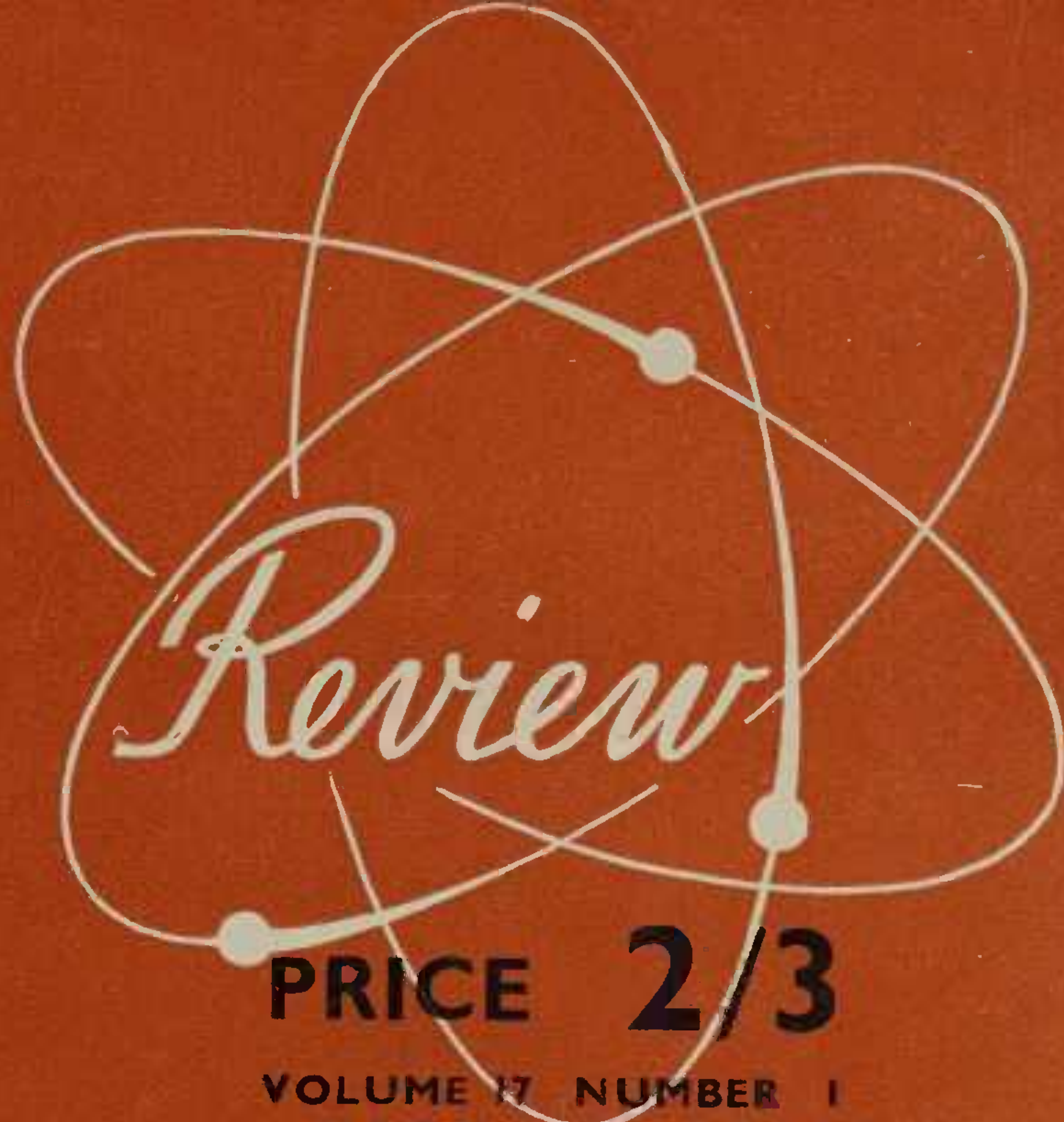


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PUBLISHED MONTHLY IN THE INTERESTS OF THE N.Z. ELECTRONICS INDUSTRY

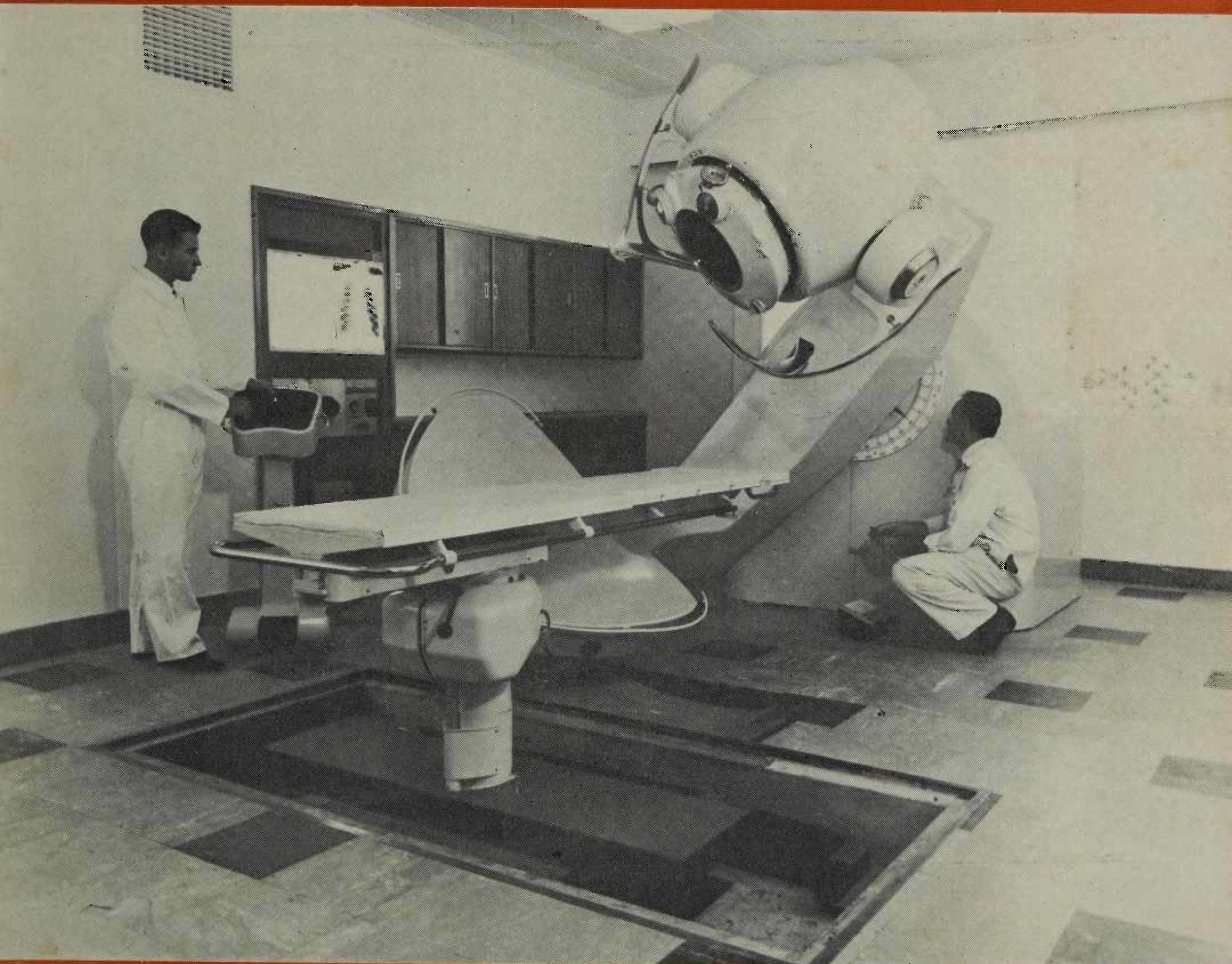
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VOLUME 17 NUMBER 1

MARCH 1 1962



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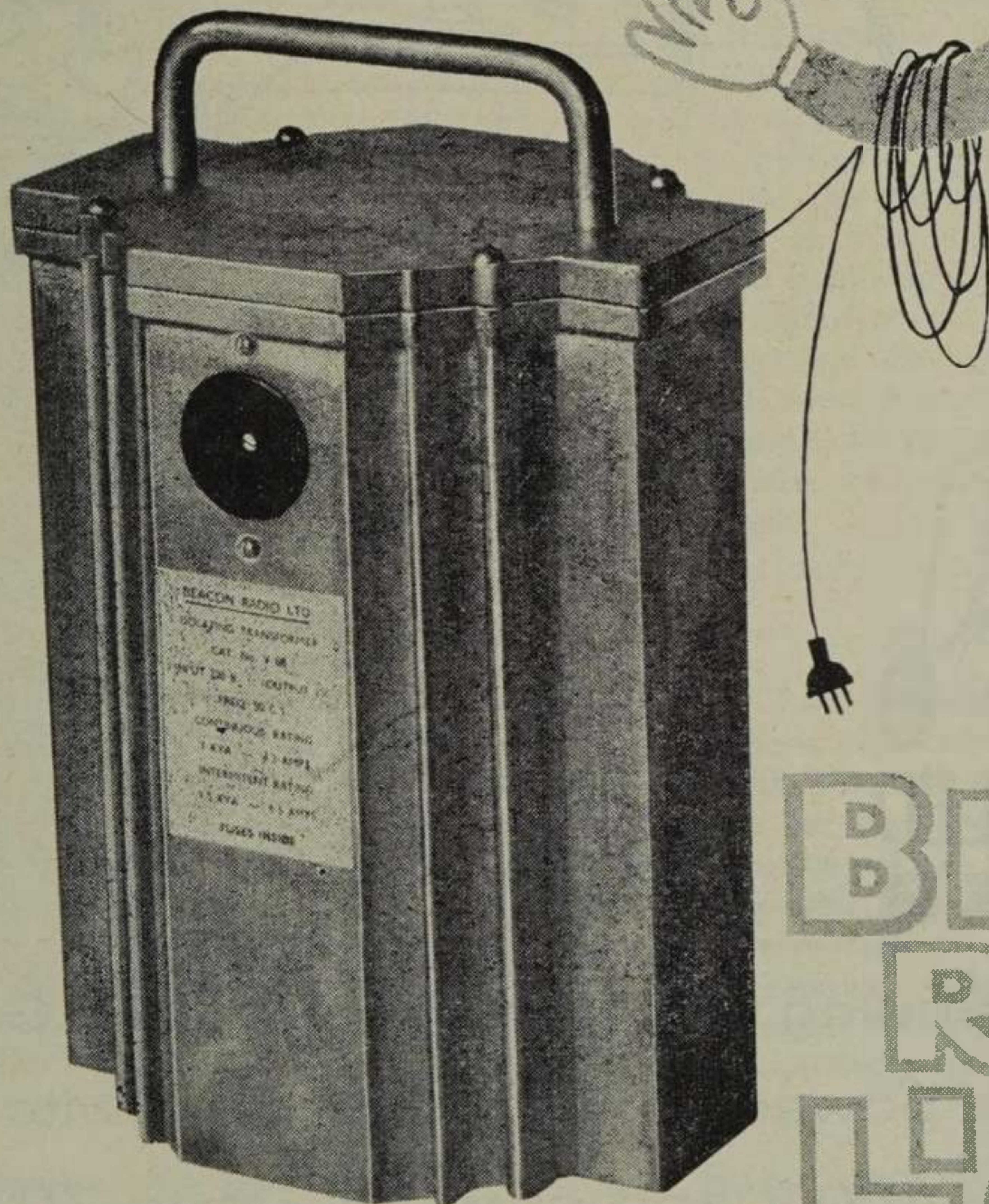
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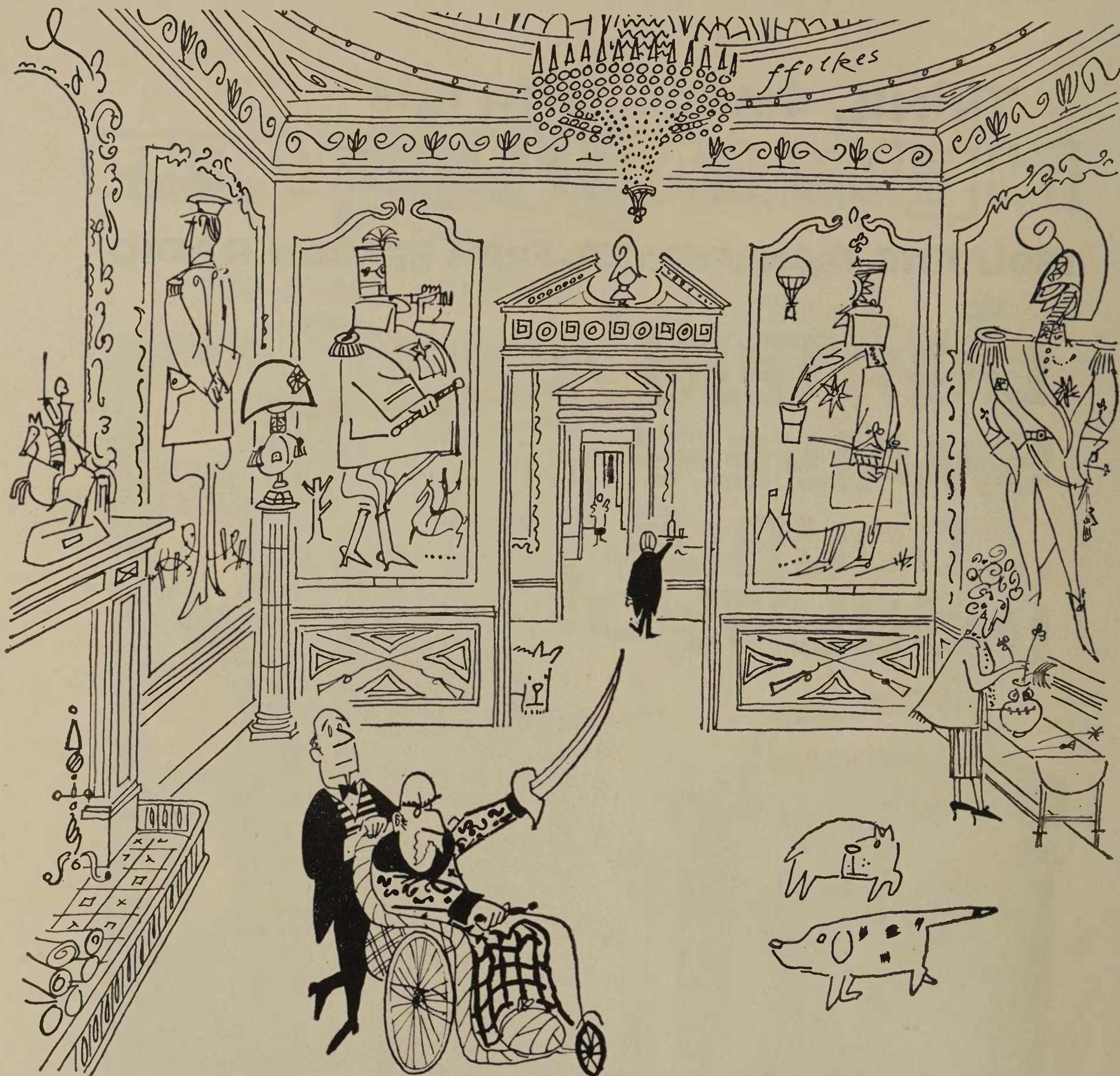


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Letters from Readers...

MORE ABOUT KIT SETS OR DO-IT-YOURSELF

Sir,

First re your query in October number, "Kits or Do-It-Yourself." Definitely for the keen "bloods," those who are springing up to replace us and push us off the road and on whom the whole show will in the future have to depend, I think your type of article the best from the point of view of training in theory or practice. We may miss a few prospects or potential members, however, this way through failure to cater for the initial confusion of the starter who has to find his way through the wood the first time, alone. I think the Kitset idea definitely fills this need of a guide. A judicious leavening of the two should best awaken the person's mind to the everyday characteristics of quality in the result obtained, for they have to obtain for a start some idea of what is good quality in order to judge what they do later on its merits. They will then wonder why they have caught a crab and realise it when they do so and normal growth processes will work to find out why—to avoid repetition. I do not see any harm in recommending basic Kitsets occasionally—you do in effect now, e.g. where to obtain coil assemblies and other key parts.

And "Bob's Service Shop"—an excellent idea. Such bright "Off the Beat" throbs. Should impress upon a few more that the wonderful ideas and results one sometimes obtains—tries to obtain?—can boomerang through misinterpretation of words in most cases: too many words can smother and be the cause of failure as well as reverse.

Secondly, on the use of tape recorders. There has been a press article on a Transport chap recording—no doubt a court hearing. An article on this sort of thing—how to handle the recording of a board meeting or technical session so that all comments and question and answer material comes in as well as that of the main "Gas bag!" might be of use.

An example is the method of handling the House of Representatives for broadcasting purposes. Type of equipment necessary, etc.

R. E. CLARK.
R.D. 3, Napier.

Opinions and suggestions appreciated—will keep them in mind.—Ed.

20 WATT MOBILE TRANSMITTER

Sir,

I enclose cheque for £1/7/6 to cover subscription for 12 issues including the June 1961 issue, if available.

Referring to your Technical Editor's reply to "SEF" in your November issue,

I shall be grateful if you will give me the same information, as it will cover some of my problems.

I am building a Mobile Xmitter with Vackars VFO, 12AT7. Buffer 12A6 and two 5763's in parallel for amateur use, substantially based on your 20 watt mobile. I wish to use a 12 volt battery, and your method of modulation.

I shall be pleased to forward a further remittance for this information on receiving your advice as to the cost of this service.

Thanking you in anticipation.

H. W. BODDY.
Z.L.4 G.G.

Copy of our letter to "SEF" has already been forwarded—trust that it will help to solve your problems.—Ed.

* * *

COPPER CLAD LAMINATE

Sir,

I see in the December 1961 issue of R. and ER., your contributor R. J. Hall, mentions in his article "Construction and Use of Printed Circuits," that the copper clad laminate for printed circuits is available in New Zealand. Could you please let me know the source of supply? I am making a "Home Brew" transistor portable and cannot obtain the laminate locally as most of the somewhat restricted supply appears to go to the large radio manufacturers in the North Island.

Regarding the magazine, I must say that I appreciate the generous number of constructional articles of late, very instructive and worthwhile projects most of them!

Best wishes for your future projects.
TOM TANNER.
Christchurch.

We have investigated your problem and have been advised by the importers that they are now only bringing in orders for the manufacturers, and are not carrying stocks for distribution. You may possibly approach one of the portable manufacturers for an offcut, at their pleasure, of course. If we have any further information we will advise you accordingly.—Ed.

* * *

NAME AND ADDRESS, PLEASE

We have a letter from "Browned Off," of Ashburton, who unfortunately does not supply his name and address. Like most other magazines and newspapers, our policy is to publish letters only when the name and address of the writer are included as evidence of good faith. So long as this information has been

supplied, the letter may be published over a nom-de-plume if preferred. If "Browned Off" cares to supply the necessary information we shall be glad to publish and reply to his letter.—Ed.

* * *

3-VALVE BROADCAST RECEIVER

Sir,

Could you please send me a copy of the Radio and Electronics November 1952 because this magazine has the circuit of a 3-valve broadcast receiver which I want to make. I would be very grateful if you could send me a copy.

(Master) NEIL LAMBERT.
Inglewood.

We are endeavouring to secure from the previous publishers a copy of this particular magazine. Otherwise we will have to arrange for a copy of the article to be prepared for you. You will by now have received your February copy and hope you will be interested in the Triplex receiver described in the February issue and concluded in this issue.—Ed.

* * *

OLD READER PLEASED

Sir,

I have been a subscriber to "R. & E. Review" (the old "R. & E") since 1948 or thereabouts. I am most favourably impressed with the journal in its present format.

Bank draft for the necessary amount is enclosed.

Wishing you every success in the future—a bigger, brighter, better informative journal.

ALAN W. GARDNER.
Holland Park, Queensland.

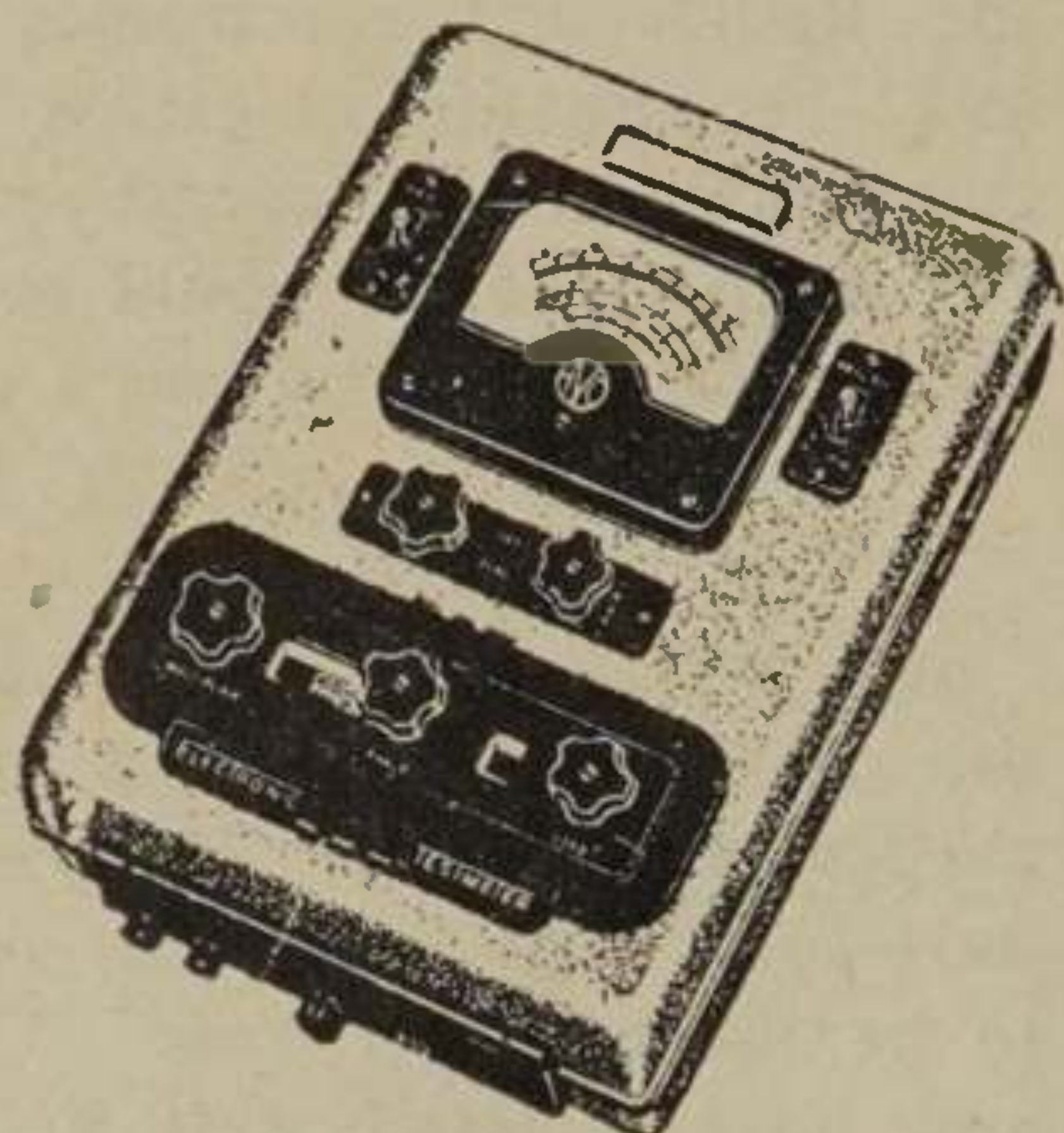
* * *

Mr. I. J. Forrester,
Trentham.

