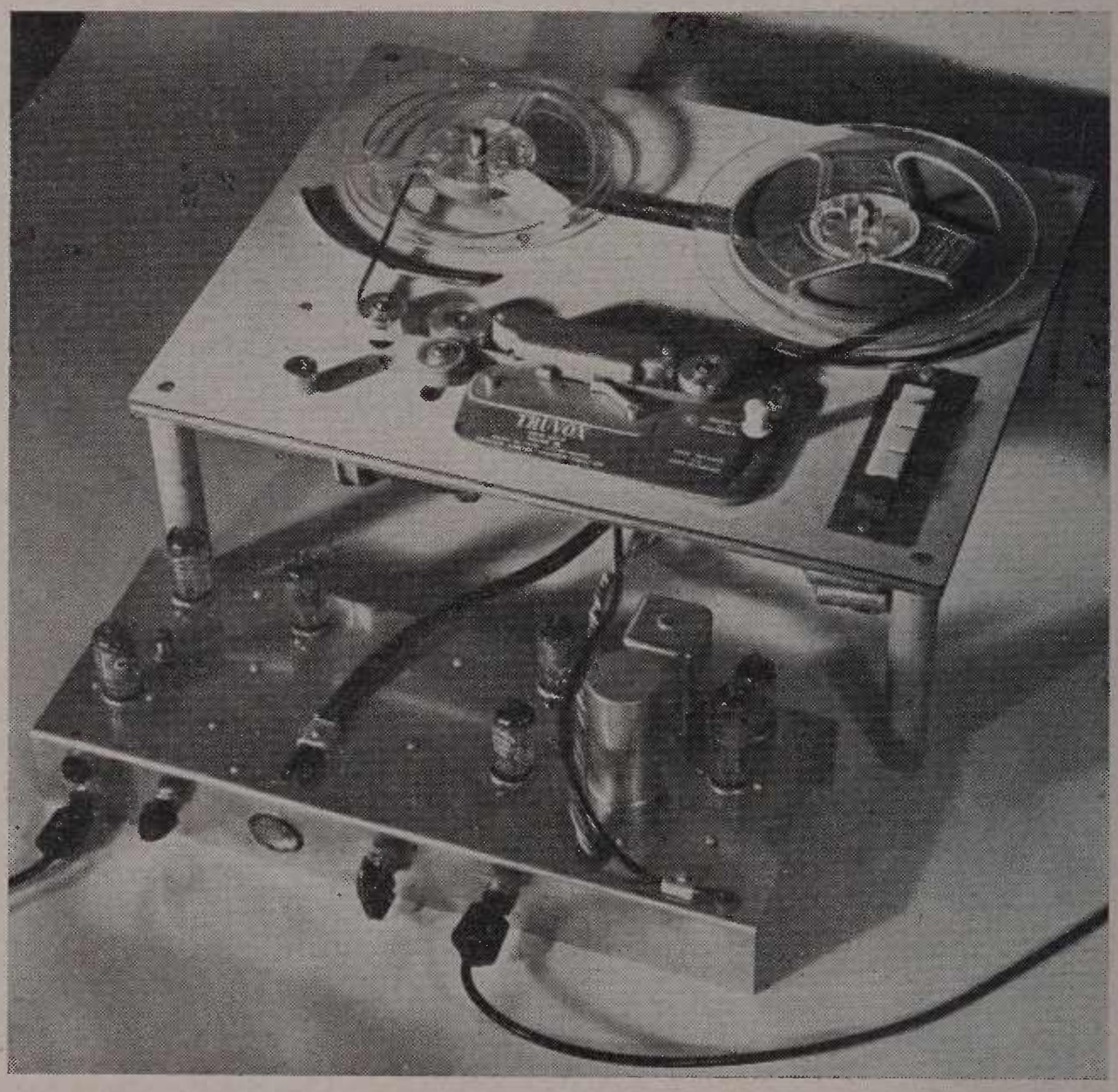
THE "R. & E." TAPE-RECORDING AMPLIFIER

Following on the success of our recent series of articles on tape-recorder circuits, we have been encouraged to design for our readers a complete tape-recording amplifier system, built on one chassis, and requiring only a separate power amplifier for operating the loudspeaker. Although the design was used with a particular make of tape deck, the circuits are such that little modification will be needed in order to make them suitable for any deck which uses high-impedance heads.

INTRODUCTION

There is little doubt that the availability of reasonably priced tape decks, of good performance has brought the construction of complete tape recording equipment within the capabilities of a large number of enthusiasts. The precision with which the mechanical part of a tape recorder must be built if its performance is to be even reasonably satisfactory has prevented many, who would no doubt have liked to try, from attempting to build their own tape decks. In the same way, we are sure that a fairly large proportion of those who have essayed this difficult task have been disappointed in the results they have obtained.

Any form of recording, whether on tape or on discs, has as an unavoidable pre-requisite, the achievement of constant-speed motion; so sensitive is the human ear to variations of pitch, that the precision that must be achieved in doing this is very high indeed, and unless the remaining "wow" and flutter is so slight as to be quite unnoticeable without the employment of special instruments for detecting it, there is little or no point in attempting to carry on with the electronic portion of the recording system.



View of the chassis together with the deck which was used as our lab. "guinea-pig". The combined results have been excellent.

Recently, however, there have arrived on the market a few makes of tape deck whose performance is good enough even for the high-quality reproduction of music, so that if one can afford to purchase one of these, it is possible to build one's self a recording outfit which will by no means disgrace the excellent disc-reproducing equipment that so many enthusiasts possess today.

In the series of tape-recording articles which we printed in these pages commencing in November last, we had more than a little to say about the fundamental mechanism of tape recording, and while on the subject, we gave circuits for the individual essential portions of any tape recorder which uses high-impedance heads. In particular, we explained the different requirements of tape recording in its electronic circuits, and showed how these days it is possible to use a standard type of playback amplifier which enables one successfully to play any tape which has been made to conform with the C.C.I.R. standard, irrespective of where, or on what machine the record was made. For those readers who are tackling the subject for the first time, it would be very useful to read the original series of articles, or some other simple explanation of the technicalities of tape recording and playing back, because to those who are used to dealing only with amplifiers whose frequency response is flat, tape circuits are a little unfamiliar. However, the last thing we wish to do here is to frighten off the newcomer to tape recording. Although some of the types of circuit that are used may be a bit strange at first, there is nothing difficult about them, either in construction or in understanding their functions, especially if one has

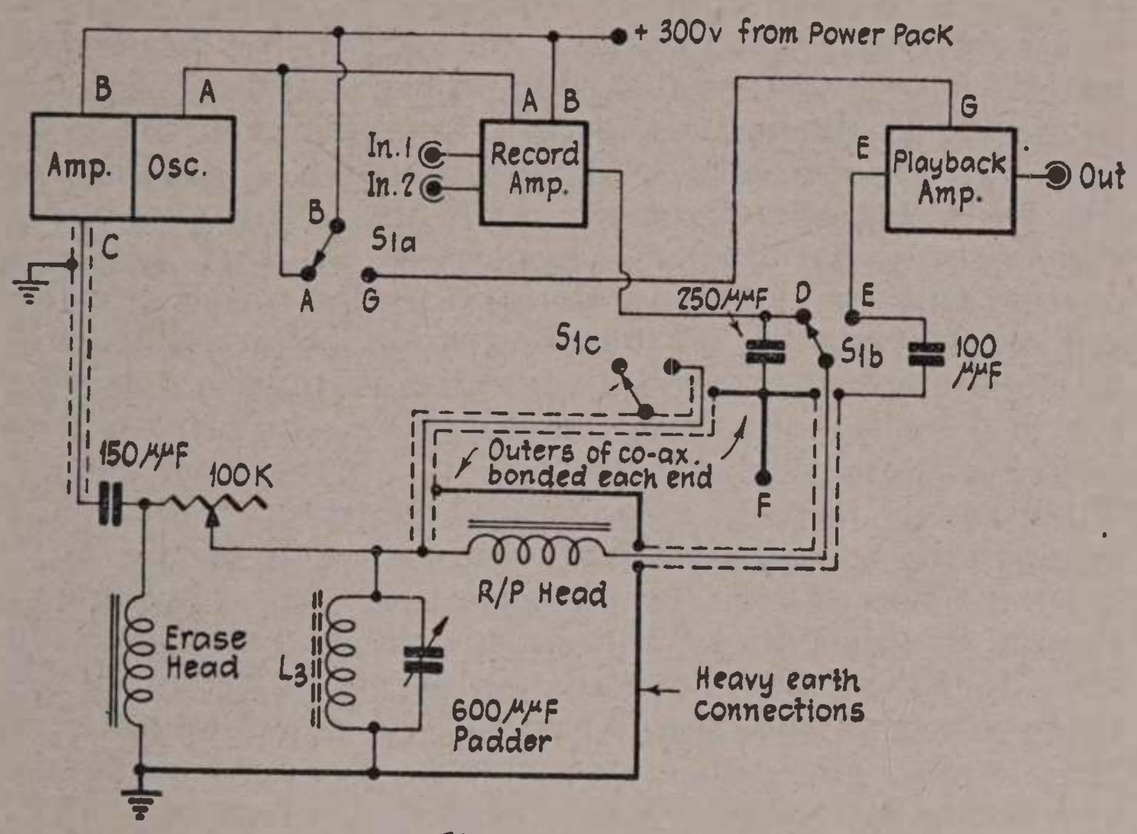


Fig. 1

The switching diagram and head circuit.

dealt successfully with the not very alarming intricacies of compensation for the frequency responses of 78 and L/P recordings. In addition, we have gone out of our way to make things as simple as possible for the builder, by giving him entirely separate amplifiers for recording and playing back, and by refraining from recommending cheap, but sometimes very nasty composite circuits, which use complicated switching in order to make the same valves perform several different functions. About the only virtue of such circuits is that they use very few valves, and their disadvantages are such that should a circuit give trouble, it is almost certain to be of the kind that is spelt with a capital T!

DESCRIPTION OF EQUIPMENT

In designing the circuits for a tape recorder, there are a few things that must be decided before the detailed work can begin. For example, is the instrument to be completely portable, or is it to be installed as part of a fixed audio system in the home? Secondly, what facilities are required for monitoring what goes on to the tape? Third, are separate heads to be used for recording, playback, and erasure? Fourth, are audio mixing facilities to be provided, so that it is possible to select more than one audio source for recording? and if desired, to mix two or more of them during recording? Fifth, what audio sources are to be provided, from which recording can be accomplished? And so on.

If answers to all these questions are known, then the general scheme of the amplifying equipment can be decided, but in a case like ours, practically all of the answers are unknown, because different users want different specifications, to meet their own particular ends. Thus, all we can do is to decide on a specification that will suit a number of people, and build the gear accordingly. This does not mean that we thereby ignore those whose needs may be slightly different. In many cases, simple additions or modifications can be made which will take care of different requirements, so that only a small minority are not finally suited. This is what we hope we have achieved in the present instance.

First of all, the circuit does not include a power amplifier or a loudspeaker. This decision was taken on the principle that many users of tape recorders do not want or need a completely self-contained instrument. For those who already possess an amplifier for gramophone record playing, it is usually quite unnecessary to have a built-in amplifier and speaker in the tape recording gear, because much the best quality will be obtained when the equalized output of the playback head is fed to the main amplifier. Thus, for playback purposes, the only circuit that must be provided in the tape recorder is a special equalizer and pre-amplifier. In the present equipment this accounts for two of the seven valves. The output from the playback section, as this part of the circuit can be called, is large enough to fully load any modern amplifier, and requires no special tone correction, since the response is already compensated in such a way that the signal from a standard tape emerges from it with a level frequency response, which it certainly does not have as it comes from the playback head itself. The remaining five valves are in use during the recording process. Two of them are concerned with providing the supersonic bias and erasing signal, and the remaining three perform the necessary amplification and response equalization for feeding the recording head. Of the three, two make up the recording amplifier proper, and the third is a pre-amplifier, which is needed only when a low-level microphone is used for recording.

There are two input sockets for recording. One takes the input to the pre-amplifier valve, and is used for the microphone only. The other feeds the input to the first valve in the recording amplifier proper, and so is intended for use with signals of much greater amplitude than are obtained from a microphone, such as a gramophone pick-up or a radio-tuner. Both jacks are of the closed-circuit type, the No. 1 (Mic.) jack being arranged to earth the control grid of the pre-amplifier valve when a plug is not inserted in it. The No. 2 (Radio) jack is connected so that when no plug is inserted, the output of the pre-amplifier valve is automatically connected to the input of the recording amplifier. When a plug is inserted, this connection is broken, and the only input is from the cable connected to the plug. From this is it can be seen that it is not possible to have two inputs to the recording amplifier at the same time, so that if mixing facilities are wanted, they will have to be provided separately. However, this is not difficult to do, should it be necessary in order to obtain special effects, such as recording a commentary for a film, with music playing softly in the background.

The output of the playback amplifier is brought to a third jack whence it can be taken to the input of the main amplifier, as described earlier. If the latter has a separate input socket for a tape recorder output, this connection can be made permanently, and the selector switch turned to this position when the tape recorder is in use.

The only other working control is the volume control for recording. A magic eye is used as a level indicator, and it is mounted under the chassis so that its face appears in line with the jacks and the volume control knob. There are various pre-set controls, but as these have to be adjusted only during the initial setting-up, and at rare intervals thereafter, they have been placed under the chassis. These are the controls for adjusting the erase and recording bias amplitudes, and the sensitivity of the magic-eye level indicator, and also the tuning controls for the

supersonic oscillator and amplifier, and a portion of the record/playback head's circuit.

The question of how many heads are to be used is determined by the choice of tape deck, and the one used has the conventional arrangement of a separate erase head, and a combined record/playback head. About the only advantage of a three-head machine is that it becomes possible to have both the recording and playback heads, which are entirely separate, working at the same time. This enables the record to be played back only a fraction of a second after it is made, the delay being simply the time taken for the tape to travel the distance between the recording and playback heads. As this distance is seldom more than a couple of inches, the delay is only about a quarter of a second, when the tape speed is 7½ inches per second. A system like this is often used in professional machines, because it gives almost instantaneous warning if something has gone wrong with the recorder. In an instrument intended for home use, what is being recorded can easily be monitored at the same time as the record is being made (although not from the tape) because the output of the radio tuner, for example, can be fed simultaneously to the tape recorder and the main speaker amplifier. Of course, if one wants to record something and play it back while the main amplifier is in use for some other purpose, an additional speaker or headphone amplifier is essential.

It might be thought that for recording in the home from the microphone, it would be necessary to have the whole of the recording and reproducing gear in self-contained portable form, but this is by no means necessary. Most modern microphones can be used successfully at the end of a very long piece of cable, if desired, so that all that must be extended is the microphone lead, even if one wishes to operate at several hundred feet from the recorder.

It might be thought that a certain amount of complication would be avoided if permanent-magnet erasing were used, so that no erase head would be needed, with the electrical arrangements used for feeding it with a watt or two of supersonic erase frequency. However, it is some time since tape recorders which pretend to any sort of quality have used permanent magnet erasing. The main reason for this is that it results in a noisy tape, in the same way as does D.C. biasing during recording—a system that has disappeared altogether since H.F. biasing first gained prominence. Because of this, only very inexpensive tape decks, which are not intended for high-quality reproduction, will be found to omit an erase head, and it is standard practice to use the same supersonic frequency for both erasure and biasing, during recording. Also, since an H.F. oscillator is needed for recording bias, irrespective of what system of erasure is used, there need be no complication of the electronic circuits, merely because H.F. erasing is chosen. In the present instance, an ingenious circuit is used for feeding the erase head and the record head from the same H.F. amplifier, so that there is no need for separate amplifiers for bias and erasing. The H.F. part of the system therefore consists of an oscillator and a single power amplifier.

CIRCUITS

Even when the individual circuits of a tape recorder are quite separate from each other, as they are here, a complete circuit diagram, drawn with the necessary switching on a single page, tends to look rather fearsome. Accordingly, the system has been split up into four separate diagrams. Three of these are the recording amplifier, the playback amplifier, and the H.F. bias and erase circuit, while the fourth is a drawing of the switching arrangements, with the separate circuits shown only as blocks. The letters on this diagram correspond to the same letters to be found on the individual circuits, so that there will be no confusion as to the exact point on the circuit that is brought to the switch in each case. Also shown on the switching diagram is the circuit of the two heads. This saves having a separate diagram, with feeds going both to the switching diagram and to the H.F. section. The reason for this is that the components shown in this part of the circuit are actually situated on the deck, on a small panel specially mounted there for the purpose. This has to be done because the erase and bias frequency is approximately 60 kc/sec., so that to a considerable extent, R.F. wiring technique must be used if the proper performance is to be obtained. This is discussed further later in the article.

In practice, the three main circuits have all been built on the one chassis, but they are none the less separate entities, for all that, and they can be built and tested quite separately. In this way, the job is broken down into three separate ones, each of which is quite small, and not at all difficult. The lay-out was made in the expectation that complete shielding of the R.F. oscillator might be needed, but it was found not to be necessary after all, and so was omitted.

SWITCHING ARRANGEMENTS

The first part that should be described is the switching diagram, together with the arrangements for feeding the heads. The former is very simple, mostly because of the complete separation of the amplifier functions, mentioned earlier. There is only one switch, comprising several single-pole two-position sections, the two positions being "Record" and "Playback". All the switches are ganged together and in practice are sections of a wave-change type of wafer switch.

One section switches the H.T. to the H.F. oscillator on "Record", and to the playback amplifier on "Playback". A second connects the record/playback head to the output of the record amplifier or to the input of the playback amplifier, according to function. It will be seen that the H.T. is left on the H.F. amplifier and on the record amplifier at all times. The purpose of this is to use the current drawn by these valves as a bleeder on the power supply. Most of the current drawn by the circuit is accounted for by the H.F. amplifier, and since it is a Class A amplifier, its plate current is constant, whether or not there is any excitation for it. Thus, if this valve were switched off on playback when it is not otherwise needed, the power supply regulation would allow the H.T. voltage to rise appreciably. There is no need for any more than 300 volts in either position of the switch, so that leaving the amplifier valve running avoids the use of a resistor of fairly high wattage as a bleeder. In this way, large thumps in the playback amplifier are avoided when the R/P switch is operated. The third section of the switch connects one end of the R/P head to earth during playback, for reasons that will be described in a moment.

The head circuit is an ingenious one, described in the Nov., 1954, issue of "Wireless World" by A. F. Fischmann. Its main advantages are that it simplifies the feeding of H.F. bias current to the R/P head during recording, and that it overcomes in a very elegant manner one of the difficulties usually associated with bias feed circuits. The difficulty, particularly with high-impedance heads, is that the impedance of the R/P head at the high bias frequency is very large indeed. This means that in order to obtain the right amount of bias current through the head's winding, a quite high bias voltage must be applied to it. Now in order to record, a relatively very small audio voltage is applied to the head at the same time, and, because of the presence of a large voltage at bias frequency, this voltage is very likely to be applied to the output terminal of the record amplifier. Some arrangements manage to prevent this from happening, but others are quite poor in this respect. In bad cases, the presence of over a hundred volts of bias frequency at the output plate of the record amplifier can actually cause the plate current in this valve to be cut off for part of each cycle of the bias frequency, and can thus upset the D.C. operating conditions of the valve, if it does nothing worse. At the same time, it is very easy under these circumstances for the early stages of the record amplifier to pick up appreciable quantities of bias voltage on their control grids. This can lead to distortion in these stages, and the over-all result will be very poor recording quality.

In the present instance, approximately 125 volts of H.F. bias must be applied across the head during recording, and with the recording amplifier circuit used, this could mean that the whole of this 125 volts is applied directly to the plate of the final stage in the record amplifier. When it is known that at low audio frequencies, the signal voltage across the head is only of the order of 25 millivolts, it can readily be appreciated that the conditions for the production of distortion, and other undesirable effects are very favourable. The circuit used here, however, almost completely eliminates the difficulty. When the 125 volts of bias is measured across the head, only 6 volts can be measured at the plate of the last tube in the record amplifier. Under the circumstances, this is quite innocuous, and eliminates altogether the difficulties mentioned.

It can be seen that both ends of the R/P head are above ground when the switch is in the "Record" position, and that the audio signal is fed to one end, and the bias to the other. The bias is fed in from the erase head's "hot" terminal, through a series resistor, which forms a potential divider for the bias frequency, with the aid of the tuned circuit, which is peaked at this frequency. Thus if the output of the bias and erase amplifier is first adjusted so that the correct voltage appears across the erase head, the 100 k. variable series resistor can then be adjusted to give the correct voltage across the record head. This is feasible because the erase head, when properly excited, has a larger voltage across it than is required by the record head. At what may be termed the audio end of the R/P head, the latter is connected (through a blocking condenser which appears on the record amplifier diagram) directly to the plate of the last amplifier valve. The connection is made through a foot or two of co-axial cable, so that there is a capacity of approximately 50 $\mu\mu$fd. connected from this end of the head to earth. This capacity is supplemented with a small fixed condenser, so that the total capacity to earth at the audio end of the head is about 250 $\mu\mu$fd. At the bias frequency, this capacity has a very low reactance, so that it acts to this frequency as a bypass condenser. Thus, as far as the bias is concerned, the audio end of the head is effectively earthed, and except for the six volts mentioned, the whole H.F. voltage applied to the other end of the head appears across it.

If we now look at the bias end of the head, we see that there is the tuned circuit connected between this point and earth. As the circuit is tuned to 60 kc./sec., its impedance at all audio frequencies is very low; thus, it appears to the audio signal, entering the head from the other end, as a short circuit, and the whole of the audio signal is developed across the head. From this description, it can be seen how the circuit allows both audio and bias voltages to be

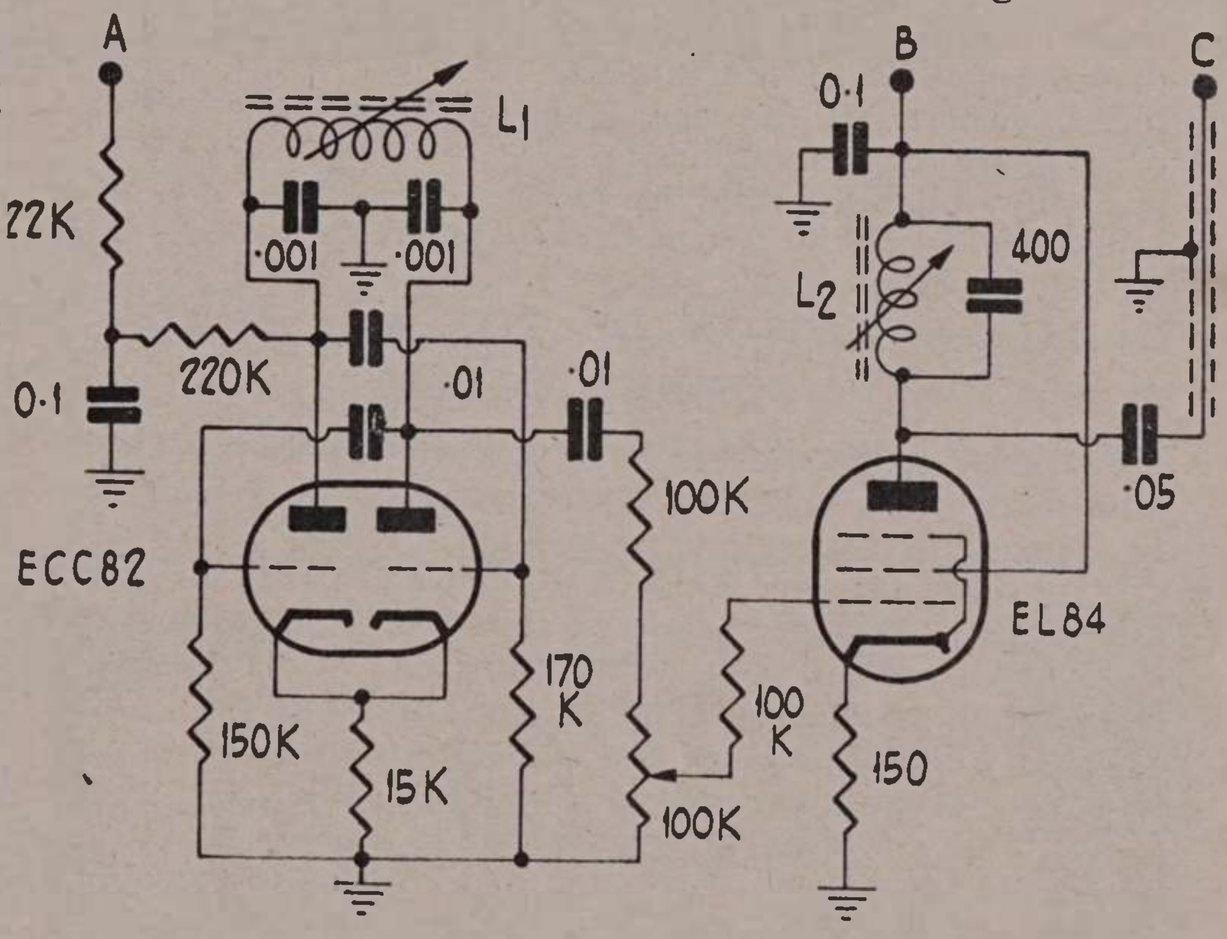


Fig. 2

The H.F. oscillator and amplifier, supplying both erase and bias currents.

developed across the head, without interaction between the two feed circuits.