Further to your letter, published in December issue, we are not able to trace any details of a front-end tuner for the 5-in. T.V. set. There was, however, a circuit and coil details for a Channel 2 tuner published in the August 1959 issue of this magazine on page 27. A slight increase in inductance will be necessary in the coils but this will probably be within the range of the slugs and the oscillator tuning condenser will probably cover the right oscillator frequency for Channel 1. This circuit should be satisfactory providing you are living in an area with a good level of signal. If, however, the signal level is low we suggest that you replace the E80 R.F. amplifier with a double triode cascade type amplifier using a 6BQ7A or similar tube type.—Tech. Ed.

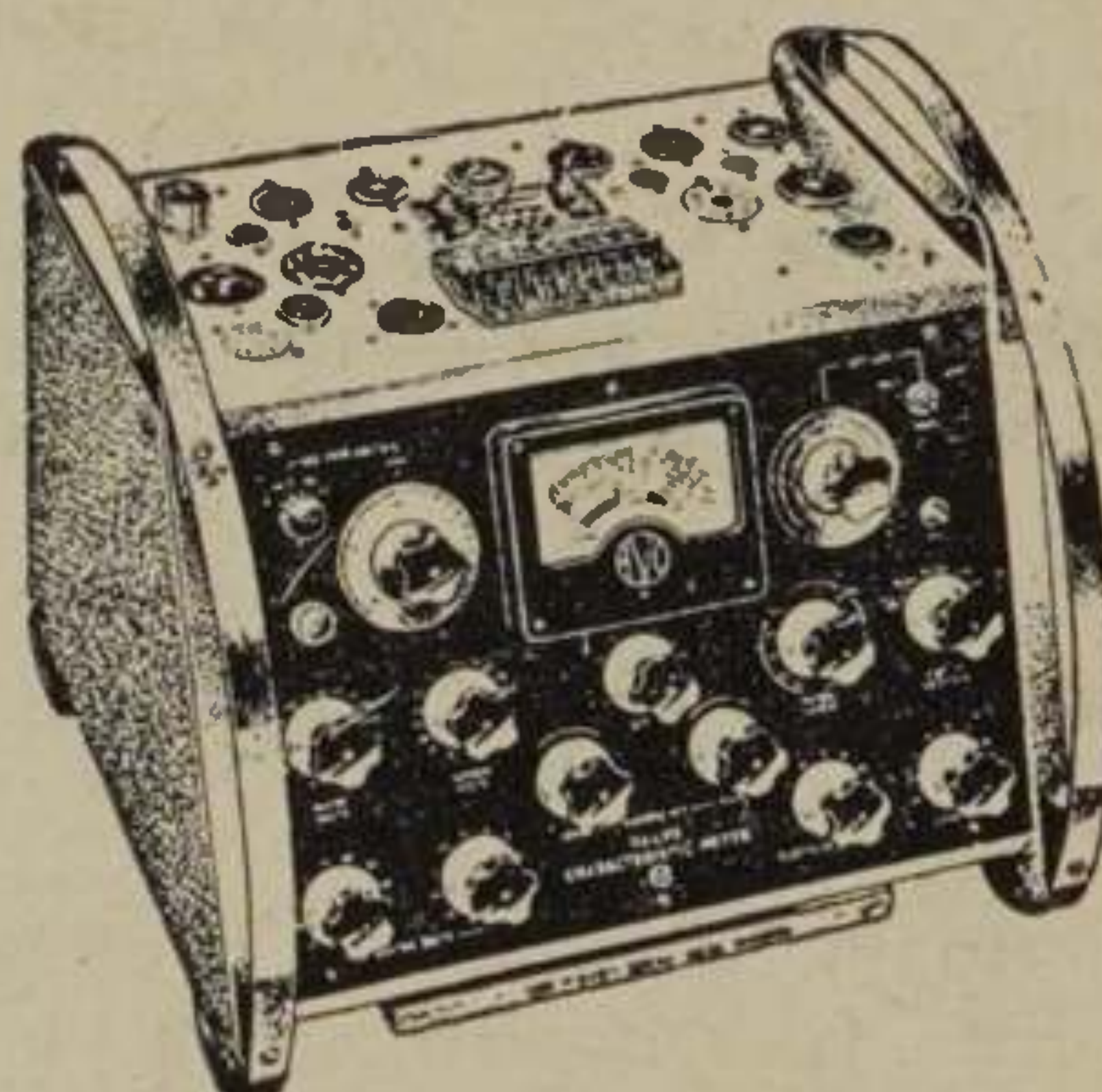
A1.2

TESTING INSTRUMENTS YOU CAN DEPEND ON...



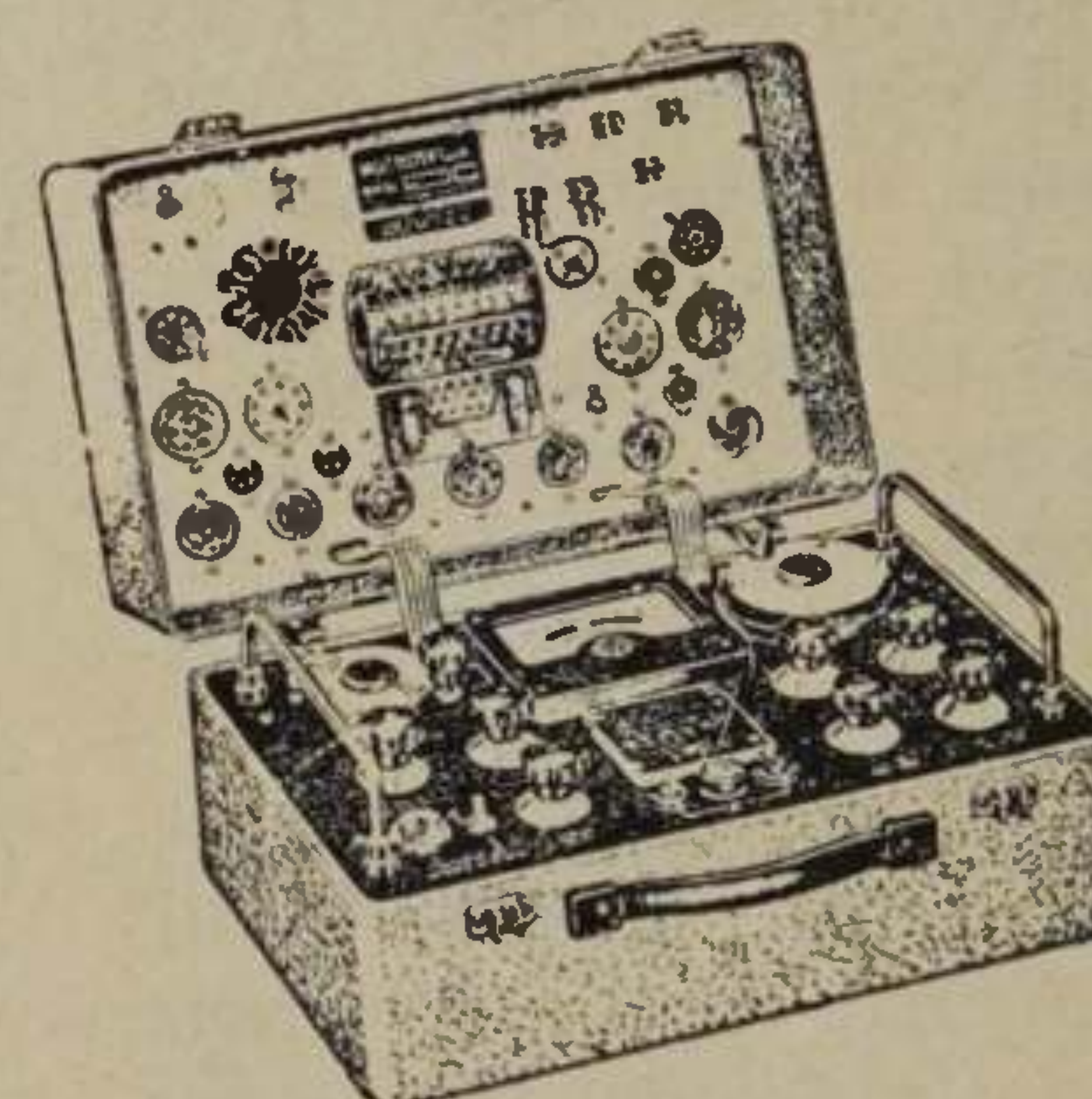
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This instrument consists basically of a balanced bridge valve voltmeter and has a wide set of ranges. It is almost impossible to damage by overload.



Valve Characteristic Meter—Mk. IV

This compact and most comprehensive Valve Tester will quickly test any standard receiving or small transmitting valve on any of its normal characteristics under conditions corresponding to a wide range of DC electrode voltages.



Valve Tester Type I60

A new simple-to-use Valve Tester of pan-climatic design, which will check any standard receiving or small transmitting valve, and produce accurate readings of mutual conductance by applying to the control grid an incremental voltage inversely proportional to the slope of the valve characteristic.

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Radio and Electrical Review

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Institute (Inc.).

The New Zealand Radio and
Television Manufacturers'
Federation.

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* * *

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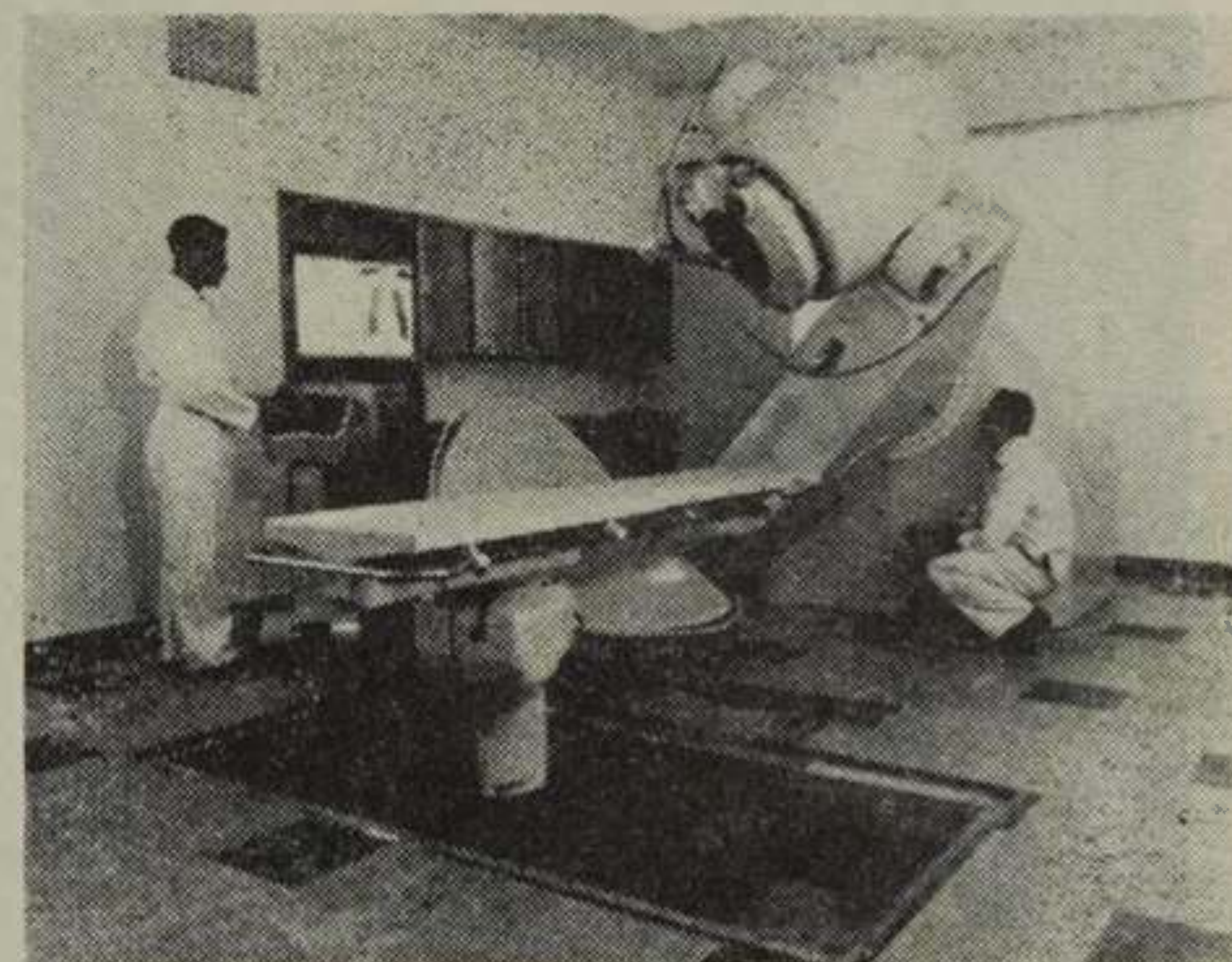
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MARCH 1, 1962

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On Our Cover



COBALT UNIT AT WELLINGTON HOSPITAL

The Mobaltron 11 is the most advanced Cobalt Unit available and provides for a wide variety of treatment techniques. The design of the unit is such that should present techniques change new requirements can be added at any time in the future.

The Mobaltron is, perhaps, the most versatile Rotating Cobalt Unit available in the world today and it is the best shielded. The unit is capable of being loaded with 30,000 curies of Cobalt 60 and still meeting with the United Kingdom recommendations for protection which call for a maximum radiation at the surface of the container of 6.25 mr/hr.

The cover picture shows Amalgamated Wireless (A/Asia) N.Z. Limited's Engineers putting the unit through the final tests at the conclusion of the installation.

See story page 24.

Featured Next Month

- ☆ Transistorised Power Supply
- ☆ Computers—First Part of a Series
- ☆ Solartron Tactical Simulator
- ☆ A 50 Watt Modulator

OVERSEAS NOTEBOOK : NEW PRODUCTS : SHORTWAVE SURVEY : TECHNICAL JOURNALS CONTENTS



**A twirl of the dial and . . .
PRESTO - YOU'RE
CHATting
to AUSTRALIA**

(and hearing clear as a bell, what's more)



From now on phoning friends or business associates in Australia is as simple and successful as phoning across the street. Fast as a local person-to-person call—the new service actually IS person to person at no extra cost—no more of the fading or static that used to make a call to Australia such an ordeal. No booking rigmarole, either—you can ring at a moment's notice—and it only costs you 30/- for 3 minutes. Try it—you'll be astonished.

WHY SO FAST, SO CLEAR?

This superfine service is made possible by a revolutionary new type of cable between Auckland and Sydney which allows an Auckland operator to dial direct to any number in any major Australian city—and vice versa. The cable handles 80 telephone conversations, telegraphic traffic, International Telex, picture and document facsimile transmissions simultaneously.

PHONE AUSTRALIA

ON THE NEW, FAST TRANS-TASMAN TELEPHONE CABLE

ISSUED BY THE POST OFFICE

Progress Report — *and Future Prospect*

This issue is the twelfth since this company took over Radio and Electrical Review and it therefore seems a good time to review this initial year's work. In our first Editorial—April 1961—we invited readers' comments. Quite a number have been received—a few brickbats and many more bouquets—for both of which we are equally grateful.

Radio and electronics were, to us, a new field of interest. We therefore felt that our first step must be to build up a strong technical editorial team. This has been achieved and we are grateful for the amount and quality of work which has been carried out by our Consultant Editors and specialist writers. They form a guarantee to readers of the interest and accuracy of material published. First, they have done a great deal of original writing and designing to suit local conditions (15 original construction projects have been published in the past year). This high proportion of original articles has enabled us to control strictly the amount of contributed or reprint material at a point where it is selected solely on the grounds of interest and value to readers. A second important function of the editors is that all such material is fully reviewed before publication.

In general, our editorial policy has been to concentrate our appeal towards technical people, both professional and amateur. In that manufacturers and retailers employ technical personnel and servicemen, the magazine must also be valuable to the trade. Our articles on industrial electronics, or the application of electronics to the use of industry generally, are intended to have wide appeal to manufacturers and industrialists.

A year ago we forecast new features

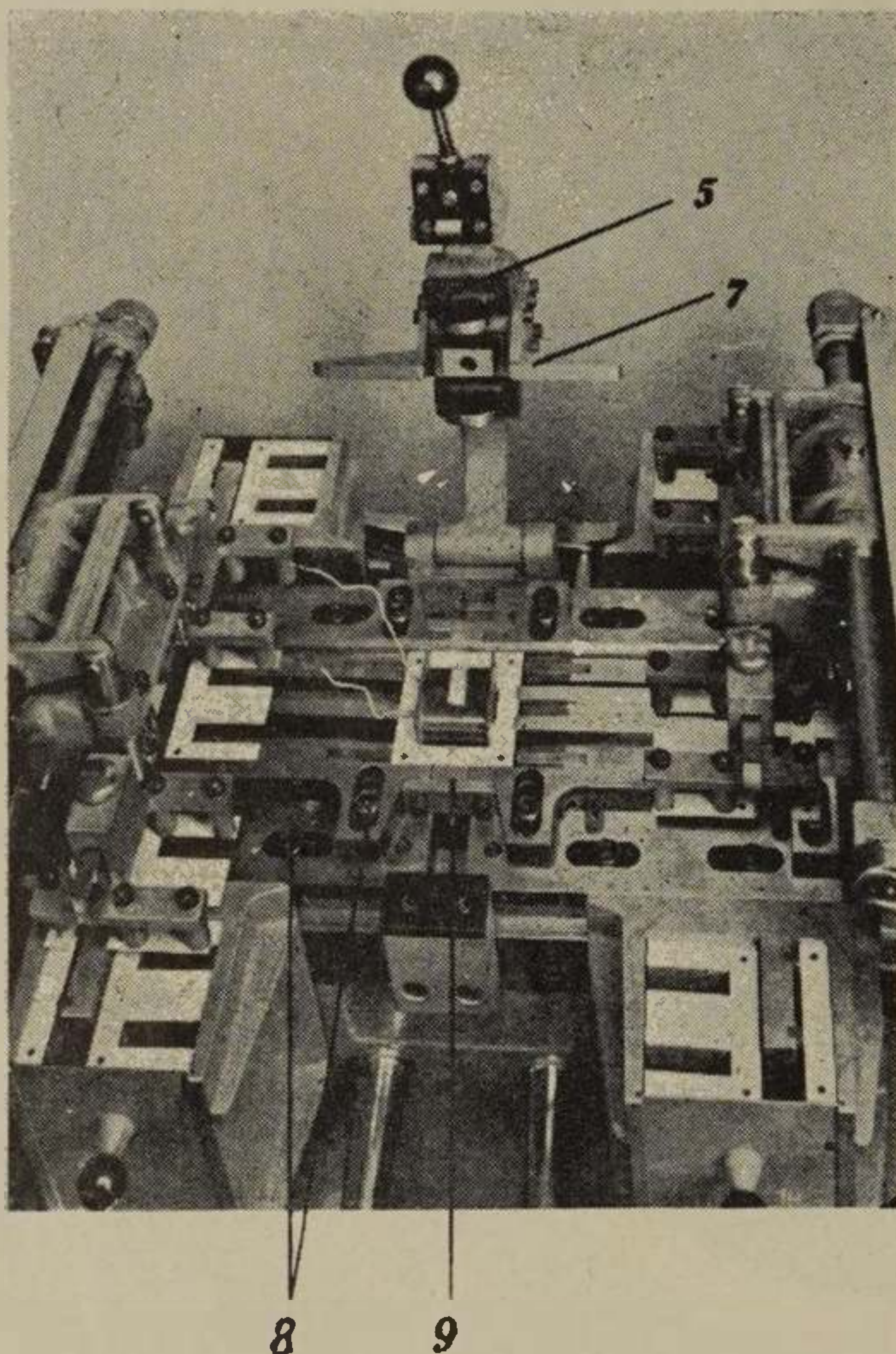
in the journal and we have since introduced a correspondence column, which has been well patronised, shortwave notes, book and record reviews, greater use of illustrations and synopses of technical journals and standards. The development of these or additional new features depends entirely on readers' interest.

At this stage we should therefore like to appeal to readers for an expression of opinion on the developments which we have made so far. If you like, or dislike, certain features—if you would like further new ones—please drop us a note or a postcard. Your views will be of great help in making future plans.