On playback, it would be possible to leave the bias end of the head connected to earth through the bias tuned circuit, the only change being to switch the audio end of the head from the output of the record amplifier to the input of the playback amplifier, and to turn off the H.F. oscillator during playback. Unfortunately, this simple arrangement is impracticable, for the following reason. The unshielded coil of the tuned circuit is not far from the electric motors, and picks up a few millivolts of hum because of their stray field. This hum is quite great enough almost to swamp the signal from the head, on playback, and must be eliminated. The obvious remedy is to short-circuit the coil. For some reason, one's immediate reaction to this suggestion is that the shorting switch will have to be as close to the coil as possible, but this, too, is impracticable, because we certainly do not want to have two switches to operate when changing over from record to playback, and vice versa. The solution is to take a shielded lead back to the main switch, from the bias end of the head, and to short-circuit this end of the head to the common

earth point, back at the chassis. It will be noticed that this scheme does not prevent the coil from picking up hum from the motors, but does prevent that hum from being connected in series with the head during playback. Incidentally, the amount of hum picked up is quite negligible during the recording, as both theory and practical tests indicated.

Of course, another method of overcoming the hum picked up by the coil would be to enclose the tuned circuit in a mu-metal shield. However, such shields are rather difficult to come by, and in any case are difficult to make completely effective, so that the method of shorting the tuned circuit at the far end of a piece of co-axial cable is probably the better one in any case.

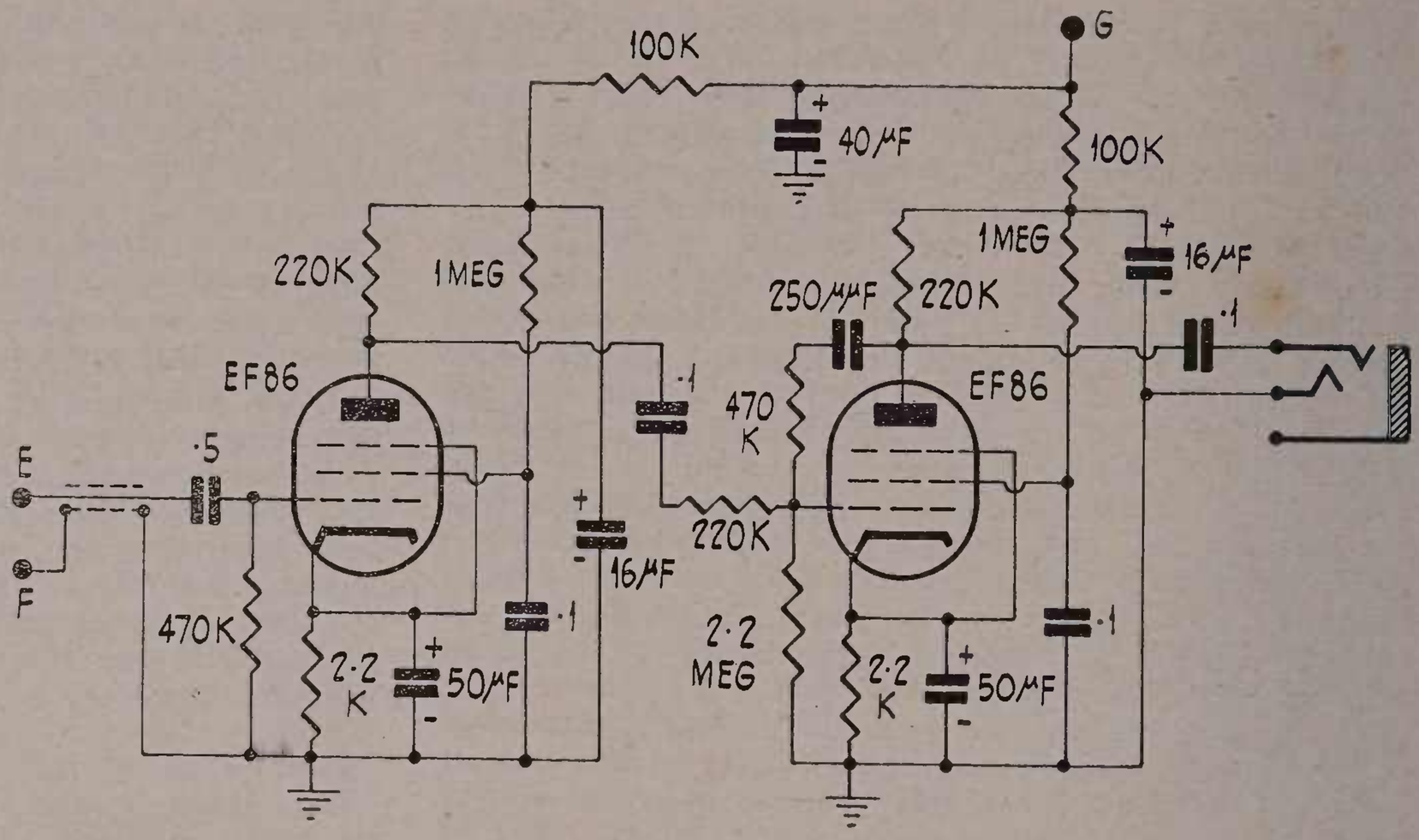


Fig. 3

The playback amplifier circuit. The output is sufficient to drive any main amplifier directly. The record amplifier circuit, and chassis details will be printed in the next instalment of this article.

MODIFICATION OF THE R/P HEAD CONNECTIONS

In order to make this head circuit possible, a slight modification is necessary to the way in which the R/P head is connected in the deck itself. As originally purchased, the R/P head connection is brought out through a single piece of shielded wire. The "hot" lead is the inner wire, while the earthy end of the head winding is connected to the shielding AT THE HEAD ITSELF. In order to pick up this end of the winding, it is necessary to unscrew the cast cover plate. This enables the head assembly to be lifted up, when the two wires from the R/F' head are revealed. A piece of hook-up wire is connected to the one that was previously earthed, and this is shielded with a piece of braid. The shielded lead from the "hot" end of the head is left undisturbed, so that the modification consists only in bringing out the other end through its own piece of shielded wire. This should be bonded to the HEAD END of the original shielded wire, and the common earth point on the terminal strip provided for the heads by the makers of the deck. There is a spare lug on this strip, which can be used for terminating the new lead from the head.

OSCILLATOR AND AMPLIFIER CIRCUIT

The oscillator uses an ECC82 in a push-pull arrangement, the chief advantage of which is its excellent waveform. It is extremely important that the output of the oscillator-amplifier combination should be as pure as possible, in order to avoid noise and distortion, so that an oscillator capable of producing a pure waveform to begin with is of considerable assistance in this respect. In order to achieve a good oscillator waveform, it is preferable to have it running at a very low level, relying on it only for driving voltage for a separate amplifier, rather than asking it to produce a watt or two of output itself. In order to make the oscillator valve operate as nearly under Class A conditions as possible, a large common cathode resistor is used. This helps to balance the two halves, and ensures that the valve gain is kept low. Both of these help to reduce distortion. H.T. is fed to the valve sections through a 220 k. resistor from the H.T. line, to one plate. The other plate gets its voltage through the low resistance of the tuning coil, so that both sections have the same H.T. voltage. This scheme of feeding in the H.T. in an unbalanced manner is permissable only because of the high value of the feed resistor. Strictly speaking, the coil should be centre-tapped, and the resistor connected to this point, but when the feed resistor is so high in value it can be connected in the manner shown without appreciably unbalancing the circuit, because its value is considerably higher than the impedance of the tuned circuit.

The output is taken from one plate of the oscillator. It is important to note that this is the opposite plate to that used to feed the H.T. to, and that the resistance connected to earth from the output plate is approximately the same in value as the feed resistor. Because of this, the resistive loading on the two halves of the push-pull oscillator circuit is balanced, so that any unbalance arising through the unbalanced H.T. feed is counteracted by the output connection. The potentiometer feeding the grid of the EL84 power amplifier is there to enable the output of this tube to be adjusted until the correct H.F. voltage is found across the erase head. Being a pre-set control, whose setting hardly ever needs to be altered, it is placed under the chassis on a small bracket, as closely as possible to the grid of the EL84.

The EL84 is a tuned amplifier, so that in its plate circuit we find a parallel-tuned circuit, adjusted to the same frequency as the oscillator. This helps to remove traces of distortion that inevitably occur in even a good oscillator like this one, and the waveform at the plate of the amplifier is quite likely to be a little purer than that from the oscillator. A large blocking condenser removes the D.C. from the am-

plifier output before it is connected to the co-axial cable which feeds the H.F. power to the erase head. At the other end of the cable is a small silvered mica condenser which might at first sight appear to be unnecessary, but such is not the case. Its value has been chosen so that it acts with the inductance of the erase head as a series-tuned circuit. In this way, the inductive reactance of the head is cancelled out, and to the amplifier valve, the circuit looks like a pure resistance of some 5000 ohms. There are two ideas behind tuning the head like this, both of them beneficial to the performance of the amplifier and thus to the purity of the H.F. waveform. First, a purely resistive load is the best kind for obtaining a large output voltage of good waveform. Secondly, although the Q of the tuned head circuit is only about 1.6, this means that the voltage across the head is 1.6 times the voltage at the output end of the cable. This reduces the voltage that must be produced by the amplifier, which once more improves the quality of its output. At the same time, the head tuning provides a small amount of discrimination against harmonics which may be present in the amplifier output in spite of our precautions.

As for the R/P head, no attempt is made to tune it to the bias frequency, for there is no need to do this. Its inductance is much larger than that of the parallel-tuned circuit which forms the lower leg of the voltage divider, so that it does not prevent this circuit from having quite a relatively high Q, and thus tuning quite sharply. This circuit, discriminates quite strongly against harmonics in the H.F. waveform, and provides a specially pure bias waveform for recording. Because of its high Q, this circuit needs a pre-set tuning adjustment, provided by the 600 $\mu\mu$fd. padder. There is no need, however, to make the tuning of the erase head variable. Its very low Q makes it insensitive to large changes in the tuning capacity, so that a fixed tuning condenser is adequate.

COILS FOR THE H.F. CIRCUIT

The three coils used in this part of the circuit are identical, each being a winding taken from a 100 kc./sec. I.F. transformer. The oscillator and amplifier circuits are tuned with their own slugs, the capacities being fixed. The coils are made in the following way, starting with a complete 100 kc/sec. I.F. transformer.

First of all, the transformer is removed from its can, and the leads to the upper coil are carefully unsoldered. The former is then sawn in two, mid-way between the coils. For the oscillator coil, the can and the winding still attached to the base are used. The existing tuning condenser is removed, and is replaced by two 0.001 μfd. condensers, connected in series across the winding. The centre junction of the condensers is then given a lead of bare tinned copper wire, which is taken through one of the spare holes in the transformer base. It will be noticed that at the top of the can, there is a pressed recess into which the end of the original coil former fitted. The idea of this is to make the whole assembly rigid inside the can, but since we have removed the upper half of the coil former, it is necessary to replace it with something of approximately the same diameter. This was done by whittling the end of a piece of thin dowel rod so that it was a push fit inside the coil former. The dowel was then cut to the right length to allow it to fit in place at the top of the can, just as did the original coil former.

This done, there is no base on which to mount the remaining winding, which is to be used as the plate coil for the EL84, so one has to be made. In our case it was made from a small square of polystyrene. A hole was drilled in the centre such that the former was a push fit into it. Two rivet-lugs were then mounted on it to take the ends of the winding, and the fixed tuning condenser, and screw holes were provided with which it could be bolted to the chassis.

Either of the two methods described can be used for making the coil for the tuned circuit L_3, which is mounted on the small panel under the deck. There is little or no point in using the can in this position, because the hum pick-up is magnetic, and the aluminium can will not have the slightest effect on this.

(To be continued)

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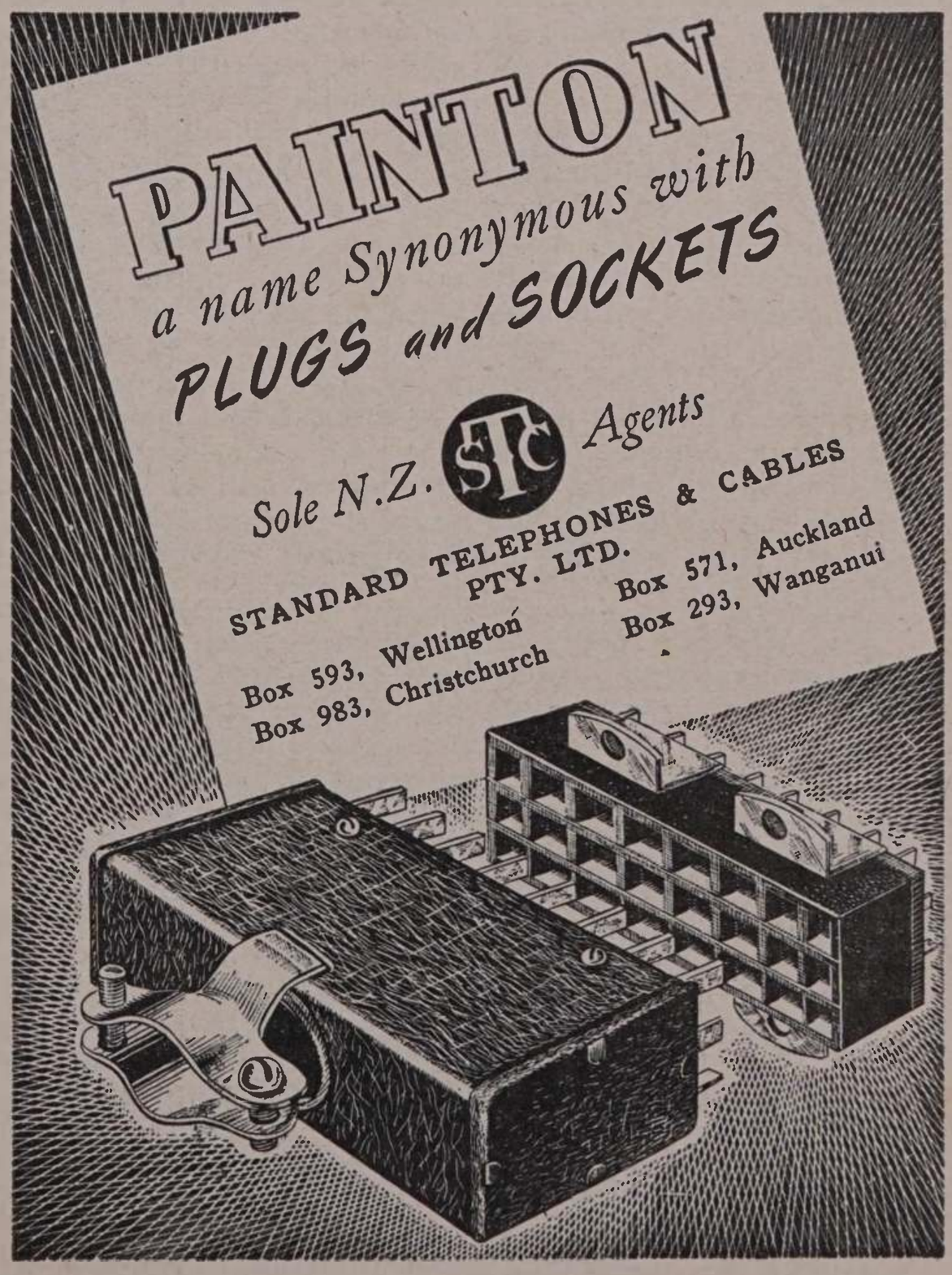


The PHILIPS Experimenter

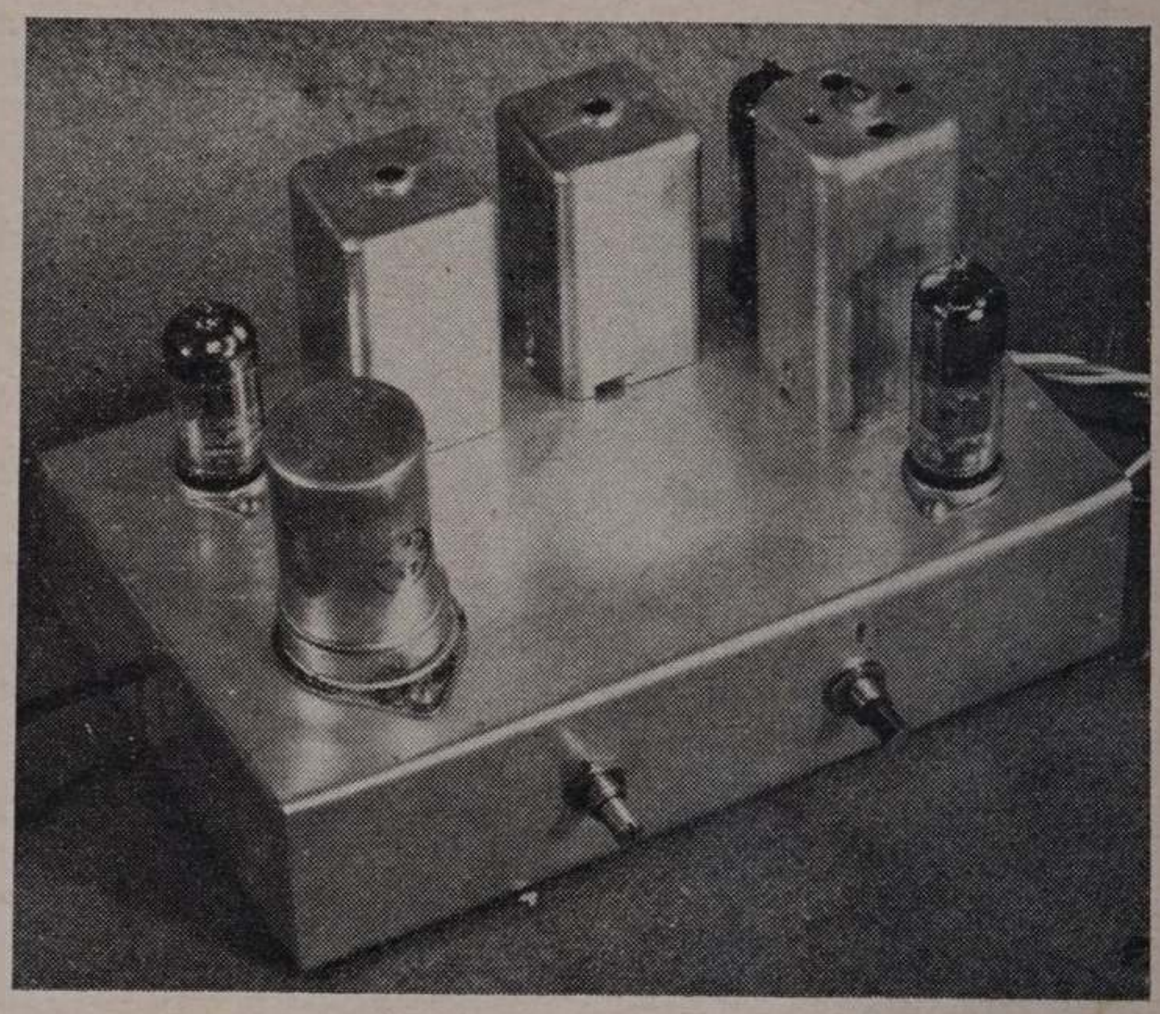
An advertisement of Philips Electrical Industries of N.Z., Ltd.

No. 106: A Panoramic Adaptor for Amateur Receivers—Part 2

Last month .we described the principle of the panoramic receiver and gave a block diagram of the portion of the complete system it was proposed to build as an adaptor. The circuit of the adaptor is given here, complete with photographs and a chassis drawing, and from these it can be seen how little needs to be constructed if one already possesses an oscilloscope, with its built-in sweep generator.

The first valve, an EF80, is an amplifier, working at the intermediate frequency of the main receiver, which we will assume for the moment to be 455 kc/sec. Its input is not provided with its own tuned circuit, but attaches to the plate of the frequency converter in the receiver. The reason for picking off the signal at this point rather than later in the receiver, is that here the only selectivity is that due to the R.F. end of the receiver, together with the primary winding of the first I.F. transformer. Thus, at the plate pin of the mixer, we have the signals after conversion to the I.F., but without the main portion of the selectivity of the receiver having had a chance to reject everything but the signal that is exactly on the intermediate frequency. Thus, although there is some selectivity active at this point, there is some response, and therefore signals present, in a band of appreciable width, which is centred on the nominal I.F. This band extends for several tens of kilocycles on either side of the nominal frequency, so that if we amplify this band non-uniformly in a subsequent stage of the panoramic adaptor, we can arrange for the overall amplification of the band represented by (I.F. ± 30 kc/sec.) for example, to be uniform. If this is done successfully, we will have arrived at almost the opposite of the result sought for by the I.F. amplifier in the main receiver. Here, the question is one of rejecting all the signals in this band except the one which may be at the nominal intermediate frequency of 455 kc/sec.

The desired result is obtained in the panoramic adaptor by using a coupling transformer in the plate circuit of the first valve and widely staggering the tuning of its two windings. Thus, the primary of $I.F.T._1$, which is a conventional 455 kc/sec. transformer, is tuned to some frequency considerably higher than 455 kc/sec.—say 470 kc/sec., while the secondary is tuned to 440 kc/sec. In this way, the response at the output of the secondary of $I.F.T._1$ can be made reasonably flat from below 440 kc/sec. to above 470 kc/sec. With proper adjustment this band would probably extend from about 430 to 480 kc/sec. Thus, the EF80 provides enough amplification to enable the bandwidth to be extended in this way, because if an attempt were made to use the staggered I.F. transformer without additional amplification, it would be found that the signals had been attenuated too much, making necessary a stage of wide-band amplification following the wide-band input circuit.



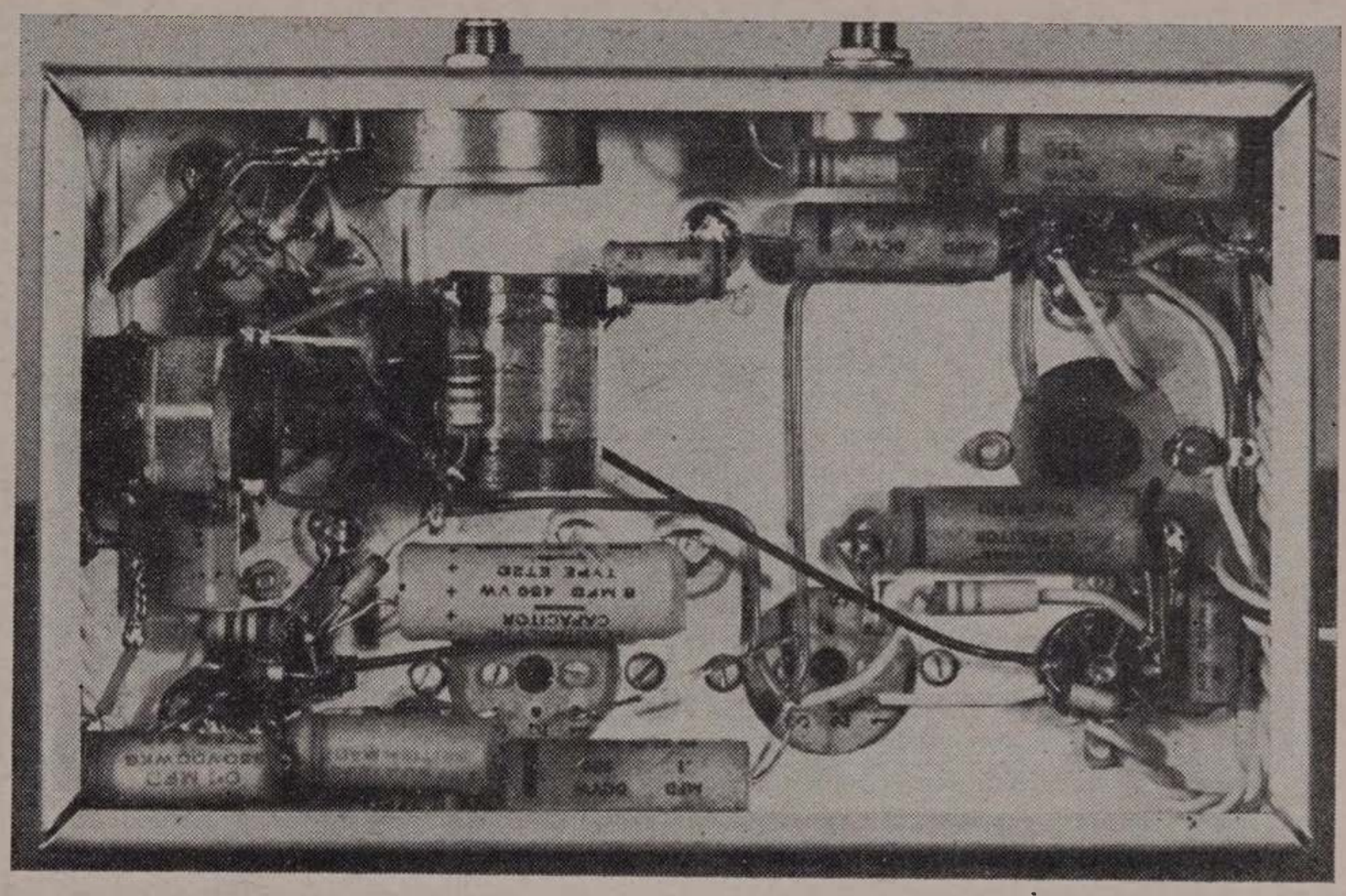
This photograph gives some idea of the small size of the adaptor needed when the C.R.T. and its power supply are separate.