As already explained we have felt that our first attention had to be devoted to editorial development, in the interests both of readers and of the magazine's future progress. Accordingly, and unfortunately, it has been possible to catch up only a little of the time lost in taking over and reorganising publication. However, the recent Communications Special Issue replaced the one missed last year and we now plan, while maintaining the highest possible editorial standard, to catch up a few days each issue until we regain our proper publication dates.

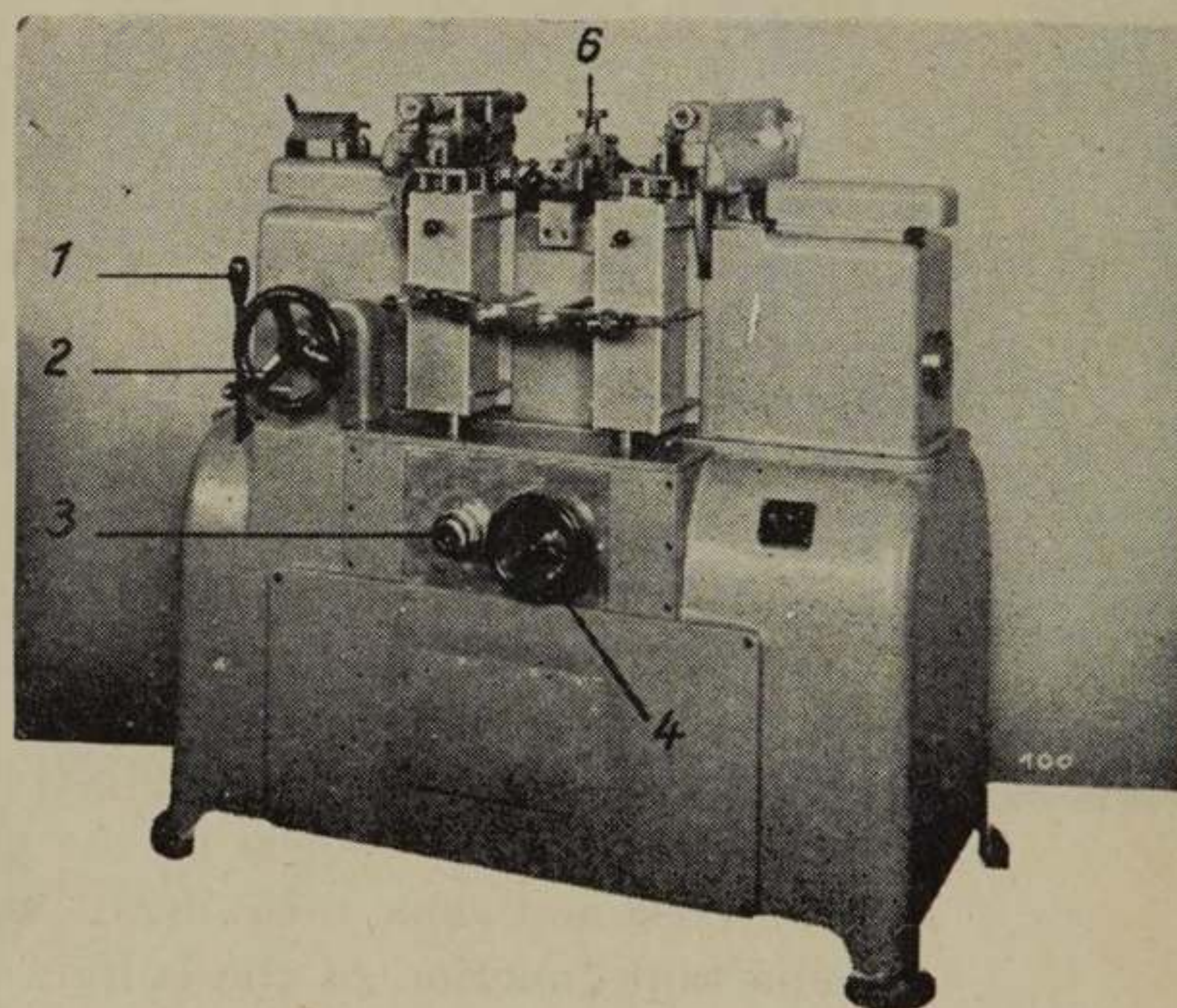
Apart from readers' letters, we have been chiefly encouraged by the facts that most subscriptions have been renewed and that new ones are coming in steadily. We are indeed grateful to both readers and advertisers who have maintained their confidence in the magazine during the difficult period of reorganisation. We hope that "R. & E's" future development will more than justify their confidence and will keep pace with the almost limitless progress in electronics which will fill the next generation.

The Auckland Transformer Company



See the PACKING MACHINES in action and discuss any problems you may have with one of the four Hams on the Staff.

extends to all Hams in or visiting Auckland, a cordial invitation to visit their factory in Newmarket, to which they have just added another 4,000 sq. feet floor Space.



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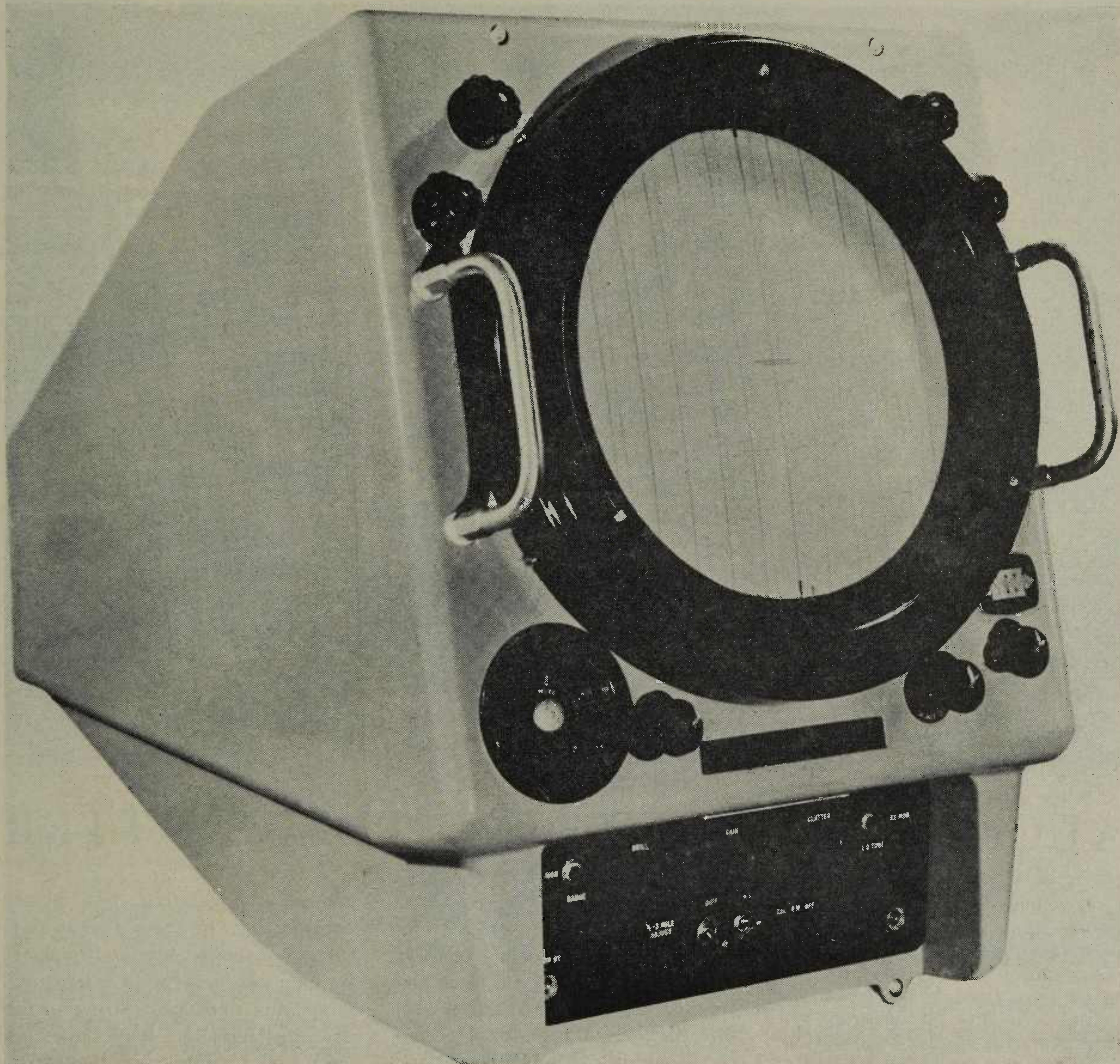
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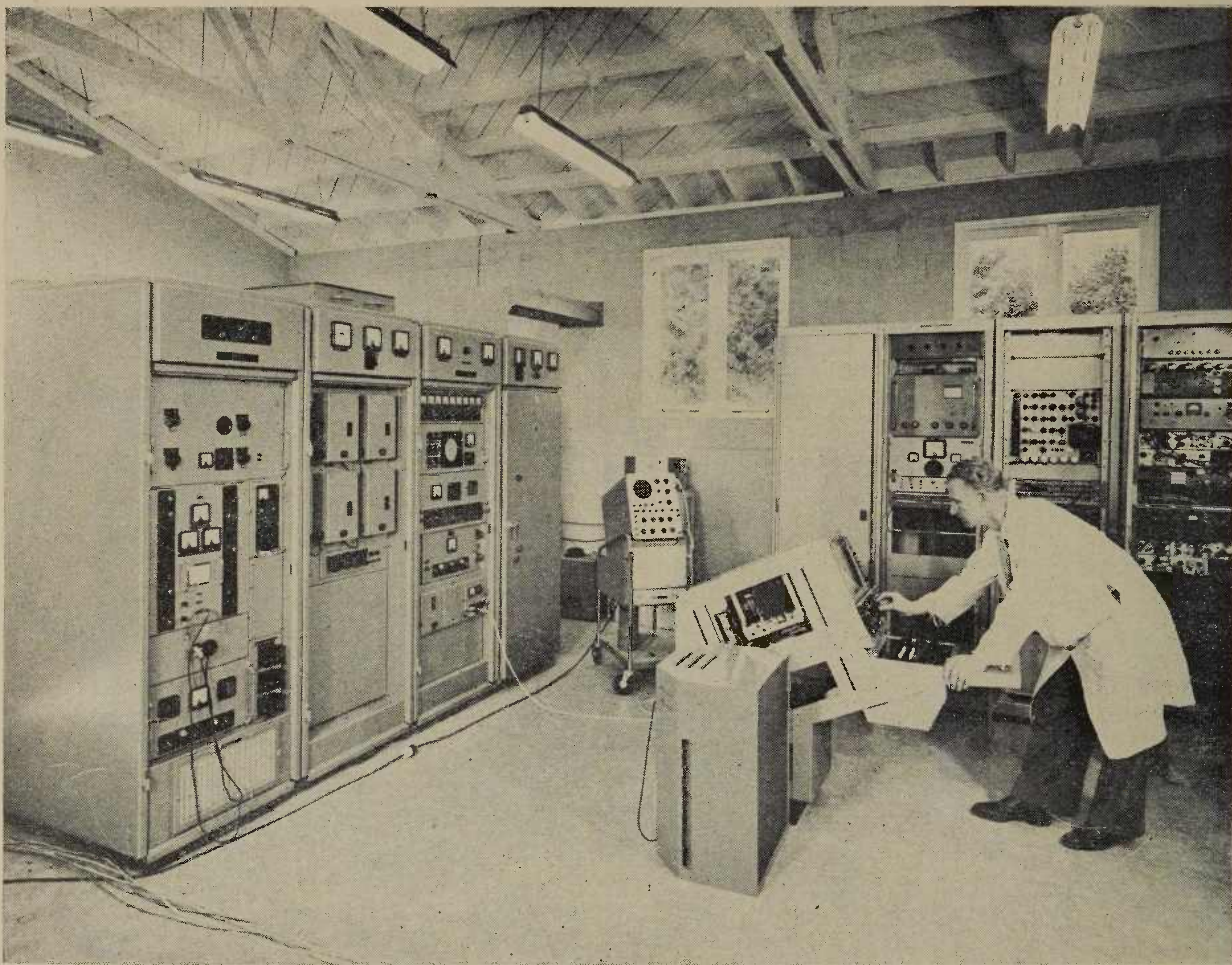
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Telegrams: "TRANSFORMA," Auckland

ALL LEADING WHOLESALE STOCK A.T.C. PRODUCTS



Radar, born in war, and one of our main instruments of attack and defence, immediately rehabilitated itself in a world at peace. The illustration shows the 12 inch Display Unit of the Kelvin Hughes Type 14/12 radar being supplied by Amalgamated Wireless (Australasia) N.Z. Limited for installation in two new deep sea cargo vessels now being built for the Union Steam Ship Company in the U.K. at Caledon Ship Yord, Dundee, Scotland. These new cargo vessels have been named "Ngakutu" and "Ngatoro."



AUCKLAND'S NEW TV TRANSMITTER

The Scenic Drive in the Waitakere Ranges, west of Auckland, is well known for its panoramic view and for the beautiful vistas to be seen from various vantage points. In this picturesque setting, standing higher than stately trees and framed only by the skyline, is the television tower of Auckland's AKTV2 which has been added by engineers of the New Zealand Broadcasting Corporation as part of the 10 kw transmitter which is located in a building on a site directly beside the scenic highway.

The photograph taken during installation shows the 1kw F.M.

sound transmitter mounted alongside the vision transmitter which has a peak sync power output of 5 kw. The output from these two transmitters is combined in the filterplexer mounted in a framework behind the main transmitter cabinets and fed via a single coaxial cable to the antenna. The transmitter, one of the most modern types, was supplied by Marconi, and is similar to that at present operating in Wellington and Christchurch.

Programmes are originated from the Channel 2 Studios in Shortland Street, Auckland (the

site of the existing low power transmitter) or from a new Marconi 4 camera outside-broadcast vehicle and sent via a microwave link from Shortland Street to the transmitting site. Here the vision and sound signals are processed to provide a standard level input to the transmitters. The effective radiated power of the vision system is 10 kw.

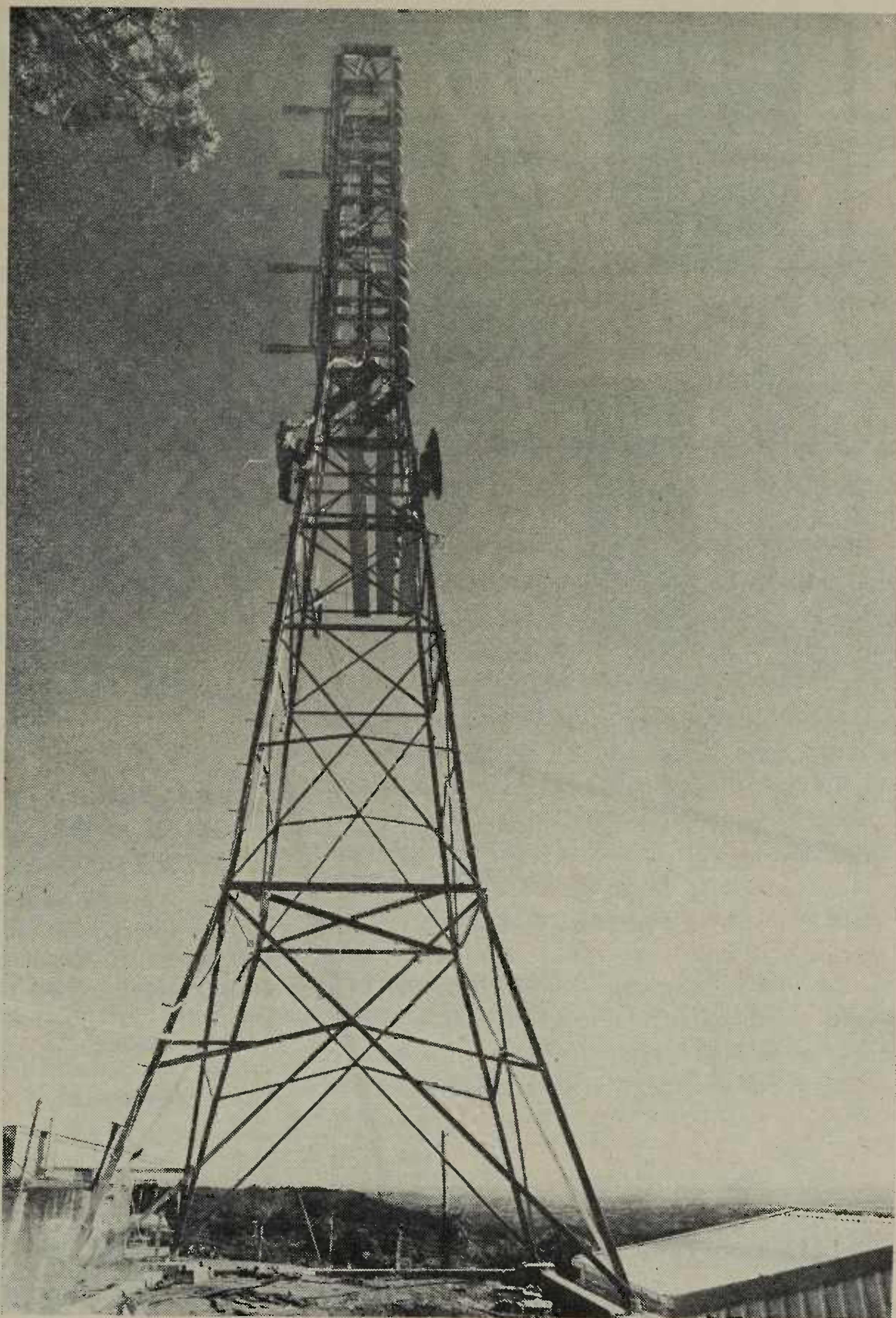
The link, terminal and programme input equipment together with a comprehensive range of specialised test equipment are housed in the cabinet racks seen to the right of the photograph.

One of the unique features of this Marconi equipment is the provision of monitoring points at various critical stages of the vision and sound transmitters, signals from these points can be fed to the picture and waveform monitors mounted in the console housing in front of the transmitter.

Another unique feature is the provision of a microwave relay link on the top of Auckland's highest volcanic mountain—Mt. Eden, to provide the maximum coverage of Auckland's city and suburbs, with the Outside Broadcast Van. Signals are beamed again by microwave, from the van to Mt. Eden and thence to the Shortland Street Studios whenever there is no line of sight path available between the van and the studios.

The NZBC have chosen the Waitakere sight which is at an altitude of nearly 1,300ft. so that the greatest number of viewers may benefit and preliminary reports indicate that a strong signal is received as far away as Whangarei—90 miles to the north and Hamilton and the Hauraki plains over 70 miles distant.

The second photograph shows the 88ft. transmitting tower supporting the transmitting antenna. At the time this photograph was taken the tower was also carrying the microwave link paraboloid which was used in the initial tests. Both on this mast and the one mounted on the top of the studio in the city, the final form of the microwave equipment will consist of a plane reflector mounted on the tower at an angle of 45 degrees to the line to the other terminal of the link, and reflecting the signal into or from the microwave parabolas which are located



in small buildings situated at the base of the towers. One of these buildings can be seen at the base of the mast. In order that the roof of the building can be transparent to the microwave signal, the roof material is composed predominantly of perspex sheet. This enables the microwave equipment to be easily serviced and operated. Although the Klystron tube in the transmitter produces about 1 watt on its operating wavelength of about 6 cms the

large power gain produced by the parabola means that the effective radiated power of the microwave transmitter approaches 5 kw.

The transmitting antenna was produced by the engineering staff of the N.Z.B.C. The television transmitter, associated monitoring equipment and the microwave links were supplied by Amalgamated Wireless (Aust.) N.Z. Ltd., to whom we are indebted for this information.



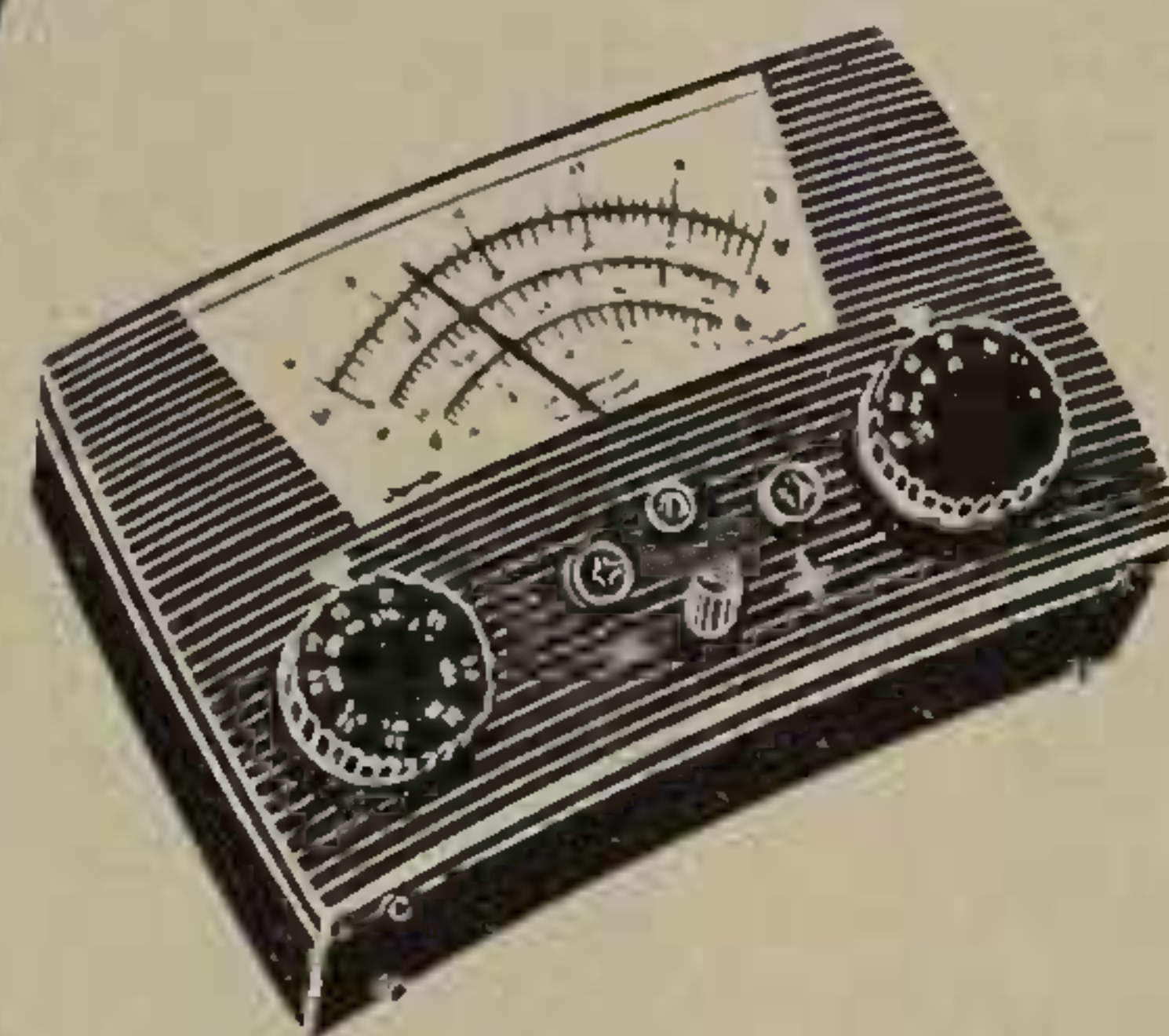
TV SERVICE INSTRUMENTS

the right tools for the job!