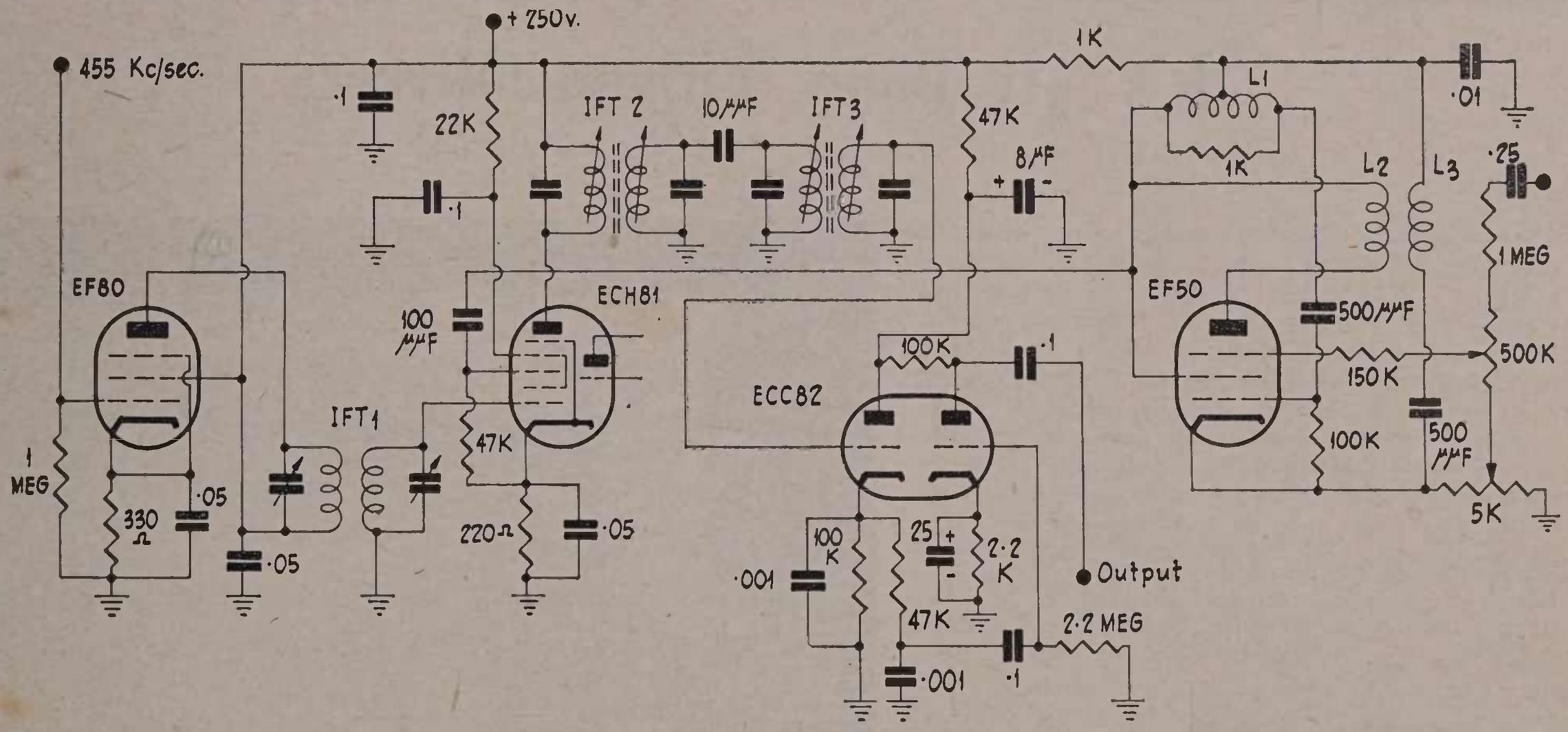
The next tube is an ECH81, and it is used as a converter, changing the signal frequency to 100 kc/sec. From here on, the requirement is for as much selectivity as we can get, and most panoramic adaptors use a stage of amplification at this frequency, and two very sharply tuned 100 kc/sec. I.F. transformers. The oscillator section of the ECH81 is unused, and a separate EF50 is used instead. The reason for this is that in order to achieve the panoramic display of the signals that might be present in the wide band accepted by the input circuits, it is necessary to sweep the oscillator repetitively, as explained in the first instalment of this article, so that the signals present at the input of the mixer are successively converted to the 100 kc/sec., second I.F. It would have been possible to use the oscillator section of the ECH81, and to use another valve purely as a frequency-modulator. It was decided not to do this, however, because we had discovered a new and interesting circuit that looked as if it might simplify the construction quite a bit. This circuit is one whereby a pentode, used as an oscillator, is able to act at the same time as its own frequency modulator, requiring only a saw-tooth modulating voltage to be applied to the suppressor to enable excellent frequency modulation over a wide band, to be obtained. The same number of valves is used as in the conventional arrangement, and yet the new circuit is simpler to construct and requires no special adjustment. Its operation, however, is rather more complicated than

its circuit diagram, so that here, we will content ourselves with a simplified description of it. Interested readers will find a fuller description in a forthcoming Philips Application Note.

THE SELF-MODULATED OSCILLATOR

By this, we do not mean that the oscillator generates its own modulating waveform, or anything like that, but that it is able to act as its own modulator. Contrary to appearances, the oscillation frequency is governed, not by L_1, but by L_3, which, together with the 500 $\mu\mu$fd. condenser, forms a series-tuned circuit. This circuit is effectively in series with the cathode of the EF50, for what is the upper end in the diagram is earthed as far as signal frequency is con-





cerned, by the 0.01 μfd. bypass condenser. The winding L_2 is tightly coupled to L_3, and the plate current, both D.C. and R.F., flows through this winding. It will be seen that the control grid of the valve is not returned to earth, but to cathode, so that the R.F. voltage across L_3 is not applied to the grid circuit. Because of this, there is no feedback to sustain oscillation. This feedback is provided by L_1. This is actually tuned to the same frequency as L_3, but only by its self-capacity, and by strays, and it is also heavily damped by a 1000 ohm resistor. The H.T. is fed to the plate of the valve through a tap on L_1, with the plate winding connected to one end. Since L_1 is a tuned circuit, the R.F. voltage at the opposite end of L_1 will be 180° out of phase with that at the plate end. The voltage from the opposite end is fed to the control grid of the tube, and, being out of phase with the plate voltage, this feedback is of the correct polarity to sustain oscillation. The screen grid is also connected to the plate end of L_1, and is unbypassed, so that there is a certain amount of R.F. screen current, in phase with the plate current. The modulating voltage is applied to the suppressor, and its effect is to vary the manner in which the cathode current is distributed between the screen and the plate. It is this variation that causes the frequency modulation to take place, in a manner which it is not possible to elaborate on here. It should be noted that the feedback from L_1 is not able to cause the circuit to act as a simple Hartley oscillator, with L_1 as the frequency-determining circuit, because this is so heavily damped. Its purpose is solely to act as phase inverter. The damping on L_1 makes it tune very broadly, so that the phase inverting action is able to take place over a wide band of frequencies, and it is this which accounts for the ability of the circuit to be frequency-modulated over a wide band, without significant change in output voltage.

The output is taken from the plate end of L_1 and is fed through a blocking condenser to the injection grid of the ECH81, which performs its frequency-conversion in the normal manner.

SELECTIVITY WITHOUT AN I.F. AMPLIFIER

Readers will remember that it is necessary for the 100 kc/sec. I.F. circuit to be as selective as possible, in order that the panoramic display shall be able to distinguish between signals whose frequencies are very close together. A suitable degree of selectivity is provided by two high-Q I.F. transformers, in the well-known "back-to-back" arrangement, coupling between them being effected by means of the 10 $\mu\mu$fd. condenser, without sensible loss of signal voltage. Since there is considerable amplification in the ECH81 mixer stage, additional gain at the I.F. is not needed, and in this way a valve and its circuit are eliminated.

DETECTOR AND AUDIO STAGES

For the detector, one half of an ECC82 has been used, in the infinite-impedance detector arrangement. This has a distinct advantage over a diode detector in the present application, because of the property which gives it its name. It produces virtually no shunting on the secondary of I.F.T.$_3$, so that it does not reduce the Q of this winding appreciably, nor therefore, does it reduce its selectivity. Since it is important to have the 100 kc/sec. channel as selective as possible, there is ample justification for the choice. The detector output voltage is well filtered before application to the second section of the ECC82, which amplifies it before passing it on to the oscilloscope amplifier for application to the Y-deflection plates. Note that a large output-coupling time-constant has been used, in a 0.1 μfd. condenser and a 2.2 Meg. resistor. This is important, because the sweep frequency, and thus the repetition rate of the output waveform, will be only 25 c/sec., and very good low-frequency response is needed, following the detector, if we are not to finish with a distorted waveform, and a picture with response pips that are improperly shaped.

The third and final instalment of this article will describe the setting-up and use of the panoramic adaptor.

(To be concluded)

It's All Done Without Mirrors

(Reprinted from Pye Television Newsletter)

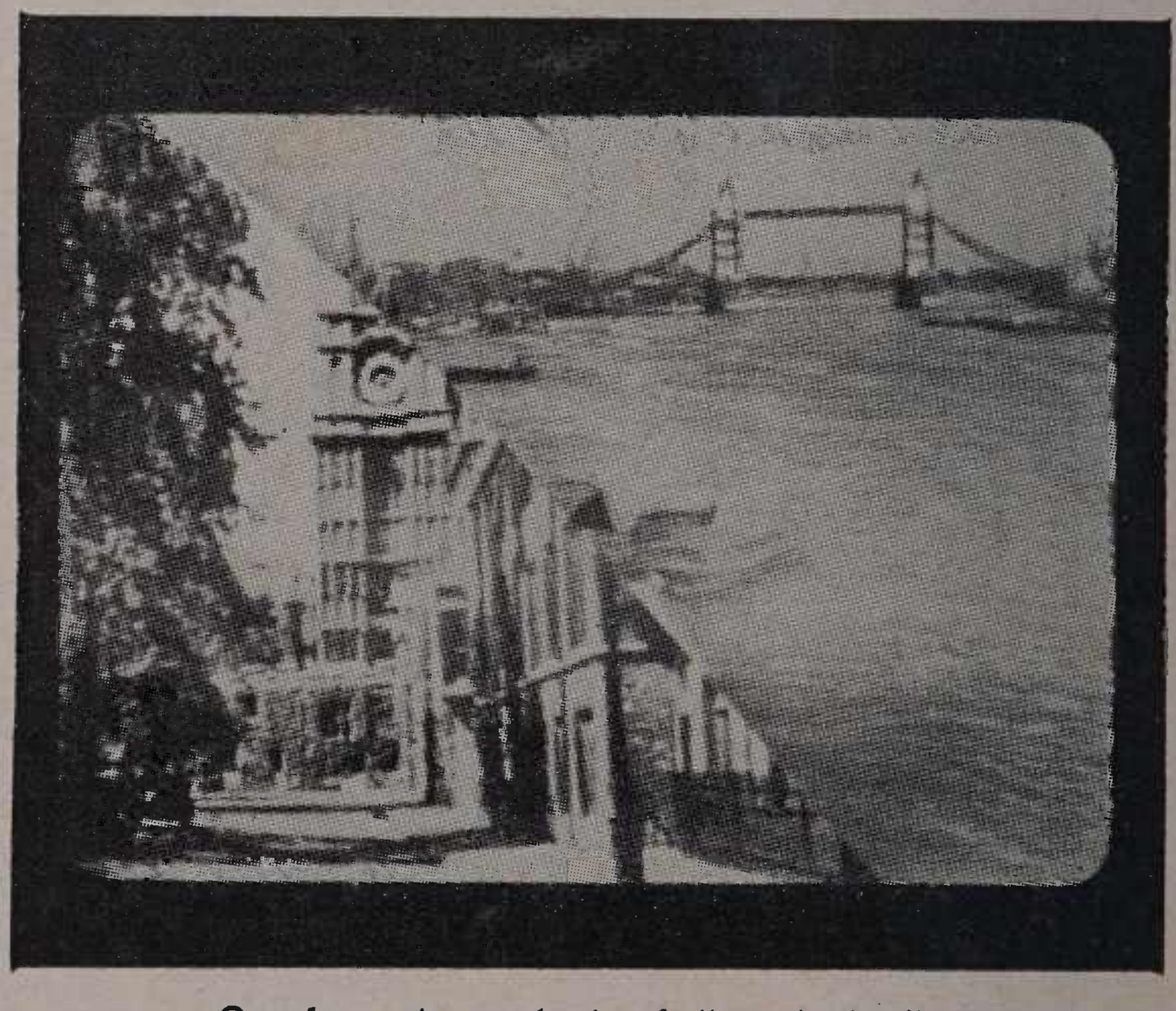
Television is using new tricks which heighten dramatic effect on the screen and produce startling "composite" pictures of people and places many miles apart. Superimpositions, "cross-fading", and similar camera-work have long been standard procedures. Recently, however, fresh developments have resulted in "split-screen" pictures, in which an artist in a studio can be seen talking to someone else facing a camera in a different part of the country.

Another use development for TV producers has been the introduction of "wipes" and other novel effects which act as linking shots between programme items. The film industry has always used this type of camera trickery, but to produce the same illusion "live" has taken a great deal of patient invention by television experts. Now, such effects are regularly used in B.B.C. programmes to British viewers.

The technical details of these processes are necessarily complicated, but from the layman's point of view they involve the addition of a bank of electronic equipment in a TV control room. When special effects are requested, pictures from various sources are fed into this "box of tricks", which is separately operated and which re-mixes and "sorts out" the images to produce predetermined montages of the original televized subjects. Very careful alignment of cameras and positioning of artists are necessary, because of the fine limits involved.

The processes involved usually fall under two main titles known to TV engineers as "Inlay" and "Overlay". Here are the official definitions of them:

Inlay: A method of combining in one complete television picture selected areas of two pictures obtained from separate sources, the required areas of each picture being determined by the shape and position of an opaque mask placed in a silhouette generator.



Overlay: A method of "overlaying" one picture with a picture from a different source, so that, for instance, a man standing in front of one camera appears to be "inserted" into a background actually televized separately by another camera.

As the scope and size of TV rapidly increases throughout the world, these "tricks of the trade" are helping to give new meaning to an old slogan. Now TV experts are saying, "Anything you can do, we can do better."

EICOnomise - Buy EICO INSTRUMENT KITSETS

Loudspeakers

HOW TO BUILD SPEAKER CABINETS

We have often been asked questions about how to baffle speakers; most of these questions relate to such matters as the "best" type of baffle to use, and the proper size of a reflex enclosure to suit a certain speaker, but very seldom does anyone ask us how to build the baffle once they have determined its type and size. In a way, this is unfortunate, because the performance of any type of speaker baffle depends just as much on its construction as on its design in other respects. A little learning is definitely dangerous in this field of endeavour, for its is possible to be very disappointed in a baffle, just because the basic principles that should be taken into account during its construction have been neglected—usually through lack of knowledge.

Perhaps because it is the most commonly used type of baffle, one often hears the bass reflex enclosure, or vented baffle, decried, or called by some derogatory name as "boom-box". There is no doubt that some examples do behave in this manner, and the reasons for it could be quite numerous, but it is probably a fair guess that most cases of difficulty with the bass reflex cabinet could be put down to improper construction.

Bass-reflex cabinets are not the only ones that can suffer in this way. Indeed any baffle, of whatever type, is liable to the troubles that arise when it is not properly made, so that this article really applies to whatever form of baffle may be chosen.

CONSTRUCTION

Undoubtedly the most important feature of the construction of any baffle is its rigidity. It is situated closer than any other object to the source of sound —the speaker unit—and so is subjected to high sound pressures. In the case of an infinite baffle, for example, as much power is radiated into the relatively small enclosure as is radiated into the room, and the job of the box is to prevent utterly the sound received from the back of the speaker cone from getting out of the box and being heard. If the box is not rigid enough, the high sound pressures may cause its panels to vibrate. The mechanical energy (or at least some of it) which this vibration represents, must have come from the speaker unit, because there is no other source of mechanical energy present, and if this is the case, it represents a loss of energy that should have gone towards producing sound in the room. In addition, the vibration of the structure of the baffle will not necessarily be inaudible itself, and the colouration it is likely to lend to the music cannot be described otherwise than as distortion. If the vibration of the box is a pure forced vibration (i.e. not at one of the resonance frequencies associated with the structure) all the energy represented by it will have come from the speaker, so that there will be a reduction in the radiated sound at the frequency concerned. On the other hand, if the vibration is at the resonance frequency of one of the panels of the baffle, only a fraction of the energy represented will have come from the speaker, and the amplitude of the vibration is likely to be much larger. In a case like this, the sound output of the system at this frequency is likely to be enhanced in volume, if not in quality, and the effect can be similar to that of the well-known "one-note bass" delivered by so many radio gramophones which use deep open-backed cabinets of not very substantial construction. Now since a box has six sides, it is possible for a number of resonances of this nature to occur simultaneously. The actual number is unpredictable, but it is much greater than the number of sides, and the result is likely to be rather painful to the ear if the music is such that a number of these resonances are excited simultaneously.

The simple and obvious cure for all this is to make the baffle of heavy material, that is not easily excited into resonance, and to bond the structural members together very securely. Experience has shown that for baffles constructed of wood, the timber should not be thinner than three-quarters of an inch. Various people have recommened going to great lengths to secure rigidity and non-resonant behaviour, such as constructing baffles of brick, or of double-skinned form, with the intervening space filled with sand. While it is doubtful whether it is necessary to go to such lengths, doing so is a fault in the right direction —acoustically, anyway—though the present writer would rather not be faced with the prospect of moving house were he to possess a brick loudspeaker enclosure!

ACCESSIBILITY FOR THE SPEAKER UNIT

One difficulty that can crop up is that the baffle cannot be hermetically sealed (apart from the essential orifices, that is) because it is necessary to have access to the speaker unit, if only in order to install it. It is here that some builders go wrong, after having taken excellent precautions with the construction of the baffle as a whole. Fortunately, the back seldom has to be taken off a bass reflex enclosure, for example, so that using a large number of screws to fix the back on does not represent a very great hardship. On no account will a mere four screws, one at each corner fill the bill. Screws should be large ones, and thus capable of being driven home with a large screw-driver and much elbow-grease. This firm fixing should take place at least every six inches round the edge of the back.

FITTING AND JOINING

Since the avoidance of vibration is one of the prime requisites of any baffle, the fitting together, and the ultimate joining of the panels should be as accurate and firm as possible. The joints that do not show should be held together, not just with screws or with glue, but with both. Cabinet-makers have large cramps with which glued joints can be firmly held together until they are set, and under these circumstances, screws are hardly necessary, but few of us who build our own baffles have the facilities for making properly glued large joints in this way. It is for this reason that the panels should be well screwed together, for the screws will hold the glued joint tightly together while the glue sets. Also, should

one have been unfortunate enough to use timber that at a later date wants to shrink, the use of screws will prevent the joints from pulling away from the glue.

If the construction is not solid enough, and panel vibration does take place, one likely fault is that the edge of the vibrating panel may intermittently touch one of the panels next to it, causing a distressing buzz. Such buzzes are very difficult to track down, and not always easy to eliminate when found, but they can all be avoided in the initial building. To make assurance doubly sure, it is an excellent plan to screw and glue square battens along each inside joint between panels. This vastly increases the solidity of the construction without materially reducing the volume of the enclosure.

If the baffle is so designed that one or more panels are very large, they may vibrate even though all these precautions have been taken. If this is so, it is only because of the size of the panel, and it may be necessary to brace it with two rigid battens screwed and glued diagonally across it.

CARE NECESSARY WITH THE FRONT PANEL

With most baffles, the speaker unit will be mounted on the front panel, and special care should be taken to see that this is not only rigid, but quite flat. If it is not, it may be found that when the speaker is firmly screwed down to it, the frame warps enough to allow the voice-coil to scrape on the pole-pieces of the magnet system. This might sound like a tall story, because the makers of speakers go to considerable lengths to make the structural part as rigid as possible, of cast or pressed steel or light alloy, and one would hardly expect the frame to bend. Nevertheless, it has happened, and will happen again. The reason is seldom that the speaker frame is poorly designed; a consideration of the form of the speaker frame will show that even an infinitesimal warp in the edge of the frame will cause quite a large movement, relatively speaking, in the voice-coil end of the cone. And if the clearance between the voice-coil former and the magnet poles is very small, such a warp can easily cause the fault mentioned.

RIGIDITY OF HORN STRUCTURES

All the remarks that have been made so far apply as much to the folded horn type of baffle as to the simples bass reflex enclosure. Indeed, there are some parts of a horn structure which need to be more vibration resistant, if possible, than the reflex baffle. In particular, this refers to the compression chamber which encloses the back of the speaker in all true horns, folded or otherwise. Because of the relatively small volume of the compression chamber, the acoustic pressures developed in it are very great. Fortunately, the panels making up the compression chamber are usually much smaller than those of more ordinary types of baffle, so that rigidity is easier to achieve. It should be remembered, however, that in the folded horn, the outside walls of the compression chamber also act as the inside walls of a portion of the horn, so that vibration of the compression chamber can have disastrous effects on the smoothness of response of the horn. It is difficult enough to get a folded horn, made up of flat panels, to have a smooth response over any reasonable frequency range without deleterious side effects of this nature, let alone with them.

ABSORBENT MATERIAL INSIDE THE BAFFLE

It is surprising how many builders of baffles do not realise that some sound-absorbent material inside a baffle is absolutely essential. In the case of the reflex cabinet, the behaviour required at different frequencies is not the same. At low frequencies, for example, the sound inside the cabinet is not required to become absorbed, but to issue from the vent or port. At middle and high frequencies, however, it is important that standing waves of pressure should not be set up inside the baffle. This can happen very easily at frequencies that are high enough for the dimensions of the enclosure to be large compared with a wavelength. Standing waves react upon the speaker cone, and can cause severe dips and peaks in the response of the system, not to mention actual distortion, especially at high sound levels.

Fortunately, the differing requirements of different frequencies are automatically met if the correct amount of a suitable sound-absorbent material is used to line some of the inside surface of the enclosure. This can readily be appreciated when the mechanism of sound absorption is understood. Sound waves are a form of mechanical energy, and because energy cannot be lost, but only converted from one kind to another, anything which causes a sound to decay in intensity (which is what we mean when we say it is absorbed) must have converted that sound into some other form of energy. If the wave is in air, its intensity decays only slowly, but it does decay, and the loss of energy in the sound wave shows up as heating of the particles of air, owing to friction between them during their enforced vibration. If in the path of the sound wave we place some porous material, such as matted horse-hair, or layers of loosely woven cloth, the air particles have difficulty in pushing their way through the spaces in the material, in the course of executing their vibrations. The material increases the frictional resistance to the air, so that some of the sound energy is lost in heating up the material. Thus, the intensity of the sound wave as a whole is reduced. Now the effectiveness of a porous material in this way depends on the size of the spaces in the material, compared with the

(Continued on page 52)

Plessey

RADIO COMPONENTS

Variable Capacitors, Air and Compression Trimmers, Drives and Couplings, Vibrators, Chokes and Transformers, I.F. Transformers, Wavechange and Toggle Switches, Valve holders and Pilot Lamp-holders, Loudspeakers, Iron Dust Cores and Formers, Potentiometers, Cascap and Caslam Capacitors, Electrolytic Capacitors.