OSCILLOSCOPE GM5650:

An outstanding oscilloscope for TV service work. With a frequency range from d.c. to 6 Mc/s it gives accurate display of band pass curves and pulse shapes.



MULTIMETER P.817.00:

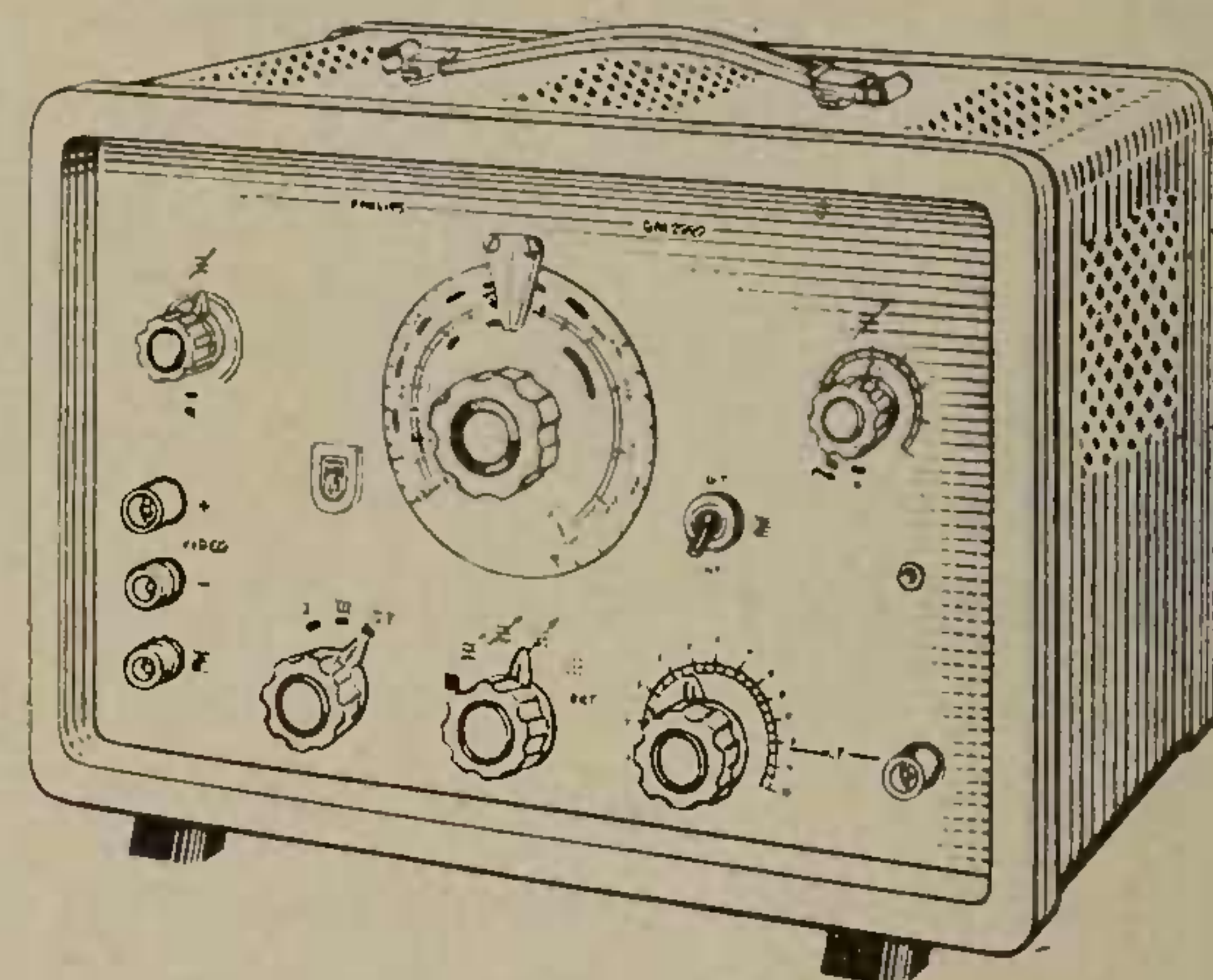
An excellent 28 range test meter of robust construction yet with a sensitivity of 40,000 ohms/volt. Voltages a.c. and d.c., currents a.c. and d.c. and resistances can all be measured.

PRICES:

GM 5650	£59.15.0
P.817.00	£19.19.0
GM2892	£82. 5.0
GM2877	£92. 6.0

PATTERN GENERATOR GM2892:

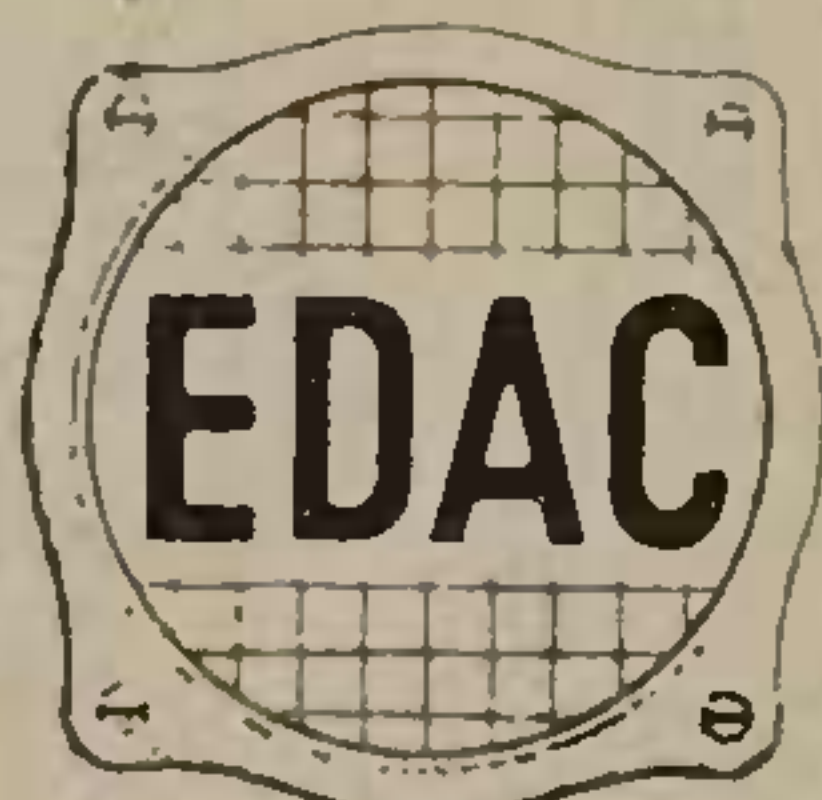
A "must" for TV servicing outside telecasting hours, this generator produces a pattern of inter-laced vertical and horizontal bars whose spacing can be varied. All channels from 1 to 5 are included.



ALSO AVAILABLE:

Universal Bridge GM4144	£37.16.0
V.T.V.M. GM6009	£52.10.0
Modulated H.F. Oscillator GM2893	£63. 0.0
H.F. Oscilloscope GM5662	£172.10.0

Full Technical Information on all these instruments is available upon request from:



ELECTRONIC DEVELOPMENT AND APPLICATIONS CO. LTD.

P.O. Box 9338, NEWMARKET, AUCKLAND and P.O. Box 6415, WELLINGTON.

DESIGN of TV RECEIVERS

—from a survey of the industry in "Design" Magazine, January 1962, by Peter E. M. Sharp. The critical assessment of models is from the level of "Design's" always very high standard. We have omitted the first part of Mr. Sharp's article which dealt with regrouping within the industry in Britain and economic aspects such as the drop in sales since 1960—presumably the market is near saturation—and difficulties of the export trade. It did not seem applicable here, where television is just

getting started. However, the portions dealing with design and the comments on individual models, which are reproduced in full, are worthy of careful study by our local manufacturers.

It is interesting to hear, as we go to press, that Collier & Beale's Admiral "Pasadena" TV Receiver has been selected for the first exhibition of the Design Association of New Zealand. We hope to illustrate this model next month.

Annual Hunt For Novelty

Looked at as a whole the industry has not established a very clear or satisfying tradition of cabinet design for radio and television receivers. The pre-occupation with an apparent need for annual model changes has forced designers to think up an endless succession of gimmicks to ensure that this year's model looks different from last year's and the year before that. Overshadowing any company design policy is the need to produce something new for the **Radio Show**. The strong tie with this annual show has inevitably prevented the evolution of a more positive tradition of cabinet design.

Apart from the burden which this phrenetic hunt for novelty imposes on the designers' inventive skills, it also means that limited and uneconomic methods of manufacture have to be employed. This is further emphasised by the multitude of different models that are produced under individual trade names. The relatively small production runs that result often prevent the designer from using new materials (such as plastics with high tool costs and low material costs) and leave him little alternative but to select items such as knobs, scales, escutcheons and handles from those standard designs currently available in the component makers' brochures. Since most of these items must compete for attention with those from other firms, it is hardly surprising that they seem to be engaged in a race to produce the most glitter. The rationalisation of production that **could** result from the present regrouping of the **industry** will provide an opportunity for investment in tooling for longer runs. This in itself should tend to work against the idea of the annual model change and the need to use standard knobs and handles which often are unrelated to the rest of the designs.

Lack Of Fresh Talent

An industry so committed to a ceaseless output of new designs must have a well developed design organisation to keep satisfying the demand. Most firms have their own staff designers or use the staffs of independent cabinet makers. Seldom is fresh

talent sought from outside, yet on the rare occasions when this process has been adopted the results have invariably been stimulating and successful from a design point of view. Before and immediately after the war the designs produced by Professor R. D. Russell for Murphy set a high standard in radio cabinet design. Pye has occasionally commissioned Robin Day to design various models, and his 17-inch television set of 1956 was well ahead of its time (it received a 1957 **Design Centre Award**).

But seldom, until Eric Marshall's appointment to Ultra two years ago, has a designer of high calibre been brought in from outside to design the whole range of a firm's products. The success of this venture is now well known (Mr. Marshall won the Duke of Edinburgh's **Prize for Elegant Design**, for his TR70 transistor radio last year—see Radio & Electrical Review, July 1961), and has finally disproved the contention that an adventurous approach to design in the radio industry is incompatible with commercial success. It is certainly widely rumoured that the new Ultra range saved the firm from financial difficulties.

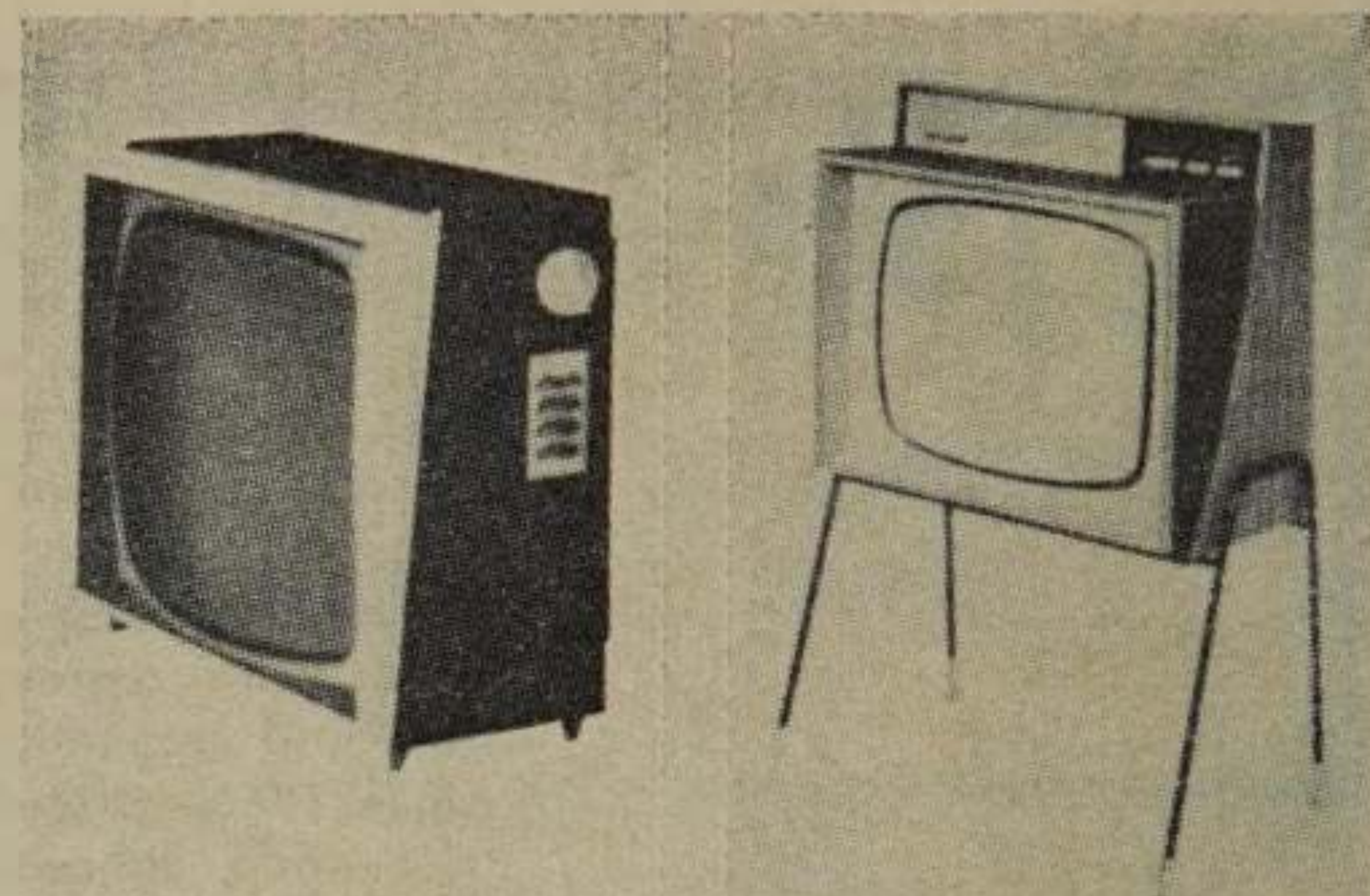
Two Approaches

What is evident from the work of these few designers is a more direct and positive approach to cabinet design than is apparent in the normal output of the industry. Two approaches to design in this field have emerged in recent years, generally known as the 'furniture approach' and the 'instrument approach'.

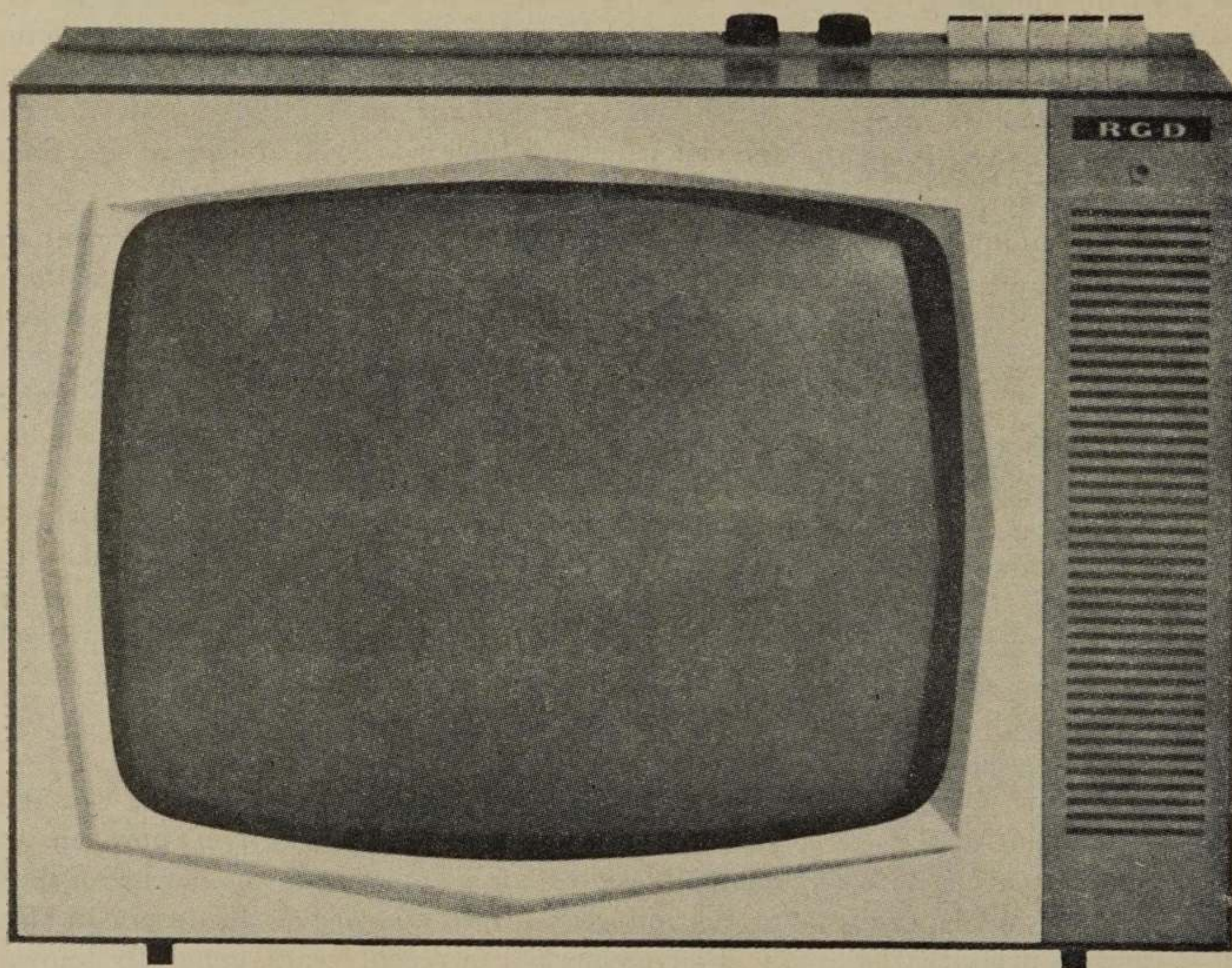
Briefly, the arguments are, on the one hand, that since a radio or television set is normally kept in the living room it should be regarded as a piece of furniture that should fit in with the sideboards, tables, etc. The opponents of this view say, on the other hand, that a radio or television set is essentially a refined electronic instrument and as such its appearance should express this idea and should not be disguised as something else—just as the Post Office does not attempt to make the telephone look like a piece of furniture, even though it too may be kept in the living room.

Where several different trade names belong to one manufacturing group, designers have to strive to produce a marked difference between models—presumably so that names will not become associated with the one group. The emphasis is frequently on gimmicks. In RGD's model 619, 1, the designers have produced a simple, well detailed box with controls located neatly on the top. Interest is provided by the contrasting surfaces on the front; but this apparently is not sufficient. Detracting from the simplicity of the cabinet is the fashionably faceted mask around the tube, which has allowed the maker to publicise the new range as the Diadem.

Certainly the integration of the picture tube with its cabinet has always provided a problem for the designer. At one time, when bonded implosion guards were not commonly used, the designers had to devise a method for mounting the separate guard before the tube, without unnecessary prominence being given to it. This was achieved successfully in Ultra's Bermuda range, 2, where the cabinet would have appeared massive had not the designer produced the concept of a 'frame within a frame'. This model, first produced in 1960, makes an interesting comparison with Ferguson's Senator, 3, which was marketed in May, 1961.

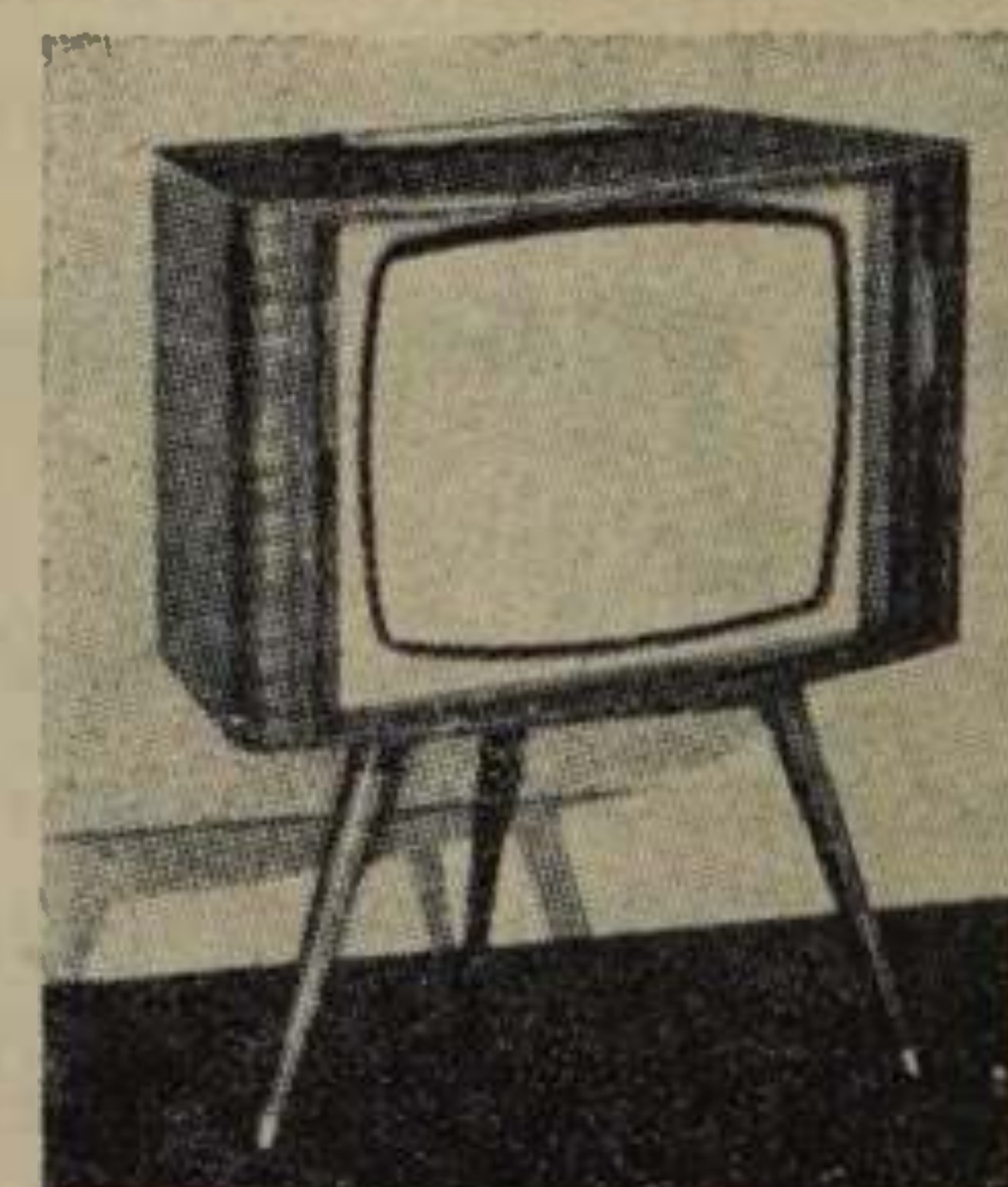
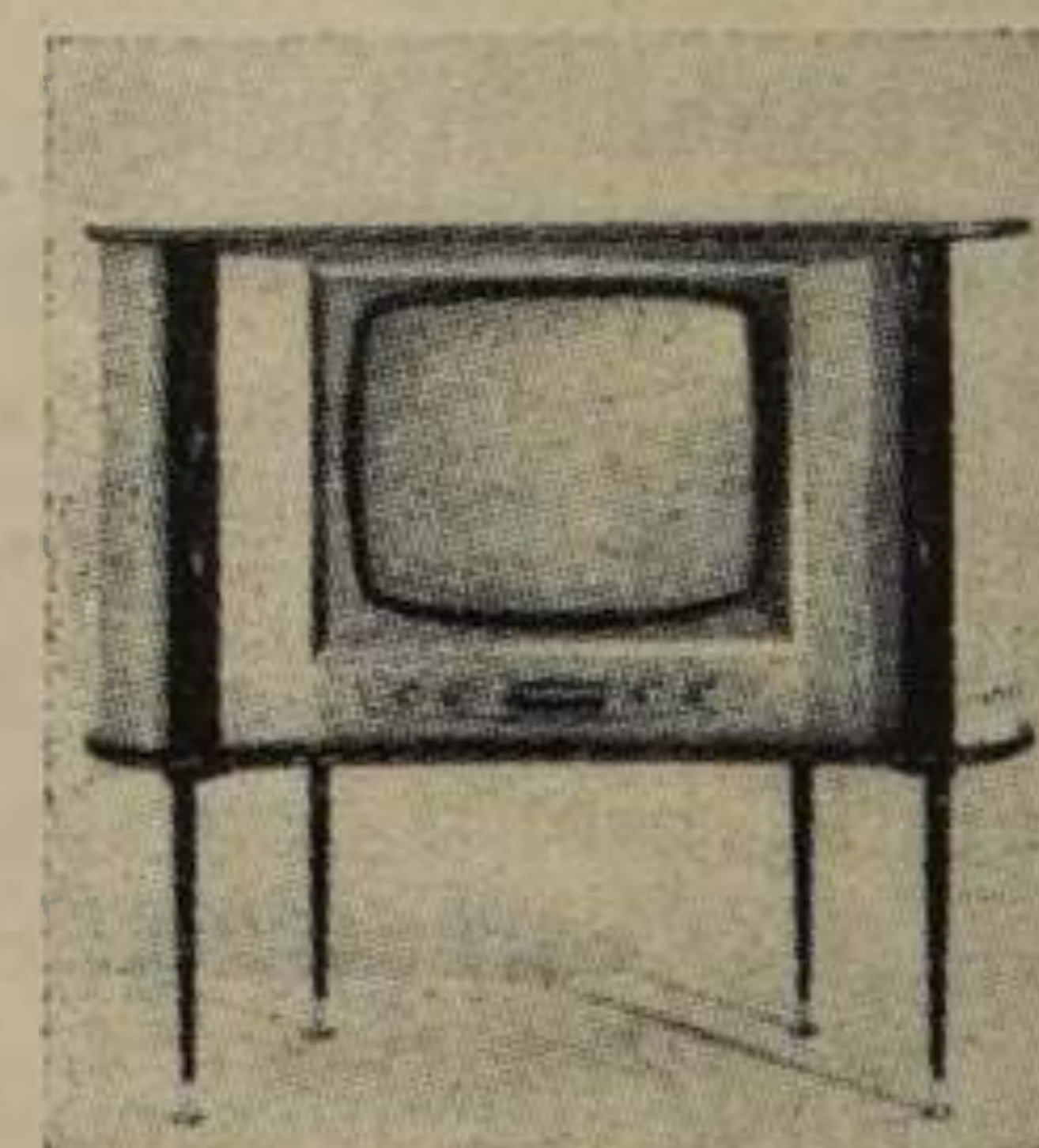
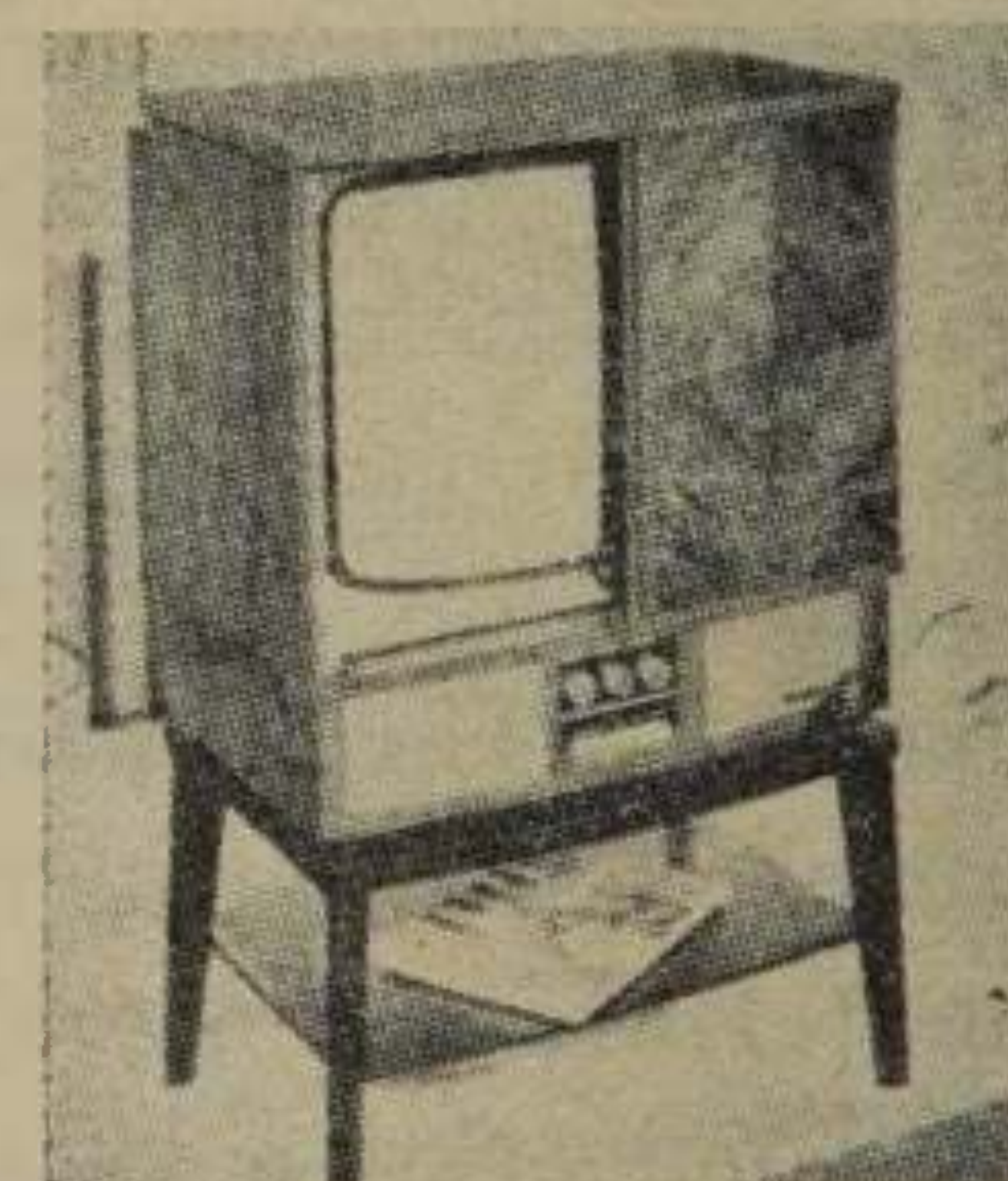


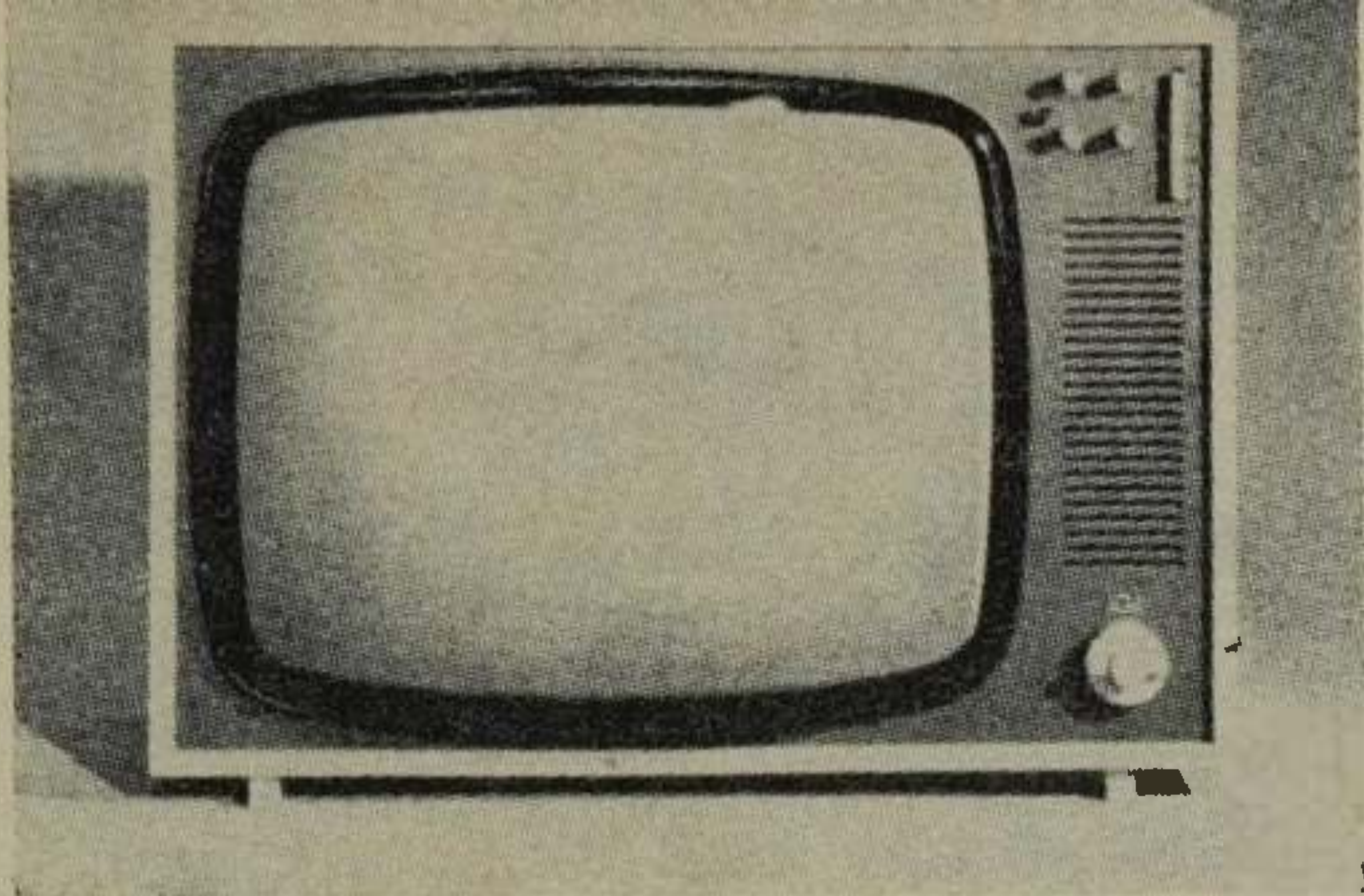
1 (below) 19-inch, model 619. Designer THM Partners. Maker Radio Gramophone Development Ltd.
2 (above-left) 19-inch, model Bermuda. Designer Eric Marshall. Maker Ultra Radio and Television Ltd. No longer in production.
3 (above-right) 19-inch, model 705T Senator. Maker Ferguson Radio Corp. Ltd.



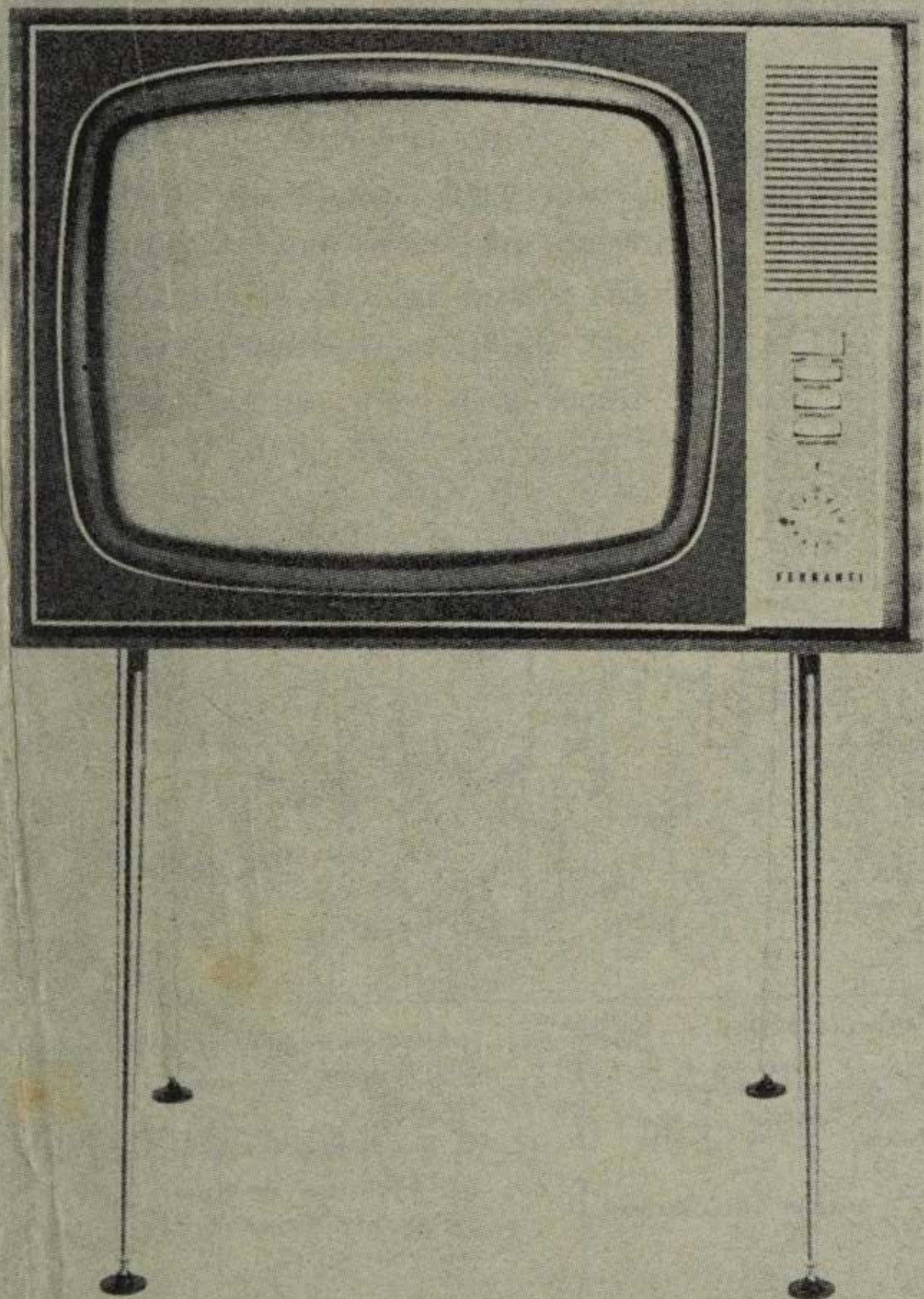
There seems little point in pressing either case to the detriment of the other since both arguments are clearly valid. Where the industry has fallen down is in failing to tackle either approach in a positive manner. Though most sets have a vague furniture look about them they certainly cannot be said to be in line with current developments in the furniture industry. The high gloss finishes, figured veneers and complicated forms are in direct contradiction of the main trends in furniture design which have been developing steadily over the past few years. Nor has the industry wholeheartedly attempted an

(Please turn to page 25.)