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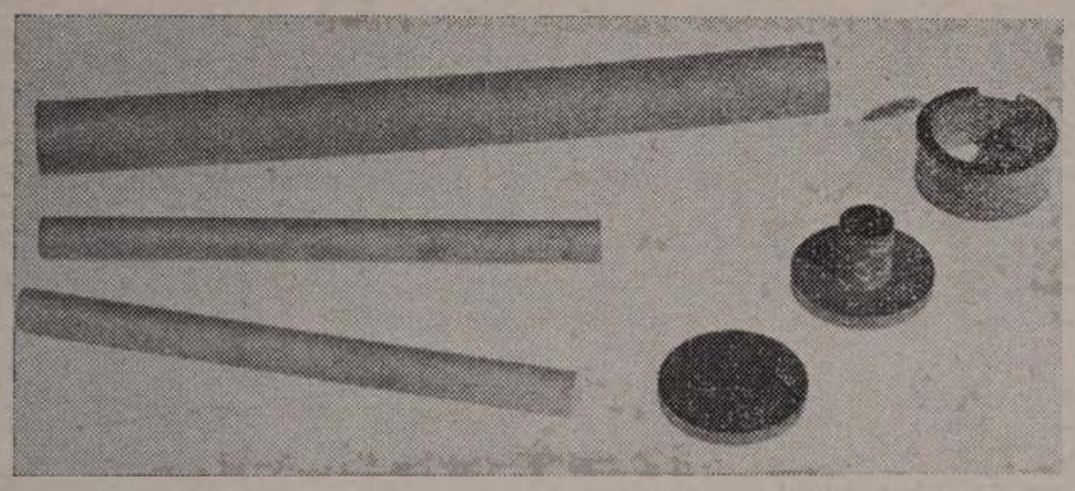
Latest Overseas Developments

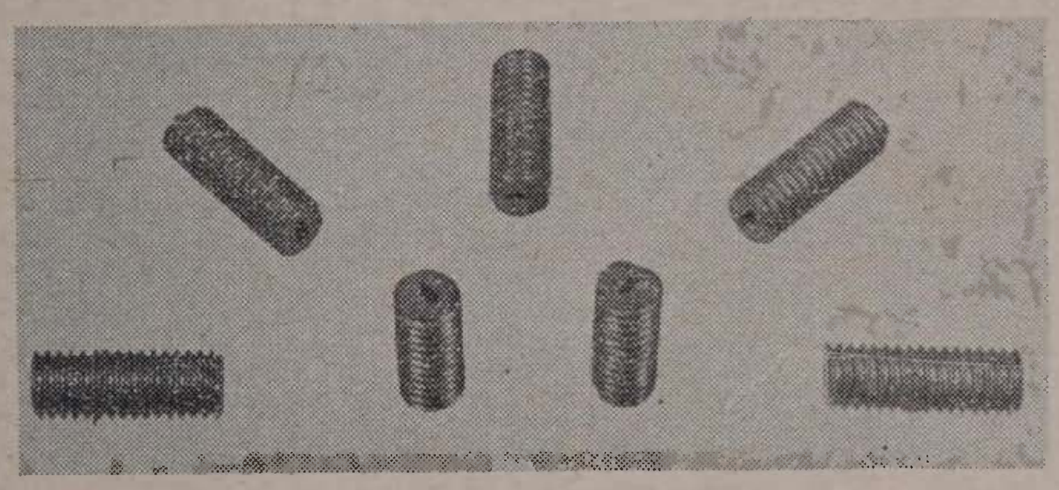
NEW FERRITE MATERIALS

New ferrite materials developed by The Plessey Company Limited are now providing the solution to many problems in the radio and electronics industries where miniature components with improved electrical properties are required.



Ferrite rods and ferrite filter core components manufactured by the Plessey Company Ltd.

Basically, Plessey ferrites are ceramic materials, the properties of which can be infinitely varied by differences of composition and manufacturing technique to give the optimum performance for specific purposes. This versatility enables grades of ferrite to be selected to suit a very wide range of applications which includes compact aerial units, r.f. filter units, T.V. components, frequency modulator reactors, square hysteresis loop and microwave applications.



A group of screw components manufactured by the Plessey Company Ltd. from the new ferrite materials.

Ferrites have relatively high resistivities and as a result the eddy current losses are intrinsically low. This enables full advantage to be taken of the high initial permeabilities obtainable.

New Zealand representative for the radio and television component range of Plessey International Ltd., is William J. Blackwell, of P.O. Box 1622, Auckland.

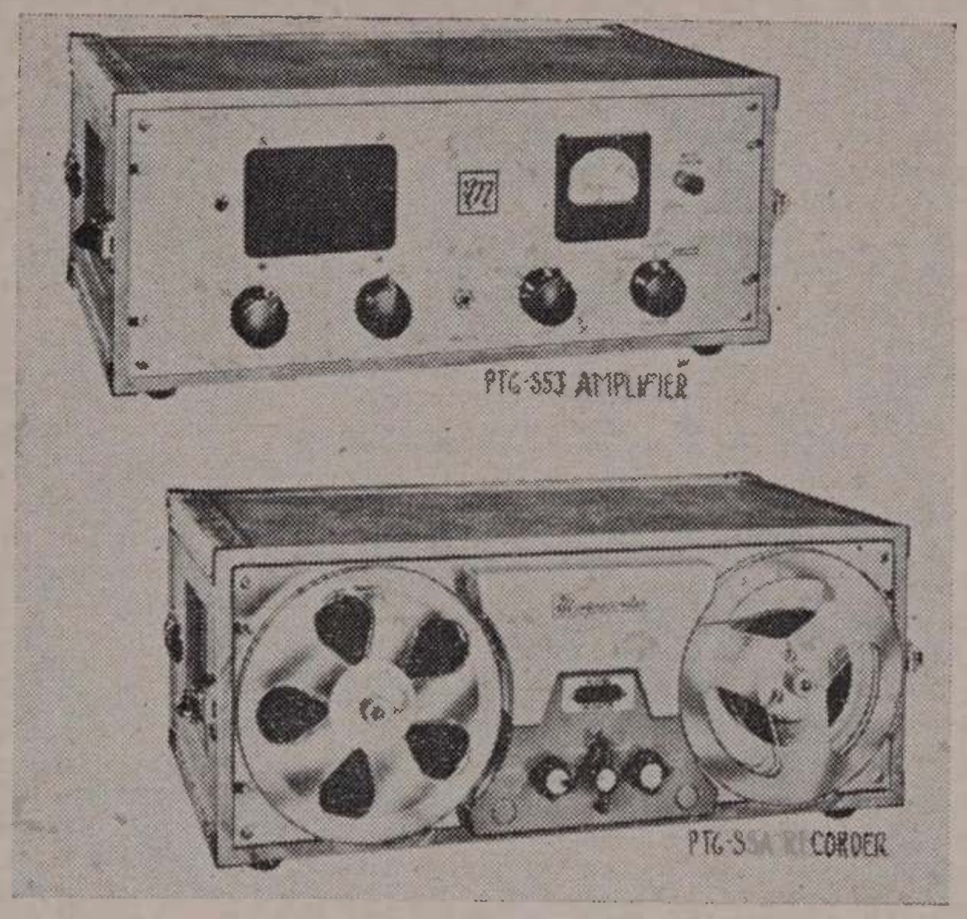
•• ••

MAGNECORD'S NEW "EXPERT" SERIES PROVIDES MULTI-PURPOSE TAPE RECORDER

An achievement in operating efficiency and electronic engineering is realized in the newest tape recorder combination from Magnecord, the professional "Expert" PT6-S5JA Series, which includes the PT6-S5A Recorder and the PT6-S5J Amplifier.

An outstanding feature of this new "Expert" PT6-S5A Recorder is its construction which simplifies maintenance and permits many special and unusual equipment combinations to be made up from standard units. The "Expert" is light enough in weight to record easily away from the studio or in the laboratory. For quick setup, cables between recorder and amplifier are plug-in and it features 2-speed hysteresis synchronous drive motors, separate rewind motor, automatic tape lift to prolong head life.

The PT6-S5J is an all-purpose recording and reproducing amplifier for recording from a single microphone, with low impedance mike outputs plus bridging input. Has illuminated VU

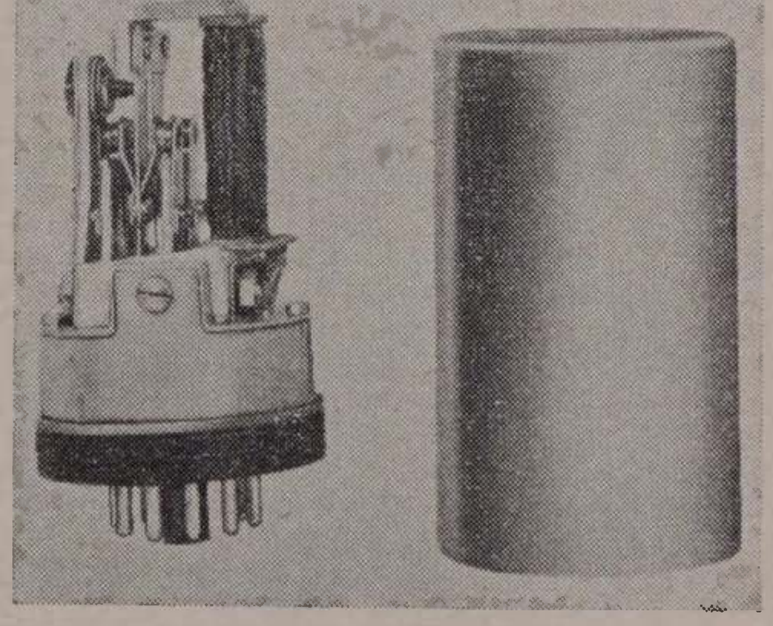


meter. Ten watts of audio output may be used with internal monitor speaker or external speakers. Plug-in dual equalizer is supplied with front panel switch.

The "Expert" series have new satin chrome matte panels 19 in. x 7 in. for standard rack mounting and are available in rugged heavy duty carrying cases with fibre reinforced edges.

Further details are available from Ad. Auriema, Inc., 89 Broad Street, New York 4, N.Y., U.S.A.

PLESSEY 100 WATT VIBRATOR



In many commercial electronic and communication equipments designed for mobile operation, it is undesirable to employ motor-generators to produce the necessary A.C. supplies from D.C. inputs. Vibrators are the usual answer to the problem, but where medium power requirements have to be met ordinary vibrators are inadequate.

The Plessey Company Limited have now produced a 100-watt heavy-duty vibrator designed originally for Services' use, but which is now commercially available. It can be used in a power pack to give a variety of A.C. output voltages for supplying bias circuits, valve heaters requiring isolation, E.H.T. supplies, etc. For instance, a power pack specially developed by Plessey for Services' use has the following operating figures:

Input: 24 v. 8A D.C. Output: 350 v. 140 ma. D.C.; 175 v. 145 ma. D.C.; 12 v. 500 ma. A.C.; 6.3 v. 3.25 A A.C.; 6.3 v. 1.1 A A.C.; 6.3 v. 0.85 A A.C.; 6.3 v. 350 ma. A.C.

Overall power pack efficiency 60%, including rectification, smoothing and R.F. filtering.

The heavy-duty vibrator has a number of advantages over the rotary transformer, including a reduction in weight, space and noise, an improved circuit flexibility and higher efficiency. A

(Continued on page 51)

RECORD TALK

by JOHN GRAY

With the approach of the "Kismet" film the record companies are painstakingly promoting discs of tunes from the show, of which the music is "borrowed din from Borodin", to quote a pithy American review. HMV have the film sound track on a gaily covered MGM disc (MC 6001), while Philips are offering selections from the original stage production. These latter are "Stranger in Paradise" and "Rhymes Have I" (B21536), and "Baubles, Bangles and Beads" coupled with "The Olive Tree" (B21537), the featured singers being Alfred Drake and Doretta Morrow. I hope they see their way towards a release of the LP of the whole stage version, which crackles with vitality. On the other hand, the many who flock to the film (a stock Hollywood presentation of the Gorgeous East, redeemed by Howard Keel's forthright acting and singing) will rightly make for the MGM version. Philips have also put out four sides of Doris Day's numbers from the film "Love Me or Leave Me" (B21622 and 21625) and amid their other single discs is a very attractive Percy Faith offering "Mademoiselle de Paris" and "Under the Bridges of Paris" on B25409.

In the extended play series there is a good bargain in the shape of the two Beethoven romances for violin and orchestra, the more so as these pieces have been known to occupy a whole 10-inch LP. They are played by Francescatti and an orchestra under Jean Morel and thus offer exceptional value (ABE10003): the music is of course Beethoven in a more restful mood than usual. Bruno Walter conducts spirited renderings of four Brahms Hungarian Dances on ABE10002, while there is a souvenir of the octogenarian Pablo Casals on ABE10004. The great man takes up his 'cello to play a traditional Spanish tune "Song of the Birds" and 'Nana" from Falla's Seven Popular Spanish Songs. In addition, he conducts his Prades Festival Orchestra in another traditional air, "Saint Marti del Canigo". During his self-imposed exile in the Pyrenees the great musician has had the satisfaction of seeing the world beat a path to his door, and this disc is a capsule reminder of wonderful days of music making which have made the little town of Prades known wherever music is heard and loved. Also in this Philips extended play series are some melodious Tchaikovsky and Grieg pieces played by the Boyd Neel Orchestra under Cedric Dumont (NBE 11006) and four Irish songs sung by Father Sydney McEwan with Philip Green's orchestra (NBE11008).

From Festival there is much, as usual: so much that one is uncertain where to begin. In the world of light entertainment this firm is out on its own; there is something for everyone from the sweetness of Guy Lombardo to the jazz of the Lawson Haggart Band. Show tunes abound, too. I do not think we have previously been offered LP presentation of Sigmund Romberg's ever popular "New Moon", and here are all the best loved tunes gathered on to CFR10-397, with soloists Jane Wilson, Lee Sweetland, and Thomas Hayward, chorus and orchestra being under the experienced guidance of Victor Young. In the same vein is Fred Waring's record of songs from stage shows of a later vintage: "Oklahoma", "Carousel" and "South Pacific" (CFR10-350). The first two of these are due as films, the last we have seen on the stage and most admirers of it will of course have the original cast LP on Columbia. The most vital of these popular LPs is Ethel Merman's disc of "Songs She has Made Famous", done with such aplomb and style that one longs to hear her in the flesh. Truly she bids fair to wake the dead with her rendering of "Blow, Gabriel, Blow", and the disc is almost worth buying for only one priceless number, "Eadie Was a Lady", which turns out to be rather an overstatement. All in all, here is the best of Ethel (CFR10-529, previously on Brunswick).

There is also the original cast recording of "Guys and Dolls", a show which arouses the most violent reactions both for and against. For some it is too strongly American; for the others, all I need say is that the number is FGL12-806, and the cast, including Vivian Blaine, Isabel Bigley, Robert Alda and the rest, are as full of vitality as ever. "Carousel", besides being featured in the Fred Waring disc mentioned above, turns up again, in its original form and at length, on FR12-901: this is the stage production, not the film version. The popular singles include Johnny Desmond's singing of two numbers from the film "Land of the Pharoahs" (CS827), Eileen Barton in "My Social Top Dog" and "Teenage Heart" (CS957) and Lawrence Welk's "Moritat" (the "Threepenny Opera" theme of which we are hearing so much just now) coupled with "Stompin' at the Savoy" on CS951.

The Westminster classical release contains a fine recording by one of our recent visitors, the extremely gifted young Viennese pianist Paul Badura Skoda. Here he is heard in Beethoven's fourth concerto in G major, accompanied by the Vienna State Opera Orchestra under Hermann Scherchen, and despite competition from other quarters this is a version to be seriously considered (WL5143).

Reverting for a moment to show tunes, of which a surprising number are cropping up just now, there is a Parlophone extended play disc of excerpts from "Salad Days", the musical production which has made as great an impression on New Zealand audiences as any seen here since before the war: that it has been an all-New Zealand presentation is the happiest of coincidences. Both tunes and words are quite unpretentious, and perhaps could mean little to those who have not seen the show, but those who have, and there are thousands of them, will find memories pleasantly aroused by the record (GEP8519) whereon eight of the songs are done by the English cast, Patricia Clark and Charles Glanville being in the leading roles with the Peter Knight Singers in support.

Artists from both sides of the Atlantic feature in the latest batch of popular singles from the HMV companies. There is Josef Locke, for instance, singing this time a good ballad called "My Mission" and, of all things, a version of that stirring march, "Blaze Away" (DNZ10019). There is the irresistible Max Bygraves with "Out of Town" and "Fingers Crossed" (HR10245), and a really good disc from Norrie Paramor's Orchestra featuring "Poor John" which is the tune also known as "Poor People of Paris". Its backing on DNZ10027 is the "Threepenny Opera" tune which must now be amassing a fortune for the heirs or publishers of its late composer, Kurt Weill. To coincide with the visit of Serge Jaroff's Don Cossack Chorus there is a re-issue of what was perhaps their most famous record, the old Columbia coupling of "Monotonously Rings the Little Bell" and the "Song of the Volga Boatmen" (9085). A ten-inch offering "Don Cossack Song" and "The Nightingale", is also made available on DW4451. If the Cossacks who have just arrived as I write these notes are the ones who sing on these records, they must be very old men by now! Doubtless the choir has replenishments from time to time; what does not change is the authenticity of their style of singing and, of course, the personality of their veteran conductor and trainer, Serge Jaroff. From the other side of the fence we are brought up to date with a jolt: J. P. Morgan's "Pepper Hot Baby" (HR10208), Eddie Fisher's "Dungaree Doll" (HR10264) and Bonnie Lou's "Bo Weevil" (NZP39) are obviously beamed at the teenage market and can safely be left to find it.

The Woolston Brass Band and chorus have followed up their "All Blacks' Football Song" with another topical issue, "On the Ball" backed by the unofficial South African anthem, "Sari Marais", also known as the Trek Song (DNZ103). The associated vocalists here are the Papanui High School Choir, and I hope they sing with a little more conviction than did the unidentified "chorus" which participated in the previous disc. Another local recording, DNZ102, holds "Band of Gold" and "If I were a Bell", as done by visiting vocalist Kay Hancey.

Light entertainment on LP comes plentifully, as is usual from this source. The third of the "Cabaret Night in Paris" series (33S-1083) includes the expected contributions from people such as Josephine Baker and Charles Trenet, but there is also one number, "Je Cherche un Millionaire", sung by the fabulous, almost legendary Mistinguett, whose recent death, at a very advanced and still unrevealed age, removed a figure whose fame had persisted for well over half a century. Also on Columbia you will find a stirring medley by the band and pipers of the Scots Guards, back from their phenomenally successful tour of the United States, where they caused a veritable sensation in Show Business circles. An astonishing number of selections by band and pipers, and both combined, have been assembled on to this twelve-inch LP, 33SX1042, and I understand that a second release will follow shortly. Then, there are some traditional Irish dance tunes, recorded authentically in Belfast, by David Curry's Irish Band (33S1086). Parlophone has a welcome revival of old Richard Tauber numbers, collected on PMB1009 under the title of "Songs of Stage and Screen". Here was one of the great singers of the last generation who spent more time singing popular material than his admirers thought warranted, but who somehow ennobled everything he sang, and this record is a

timely reminder of the fact. In the light orchestral sphere we find as much material as ever, perhaps the most interesting release, because it treats us to something quite new and fresh, is Robert Farnon's latest disc, of a composition of his own which he has called "Canadian Impressions", and which he himself conducts, of course, on Decca LK4119.

Among the more interesting of the HMV classical releases is a complete set of the Chopin Etudes, including the three posthumous ones (ALP1310-1). These are undoubtedly excellent "studies" for the pianist, but they happen also to be splendid music, in which Chopin's art is seen in all its facets, and we have waited long for a worthy representation in the LP catalogue. Shura Cherkassky, who visited New Zealand for the 1955 Auckland Festival, is a tremendous technician for whom these pieces hold no terrors, and those who like Chopin played in a "big" way need look no further. On a less heroic scale is a performance of Beethoven's "Kreutzer" Sonata by the leading woman violinist of Italy, Gioconda di Vito, with Tito Aprea at the piano (ALP1319), while for the opera lover HMV have produced Puccini's "Manon Lescaut". This was the earliest of his operas to win world-wide recognition (three years before "La Boheme"), and is much more robust than Massenet's treatment of the same story. Puccini's has stirring pasages in the full-blooded Italian manner, and rises to great heights in a passionate duet for Manon and her lover in the second act. With singers such as Licia Albanese and Jussi Bjorling we can be sure that no dramatic point is lost, and there is a sense of real achievement about this latest of the series recorded in the Rome Opera House (ALP 1326-8). Included in the supporting cast you will notice the name of Plinio Clabassi, the fine bass who visited us with the Italian company a few years ago.

Columbia are continuing their issue of Beethoven symphonies under Herbert von Karajan, and on 33CX 1227 is a brilliant account of the second, in D major, which is still, for whatever reason, the most rarely played of the nine. Placed alone on a disc it would be short measure by today's standards, and a welcome bonus appears in the shape of the "Coriolan" Overture, given rich if rather deliberate treatment. Altogether, a most acceptable gift for admirers of Beethoven's symphonies.

The Philharmonia Orchestra are in fine form here, as are they also on 33CX1327, a disc labelled "Operatic Ballet Music". This gives such diverse attractions as the well known "Dance of the Hours", and the equally familiar ballet from "Aida", together with Moussorgsky's Persian Dances, some extracts from "Prince Igor" and, rather more unusually, the Venusberg Music from Wagner's "Tannhauser". All of this has previously been obtainable on LP, but many people will be attracted to the collection and also to the fact that Karajan is conducting. Much in the same vein is a very generous suite from the Delibes ballet "Sylvia", including some portions of the score never before recorded (Philharmonia under Robert Irving, HMV CLP1058) and an infectious disc containing on one side Johann Strauss polkas and on the other some of Waldteufel's most melodious waltzes, all done to a turn by Arthur Fiedler and the Boston Promenade Orchestra (CLP1065). From Parlophone we have a huge organ symphony by Widor, one of the late nineteenth century Frenchmen who revelled in the composition of brilliant music for the vast organs so much in vogue in those days. The

(Continued on page 49)

BOOK REVIEWS

"HI-FI LOUDSPEAKERS AND ENCLOSURES",
by Abraham B. Cohen.
John F. Rider Publisher, Inc., New York.

In view of the present tremendous interest in high-quality reproduction of sound, a book on this subject will be very welcome. In the main, loudspeakers and their baffles is a portion of the subject that for many devotees, technical and otherwise, is shrouded in mystery. Almost every issue of some American periodicals seems to contain details of some new baffle, for which extravagant claims are made by its originator, and the average reader has no means at his disposal of evaluating each new scheme as it appears, or of assessing the likelihood of its being a real improvement on well-known performers like the bass reflex enclosure and the infinite baffle. One of the reasons for this is that it is far too time-consuming and expensive a business to tackle experimentally. What is more, the results, even if one undertook an extensive programme of building different systems and comparing their performance, would be very unlikely to prove anything at all, except perhaps in relation to the one type of speaker used in the tests.

The truth of the matter, as the author of this book points out very closely, is that there is no "best kind of baffle". A baffle, enclosure, or what you will, is as incomplete without a speaker unit as the latter is without the baffle, and the results can be judged only when the complete system is assembled. There is an answer to the question "what is the best kind of baffle for such-and-such a speaker?" but even this is not clear-cut, and Mr Cohen makes no attempt to answer even one such question.

The virtue of this book is that in it, the author describes in sensible, though non-mathematical terms, the mode of action of the two fundamental kinds of baffle—the enclosure and the horn —and goes on to show how the performance of each type is related to the characteristics of the speaker unit. There is some excellent material on the problem of obtaining bass from small baffles, even though the author's commercial affiliations fairly obviously lead him to beg the question somewhat, rather than admit straight out that you can't have the really low notes without a large baffle.

This reviewer has for some time held that about the only "fool-proof" baffle, that can be made to give good results with any good bass speaker, is the bass reflex, or vented enclosure, and he was very interested, in reading the book, to find that there is nothing in it which contradicts this view. The author does not state it in so many words, but it is clear, when reading between the lines of his descriptions of the more complex folded-horn types of baffle, that he considers them not only trickier to handle, but capable of actively poor results.

Reference is made to most of the major manufacturers of high-fidelity loudspeakers (the author is currently an engineer on the staff of one of them) but there is no mention at all of what is perhaps the best loudspeaker of all—namely the famous LC1-A, of R.C.A. In fairness, it should be pointed out that this speaker has only just been released for sale to the public, having previously been reserved for broadcasting stations, and the like, so that when the book was written, it was unavailable to most enthusiasts. Even so, the LC1-A is very well known, as are its design details, which were published several years ago, and it seems quite fair to take the author to task for not mentioning a speaker which must at least be one of the best available, if not THE best, and which appears to owe its excellent performance to the rather striking departures from conventionality in its design. This omission tends to emphasize how difficult it is for an author to appear impartial when he decides to make reference to commercial equipment at all.