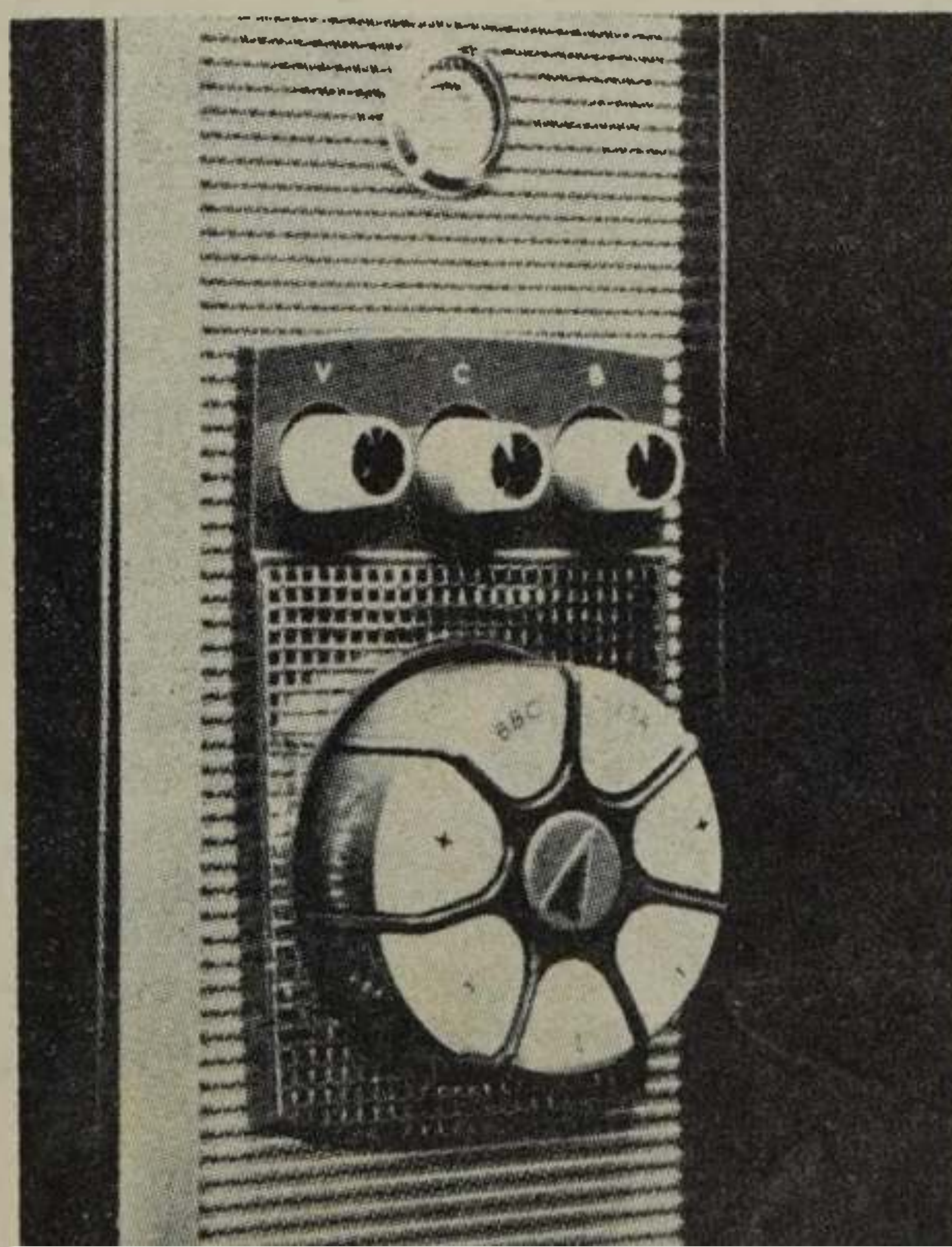
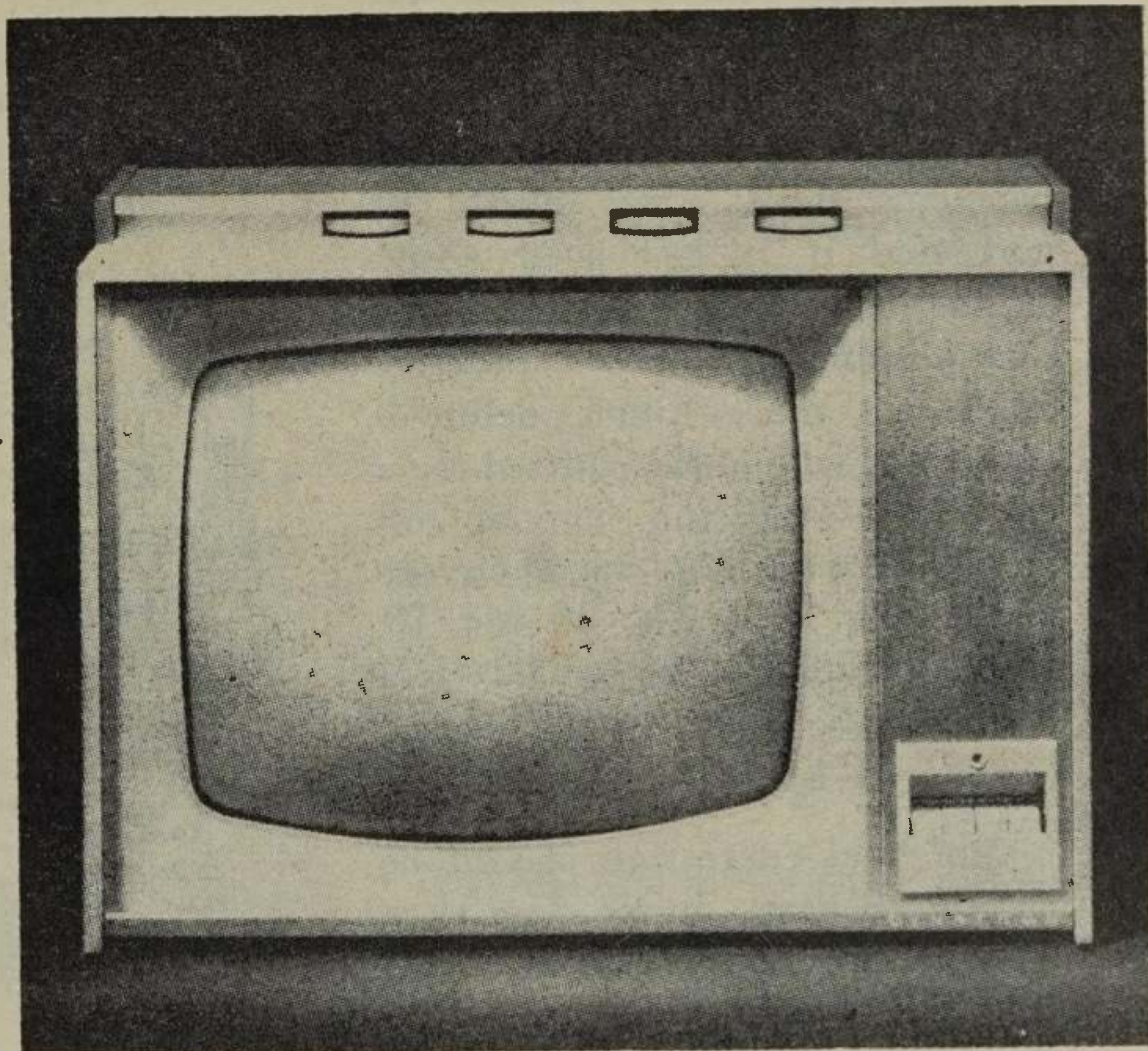


4 (above) Model 562. Designer Jan Ostwald in consultation with maker. Maker Aga.
5 (below) 19-inch, model T1075. Maker Ferranti Radio and Television Ltd.
6 (below-right) 19-inch model TV52. Maker Dynatron Radio Ltd.



segment is pressed the arrow rotates to face that segment giving an indication of the setting. In the past, Murphy has usually paid careful attention to detail, but this ingenious idea is unfortunately surrounded by an over generous amount of glitter.

A tube with a bonded implosion guard can be incorporated in a design successfully as in 4, a Swedish design by Aga (not yet available in Britain). The simplicity of the cabinet can be closely compared with RGD's model 619, 1, but instead of the contrasting surface treatment interest is provided by the control layout. In these designs there are indications that a television set is being treated more as a refined electronics instrument than as a piece of furniture containing electrical trickery. Ferranti's new range is a further example of the instrument approach, 5, and from the same group of companies comes also the Planet range under the name of Dynatron; 6 is one of the models. In direct contrast, but again by Dynatron, is the ugly chunk of furniture (with walnut finishes) of the TV56 model. 7. Two further designs epitomise the low standard of design in some sections of the industry: Sobell's SC371, 8, and Decca's DR39/C, 9. Finally, a look at one detail of a TV set. A selector switch of some ingenuity is on the Murphy V689X, 10; when a



7 (upper-left) 23-inch, model TV56. Maker Dynatron Radio Ltd.
8 (centre-left) 19-inch, model Sobell SC371. Maker Radio and Allied Industries Ltd.
9 (lower-left) 23-inch, model DR39/C. Maker Decca Record Co. Ltd.
10 (right) Detail of 19-inch model, V689X from Astra range. Designer Geoffrey Gifkins. Maker Murphy Radio Ltd.

THE TRIPLEX . . .

PART TWO

photographs by Barry McKay

by Irving H. Spackman

Carrying on, as we promised last month, with the description of this simple receiver, we have one or two preliminary remarks and corrections to make.

The first point is a small correction to the circuit drawing. In the February issue the circuit was drawn with the earthy side of the aerial coil connected to the grid return. It is shown this month in corrected form. This should be corrected if it has been wired as per last month's circuit. This new circuit also has the polarity marks on the rectifier included. One detail which was omitted from the circuit was the type of coil we used for L1 and L2. These are "Q" coils Type No. 40 for L1 (L1/L2) and No. 45 for L2 (L3/L4) manufactured by Inductance Specialists Ltd.

One final correction should be mentioned here. In No. 7 on page 23 of the February issue we stated that pin 9 on the EF89 socket should be earthed. Slightly better performance can be achieved if pin 9 is connected to pin 3.

We will now continue the wiring up of the final parts of the R.F. section.

1. Wire a 3ft. length of Red wire through the small grommet on the back of the chassis on to the yellow pin of L1 and similarly connect a 3ft length of black wire on to the earth lug alongside L1. These are the aerial and earth leads respectively.

2. Wire from Red lug on L1 to this earth lug mentioned in 1 above.

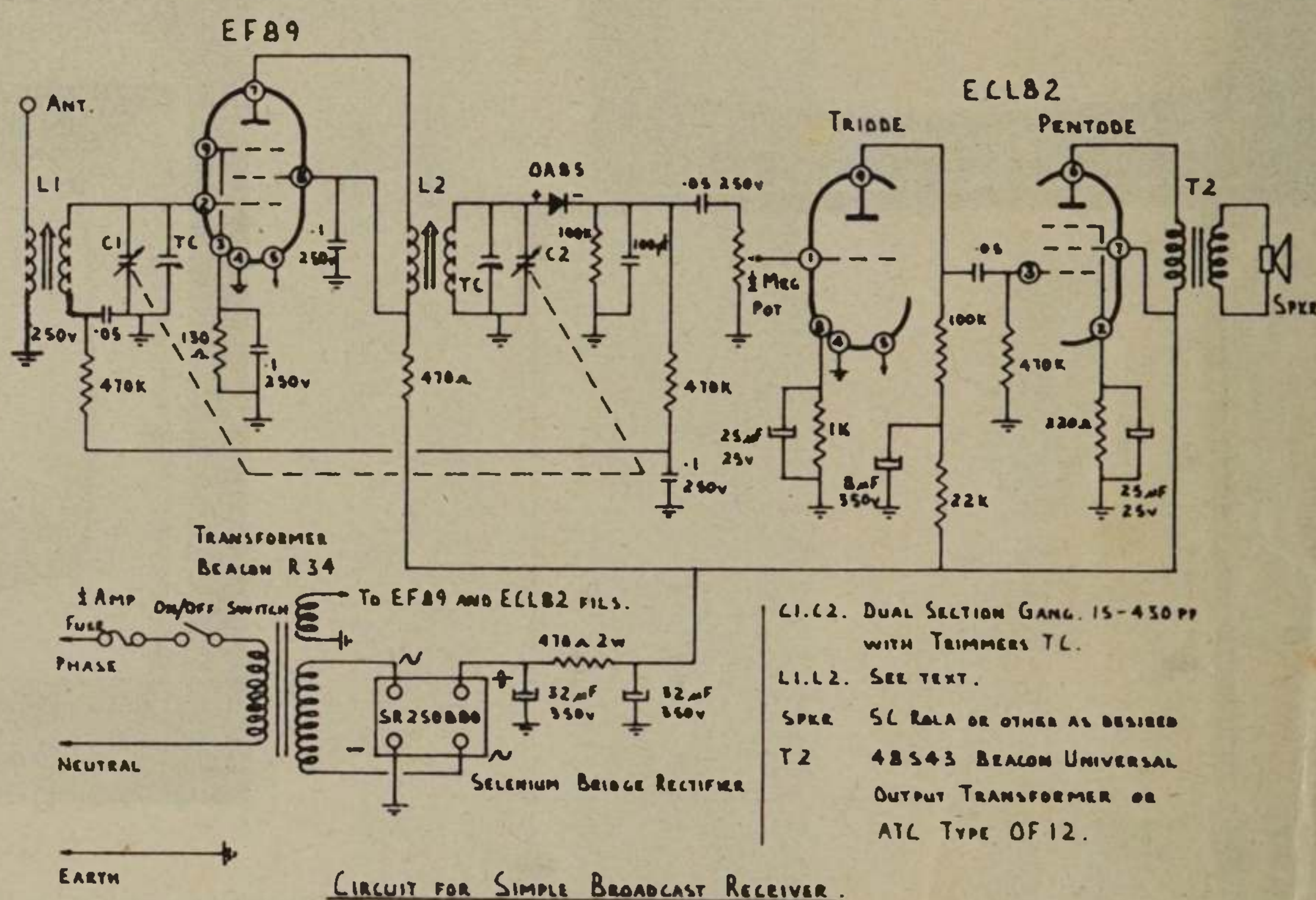
3. Connect the 10 pf. ceramic condensers supplied with the coils directly from the green tag to the yellow tag of each coil.

This is an optional extra, is not shown on the circuit, but tends to equalise the gain of the R.F. section over the whole band.

4. Wire the OA85 diode with the barred end on to the tag carrying the wire coming down

one to the black lug on L1 and the other to the diode. From the junction of the two 470k resistors, wire a .1 mfd condenser to earth.

5. If the two coaxial sockets are being used, wire a shielded wire from the second coaxial socket to the top of the volume control with the shield connected to the bottom lug of the volume control.



through the chassis from the green tag on coil L2. Connect the other end of the diode on to the other free tag. From this tag connect the 100 k. resistor and the 100 pf. condenser to the earthed centre tag. Also from this tag connect the .05 fmd condenser to the coaxial socket on the back of the chassis if this has been installed, otherwise connect it to a free tag on a 3-way tag strip mounted alongside L1. From the other free tag on this extra tag strip, wire a pair of 470k resistors,

If the two coaxial sockets are not used, this shielded wire is run from the tag strip mounted alongside L1 and carrying one lead of the .05 condenser, and its associated earth tag.

Now we will finally wire up the audio section.

1. From the centre lug of the volume control we run a shielded wire to pin 1 of the ECL82 socket, with the shield connected also to the bottom lug of the volume control.

2. Wire one blue wire from the output transformer to pin 6 and the other blue wire to pin 7. Tape up the end of the unused red wire. Mount a 3-way tag strip under one of the holding screws for this socket as shown in the photograph.

3. From Pin 2 wire a 220 ohm resistor and a 25 mfd. condenser to the earth lug of this 3-way strip.

4. Similarly wire a 1 k. ohm resistor and a 25 mfd. condenser to this same earth lug.

5. Wire the 100k. ohm resistor from pin 9 to one of the free tags on this tag strip. From this tag a 22k. ohm resistor is wired to the other tag. From this second tag a wire is run to pin 7 of the adjacent socket and from this pin, wire across to the output side of the H.T. filter.

6. From pin 9 wire the .05 mfd. condenser to pin 3 and from pin No. 3 connect a 470k. ohm resistor to the earth lug alongside the socket.

7. Just to the front of the ECL82 socket mount another 3-way tag strip. From one of these wire a 470 ohm resistor to pin 3 of the EF89 socket, and also run a wire over to the output of the H.T. filter. On the other free lug mount the 8 mfd. condenser with the earth connected on to the earth lug on the tag strip holding the power supply filter components. (See photos). From the positive side of the 8 mfd. electrolytic run a wire across to the junction of the 100k and 22k resistor.

NOTE: The two 25 mfd. electrolytics have their positive or red ends connected to the valve socket pins.

This completes the audio section.

Now wire a pair of twisted wires from lugs Nos. 1 and 4 on

the output transformer to the speaker voice coil terminal.

Wire a piece of 3 wire mains type Trurip or Cabtyre through the half inch grommet in the back of the chassis. Connect the GREEN or uncovered wire to a nearby earth point—the centre tag of the 3-wire tag strip is satisfactory. On one free lug of this strip a blue wire has already been soldered. Connect the BLACK or neutral wire to this tag. Connect the RED or phase wire to the unused terminal of the fuse holder if this is used, otherwise connect it to the other lug on the switch opposite the lug carrying the blue lead from the power transformer.

If the two coaxial sockets have been installed wire up a short jumper, using shielded wire with the two coaxial plugs on the ends as shown in the photograph.

Now, before connecting the power plug check over all the connections and wiring against the circuit to avoid any silly mistakes. If you are not sure, get a serviceman or other experienced person to check you and put you right.

Now wire up the power plug, again making sure that the phase, neutral and earth wires are connected correctly. Use a plug which is properly labelled. If the fuse holder has been included, a highly desirable feature, insert the fuse.

CAUTION. Now plug in the tubes and switch on the power, watching the tubes carefully for any unusual signs. If they warm up slowly listen carefully at the speaker to detect the presence of a slight hum. If this is present after a half minute warm up, turn up the volume control to the full on position, connect aerial and earth and tune the gang slowly from maximum to minimum capa-

city. Select the local station nearest the high frequency (minimum capacity) end and with an insulated screwdriver carefully adjust the trimmers on the condenser gang for the loudest signal. Now tune to the lowest frequency (maximum capacity) station and adjust the slugs in the coils for maximum signal strength. Go over these adjustments several times as they tend to interlock a little.

If a V.T.V.M. can be borrowed, this can be used to adjust the coils more accurately, using the negative voltage at the diode for an indication of correct alignment.

Using a multimeter or V.T.V.M., approximately the following voltage figures should be obtained at the various valve socket pins as set out below:—

EF89	Pin 7	90v
	Pin 8	90v
	Pin 3	1v
ECL82	Pin 9	30v
	Pin 8	1v
	Pin 6	80v
	Pin 7	90v
	Pin 2	6v

To finish off this unit, a simple little cabinet can be built with only the simplest wood-working tools. The main materials are pieces of 6 x 1 dressed radiata pine for the top and bottom sides, and a piece of 3 or 5 ply for the front. The front can be covered with a remnant of suitable material after first cutting out a 5 in. hole located in front of the speaker, and a half inch hole to clear the shafts of the volume control, tuning control and the knob of the power switch.

If the sides, top and bottom are mitre joined so that there is no sign of end grain; small pieces of quarter round beading are used to mount the front, or it can be

set back into grooves cut in the timber (a more difficult job however); the cabinet given a coat of blinding compound and then clear varnished; the front adorned with suitable knobs; and four feet placed on the underside of the cabinet; then this little radio will not only look neat but give a good account of itself as far as quality is concerned, taking into account the size of the speaker.

In conclusion we will deal with one or two questions which have already arisen from some of our readers. One of the queries was whether or not a ferrite rod type aerial would save the necessity of an outdoor aerial.

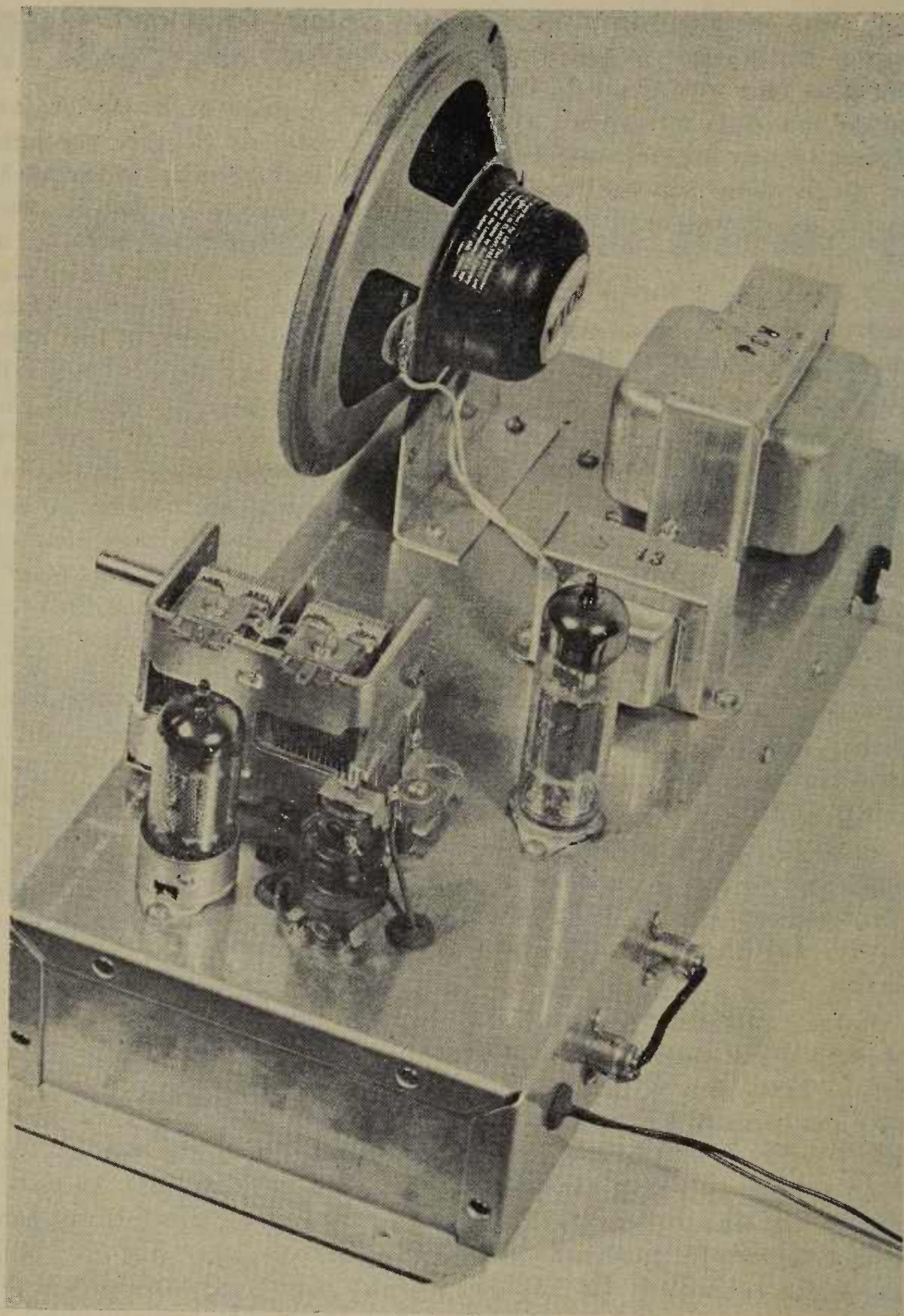
Our first thoughts on this matter were that it could be the cause of a little difficulty. One of the problems would be that of mounting the ferrite rod above the chassis in a suitable fashion. Whilst not difficult mechanically or electrically, there is the problem of locating the ferrite in a region so that the field from the plate coil of the R.F. stage which at the moment is above chassis, is not coupled back to the ferrite rod antenna coil, thereby producing instability or even uncontrolled oscillation. The second problem was whether or not it would be easy for the newcomer to adjust the inductance of the ferrite rod antenna coil to secure correct tracking. The final point is, although this receiver is only a local station project, it does not seem very fair to limit its ability, by restricting its signal level and consequently using a ferrite rod in most parts may be just expecting too much. However, we will try out such a modification on the prototype and report success or otherwise in a forthcoming issue.

We have had a further query regarding the use of the triode

section of the ECL82 as a regenerative detector, doing away with the diode. Although such a detector would give improved performance and selectivity, it would cause complications should it be desired to feed audio through it to use the "back-end" of the receiver as an amplifier. It could also cause problems in the tracking of the RF stage whilst a certain amount of manipulation of the regeneration control would be needed when tuning between

stations. Whilst suitable for an enthusiast, such a set would not be a very good proposition for use as a "family" set for back or den.

Our final comment is one regarding the use of silicon rectifiers for the power section. The present transformer is rather unsuitable for silicon rectifiers, although one could be used as a half-wave system, giving slightly higher voltage at the expense of more hum, which would necessi-



tate improved filtering. We are investigating the possibilities of a suitable transformer for use with silicons and we will report on this also in a future issue. So there it is—a beginners receiver, which should give endless enjoyment whilst being simple enough for the relative newcomer to build and align. We also hope that it should do no more than put a dent in the pocket book. Good building good listening.

For the benefit of those constructing this receiver here is a complete parts list.