However, this criticism should not give the impression that the book is not considered a good one. It is excellent in many ways, and will be found most informative reading by tyro and expert alike; even if it does not contain ready-made answers to some of the most often-asked questions on the subject, it will certainly enable the reader to understand just what baffling a speaker is, and how the main types function under various conditions.

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"MULTIVIBRATORS"
Edited by Alexander Schure, Ph.D., Ed.D.
John F. Rider Publisher Inc., New York.

This small book of some 50 pages can be considered as a brief description of the three main types of multivibrator, classified as a-stable, monostable, and bistable. It is completely non-mathematical, and aims only at giving the technician a qualitative explanation of how these three types of circuit work, and some idea of the uses to which they are put. As the author states in his preface, no attempt is made to give an exhaustive list of applications, but in any case such a list would serve little purpose. The need for such a book lies in the very wide range of present-day equipment which makes use of multivibrators of one kind or another, and it seems unfortunate that the treatment accorded them in this booklet is so very elementary. The theme is not elaborated in the slightest degree, as, for example, when no mention is made of the methods used to ensure quick recovery time, or to allow of large mark/space ratios. It might be argued that such material as this is unwarranted in a book so obviously directed at technicians, who will presumably not have to design multivibrator circuits, but even within the non-mathematical scope of the treatment there is much useful material which could have been included. To do so would have greatly increased the usefulness of the book without in any way "scaring off" the type of reader which it hopes to attract.

Australia Develops Radio Telephones

WIDE RANGE OF USES

The use of two-way radio for control of fleets of vehicles such as ambulances, electricity services, taxis, fire-fighting services, police administration, and small vessels such as tugs, lighters, and pilot services and passenger ferries, has grown rapidly in Australia.

As in other countries, there were many experimenters in Australia who set out to establish wireless communication to cars, trains, and aeroplanes from the early beginnings of radio, and tests were made using spark sets and operators trained to use morse code. This requirement, of course, had such obvious restrictions that telephony was hailed as the answer upon the introduction of the vacuum tube.

However, all the early attempts used fairly long wavelengths with their attendant inefficiency, but shorter waves were tried as more was learnt about the application of radio engineering principles. In the mid-1930s there were a handful of services in the State and capital cities of Australia using two-way shortwave equipment, being mainly police, ambulance, and electricity supply authorities. These pioneers laboured under three main disabilities: interference from electrical noise, necessity for the operators to keep the sets tuned, and interference from static and other stations.

With the rapid extension of Australian industries and increased electrification such as the use of neon signs, the problem of noise interference quickly dominated the position, closely followed by the crowding of shortwave channels which caused interference depending on the time of day and the season of the year.

By the late 1930s engineers in the United States had started to investigate the use of very high frequencies, with wavelengths between ten and two metres, together with the frequency modulation system instead of the amplitude modulation system which had been universally employed up to that time.

Amalgamated Wireless (Australasia) Ltd. were just starting on their own development programme to investigate these new techniques when the outbreak of war in 1939 forced a halt. Upon the restoration of peace, however, mobile radio got away to an early start, and in 1946 this company was demonstrating the tremendously improved communications which could be obtained from the frequency modulation technique, first on frequencies about 43 mc., then 75 mc., and finally on 160 mc. The two latter frequency bands were opened by the PMG Department for licences for both private and governmental purposes.

Widespread interest was shown in the new system and the volume of inquiries mounted rapidly. In 1947 the first installations were being made by AWA for public utilities, and following the publicity that these received and with the knowledge that licences were available, many private organizations became interested, and two-way radio became a firmly-established aid to business.

Equipment designs have changed rapidly in order to keep right up to date. For example, the first car sets offered in 1946 comprised three main units, measuring 26 in. x 19 in. x 10 in. and weighing 85 lb.; this large size was mainly due to post-war shortages of suitable components. By comparison, the latest transreceiver specially designed for taxis is a single-unit measuring 13 in. x 8½ in. x 5 in., weighs only 21 lb., and may easily be fitted under the instrument panel of the vehicle.

The majority of the new installations have a single fixed base station which controls any number of radio-equipped mobile units, but AWA engineers have planned several special systems having interesting features. For example, the Southern Electric Authority of Queensland—responsible for the generation and reticulation of electricity in the south-east part of Queensland, with an area of approximately 20,000 square miles—has a network of 14 fixed stations controlling 80 vehicles. The fixed stations each covering a separate area are in direct touch at all times with the main control at Brisbane. Should trouble due to storm or fire arise at night, the Brisbane operator can dial up and turn out any of the duty officers in the outer areas so as to effect speedy repairs.

The Sydney County Council has recently had new AWA equipment installed in 127 vehicles controlled by four regional fixed stations, and a special feature of this job is the use of the full duplex method of operation. This permits the operators to transmit at any time whilst also listening, in just the same way as an ordinary telephone. In other words, the necessity for press-to-talk with its "over-to-you" procedure is eliminated.

Still another interesting installation is being carried out at the present time for the Electricity Commission of New South Wales to cover a large area of country to the south of Sydney, N.S.W. Here, the technique of automatic repeating of signals is being employed, the main station being sited on a predominant hill overlooking the area and operating without attendance. The control office at Port Kembla, fitted with a transmitter/receiver, calls on one frequency channel, and its signal is picked up and re-transmitted (or repeated) by the fixed station to be heard by all other vehicles. In the same way, any vehicle can talk to another vehicle, and, as they may be up to 30 miles each side of the repeater, car-to-car working of 60 miles or more can be obtained.

FM radio-telephone equipment on Manly ferries has been installed recently in the interests of public safety. Although this is the first time equipment of this type has been installed on passenger ferries, many tugboats and trawlers in Australian waters have been similarly equipped.

The Australian Gas Light Co. in Sydney is now installing car-phones in 78 vehicles.

With the extensive use of mobile radio in the main cities of Australia, the shortage of channels for licensing is already being felt, and further development is being undertaken to employ the next higher available band of 470-500 mc. This is coming into use already in the United States, and experience in built-up city conditions has shown that it equals the performance of the lower frequencies.

ELECTRICAL AND TRADE SECTION

SHOP DESIGN

By PATRICK GWYNNE (Reprinted from "Wireless & Electrical Trader", Vol. 101, No. 1319)

The design and appearance of a shop is one of the factors which play an important part in the success of the business carried on there. Choosing the right type of premises is not easy, and this article by a chartered architect with considerable experience in the field discusses many of the points on which radio and electrical appliance dealers will look for guidance.

The design of any retail shop has two main functions to perform; one is to provide a suitable framework and background for display and the other is to act as an advertising sign, to attract the shopper to inspect the goods close to and thus, it is hoped, to enter and buy. The truth of this may seem obvious but it is as well to bear it in mind constantly when designing a shop front and interior so as to avoid the common pitfalls of introducing arrangements, effects and trivialities which, whilst perhaps attractive in themselves, do not necessarily result in a proper solution to the problem.

For example, when considering a patterned wallpaper as a background it is wise to question whether the pattern will, in fact, have any useful effect at a distance and whether it may not be merely disturbing at close quarters. A plain colour might be far more effective, although not appearing so interesting at the time of selection.

The two basic functions that have to be kept in mind are interrelated and complementary. But the fascia is one item concerned with distant effect which is not also connected with display requirements, and it is therefore surprising that more originality has not been seen in post-war designs. Considerable scope exists, fully within the bounds of good taste, for all sorts of effects, particularly after dark when the fascia comes in for its fullest use. Unfortunately, however, the insistence of most retailers for a name sign written as large as permissible certainly restricts most of these possibilities.

The real value of a name in large letters is becoming increasingly debatable, except, perhaps, where the name is particularly well known to the public. Probably of far better value is a good coloured or textured effect with the name written small, or the use of initials or the firm's sign instead. Furthermore, it has to be borne in mind that shoppers on the same side of the street normally cannot read the name at all.

Second to the fascia the distant attraction to the shop will be provided by the general appearance of the window display and, perhaps, the interior. This brings up the important and currently controversial question of whether or not to employ an "open" type of shopfront. It is debatable whether many small traders will feel able to resist the opportunities given by revealing the interior of the shop to the street, and, indeed unless a long "arcade" type of layout is used, taking much valuable central space, it is almost essential to use the bulk of the interior to display to the street the many types of instrument and apparatus which the radio and electrical retailer must put on show. There are advantages and disadvantages in this type of layout, but of the former one of importance is the strong effect from a distance which is given and a useful by-product of this is the value to be obtained from the ceiling of the shop area if effectively treated.

CEILING TREATMENT

Indeed, the effect of this expanse of ceiling might possibly be the final justification for the use of an open layout and one which gives many advantages, the importance of which cannot be exaggerated as a first need and as a priority expenditure. The full effect of so many open-fronted shops is in large part nullified by an ill-considered array of fluorescent and other light fittings which distract from the merchandise and, used in this way, offer no other compensation except brightness. There are many ways of treating the ceiling and its lighting and none of them, unfortunately, is likely to be cheap. However, an initial expenditure in this respect, if necessary by sacrificing display and other items which can be added later, will probably pay considerable dividends in the long run.

A lowered ceiling of "eggcrate" units or slats, with lighting above, or perforated acoustic tiles with recessed lighting incorporated will have a tremendous effect from the street, will alter to great advantage the proportion of most shop premises. It will result in an efficient-looking streamlined effect which can subtly assist the rest of the interior. In addition, unsightly beams and conduits are screened and sound deadening can easily be introduced.

SETTING-BACK THE FRONTAGE

Coupled with the choice of an open front will be the question of whether to set back the glass line. This usually depends on the actual circumstances and location, and on how much inside space the retailer is prepared to forego. The obvious advantage is the sheltered space for window shopping out of the way of people passing.

Against this, apart from the loss of interior shop space, the window display is made slightly less easy to view from each side, although this can be compensated for by side wall displays. The canted window with the glass and the door placed at an angle to the street is a compromise solution which has had considerable popularity in recent years, but it is not a very satisfactory arrangement and is likely to reveal its half-heartedness by dating quickly.

Linked with the question of window layout is that of the position for the shop-door and whether it should be an all-glass door or even a pair of such doors. With an open type of front a centrally placed door is probably best avoided unless the shop is unusually wide. A door positioned about two-thirds of the way across allows a big display to be arranged in the main window space and still leaves room for a lesser or wall display on the other side.

Toughened glass doors have been very generally used of recent years, and are effective and convenient in many ways, but expensive. A much less costly timber-framed door with full glazing need not, if carefully designed and decently made, be a disadvantage, and, indeed, is less frightening to some customers. Double doors are favoured by some retailers as they allow the interior to be widely opened to the street and assist the movement in and out of large sets. They have certain disadvantages, however, such as demanding a central position and of making a strong break in the window line and display.

INTERIOR LAYOUT

The general interior arrangements and design of a shop selling radio, television and electrical goods require great care, thought and especially restraint. These goods are probably more difficult to display effectively than in any other trade, ranging in size as they do from large radiograms down to the smallest gadgets, and yet with the need to place some of the larger items at the front and to move them frequently. Furthermore, the overall colour effect of the goods is mainly monocrome and inclined to dullness, unlike, for example, the furniture trade where coloured fabrics and carpets can be mixed with the browns of the furniture.

Bearing in mind these difficulties it becomes clear that to overcome an appearance of chaos a rather strict organizing and grouping is demanded, and to avoid monotony effective backgrounds and contrast should be provided. At an early stage the retailer must decide how permanent he wishes his display to be. The public are inclined to get used to a particular arrangement, however well designed, and it may be necessary to change backgrounds from time to time and to move particular items from side to side.

In some shops the displays are built up without the use of any very special fittings and this naturally gives the greatest flexibility. The result, however, is usually somewhat "amateurish" in appearance, and some permanent racking is desirable to produce an efficient appearance, as well as to create the effect of a properly "dressed" display.

TOO MANY TRIMMINGS

The weakness of most small retailers' display fittings in this trade is that, in an attempt to make supports and platforms appear attractive, resort is made to applying various motifs, decorations and trimmings which in time reveal their shortcomings by becoming tedious and also by deteriorating. Far better would it be to use a simple framework of, say, matt black steel rods or angles, in conjunction with plain rectangular panels of blockboard or similar, sprayed in three or four carefully chosen colours.

Such colours, which could be used as a scheme throughout the shop and which could be changed from time to time, should be selected to act as the best possible foils to the wood of the sets. Pale blues and yellows, vermillion and black and white are all useful; plum, most greens and all buffs and browns should be avoided.

The use of perforated hardboard and wire hangers is a simple and inexpensive means of displaying smaller articles, but it should be remembered that it provides no secondary interest or dressing, the objects being merely spread over the wall space in no special order. Some form of standardized shelf unit. whilst costing more initially, will last well and allow greater scope in dressing and patterning, as well as providing possibilities for interesting price card fixing. Perhaps the general rules for the display should be stated thus: (a) Organizing and grouping by means of the general layout and some fixed display fittings. (b) Dramatizing and setting off by means of fixed and moving backgrounds and movable shelves and racks.

LIGHTING THE INTERIOR

Lighting should not present any difficulty for the electrical trader, but it cannot be stressed too often how important it is to light the goods rather than the customers. If there is good general lighting from a suspended ceiling source, the further need will be to spotlight various items or sections. For this, flexibility being a first need, a very simple type of fitting with universal joint and mask, perhaps suspended through the ceiling grid and thus easily removable, will be preferable to a more elaborate lamp which is not necessarily always in the right place. In an electrical shop shades of fancy shapes might tend to distract or appear as part of the items for sale, which would not be the case in other trades where they may be valuable as foils to the merchandise.

Certain strong lighted backgrounds can be effective but must be considered extravagant as the goods themselves must also be lit—and perhaps more strongly to maintain the contrast. Special brightness in places and very local light on certain objects can help in giving liveliness to the display.

USING PUBLICITY MATERIAL

Few retailers appear to be very conscious of the effect of advertising matter on the general appearance of their shops. But it is not an exaggeration to say that carefully thought out display and price cards in straightforward rectangular shapes (rather than the jazzy ones so often seen), in good contemporary colours, preferably matching the general scheme of the shop, would do more for the appearance than all sorts of decorative wallpapers and the like.

Much of the printed advertising matter which is distributed to retailers can result in a confused conglomeration of colours, shapes and printed word when scattered round the premises. When this material is displayed the retailer would be well advised to consider it carefully in each case and perhaps set aside certain backgrounds, say at a high level, to take it. These could be painted black and framed in some manner to make the placards appear as an intended wall decoration.

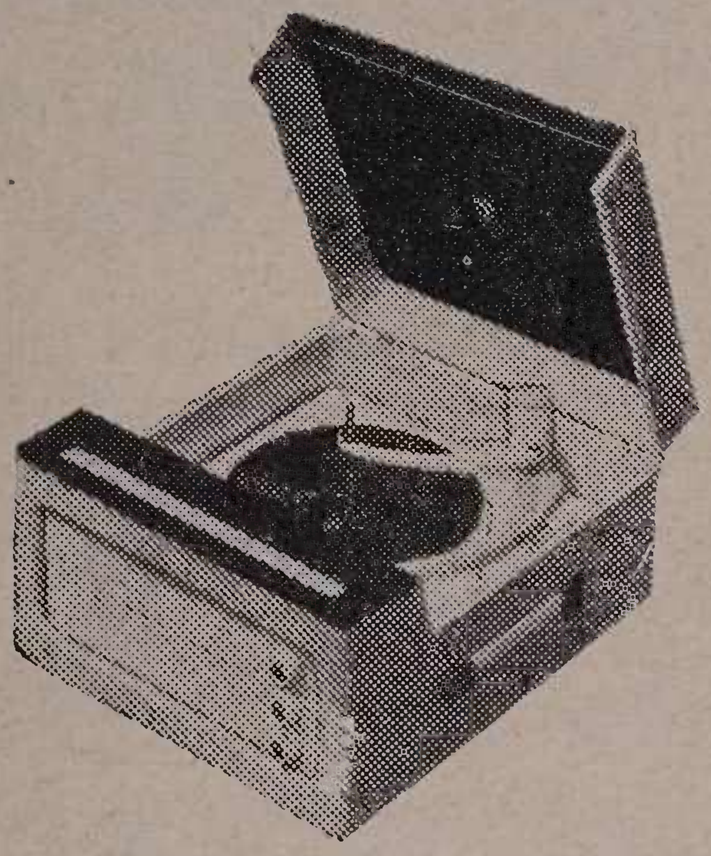
Posters and bills stuck on the window can only be harmful to a well-designed shop, and special panels can quite easily be provided for such things as record lists which must be read at the window.

(Continued on page 50)

NEW PRODUCTS: LATEST RELEASES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

This section of our paper is reserved for the introduction of new products and space preference is given to our regular advertisers. For further particulars contact Advertising Manager, R. & E., Box 8022, Wellington.

ELECTRIC AUDIO REPRODUCERS



Well ahead in the field of portable and console Audio Reproducers are the range of electric gramophones manufactured by Electric Audio Reproducers Ltd., London, represented by Russell Import Co. Ltd., Wellington, Auckland, and Christchurch, as sole New Zealand distributors.

The range now available consists of a three-speed single player portable reproducer (the non-Auto. "Bantam") at £19 17s. 6d. retail, an automatic model (the Auto. "Bantam") at £26 5s., and the de luxe automatic A.750 with Goodman 10 in. elliptical speaker and separate bass and treble controls at £36 12s. 6d. In addition, there is the A.705T which includes a dual speaker and 78/L.P. filter, and retails at £38 15s.

This latter model will shortly be available in an exquisite walnut cabinet of modern design with optional legs at approximately £45 or £47 10s. with stand, and will be known as the "Armchair Consolette."

The makers, Electric Audio Reproducers Limited, are solely concerned with the manufacture of Audio equipment and the results of their specialization is much in evidence in the excellent performance of these units.

Model A.750 is remarkable in its range of from 30 c/s in the bass to over 11 kc/s in the treble, and such performance from an instrument of these dimensions calls for the highest commendation. Whatever one's conception of the term "High Fidelity", the most ardent musical enthusiast cannot fail to be impressed with this fine instrument, which is unequalled by any table model reproducer so far available.

Each portable E.A.R. unit is most attractively styled in a substantial case, beautifully finished in washable rexine with a choice of two-tone colours.

Illustrated leaflets and price lists are available on request from Russell Import Co. Ltd., P.O. Box 102, Wellington, or Branches.

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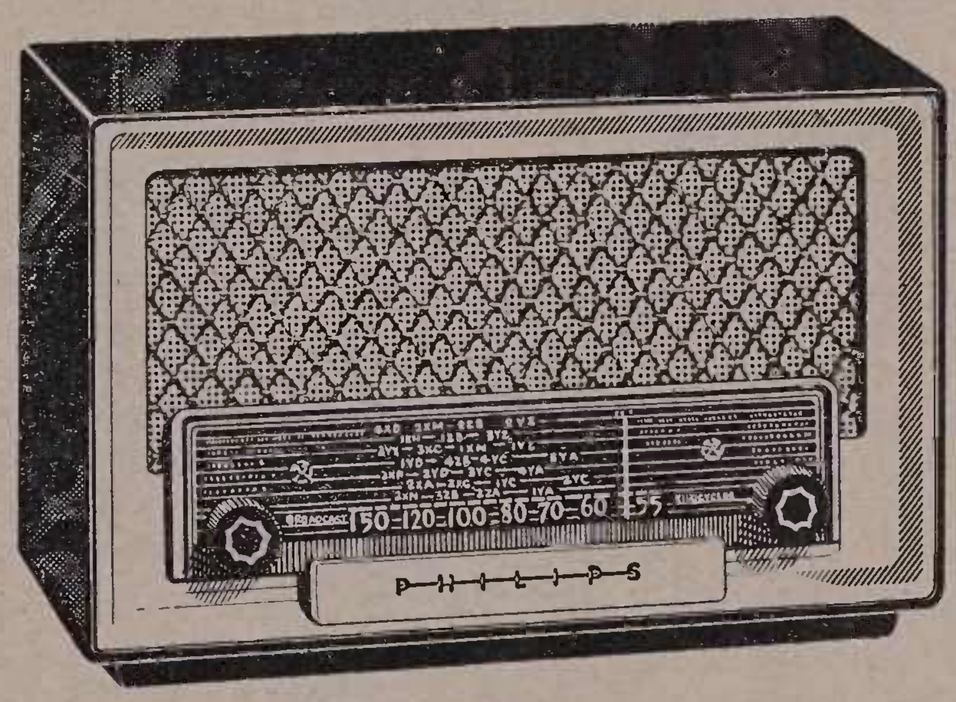
JUST THE RIGHT SIZE

The immediate success of Philips new small mantel radio, model 256 of the Ferrocoustic range, raises the fascinating question of aesthetic taste.



Artists throughout the ages have debated whether there is such a thing as public taste in the appreciation of form. If there is, then we might expect to see it reflected in people's preference for one geometrical shape rather than another. Many primitive societies were fond of the triangle. Or, to take more recent times, look at any old print of the Victorian era; mirrors and plates hung on the wall reveal how the oval and circle were in fashion then.

These days the rectangle seems to be the shape that most of us go for. There is also a generalized sense of proportion which almost everybody shares. The radio designer is faced with the problem of satisfying this sense of proportion whilst at the same time fitting the best possible circuit and speaker in the cabinet. Public response has shown that the new Philips model 256 has hit this difficult double, excelling in both proportion and performance. The 256 looks right and works right.

It is worthwhile examining how this has been achieved. Looking face on, the dimensions are 11½ in. high by 7½ in., a proportion of about 3 : 2, which is the ratio generally preferred for rectangular shape. A similar ratio is also maintained in the height of the speaker opening as compared with the height of the edge-lit methacrylite dial.

The designer's success in getting the cabinet just right has been aided by two important Philips' developments. The first of these is the perfection of the already widely used Philips' miniwatt valves whose small dimensions allow for a low chassis. The second is the Ticonal magnet steel used for the

(Continued on next page)

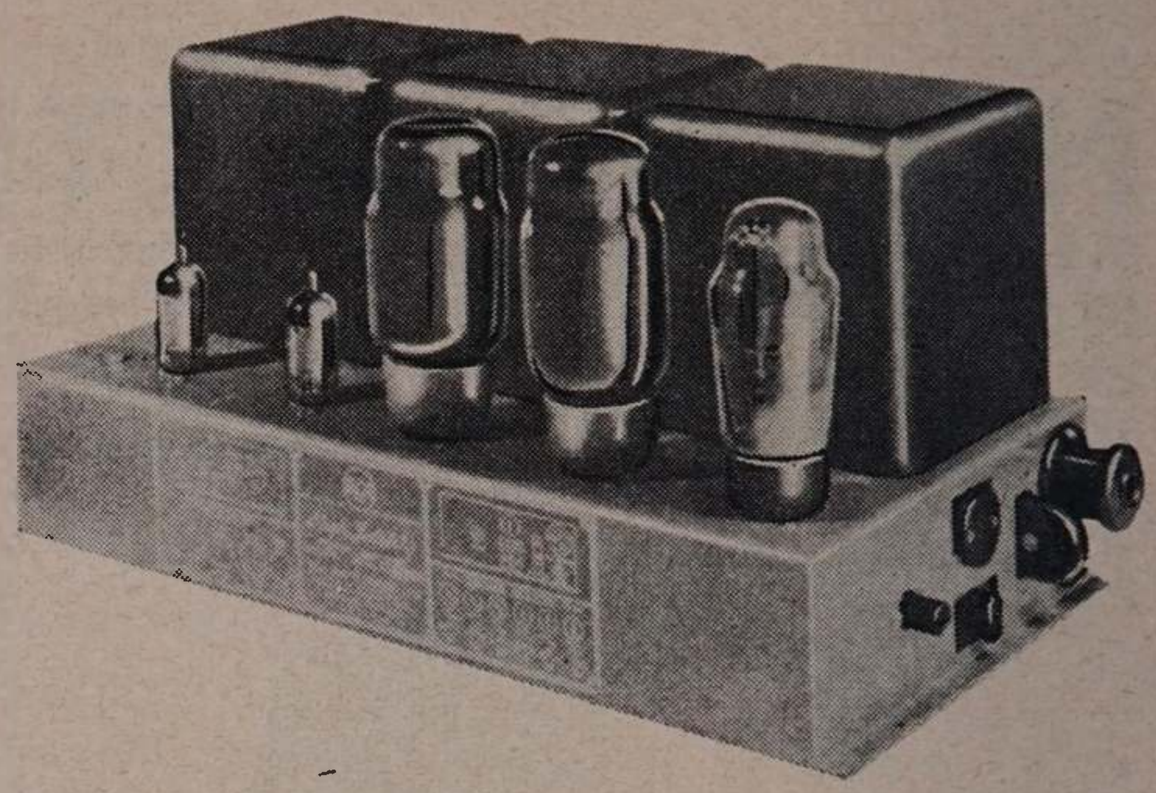
speaker, thus affording extraordinary power from the 5 in. speaker whilst maintaining the well-balanced dimensions. Needless to say, the Ferrocoustic components have played a major part in giving this new set the high level of performance people like to hear from a mantel radio. These components include the Ferroceptor built-in rod aerial, which reduces interference; "Micro 12" band pass filters with Ferroxcube cores to sharpen selectivity and sensitivity; low-loss Ferroxcube cores in all coils. The directional characteristics of the Ferroceptor have been especially appreciated by listeners following the provincial matches of the Springbok tour.

The 256, coloured cream or cream and burgundy, is finding its place in New Zealand homes as a main set and also as a second set. In either case a frequent comment which customers make is: "Just the right size". At £17 17s. 6d. it is also turning out to be just the right price for the quality-conscious buyer.

●

R.C.A. NEW ORTHOPHONIC HIGH FIDELITY POWER AMPLIFIER AND PRE-AMPLIFIER

Messrs. Amalgamated Wireless (Australasia) Ltd., Anvil House, Wakefield Street, Wellington, are proud to introduce to the New Zealand market the RCA new Orthophonic High Fidelity Power Amplifier and its companion equipment, the pre-amplifier control unit, which bring to home listening the benefits of 25 years' experience and research in professional sound engineering.



Power Amplifier Technical Data

Output: 12 watts nominal rating. Peaks in excess of 20 watts with power maintained over frequency range 25/20,000 c.p.s.

Distortion: Total harmonic less than 0.1 per cent., at 10 watts/700 c.p.s.

Noise Level: 85 Db. below rated output.

Damping Factor: Variable from positive to negative values.

Frequency Response: Within 0.2 Db. 20/25,000 c.p.s.
Within 0.5 Db. 10/60,000 c.p.s.

Feedback: 40 Db. total.

Pre-Amplifier Control Unit Technical Data

Input	*Sensitivity for Rated Output*	*Impedance*	*Response Charactertistic*
Microphone	6.5 MV	100 K/ohms	Level
Radio/Tape High Level	200 MV	1 M/ohms	Level
Radio/Tape Low Level	50 MV	300 K/ohms	Level
Crystal Pick-up	300 MV	1 M/ohms	Constant amplitude to velocity equalization
Magnetic Pick-up	11.5 to 16 MV (according to equalizing characteristic selected)	30 K/ohms (capable of modification for pick-up matching)	

The world's recording studios consistently specify RCA. These amplifiers embody many new and exclusive electro-acoustic features including a power output maintained to the limits of the audible frequency spectrum, infinitely variable loudspeaker damping factor and accurate disc record compensation for the accepted standards agreed by all record manufacturers. Control of volume is by twin-ganged potentiometer. An extensive filtering system ensures that all possible sound sources, even an inferior broadcast or disc recording, can be enhanced to a degree of sound reproduction acceptable to the trained ear of the musician. Distortion, at full output imperceptible to the human ear, is measurable only by the most sensitive laboratory equipment.

With the RCA High Fidelity Amplifier and Control Unit music lovers will experience a new realism from every recording and sound programme.

Output Impedance: 4, 7 and 15 ohms.

Input Voltage: 1.2 v. for rated output.

Spare Power: 395 v./45 ma. and 6.3 v./2.5 amps., available for pre-amplifier, radio tuner and tape reproducer amplifier.

Power Consumption: 135 VA at full load.

A.C. Input: 100/150 volts and 200/250 volts. 50–60 c.p.s.

Valve Complement: (British), Two EF86, two KT66, one GZ32; (U.S.A. alternatives), Two 6267, two 6L6G, one 5U4G.

Weight and Dimensions: 32 lb. 16⅛ in. x 8 in. x 7½ in.
Output: 1.2 volts from cathode follower stage.

Tape/Record Output: 1.2 volts from cathode follower independent of monitoring.

Bass and Treble: Lift and cut continuously variable.
Mixing Facilities: Microphone input with Radio/Tape.
Volume: Twin-ganged control with accurate volume gradation.

Low-pass Filter: Switched, 10 K/cs., 7 K/cs., 5 K/cs., and level.

Filter Slope: Variable to 35 Db. per octave incorporating main on-off switch.

High Pass Filter: Attenuation below 20 c.p.s.

Power Requirement: 395v./7ma., 6.3v./1 amp.

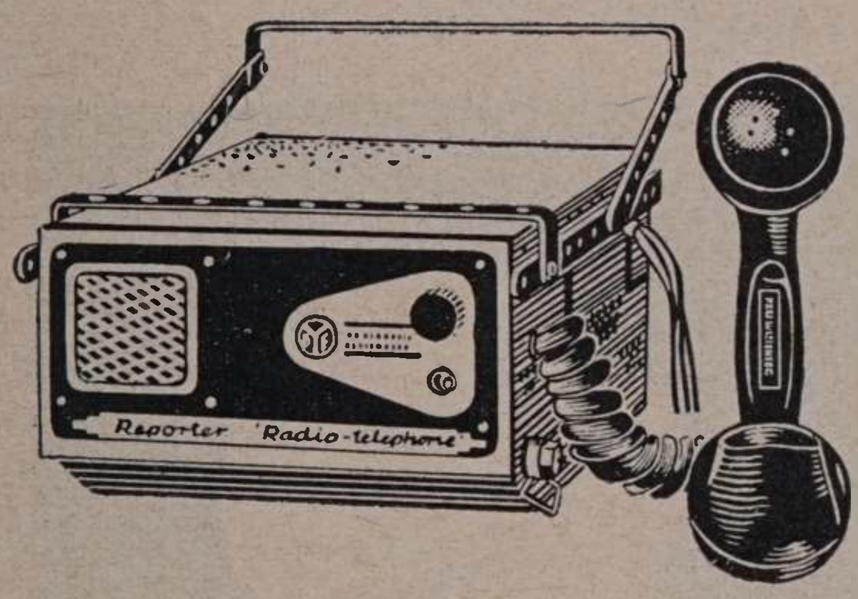
Valve Complement: (British) one EF86, two ECC81. (U.S.A. alternatives), one 6267, two 12AT7.

Weight and Dimensions: 7 lb. 12⅞ in. x 6⅛ in. x 3⅞ in.

Further inquiries should be addressed to Messrs. Amalgamated Wireless (Australasia) Ltd., P.O. Box 830, Wellington.

PYE RADIOPHONES MADE IN WAIHI

The recent addition to the Pye factory at Waihi (Akrad Radio Corporation Ltd.) has enabled Pye to begin the manufacture in New Zealand of the famous "Reporter" radio telephone. Already widely used throughout the Dominion, Pye V.H.F. equipment has achieved a reputation at least equal to that held by Pye models in the domestic radio field.



The Pye "Reporter" is a mobile radio telephone that, because of the ease with which it can be installed, is invaluable to operators of vehicles of every sort. Instant communication with vehicles wherever they may be saves transport operators both time and money, and the advantages of radiophone equipment in police cars, taxis, ambulances and fire trucks are obvious.

One of the chief features of the Pye "Reporter" mobile radiophone is the economy it offers both in initial outlay and in operation. The "Reporter" is unusually compact, light in weight, and has low power consumption, and is ideal for many mobile uses where installation of high-power equipment is impracticable.

The transmitter and receiver are designed as a single unit housed in a robust metal cabinet, and the complete equipment can be neatly installed under the vehicle dashboard. An efficient vibrator type H.T. power supply unit is incorporated. The controls are kept to a minimum and are conveniently located for ease of operation. Although primarily designed for installation in motor vehicles such as taxis, the low battery consumption and small size make the set ideal for transportable use especially in marine applications.

Very briefly, the technical specifications of the Pye "Reporter" are as follows:—

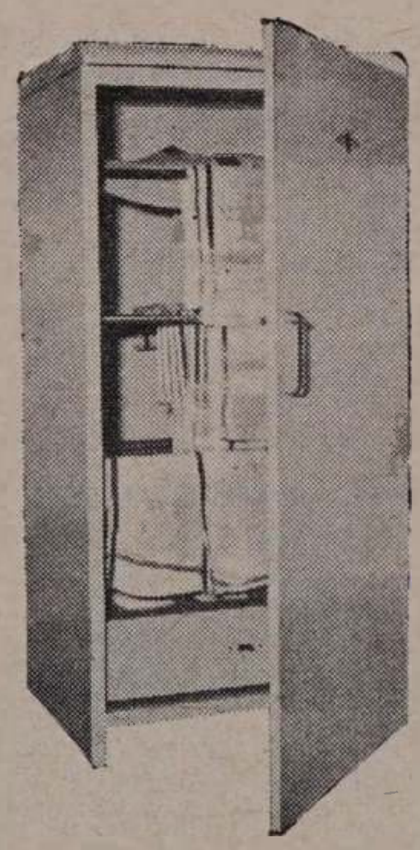
The Receiver is a high performance double superheterodyne incorporating 9 valves. These comprise an R.F. amplifier, crystal oscillator/multiplier, two mixers, two 2nd I.F. amplifier stages, detector, A.V.C. and A.F. amplifier, A.F. output stage.

The Transmitter incorporates 4 or 5 valves (2nd multiplier is omitted below 100 m/cs), comprising crystal oscillator/multiplier, multiplier, 2nd multiplier, power multiplier, modulator/receiver output.

The Controls comprise, on the front panel, On/Off switch and A.F. volume control, and on the handset a Receive/transmit pressel switch.

The "Reporter" is made in New Zealand by Akrad Radio Corporation Ltd., to the specifications of Pye Telecommunications Ltd., England, and distributed throughout New Zealand by Pye Ltd., Box 2839, Auckland, and at 43 Lower Taranaki Street, Wellington.

YOUR DRYING PROBLEMS SOLVED



No longer need a rainy day mean rooms draped with wet washing—just switch on your NEECO drier and the job is done in double quick time, the washing dried, aired, and ready to put away. The whole family can benefit, and all manner of garments can be dried this easy way.

The NEECO electric clothes drier is a roomy all-steel cabinet in gleaming white baked enamel.

Very economical in the use of electric current, with a consumption of less than 1 unit an hour (it can also be operated at half heat for airing purposes), this splendid labour-saving device uses a forced fan draught system for quicker easier drying.

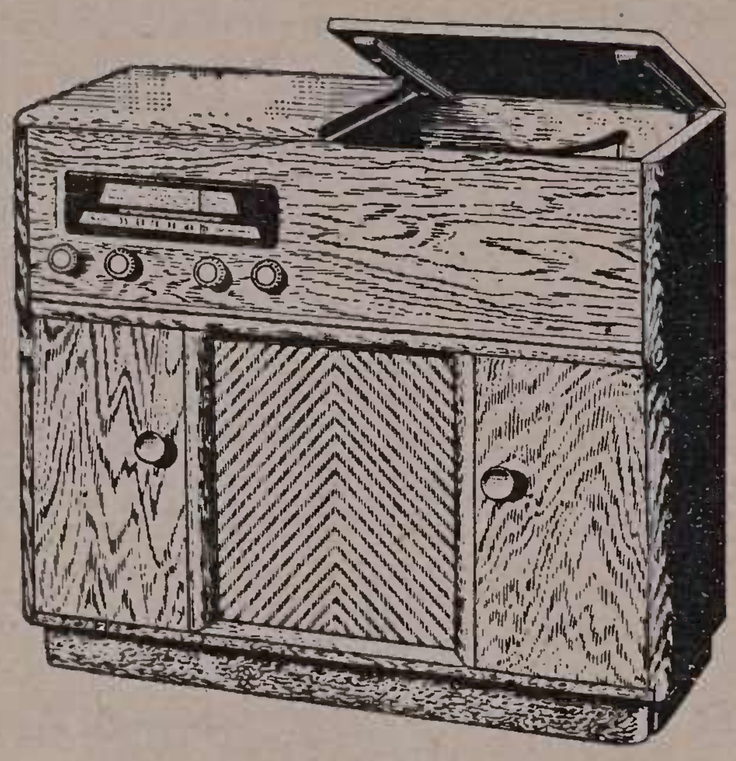
Dimensions 18 x 24 x 52 inches high. The NEECO Electric Clothes Drier is priced at £22 16s., complete with flex and plug.

Obtainable from the National Electrical and Engineering Co. Ltd., Auckland, Wellington, Christchurch, Dunedin, Hamilton, New Plymouth, Wanganui, Hastings, Invercargill.

(Continued on next page)

THE "COURIER SPECIAL" LOWBOY

A most attractive radiogram was recently released by the manufacturers of the well-performed Ultimate radios. This 5-valve broadcast lowboy is a "Courier Special" and is finely priced to retail for only £59 19s. 6d.



It is a modern lowboy of neat design and attractive lines, built to harmonize and enhance. Two particularly roomy record cupboards provide adequate disc storage and the cabinet is well finished in either blonde or medium oak.

A three-speed automatic changer gives reliable service and perfect reproduction from all types of records. The 5-valve broadcast receiver gives excellent response and a most pleasing tone. A large, clearly marked and colourful dial adds an attractive touch to an altogether superb Lowboy.

It's a "Courier Special" incorporating all the skill and know-how of New Zealand's leading manufacturers of quality radio.

Specifications:

Valves: 6BE6 frequency changer, EF41 I.F. amplifier, 6AV6 second detector, EL41 power amplifier, 6X4 rectifier.

Cabinet: Oak lowboy, light or medium finish.

Dimensions: 34¼ in. long, 15 in. wide, 30¼ in. high.

Speaker: Rola 12 in. P.M.

Output: 3½ watts.

Price: £59 19s. 6d.

Designed and manufactured by Ultimate-Ekco (N.Z.) Co. Ltd., P.O. Box 1166, Auckland.

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LOOK BEFORE YOU LEAP

Hardly anybody looks before they leap out of bed in the morning, and with an electric blanket you may be so cosy that it's not easy to leap at all, whether you look or not.

Fortunately, Philips scientists did look before leaping into the electric blanket business. They looked to the safety and comfort of people buying the blanket and they looked to the service sense of retailers who value satisfied clients.

The result of their foresight is the ERRES electrical heating blanket type BV3.

The Erres differs in two important respects from most other types on the market.

Firstly, it is designed to compensate for losses of body temperature, NOT to grill the sleeper like a pork chop from underneath. Thus the Erres is laid between the upper sheet and the blankets where its function is to make up for heat rising from the surface of the skin, which would normally escape upwards. In this way the sleeper enjoys an even temperature all over. The effect is of warmth all round rather than hot-underneath-but-only-warm-on-top.

The second important difference is in the extra safety of the Erres. Thanks to the transformer, maximum voltage is only 10 volts and the cord has a special plug to avoid direct connection with the AC mains.

The Erres is extremely versatile, having a variable heating control which can be set for 10, 20, and 30 watts. It is radio interference free, of compact size (38 in. x 30 in.) and can be washed. The retail price is £9 19s complete with heat controller and transformer.

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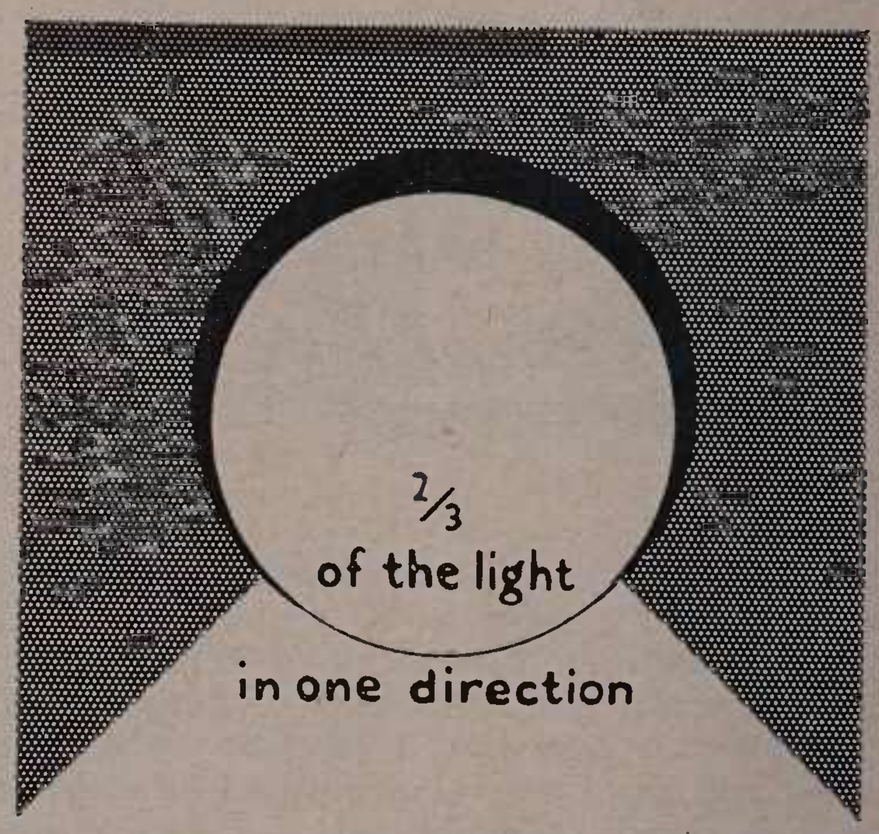
A TUBE WITH A DIFFERENCE

Philips scientists have produced a new fluorescent tube which solves two problems at once.

The new lamp. Philips "TL" F 40W, looks similar to a standard fluorescent type.



But it produces more effective illumination than a standard tube of the same wattage, because the "TL" F 40W functions as a reflector as well as a source of light.

The inside surface is coated, for two-thirds of the way round, with a special reflecting material in addition to the usual phosphor compound. This coating acts as a built-in reflector so that about 66% of the light is concentrated in a 120 degree zone, shining in the direction where you need it most. Consequently stray glare is reduced to a minimum, solving problem number one.

In most lighting situations, the 120 degree zone is pointing downwards. It is well known that dust normally collects on the top of a fluorescent tube, cutting efficiency by as much as 40%. But any such accumulation of dust has almost no effect on the output of the "TL" F 40W, since the majority of

light is being directed downwards without the dust having a chance to get in its way. Thus the "TL" F 40W solves the second problem, that of dust. When you add up the two solutions it can be readily seen that the "TL" F 40 offers immediate advantages over a standard tube wherever you want to (1) Save light from being scattered in the wrong direction; (2) Reduce glare; (3) Save space in places where a reflector is needed; (4) Save light from being dulled by dust.

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NEW PYE HI-FI MEDIUM-PRICED AMPLIFIER

You need not be a radio engineer to recognize and appreciate the value of the new Pye Hi-Fi amplifier. Representing a new approach in high fidelity reproduction the Pye H.F. 5/8 has a wide range of facilities incorporated in the pre-amplifier. This includes a choice of four pick-up compensators, for record equalization characteristics and inputs for radio, microphone, and tape recorders. Because the loudness compensator control correctly accentuates both bass and treble extremes normally lost to human ear at low volume, the grandeur of concert hall listening can be enjoyed in a home. The compensator actually ensures aural high fidelity through from minimum to maximum output.

The amplifier weighs only 20 pounds and its dimensions are 14½ in. x 6½ in. x 10¼ in. yet in performance it compares extremely well with larger and more expensive equipment.

It has a number of outstanding features designed to give wide facilities and applications for use.

There are five seperate plug-in pick-up compensators which match all good quality pick-ups. The value of these is of course self-evident.

Again, an equally valuable feature is the negative and positive feedback which raises the damping factor of the amplifier to infinity, thereby ensuring full control of the loudspeaker coil movement.

This is the perfect instrument for the High Fidelity enthusiast who requires a compact and easily operated instrument at a very reasonable price.

The Pye H.F. 5/8, which retails at £32 12s. 6d., is made by Pye in England and distributed in New Zealand by Pye Ltd., P.O. Box 2839, Auckland. Branches at 43 Lower Taranaki Street, Wellington, and 16-18 Victoria Street, Christchurch.

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MORPHY-RICHARDS ELECTRIC BLANKETS

Another two winners from the Morphy-Richards stable are the Single and Double Electric Blankets, supplies of which reached New Zealand for the first time this season. Priced at only £5 19s. 6d. and £9 5s. retail, these blankets are manufactured rigidly to British Standards Institute specifications, and are of exceptional quality. Attractively edged in satin in a choice of colours, they are extremely well presented in an appealing box in the usual Morphy-Richards manner.

All Morphy-Richards appliances are distributed by Russell Import Co. Ltd., P.O. Box 120, Wellington, and at Auckland and Christchurch.

ARMSTRONG A10 HIGH FIDELITY AMPLIFIER

John Gilbert and Company Ltd., of Auckland, are proud to introduce to the New Zealand market the Armstrong A10 High Fidelity amplifier and pre-amplifier. This equipment has been produced for the connoisseur, for the discriminating person who desires the most faithful reproduction possible from radio or gramophone records—at a reasonable price.

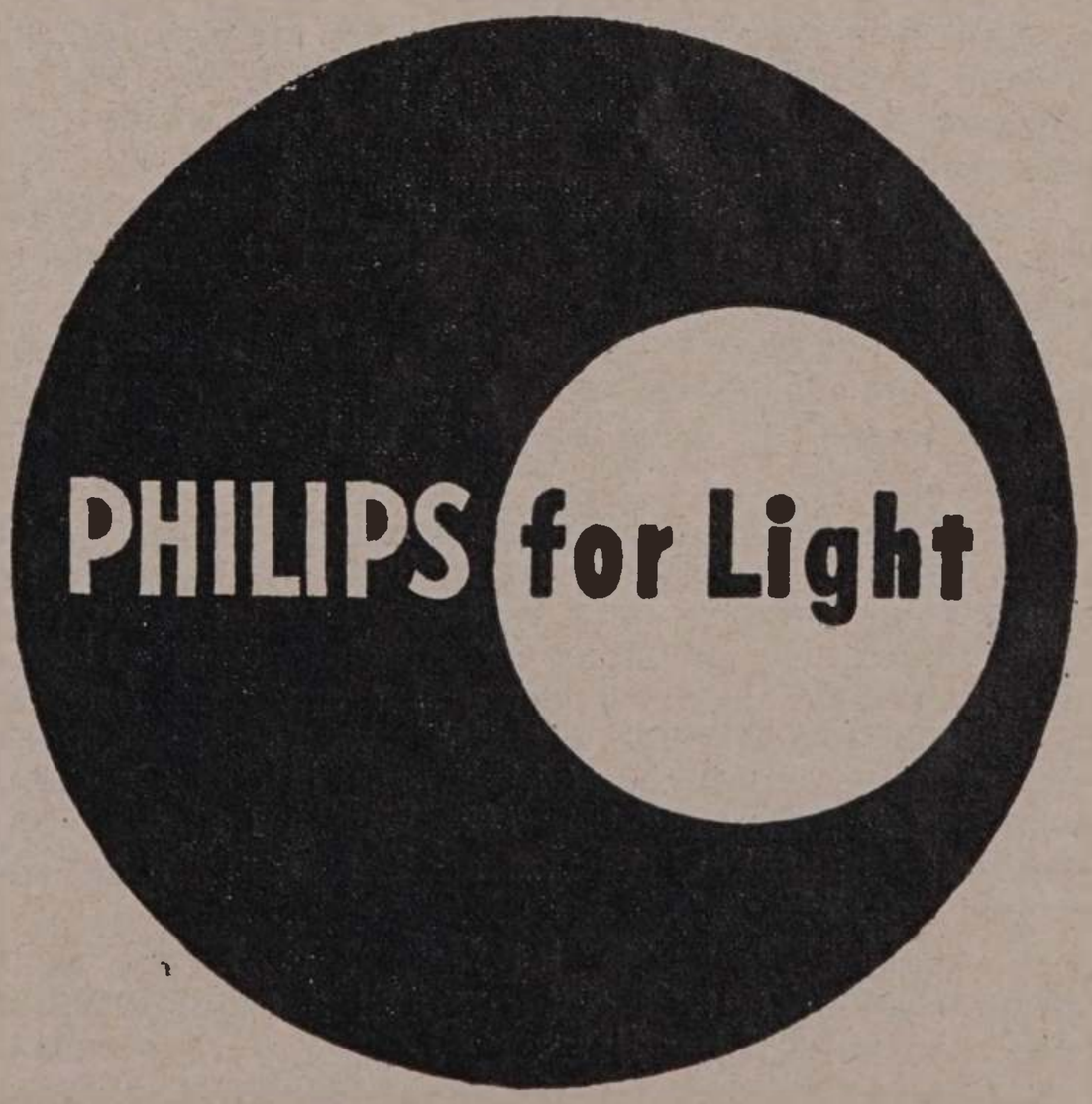
The maximum output is 10–12 watts and total haromnic distortion is less than 0.1% at 8 watts. There are three feedback loops, the main overall loop being 28 db obtained from the tertiary winding on the O/P Transformer (Partridge).