Tubes: EF89

ECL82

Germanium Diode OA85

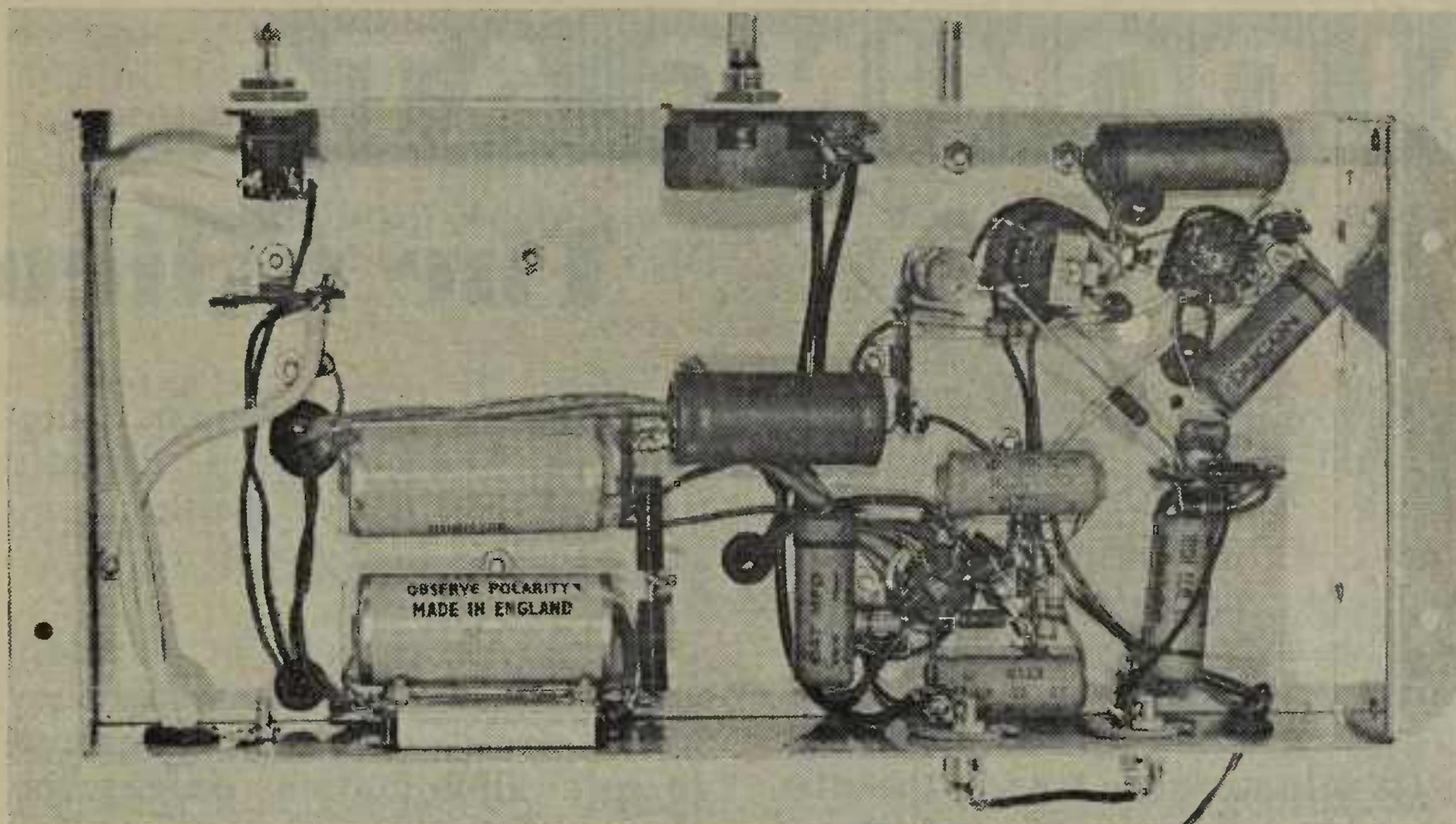
Selenium Bridge Rectifier SR250 B.80, or equivalent.

Transformers: R.34 Beacon Power Transformer or equivalent.

S43 Output Transformer Beacon or equivalent.

Coils: See Text.

Condenser Tuning: 50 to 450 pf. 2 gang with Trimmers.



Paper 3 x .05 mfd. 250v wkg. or better.

3 x .1 mfd. 250v wkg. or better.

Electrolytics: 2 x 25 mfd. 25v wkg.

1 x 8 mfd. 350v wkg.

2 x 32 mfd. 350v wkg.

Silver Mica: 1 x 100 pf.

Sockets: 1 x B9 Shielded (McMurdo or equivalent).

1 x B9 Unshielded (McMurdo or equivalent).

Volume Control: ½ megohm log. (Ducon or equivalent).

Switch Power: SPST. Toggle 2 amp 250v (Bulgin or equivalent).

Mains Cable: 6ft. 3-wire Trurip.

Mains Plug: 3-pin (P.D.L. Cat. No. 38).

Resistors: ½ watt. Carbon 3 x 470k ohm

2 x 100k "

1 x 1k "

1 x 220 ohm

1 x 470 ohm

1 x 130 ohm

1 watt Carbon 2 x 220 ohm

Speaker Rola 5C or equivalent.

Book Reviews

This month we have two interesting books for review.

"LOUDSPEAKERS," by G. A. Briggs, published by Wharfedale Wireless Works Ltd., England.

For anyone who has had to work with Public Address or High Fidelity reproduction this book makes interesting and informative reading.

When first published in 1948 this book was only some 80 pages thick but became so popular that at the end of ten years it was completely revised having undergone 15 reprints, each with minor revisions to keep it up to date.

The author introduces the book with a discourse on the way he started in business manufacturing loud speakers.

Chapters 3 to 7 cover the mechanical details and problems involved in the development of loudspeakers, magnets, speaker frames, cones and centreing devices.

Chapter 8, on Impedance and Phase angles is highly recommended for anyone attempting to obtain high performance from their equipment, whilst the two succeeding chapters on Frequency response, Quality and Distortion are objective and technically sound.

Chapters 11 to 13 are instructional chapters on Decibels, Volume and Watts,

with the last of the three entitled Power handling and Efficiency. Chapter 14 gives an insight into one aspect of Public Address equipment—Cinema Sound Systems.

Chapters 15 to 19 cover what is probably the most widely discussed section of audio systems—Speaker Enclosures, covering directional and phase effects, resonance and vibration, cabinets and horns.

The next four chapters cover the subject of High Frequency response, Transients, Tweeters, Electrostatic speakers and Crossover Networks, together with the effects produced on and by the output stage in the amplifier. This is also discussed further in Chapter 30. The final section of the book covers room and hall effects, includes Stereophonic systems and ends up with a section on questions and answers—in all a thoroughly enjoyable and practical book.

Our copy was supplied by Technical Books Ltd.

* * *

"ELEMENTS OF RADIO SERVICING," by William Marcus and Alex Levy, published by McGraw Hill Book Co. Inc., New York.

This book could well serve as a reference text for any serviceman—the infor-

mation is readily available and generally easily located.

Although probably written as a text rather than a handbook, this work covers many of the more practical aspects of servicing, and covers a large number of problems and pitfalls which servicemen may find during the course of their employment.

The first seven chapters discuss the fundamental elements of servicing and the use of the more common instruments such as test meters and signal generators.

The next eight chapters dissect out the common types of superheterodyne circuits detailing the logical methods of trouble tracing with special charts for quick localisation of the probable faulty region and helpful hints on how best to carry out the repair.

Antennae, AC/DC receivers, Portables of the valve type, and Car Radio installation and maintenance occupy the next six chapters, whilst the methods of aligning AM and FM receiving equipment take up the last four major sections in the book. Between this and the appendix which includes a number of useful tables and formulae in addition to a well appointed index, is a small section which sums up the previous chapters under the heading "Survey of the Servicing Procedure." There are also some useful pointers on the design and use of the Service bench.

Our copy by courtesy of Technical Books Ltd. END

LOOKING AT

The Silicon Solar Cell

We are now living in the space age and the era of the semiconductor. One of the many thousands of different components used in satellites and space vehicles is the silicon solar cell, a product of the semiconductor industry. In addition to its sophisticated role in space travel, the silicon solar cell has many industrial and commercial uses, some as yet unexplored, which are fulfilling man's dream of direct, instantaneous conversion of the sun's energy into useful electrical power.

This ability to convert light energy directly to electrical energy is worthy of considerable attention, especially since the cell has no moving parts, has great simplicity and reliability in operation, indefinite life expectancy, is extremely light in weight, mechanically strong, and can withstand humidity, shock, vibration and a wide range of operating temperatures. Although other materials, such as selenium, are capable of converting light into electricity, silicon cells are capable of the highest electrical output and efficiency.

Not all silicon solar cell applications are as glamorous as those of satellites and space vehicles, and the cells are finding increased use in industrial and data-processing systems for light detection, response, and movement.

The sun gives us light and life and this fact has been recognised in various ways throughout the history of man. The energy received by the earth from the sun reaches fantastic proportions and even with the considerable losses due to the atmosphere surrounding the earth, the solar energy falling on less than .01% of the earth's surface is approximately equal to the present total world power consumption. By means of

the silicon solar cell, solar radiation can be converted directly into electric power without an intermediate heat cycle.

In the early days of development, a cell conversion efficiency of 6% (ratio of electrical output to total illumination energy input) was worthy of acclaim, but now cells with conversion efficiencies of 12% and 13% are in regular production. This improve-

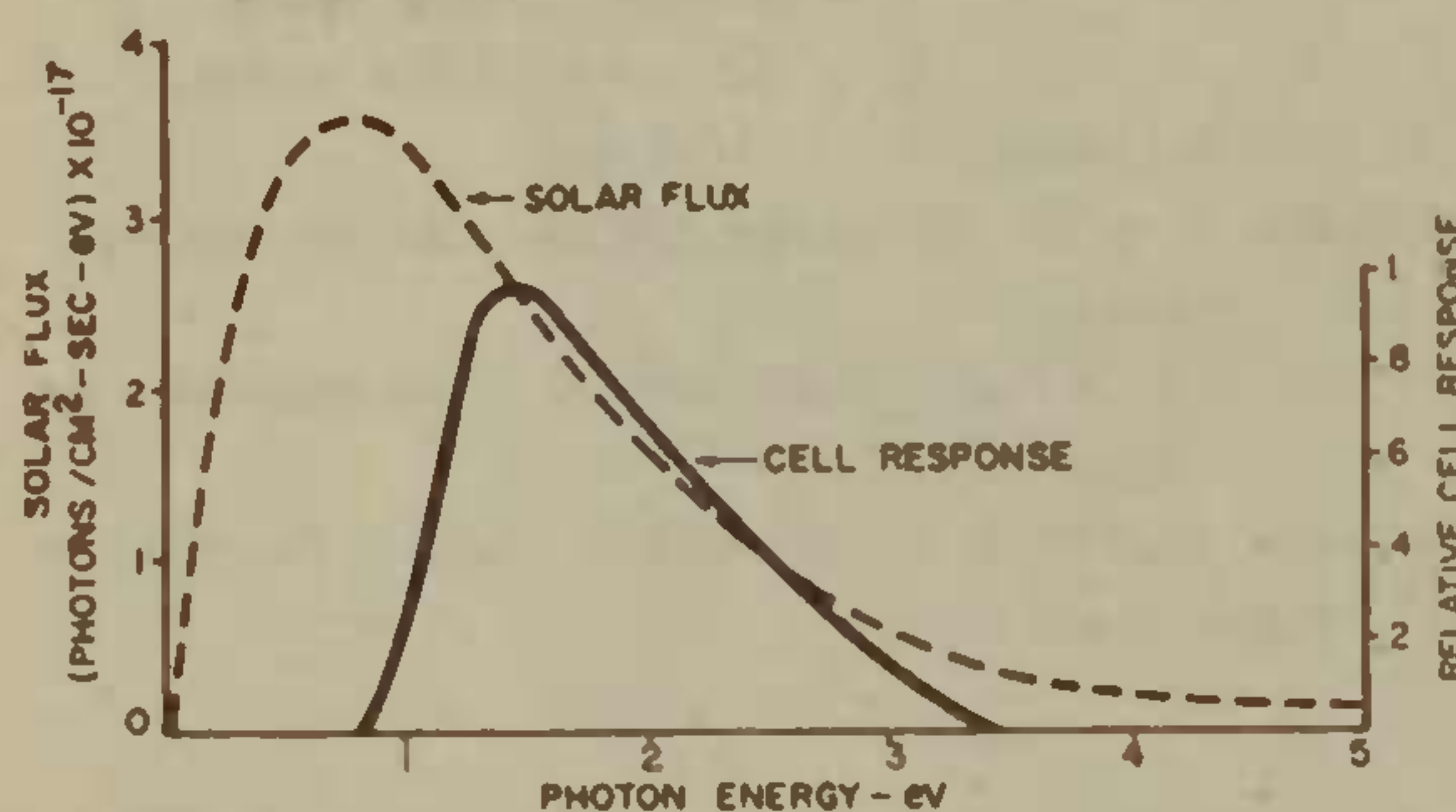


Fig. 1.

ment in efficiency is a remarkable achievement when one considers that the theoretical maximum conversion efficiency is only a little more than 20%.

It is understood that research is being currently carried out using gallium arsenide as the semiconductor material and this promises to be capable of approaching closely the theoretical maximum efficiency.

The Method of Manufacture

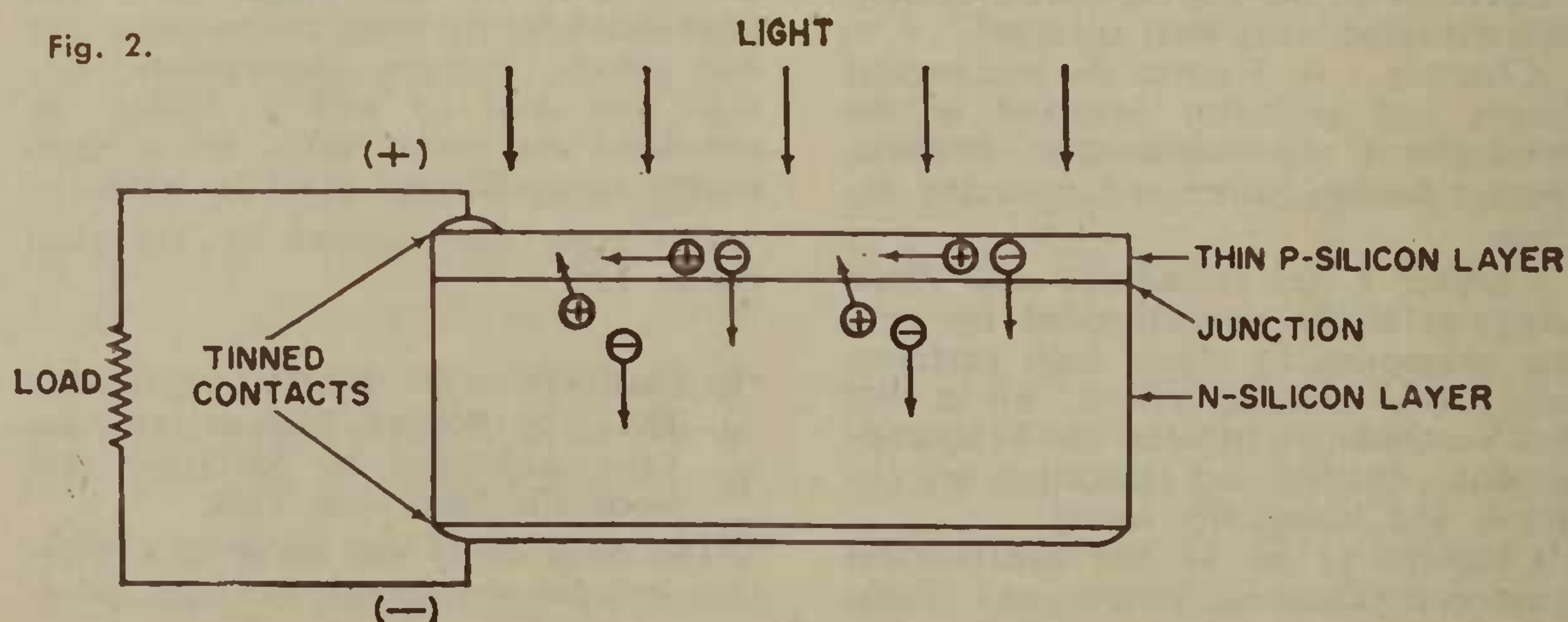
The cell is manufactured from silicon—an element which has some characteristics intermediate between insulators and conductors

of electricity. Chemically it is second only to oxygen as the world's most abundant element.

In processing the cell undergoes a very complex manufacturing procedure, starting with the chemical refining and purification of the silicon material to the impurity levels of better than 1 part per billion. The next stage is the growing of a single crystal from a furnace of molten silicon material called the "melt" at a temperature approaching 3,000 degrees C. After the crystal is cooled it is cut into wafers, the active layers or junction regions are formed and wires are attached to the unit. In all it passes through some forty different processes before the final cell is "born" and involves approximately twenty-five different chemical treatments during the process.

A finished silicon cell appears as a rectangular wafer of silicon, dark blue-grey in colour, varying between 1/64th and 1/32nd of an inch thick, and usually about ½-inch wide and ¾-inch long.

When finally processed, the cell consists of two layers of silicon, one of which is impure, compared with the other. This impure region is "doped" in a special chemical and molecular way. This layer contains a controlled chemical "impurity" rich in electrons ("n"-type silicon) and the other layer contains an impurity defi-



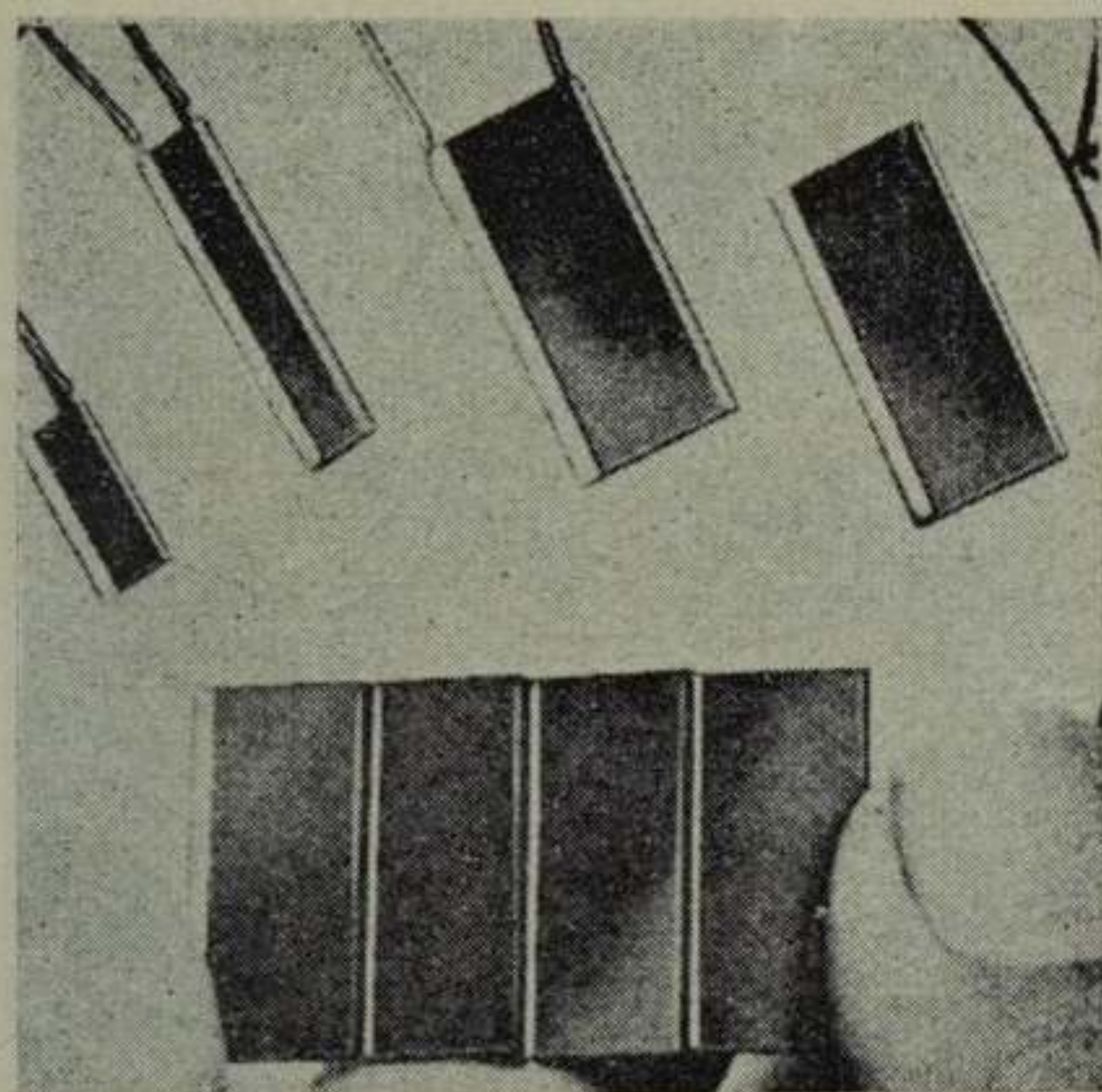


Fig. 3. Single mounted solar cells and (below) 4 cells in a high efficiency "shingle."

ent in electrons ("p"-type silicon). These two layers are in intimate contact with each other and the junction formed between them exhibits the interesting property of a strong built-in electric field which contains the electrons in the "n" silicon and the holes in the "p" silicon, thus forming a barrier between the "n" and "p" layers.

Under illumination solar photons (the fundamental carriers of radiant energy) are absorbed through the very thin "p" layer into the junction region. There they lose their energy in the process of forming equal but oppositely charged carriers, electrons and holes. If the original photon energy is sufficient, the charge carriers are able to surmount a potential barrier, similar to that existing in a normal semiconductor diode and flow through the load.

An indication of the relative effectiveness of the silicon solar cell in converting solar radiation to electric power is given by the curve shown in Fig. 1.