The control unit has four switched inputs and a four-position equalizer control. It also has a six-position filter giving roll-offs at 5, 7, 9 kc/s., a trough at 9 kc/s., a linear position, and a "presence" position. There is provision also for ± 15 db lift or cut on the treble and bass controls.

Further particulars are obtainable from John Gilbert Co. Ltd., Tasman Building, Anzac Avenue, Auckland, the sole New Zealand agents for The Armstrong Wireless and Television Co. Ltd., London.

"R & E" TECHNICAL PHOTOGRAPHS

Copies of original designs produced in our laboratory and featured in these pages are available. Prices are: Size 6 in. x 4 in. 3s. 6d.; 8 x 6, 4s. 6d.; 10 x 8, 5s. 6d. Please remit cash with order to Radio and Electronics (N.Z.) Ltd., P.O. Box 8022, Wellington.



EICOnomise - Buy EICO INSTRUMENT KITSETS

TRADE WINDS

PHILIPS' NEW GENERAL MANAGER GOES ON TOUR

Mr. Dirk Hudig

Mr. Dirk Hudig is a man with many busy miles ahead.

As newly-appointed General Manager of Philips Electrical Industries of New Zealand Limited, he is starting an extensive tour during which he will meet the New Zealand Electrical trade.

Mr. Hudig, a student of New Zealand economy and commercial development, arrived last month from Australia where for two years he has been Sales Promotion Manager of the Philips Australian organization.

This appointment is backed by 21 years of international experience with Philips during which he has handled almost all products of every division of the Philips Company. With 148,000 employees, Philips now merchanidse in 56 countries in 34 of which they have established manufacturing centres.

Captured by the Germans in 1942, Mr. Hudig was released from prison in Belgium the following year.

Since the war Mr. Hudig has made a close study of T.V. development, with special reference to the establishment of new services and merchandising organizations.

The New Zealand radio trade should be happy to have this tall Dutchman in their midst because he is a strong believer in a well-developed sales effort made jointly by retailer and manufacturer. He is known to have been very popular amongst Australian retailers who made use of his world-wide experience and who appreciated his strong interest in commercial television service. Mr. Hudig believes that New Zealand should have such a service at the earliest possible date.

As regards domestic interests Mr. Hudig is a family man with two children and a regular golfer with a very high handicap.

Before leaving his newly-found Wellington home recently on a three weeks' trip to Dunedin and Christchurch, he said:

"I am very much looking forward to seeing a lot of New Zealand scenery which, by the way, is well-advertised and already famous abroad. But even more important, I'm hoping to meet New Zealand people, and especially our trade friends. I want to make more than a casual visit to members of the radio trade because this will be an opportunity to discuss personal feelings and also business from every possible angle."

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MR. UNDRILL RETURNS FROM FLYING TOUR

The "new look" in factories—this was Mr. Eric Undrill's outstanding impression after a three-month consultation tour of Europe and North America.

Mr. Undrill, manager of Philips Apparatus Factory at Wellington, is seeing this new look take shape in New Zealand also. His company's new production centre at Naenae, now nearing readiness, is being built along lines similar to those of the beautiful buildings which are now giving European industry its graceful aspect.

He visited 13 Philips plants throughout Europe and America, ten of them newly built.

"The days of a bleak looking barn-of-a-place factory are gone," said Mr. Undrill. "The new ones are set in big open spaces— as we shall be at Naenae. They are pleasant to look at and pleasant to work in. Philips at Dublin is now installed in the park of an old estate with the mansion house converted into modern offices."

At Krefeld, Germany, Mr. Undrill discussed production of television sets and studied new techniques with a view to planning the TV production line at Naenae.

Commenting on the much talked-about question of automation, Mr. Undrill analysed it as the logical extension of a process of mechanization which has been going on since the 19th century.

At Eindhoven he was shown the new automatic plant—soon to start operation—which will produce radios "untouched by human hands". It is a production line fed at one end by raw materials and turning out finished models at the other, according to the printed circuit used.

Of his many impressions, Mr. Undrill remembers especially: the spick and span look of Dutch town and country; the tall TV relay towers which are now a feature of European landscape; the popularity of German motors cars on the continent; the superior efficiency of London Airport.

He was able to glimpse the trend in public taste for radio and television sets. Television now being a part of everyday life in Europe and America, Mr. Undrill found that the practical issues of price and screen dimensions at the moment more decisive than the appearance of the cabinet.

Design of radio cabinets was however becoming more venturesome, with smaller sets noticeably following the American style. Mr. Undrill judged New Zealand cabinet design to be slightly in advance of the "plain and severe" lines of many current English models.

As regards performance, he said that New Zealand-made sets compared favourably with any sets he heard throughout Europe and America.

MUTUAL ACCORD

At the official opening ceremony of the extension to Akrad Radio Corporation Ltd.'s factory in Waihi, where Pye radios are made, Mr. H. J. Pickett, Mayor of Waihi, said, "We are very happy to have Pye in Waihi."

Mr. C. O. Stanley, chairman of Pye in England, on a recent visit to New Zealand said, "Our factory at Waihi is a perfect example of the sort of factory we like to run in England."

RADIO TRADERS' ASSOCIATION ACTIVE IN TARANAKI

With six new members to its credit, the Taranaki Radio and Electrical Traders' Association continues unsparingly to promote the interests of its members.

Pictured above is the stand of Messrs. Huggard and Quinn in the recent New Plymouth Show. This aroused much interest.

Incidentally, Mr. J. J. Quinn is the president of the Taranaki Radio and Electrical Traders' Association.

RE-UNION OF E. & W. SCHOOL, CLASSES R10 AND R 11

Former members of the R.N.Z.A.F. E. & W. School Classes R10 and R11 at Wigram will be interested to hear of a planned re-union dinner in Auckland at Labour week-end. Accommodation can be arranged for visitors to Auckland for the occasion, and intending participants should contact Mr. W. J. Murphy, P.O. Box 1166, Auckland. Mr. Murphy would also welcome names and addresses of former members of these two classes and any help in this direction would be greatly appreciated.

In April last several Auckland members of E. & W. School classes R10 and R11 organized an evening at the home of Stewart Macgowan in Mt. Wellington, where a happy time was enjoyed reminiscing. The passing years have extracted their toll, and the changed appearance of many of the former youthful members came in for such good-natured criticism. Those present included Bill Caskie, Frank Danrell, Phil Goldsboro', Les Greendale, Stewart Macgowan, Frank Murphy, Bill Murphy, Jack Raleigh, Athol Smerdon, Reg. Truman, and apologies were received from Bob Oxenham (Whakatane), Clark Higham, Keith Randerson and Ron Drayton (Whangarei), Jack Sampson (Dargaville) and Geoff. Douglas.

A bright time is promised for Labour weekend, and a warm welcome to Auckland will be extended to all who can make the trip.

H.M.V. RECORD RELEASES

August heralds the launching of the first H.M.V. Monthly Record Magazine, featuring in an attractive way, by the use of blocks, biographical notes, newsy pars, etc., the latest on the newest recordings and artists.

Including POP and LP releases, this magazine has been specially designed to make the release lists brighter, less cumbersome, more informative, more accessible, easier to file for catalogue reference, and, in fact, an excellent magazine.

The first issue will be complimentary, after which the price will be 6d. per copy, and publication will take place in the first week of each month.

H.M.V. Record Dealers will be pleased to supply all further information.

ANOTHER "RECORD MONTHLY"

As we go to press news comes to us of the introduction of "The Record Monthly", a new magazine listing all records released in New Zealand each month. This will be sold by all Record and Music Stores and Bookshops at 1/6d. per copy.

There will be eleven issues a year (December-January being issued together), and the journal will be published on the first of each month.

Promoter of this new venture is "The Record Publishing Co.", of P.O. Box 175, 62 Manchester Street, Christchurch.

BRITAIN'S NATIONAL RADIO AND TELEVISION SHOW

Among the chief attractions in London during August will be Britain's National Radio and Television Show which will be held at Earls Court from 21st August to 1 September.

This, in fact, is Britain's annual progress report to the world, every year providing fresh evidence of the country's continuing advance in radio, television, and electronics.

British manufacturers, suppliers of television equipment to Canada, Australia, South America, Middle East and Asian Countries, and all countries linked by the "Eurovision" television network, are making receivers and other equipment to all existing standards.

British high-fidelity sound reproduction equipment, including gramophone parts, is penetrating the U.S.A. market to an increasing degree. New valves and tubes to meet the expanding use of frequencies in the VHF and UHF bands will be shown, as well as

components tested to the world's highest standards and all climatic conditions.

There are limitations in an exhibition of this kind to the display of capital equipment, but some of it will be shown by the Royal Navy, Army, and Royal Air Force and in a special display of electronics, and much of it will be in use in the B.B.C. studio and arena.

Though B.B.C. television is now available to 92 per cent. of the population, a higher proportion than anywhere else in the world, sound radio production and sales continue to rival TV. Renewed interest in sound has arisen not only through the manufacture of high-fidelity equipment, but also through the B.B.C.s very high frequency, frequency-modulated, service to be available to 84 per cent. of the population by the end of the year.

While all manufacturers are producing television sets with 21-inch tubes, the needs of those with small rooms and modest purses are not being neglected, and there is a revival of the 9-inch and 12-inch tubes for the new portable television sets.

Electronics in Industry

Lead-in to the Radio Industry Council's training and recruiting display, will be exhibits of electronics. Principal feature, shown by courtesy of the Royal Aircraft Establishment, Farnborough, will be the electronic timing equipment used in the record-breaking run of the Fairey Delta II. On an animated background there will also be shown reproductions of photographs taken during the run.

Other electronic displays will include control of the flight of a guided missile, a computer to do big sums quickly, a radar equipment showing movement on the Thames and points of interest around Earls Court, and a car racing game, the cars being motivated by the competitors' voices.

In all, there will be 110 exhibitors.

Patron of this Radio and Television Show is Her Majesty, the Queen.

CLASSIFIED ADVERTISEMENTS

Rates 4d. per word, minimum charge 3s. Deadline date 1st of month preceding publication.

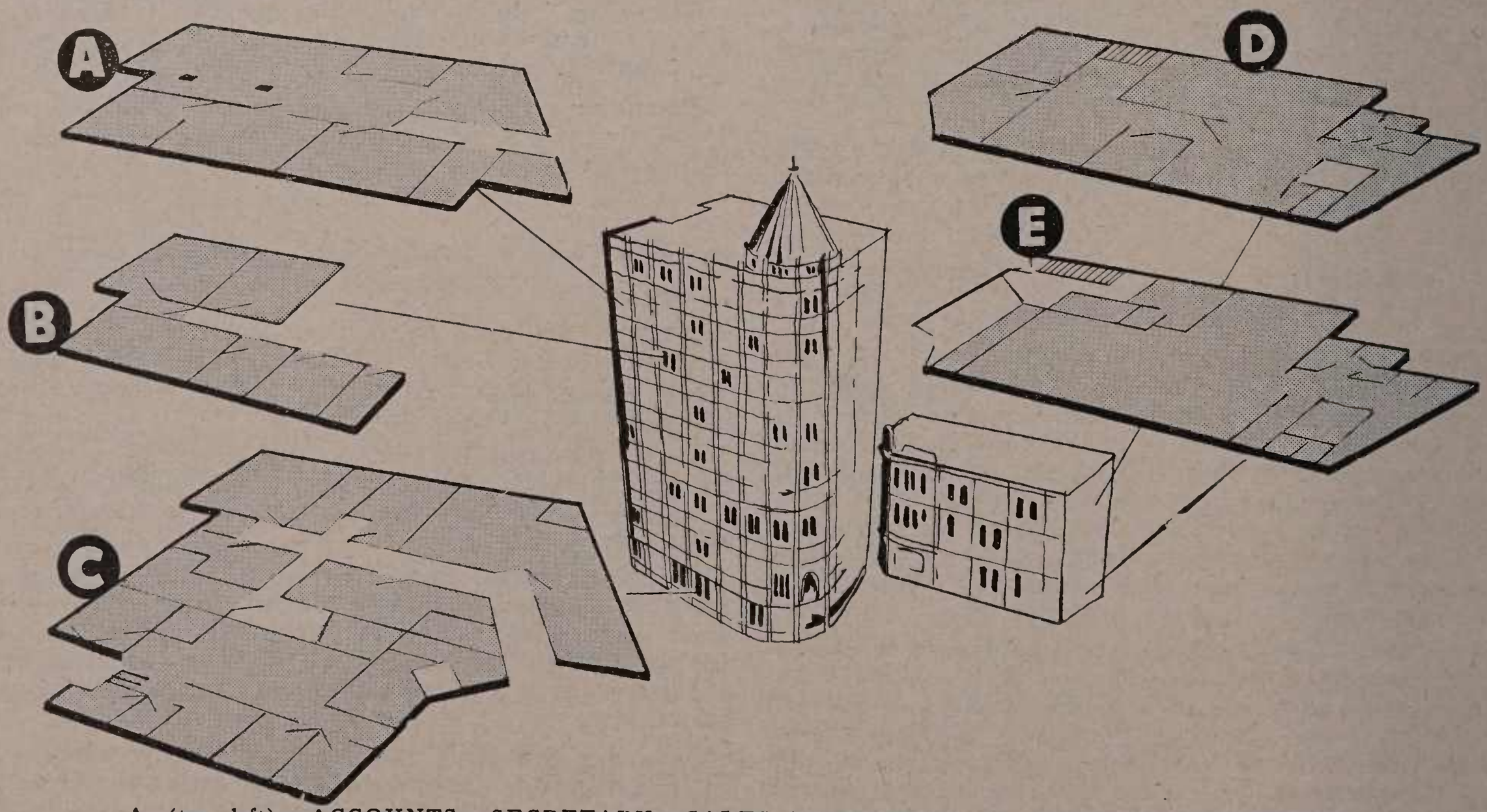
BACK NUMBERS OF "R. & E."

Available from our Office,

PYE OFFICE EXPANSION — NEW AUCKLAND PREMISES

The new offices taken over by Pye Ltd. and G. A. Wooller & Co. Ltd. in Chancery Chambers, and the acquisition of space in Johns' Building brings the total office and showrom area occupied by these associated companies to more than 12,700 sq. feet.

The illustration shows the new accommodation in Johns' Building (at right) and in Chancery Chambers, Chancery Street, Auckland, C.1.



A (top left): ACCOUNTS; SECRETARY; SALES PROMOTION. B (centre left): MANAGING DIRECTOR; GENERAL MANAGER. C (lower left): SALES OFFICE; SHOWROOM; RECORD STORE; PRINTERY. D (top right): SPECIAL PRODUCT DIVISION; SERVICE DEPARTMENT. E (bottom right): STORE.

AROUND AND ABOUT

ROBOT EYE CLEARS STEELWORKS EMERGENCY

Operator at control position of the slab-rolling mill, with the monitor screen to the left of the main dial. A picture of the ingot can be seen on the screen.

This is the story of how a serious emergency in the biggest steel works in South Wales was minimized by the use of industrial television.

The Steel Company of Wales has long been alert to the potentialities of closed circuit T.V., and some while ago, experimental demonstrations by various manufacturers of such equipments were carried out at Abbey Works, Port Talbot. As a result of these stringent tests an order was placed with Marconi's Wireless Telegraph Co. Ltd.

But before the equipment could be delivered a crisis blew up. A telephone call from South Wales revealed that the operation of the 45 in. Slabbing Mill was being seriously affected by the failure of a slab manipulator, which would take at least a fortnight to repair. Previously a similar breakdown (but on the front side of the mill and within the direct vision of the operator), had been overcome by the use of a special hook, manipulated by an overhead crane. This time however it was necessary to use the same method on the outgoing side of the mill and this prevented clear sighting by the operators. It was therefore decided to provide an "eye" behind the mill by the use of industrial T.V.

At 10 o'clock that night two engineers were dumping the equipment on the works floor at Port Talbot. By 2 o'clock in the morning the gear was in position, successfully tested, and the mill again rolling.

The effect of the breakdown was, by this means, limited to such an extent that an average of 1,600 tons per shift was produced during the time the slab manipulator was under repair.

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MALAYAN TERRORIST CASUALTY

Pictured at right is a Marconi VHF Transmitter/Receiver Type HP.11, hit by bullets during a terrorist attack on a rubber estate in Malaya. One bullet went straight through, and the exit hole can be seen in the front of the set. Another lodged inside the set, after passing through a valve and screening can.

The Manager of the estate reported:

"We use five sets of this type for security on this estate; one in the Central Police Post, one in the estate armoured car, and three in outlying divisions.

On March 24th, in the early hours of the morning, an unknown number of bandits fired into the Police Post on the Penari division doing little harm other than damaging the V.H.F. set and completely writing off a small battery receiver belonging to the Police. The fire was returned and the bandits withdrew."

The set was sent to the nearest Marconi depot for examination. When the valve and screening can were replaced, the set was found to be fully operational, and is once again in service.

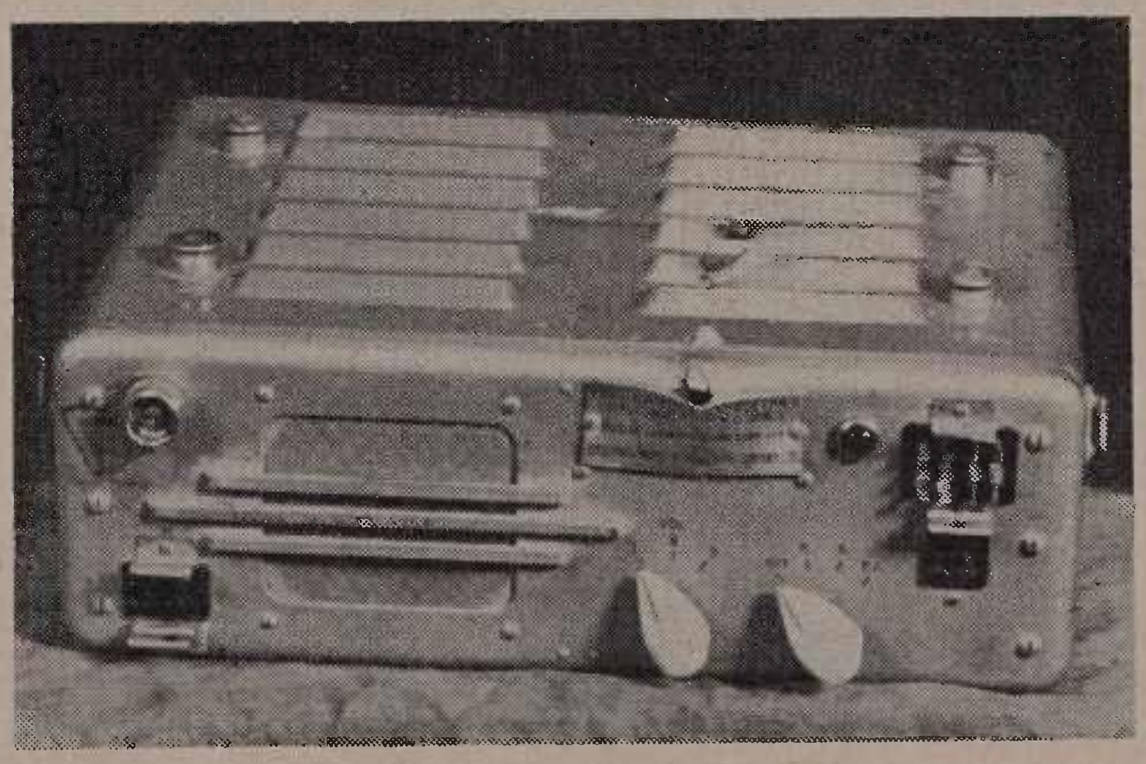
★

SELECTING TREE-TRUNKS WITH PHOTO-ELECTRIC CELLS

Selecting tree trunks as is done in wooded countries like Sweden, is an extremely tough job. The trunks arrive at the saw-mill via the rivers or by lorries and there they are selected according to their top-thickness. When a certain kind of sawn wood is ordered, it is thus possible to select at once the trees that will be the least watsteful.

An important and progressive wood processing concern at Ostertalje, Sweden, has started to select these trunks electronically, for which purpose Philips have developed a special installation. The trunks are pulled out of the water in the usual way, are peeled mechanically, then pass along an iron detector and finally reach a 100 m.-long conveyor belt which is placed alongside the various selecting levels. At the beginning of the belt, the centre of the length of the trunk is first traced by means of a photo-electric cell. Then the diameter of the trunk is measured with a sliding-scale. The result decides in which level a trunk must be placed.

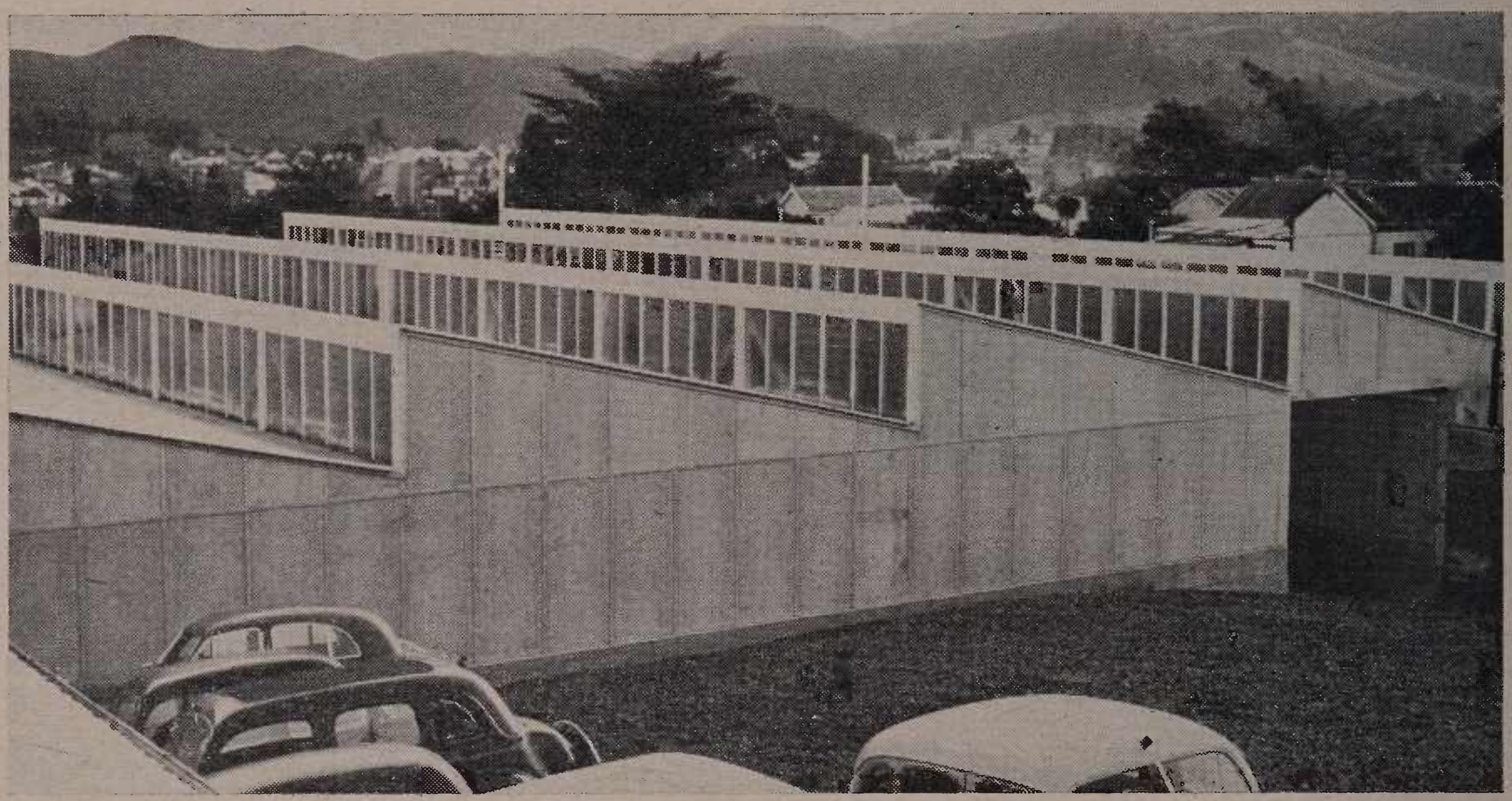
By pressing a particular button, a hole is punched in a paper-strip which is led synchronously with the conveyor-belt. Photo-electric cells near the selecting levels react to the punched holes in the paper strip and put a hydraulic installation into operation which throws the trunk into the correct partition. Formerly, before the installation of this electronic equipment, 5 to 6 men were required to perform this operation. Today, however, this work can be done by only one man.



The Marconi VHF Transmitter/Receiver type HP.11 hit by bullets during a terrorist attack on a rubber estate in Malaya.

LARGER FACTORY FOR PYE

At a function in Waihi to celebrate the official opening of the extension to Akrad Radio Corporation Ltd.'s factory, where Pye and Clipper radios are made, Mr. G. A. Walsh, M.P. for Tauranga, said: "Television is certain to come." Mr. Walsh added that there was no Government opposition to television in New Zealand, and he personally looked forward to the day when it would be established here.



An exterior view of the new Akrad factory extension. The factory now covers a floor area of 40,000 sq. feet, and several acres of ground are still available for expansion on the far side.

A Tribute to Pye

Mr. Walsh went on to say that much had already been done to bring the advent of television to New Zealand closer, and a lot of this had been done by Pye. He felt quite sure that Waihi would be the heart of the New Zealand electronic industry in the future.

When discussing the Government's interest in television, Mr. Walsh disclosed that there would be two New Zealand engineers in Melbourne for the opening of Australia's first television station to coincide with the start of the Olympic Games there. These men would report back to the Government when further consideration would be given to television here.

Mr. Walsh pointed out, however, that capital expansion of various kinds was urgent all over New Zealand, and although this would not delay TV in New Zealand when the time was ripe the question had to be given careful thought as the cost to the country would be high. The Government had to be sure that each step taken was the right one, and that each was a step forward with an assurance of added welfare for the people of New Zealand.

Mr. Walsh concluded by congratulating Pye, Akrad Radio Corporation and the people of Waihi on the progress that had already been made on TV in this country.

A Momentous Occasion

Mr. H. J. Pickett, Mayor of Waihi, paid tribute to the tremendous part Akrad Radio Corporation had played in developing the prosperity of the town and said it was "a momentous occasion" for Waihi when Pye joined forces with Akrad. Akrad's factory in Waihi, which now covers 40,000 sq. feet, was virtually responsible for saving the life of the town when the Martha Gold Mine closed down in 1945.

The security stone for Waihi's future was television, Mr. Pickett said, and he hoped that it would not be too long in coming to New Zealand.

Radio Telephone Equipment

In a short speech of thanks and congratulations to the Akrad staff, Mr. George A. Wooller, chairman of the Pye companies in Australia and New Zealand and a director of the English company, said that the Akrad factory had grown from a very modest beginning until today it was producing more domestic radios than any other factory in New Zealand. In addition, Pye had begun the manufacture of telecommunications equipment in Waihi, and young men were going to Pye in Cambridge, England, so that there would be no lack of TV engineers when the time came.

Mr. T. J. Spencer, who introduced the speakers, thanked all concerned for their help in making possible the extension to the factory and the continuing progress of Akrad Radio Corporation.

A part of one of the assembly lines working on Pye radio telephone equipment. The factory is capable of an output of 200 radios a day.

Distinguished Guests

Among those who attended the official opening and tour of the factory, and the cocktail party at the R.S.A. Hall afterwards were Mr. G. A. Walsh, M.P., and Mrs. Walsh, the Mayor of Waihi, Mr. H. J. Pickett, and Councillors, representatives of all the civic bodies and representatives of the Department of Industries and Commerce, the Department of Labour and the Thames Valley Electric Power Board, as well as leading citizens of Waihi.

Mr. G. A. Walsh, M.P., chatting to one of the girls on the assembly line. Completed TV receivers could be coming off these assembly lines within six months.

The day marked the opening of a new era both for the growing town of Waihi and for Pye in New Zealand.

—P.B.A.

Record Talk

(Continued from page 35)

unfortunate collector of organ records has never been offered much apart from Bach and perhaps some Cesar Franck, and will undoubtedly be strongly attracted by this symphony of Widor's, the sixth, in G minor, as played by Richard Ellsasser at the John Hays Museum in Gloucester, Massachusetts.

Decca records this month are largely for the connoisseur, and the most interesting issue is perhaps Ansermet's performance of Stravinsky's oratorio "Oedipus Rex" with the Suisse Romande orchestra, soloists and chorus (LXT5098). Bartok's Divertimento for strings, which has always been one of the most approachable of his works, receives a fine performance from the Zurich Chamber Orchestra on LXT5081, coupled with a sinfonia for strings and flute by the Swiss composer Muller, and Peter Pears and Benjamin Britten have re-recorded Britten's "Seven Sonnets of Michelangelo" together with a later Britten cycle, "Winter Words" (LXT5095).

In a less austere vein Sir Adrian Boult, recording for the first time with a French orchestra, conducts the Paris Conservatoire in a complete rendering of Tchaikovsky's Suite No. 3 in G. major (LXT5099). This is the work of which the last movement, a very attractive theme and variations, is nearly always performed as a separate work. Having heard the whole suite we must readily admit that the theme and variations comprise by far the better part of it, but the preceding movements, including a delightful scherzo and waltz, are well worth the occasional hearing. In the realm of French light music there are two of Massenet's suites, "Scenes Pittoresques" and "Scenes Alsaciennes", done by the same orchestra under the veteran Albert Wolff (LXT5100). Back we come to Mozart. Decca's "Cosi fan Tutte" (Vienna opera forces under Karl Bohm, LXT5107-9) is rather cruelly abridged and really cannot hold a candle to Karajan on Columbia, and there are plenty of good alternative performances of Symphonies Nos. 34 and 38, coupled by Bohm on LXT5111. But in the cheap medium play series you will find a rare gem, Janacek's "Sinfonietta" played by the Vienna Philharmonic under Kubelik. Janacek, the Czech composer who died in 1928, is only now being recognized as the master he was. His genius seems to have been most powerfully expressed in his operas, one of which, "Jenufa", is at present being introduced by Kubelik at Covent Garden. The "Sinfonietta" here recorded was written two years before his death and, right from the extraordinary opening which is scored for no fewer than twelve trumpets, will delight all lovers of full scale orchestral music. LW5213 is the number of this important issue. Similarly on this economical size of record is a transfer of Clifford Curzon's beautiful performance of Falla's "Nights in the Gardens of Spain" (LW5216) while others in the series include a condensation of the Verdi-MacKerras "Lady and the Fool" by the New Symphony under Irving (LW5028) and Wilhelm Kempff in two Brahms Rhapsodies (LW5211).

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FILMSTRIPS ABOUT ELECTRONICS

Modern industrialization without the aid of electronics is something inconceivable, and that is why the information about the possibilities of electronics, particularly to the younger ones, is so vitally important. In future, there will be an even greater demand for electronic specialists in every field, whilst some notion of this new science and its technique will also be necessary for those working outside the field of electronics since they, too, will be confronted with the subject in various ways and places.

With this in mind, Philips have made a series of filmstrips on behalf of schools, in which electronics are stripped of their mysteries. Both the pictures—which for the most part consist of drawings as well as a few application photographs—and the corresponding text-booklets in various languages, are of an informatory character only and every advertising element has been purposely excluded. In addition, the arrangement is such that the teacher is still free to choose his own way of explaining a particular subject, since the text book gives factual information only.

The first series is intended for high schools, but in the future, other strips will be made for universities, elementary and technical schools. The subjects dealt with in the existing strips are radio and gramophone, film, TV, tape-recording apparatus and electronic appliances used in industry. Strips on new subjects will appear regularly.

SHOP DESIGN

(*Continued from page 38*)

Thus treated, such lists can appear decorative and the customer is likely to respond to the care taken to present the information.

There seems to be a general belief in the trade that the public is inclined to be suspicious of any shop with a carefully organized and restrained display, that people recognize only what they are used to. If this has been so, it is certainly an attitude which is changing and will continue to do so as contemporary design becomes more accepted through such influences as modern furniture, etc.

The very great improvement in the last year or so in window dressing, particularly in the fashion shops, will undoubtedly spread, and the radio and electrical trader, for all his difficulties with many and awkward items to show, will have to keep up. Indeed, as merchandising becomes less easy so will the importance of the shop and the display become more vital for sales. Furthermore, after-sales service, which is such an important factor in this trade, can be enormously assisted by the confidence which can be instilled by really efficient-looking premises.

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(Continued from page 33)

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Because the life and performance of the vibrator is affected by the type of transformer with which it is used, the Plessey Company will advise on the transformer and circuit, or supply a specification of the power unit incorporating the vibrator.

Inquiries should be directed through the New Zealand Representative, William J. Blackwell, P.O. Box 1622, Auckland.

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Wellington:

Philips radio, serial No. 28854: dark brown bakelite cabinet 18 in. x 12 in. x 6 in., with oblong dial underneath which are two switches, one at each corner.

Autocrat 6-volt, 4-valve car radio, serial No. 24144. Brown cabinet with chrome dial and 2 white tuning knobs with gold beading.

Pye radiogram, serial No. 29431 incorporating 5-valve short-wave radio; blue rexine case 24 in. x 24 in. x 12 in., brown record disc and attachments.

Autocrat 5-valve, 6-volt car radio, model 5/6. Serial No. 29595; single unit in brown metal case with walnut coloured control knobs.

Christchurch:

Pacemaker portable radio, serial No. 53987/117040; burgundy coloured cabinet.

Bell model 5B5 portable radio, serial No. 25092; cream cabinet 11 in. x 7 in. x 5½ in.

Courtenay 5-valve broadcast radio; dark brown wooden cabinet 18 in. x 12 in. x 12 in. with vertical slide rule dial and three tuning knobs. Station tuning control defective and slips when being tuned. Set fitted with several feet of flex and three-pin plug.

Pacemaker portable radio, serial No. S.52470/L.112028; cabinet 12 in. x 10 in. x 5 in., thought to be white. Set weighs 9 lb.

Pacemaker portable radio 42611/32037; maroon cabinet with white flap in front and crack across front. Back a darker maroon than front.

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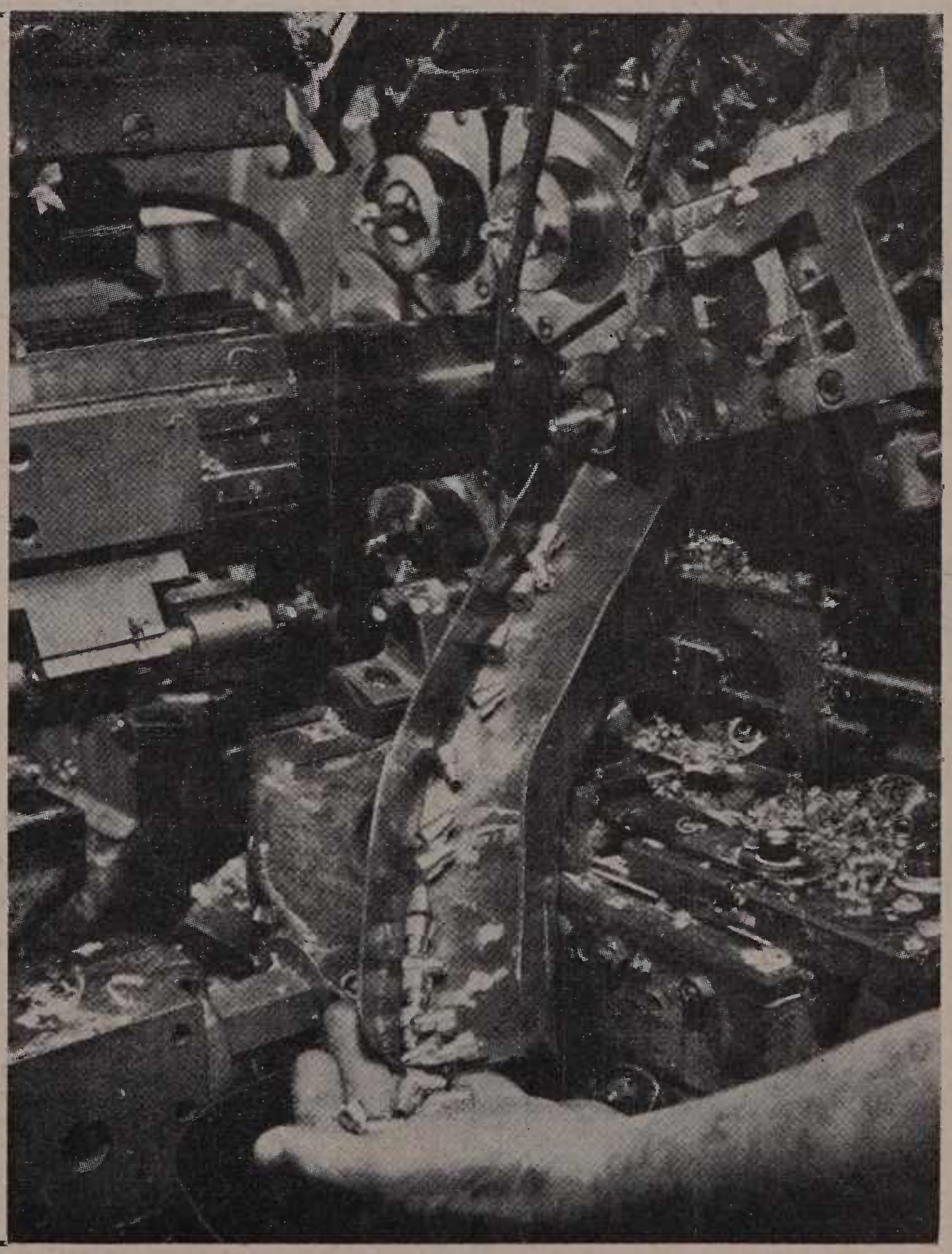

How to Build Speaker Cabinets

(Continued from page 32)

wavelength of the sound striking it. The larger the porosities compared with the wavelength, the more absorption will take place. Translating this into terms of a given absorbing material, and sounds of different wavelength, we see that the longer the latter, or in other words, the lower the frequency, the less effective the absorption becomes. From this it is clear that whereas an inch of thickness of loose carpet felt may be very effective in absorbing sounds at the high-frequency end of the scale, it will have no measurable effect on frequencies at the other end of the scale, and this is the behaviour we want. All this boils down to the fact that the interior of a reflex cabinet should be lined with absorbing material, and that if this is done, the right characteristics will automatically be obtained.

It must be pointed out, however, that this lagging can be overdone, and if so, it can cause a loss of speaker response, and dead-sounding reproduction in the very important middle range of frequencies.

Since the main object is to prevent standing waves at middle and high frequencies, it is clear that the main requirement is to have at least one, but not necessarily both of every pair of parallel surfaces in the enclosure lined with absorbent material. New, untrodden carpet felt is good for this purpose, as is cotton wadding, which can be bought in quite wide rolls. Whichever material is used, it can be glued to the inside faces of the baffle, and will need no other support.

Because of this internal reflection, enclosure designs which contain the minimum number of parallel walls are to be preferred, although simple rectangular structures are perfectly satisfactory when properly built and lined. This is why a corner-shaped reflex baffle is preferable to a rectangular one on the score of performance as well as because it takes up a minimum of room.

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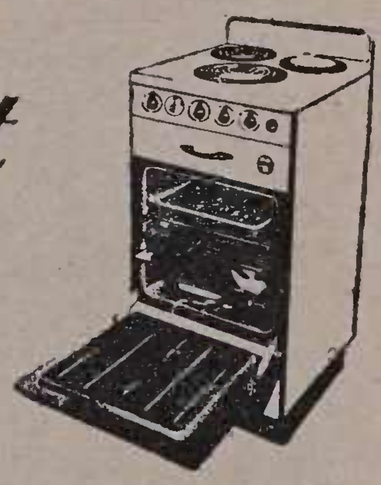

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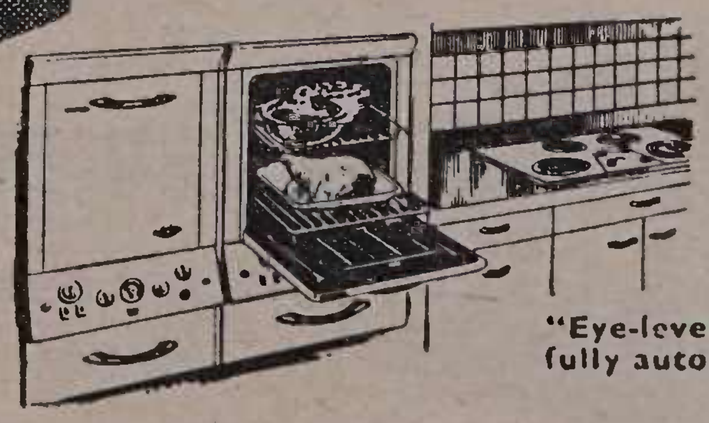

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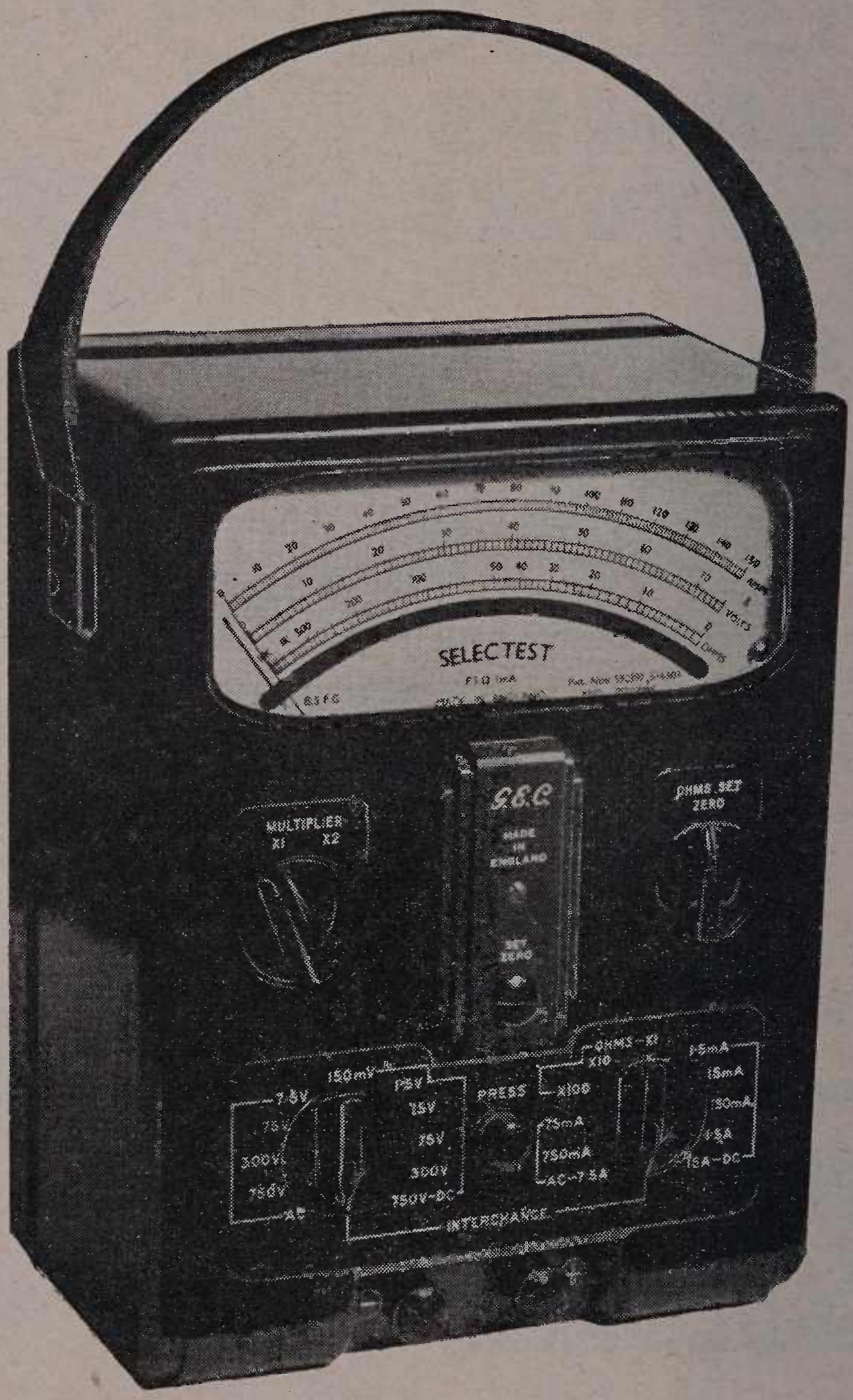

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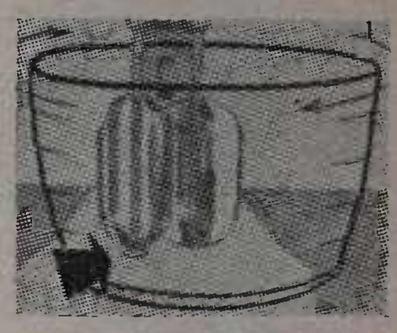

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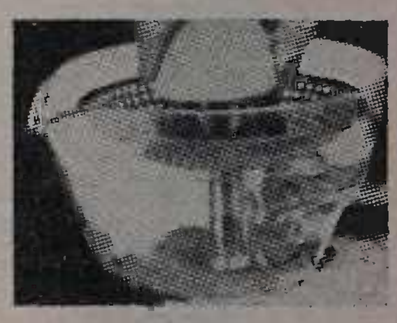

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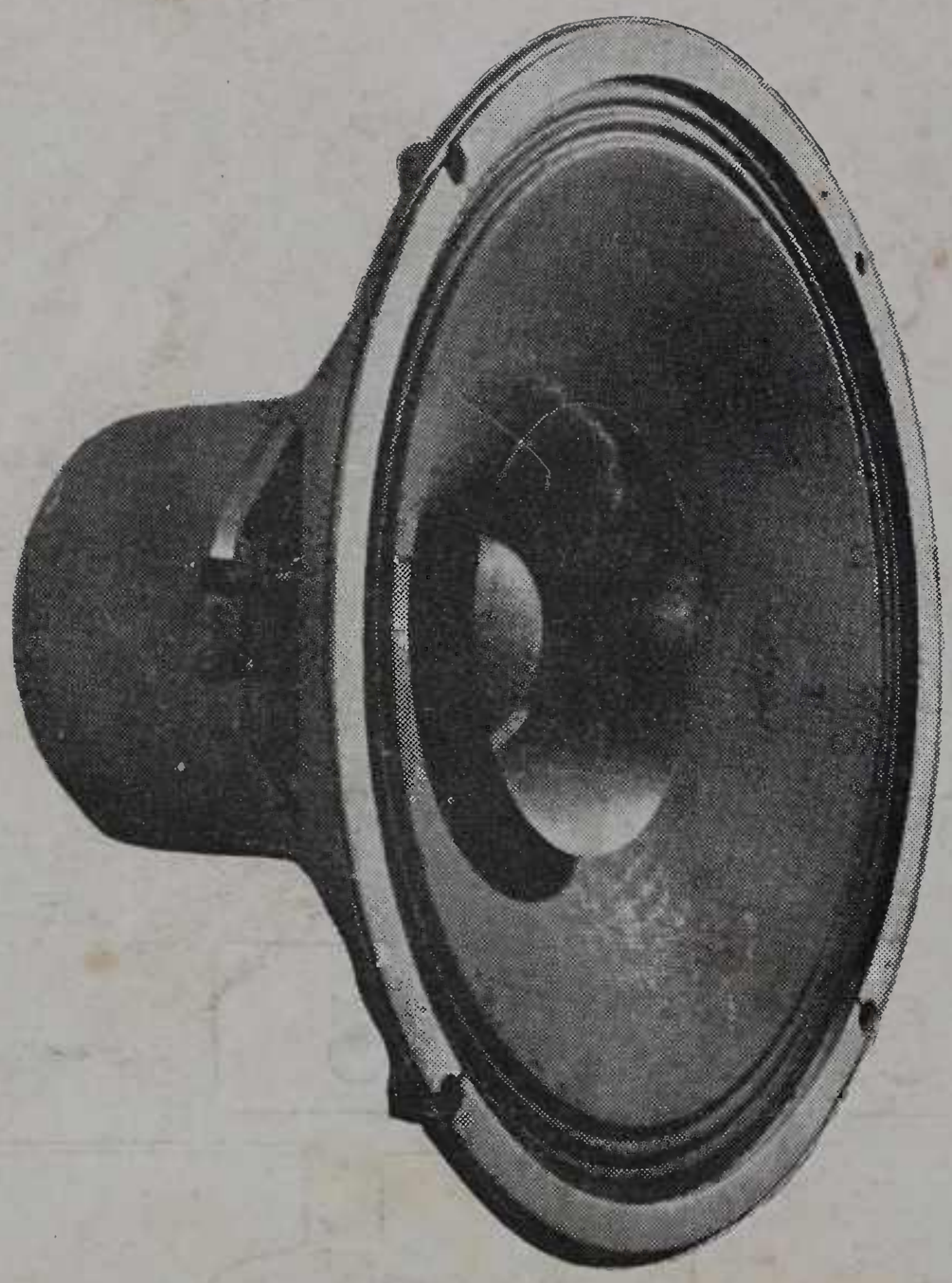

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