Connection to an external circuit causes current to flow and the direct conversion of light into electrical energy is obtained. See Fig. 2.

With present manufacturing techniques, a thin wafer of "n" type silicon is first cleaned with acid, then, in a carefully controlled time and temperature cycle

within a furnace, a thin layer of "p" type (positive) silicon is formed on the top of the wafer by allowing a doping material to react with the silicon wafer under intense heat in excess of 1,000 degrees C.

As the "p" layer is formed in a gaseous atmosphere it completely covers all surfaces of the wafer. It is, therefore, removed from the back and all edges of the wafer to leave only the active side covered. The front collector and the back are then plated and tinned to provide solder points for assembly and connections. Each cell is finally tested for electrical output in carefully controlled temperature conditions under a calibrated simulated sunlight source and graded according to the measured conversion efficiency.

As the active area of the cell plays a very important part in the energy conversion, the contact on the "p" layer side is usually in narrow strip form along one edge to present the maximum cell area for illumination and power conversion. In addition to a single front contact or collector strip, cells are now being manufactured with a number of secondary collectors protruding from the main or primary collector strip. The purpose of these is to afford better collection of the current from the active cell area and thus to increase the conversion efficiency or power output. These cells are called "gridded cells" because the collectors form a grid network over the top or active area of the cell.

Characteristics and Applications

Many factors influence the conversion efficiency of these cells. Some of these are the brightness of the lights, the wavelength of the light and its angle to the surface of the cell, the cell operating temperature and the characteristics of the external electrical circuit. It may be interesting here to note that the spectral content and intensity of sunlight on earth are different from those in space due to the filtering effects of cloud, water vapour and dust present in

the atmosphere. The electrical output of a given cell is up to 15 per cent higher in space.

These cells do not show uniform response to all wavelengths of sunlight—in fact, the response of the silicon cell is least in the regions where the solar flux is greatest. This is one region where improvements can be made in conversion efficiency.

Silicon cells suffer adversely from the effects of increased cell operating or environmental temperatures. A drop in efficiency of 1 per cent for every two degrees temperature rise imposes definite requirements for heat dissipation of the absorbed solar energy. In space, improvement in the control of cell operating temperatures can be achieved by cementing extremely thin cover glasses over the front of the cells. These cover

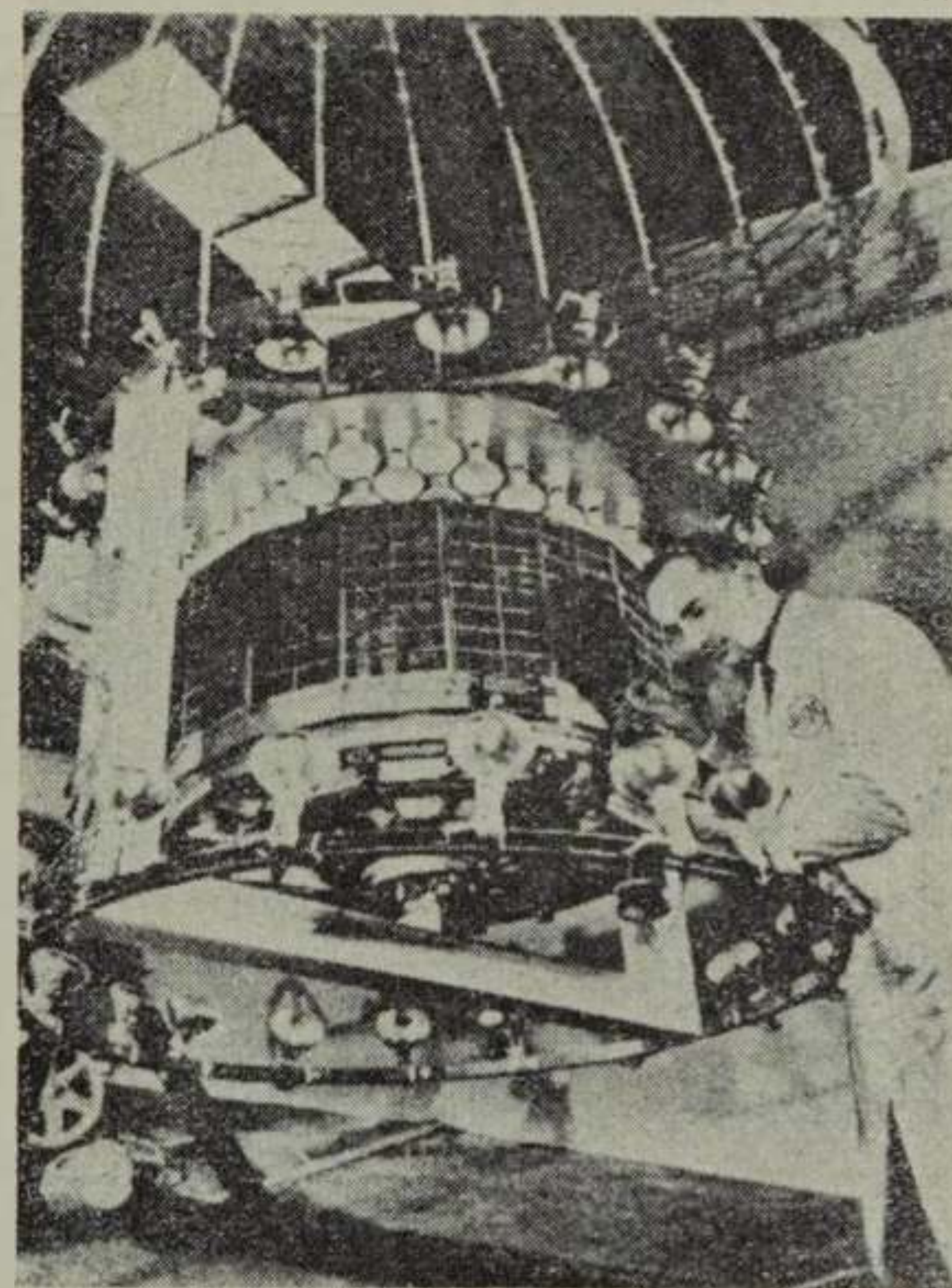


Fig. 4. One of the U.S. weather satellites "Tiros," carrying over 9000 solar cells, being checked just prior to launching. Note all the spotlights providing the necessary illumination.

glasses have built-in filters designed to reduce the transmission of the unwanted portions of the solar energy. This has the effect of reducing the temperature of the cell, an important point in satellite equipment where maximum power output for the minimum number of cells is required.

Cells can be connected in series to increase the voltage output and
(Please turn to page 28)

A New Sensation . . .

A Stereophonic Headphone Amplifier

By Irving Spackman, A.M.I.R.E.

Over the past twelve months or so we have seen a number of articles describing and discussing the equipment, to produce, and the relative merits of the reproduction, of stereophonic sound, heard through wide range headphones, rather than from a pair of acoustically spaced loudspeakers.

Following these articles came the attendant articles and letters arguing the pros and cons whether headphones or speakers produced the most realistic sound, gave the better frequency responses, or produced the more technically correct stereophonic effect. These various topics were interlaced with the problems of room echo and reverberation, isolation of the channels, the relative costs of the two systems, power output requirements, and physiological effects on other members of families, etc.

We looked on these discussions in rather an abstract way as initial enquiries had not been able to locate a ready source of suitable wide range headphones, except those for use in deaf aid systems. It was then that we heard that a shipment of suitable stereo headphones had landed in this country—here we thought was a chance

to try out these overseas ideas and evaluate them.

These headphones, called the Pioneer SE1 were well made and very comfortable to wear—admittedly one has to become accustomed to this, but the realism of the reproduction soon made one cease to realise the presence of the head set. With an excellent response from 25 cycles to 13 kcs, these headphones are in effect properly designed dynamic systems. They will only handle a maximum of half a watt and give adequate sound level on as little as 50 milliwatts.

Whilst we were cogitating what type of stereo amplifier we would try these headphones with, we discovered that one firm in Auckland had been designing a simple high quality amplifier to feed these headphones with the right level and at the right impedance. Discussion with this firm yielded us all the information about their work, together with some samples of the necessary components. It is therefore with the co-operation of Messrs. Arnold & Wright, who supplied the headphones and Beacon Radio Ltd., who carried out the preliminary work on the circuit and designed the trans-



formers for this equipment that we bring this article to you.

Our first impressions of the circuit as shown in Fig. 1 were to say the least, a little bewildering—this did not look like the typical audio amplifier we had expected. In fact the system is virtually a direct coupled version of an A.C. degenerative regulator if such a design can be imagined. The possibilities of such a circuit are the excellent output regulation and low output impedance, and, due to the direct coupling and degeneration with the large amount of negative feedback, the frequency response characteristics are exceptionally good. The circuit also seems capable of very low levels of harmonic and intermodulation distortion.

Some idea of the frequency response of this amplifier can be gleaned from the response curve shown in Fig. 2. At an output of 40 milliwatts the response is—2db at 10 cycles and—0.4db at 70 kcs. being virtually flat for the intermediate parts of the response curve.

Construction

It is an advantage to use reasonable space to layout this amplifier. Although not a complicated circuit there is need for adequate spacing for isolation of the out-

put transformers from the mains supply because of the excellent low frequency response. Similarly there is need for a high level of hum suppression. Here we had a certain amount of difficulty in getting our instruments down low enough, but our figures indicate that hum and extraneous noise is better than 60db below maximum undistorted output.

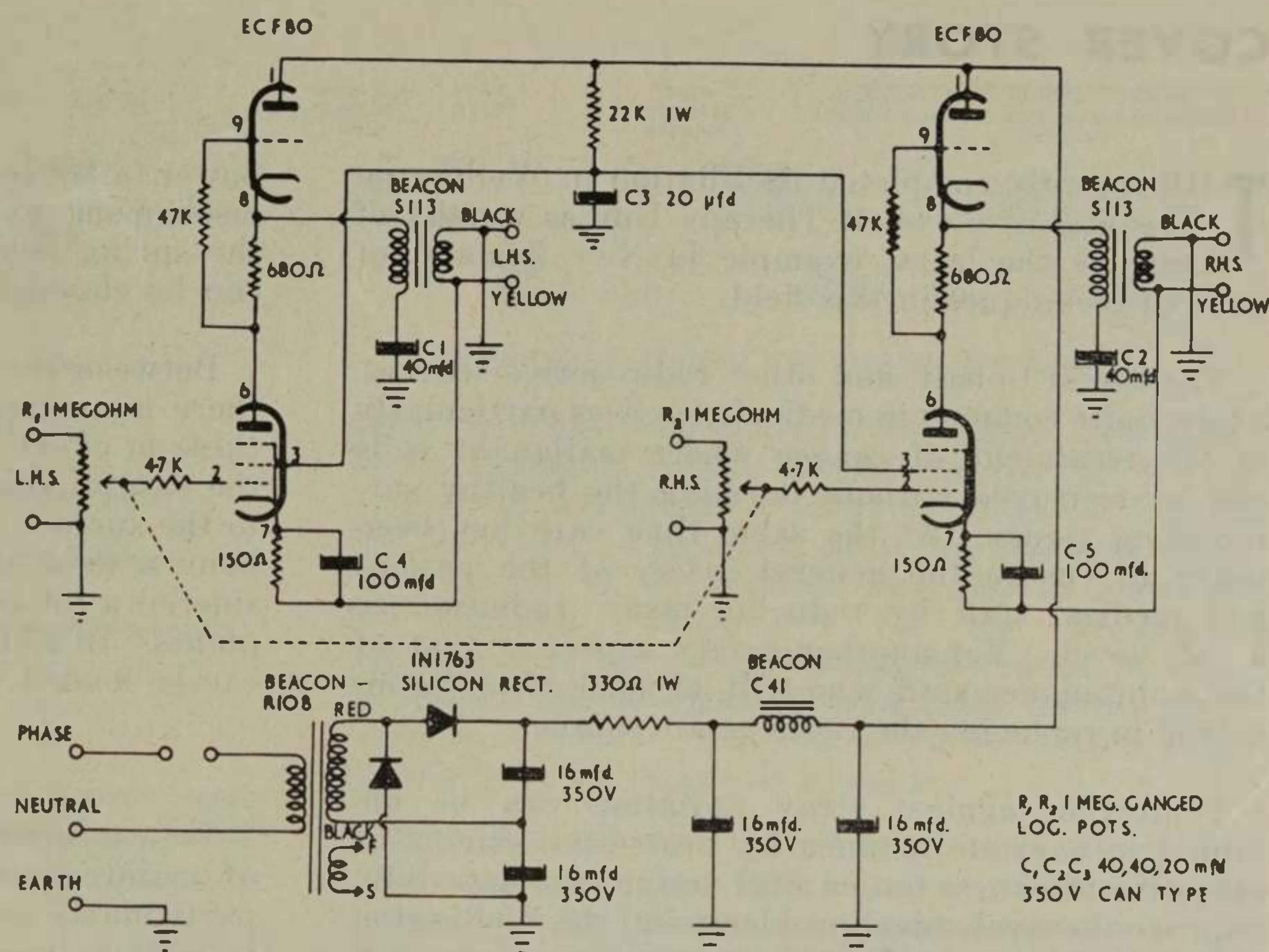
At the time of writing we have only utilised a simple input circuit for the amplifier with ganged half megohm volume controls as the input load. We do intend to spend a little more time selecting the correct input loading for the various types of pickup cartridges. We have made no provision for balance because of the relatively low stage gain, degenerative operation of the amplifier and the well matched performance of the headphone units. We are also looking into the possibility of incorporation of tone compensation circuits in the front end to correct for the various recording characteristics. We will cover our findings in a future article. The main features of the construction are the use of the electrolytic condensers to remove the DC from the output transformers, the silicon voltage doubler power supply, and the tag board—a Harwin type 3031.

The output matching is very tolerant, handling anything from 1 to 4 pairs of headphones with very little change.

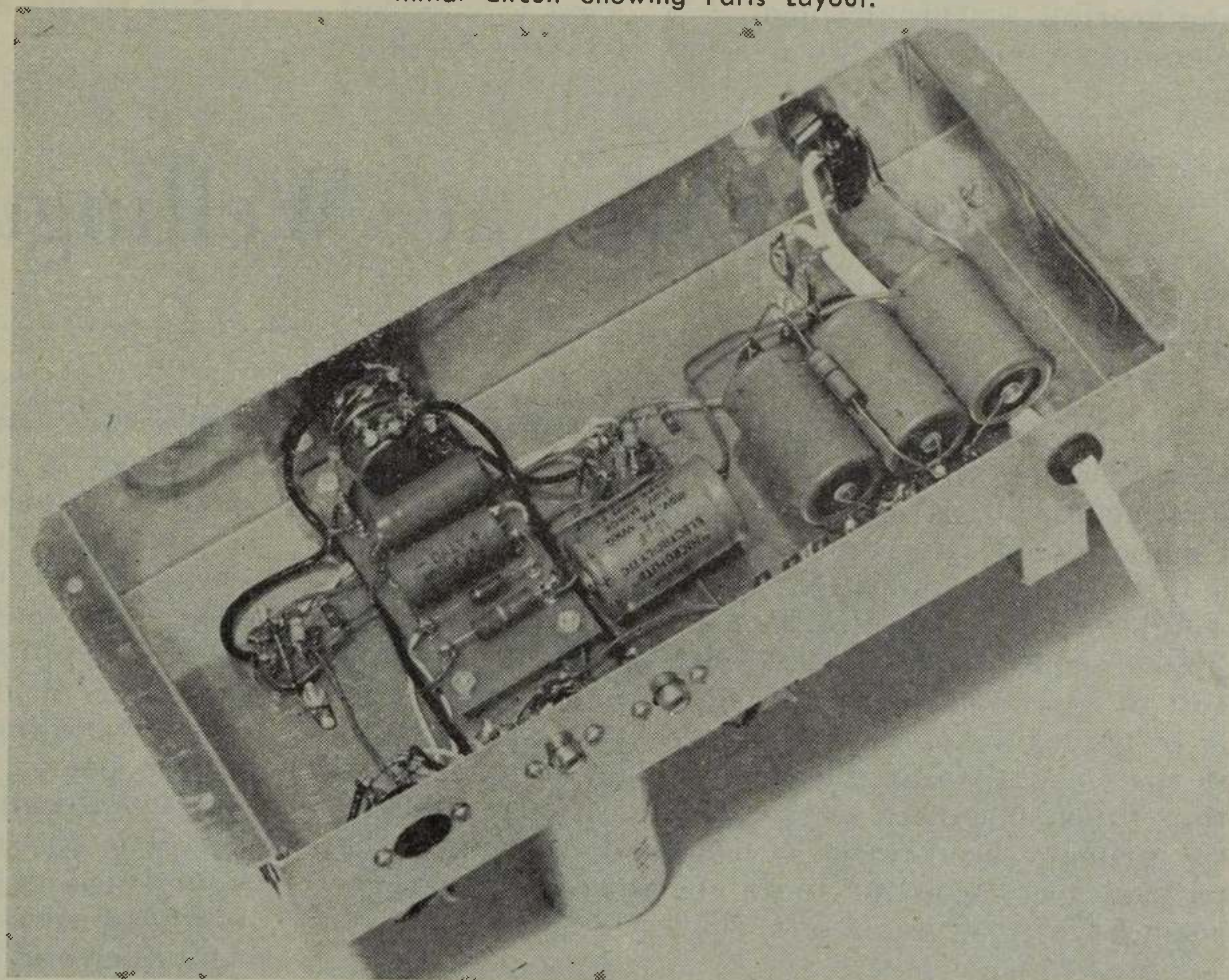
We were also pleasantly surprised when we coupled this amplifier into a conventional $7\frac{1}{2}$ ohm twin speaker system. The output of these single tubes produced good comfortable listening level with excellent frequency response.

The sensation of stereo is very real, and is thoroughly enjoyable. All those who have had the opportunity to listen to this equipment have been startled by the correctness of effect, and very few have appeared to notice the presence of the headset after the first few minutes have passed.

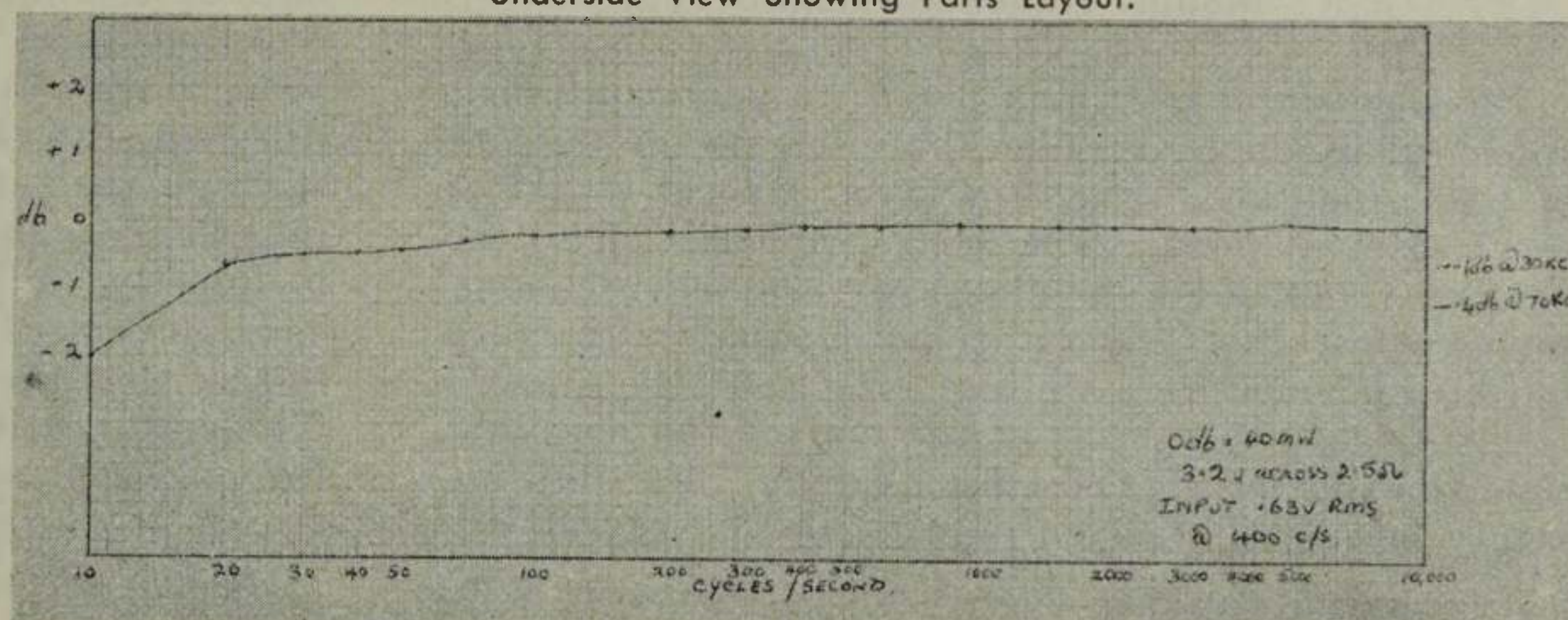
We feel that many more of our readers will find as we did, that stereophonic headphone listening can really provide a new sensation.



Initial Circuit Showing Parts Layout.



Underside View Showing Parts Layout.



COVER STORY

THE recently completed installation in Wellington Hospital of a Cobalt Therapy Unit is worthy of note as the latest example in New Zealand of modern techniques in this field.

The use of Cobalt, and other radio active sources, is now quite common in medical practices particularly in the treatment of cancer where malignant cells can be destroyed without harming the healthy surrounding tissue. At the same time care has been taken to ensure the general safety of the patient and medical staff by reducing stray radiation to a safe level. Yet another safety aspect is that of the maintenance staff who will, at some time, be involved in replacing the radio active source.

Protection against stray radiation can be obtained in a crude manner by protective shields of excessive thickness but careful design can materially improve the mechanical problems and the Wellington Cobalt Unit is an example of the application of sound engineering to this problem.

power fail or local interlocking break then the spring mechanism will operate. In the extreme case of the spring mechanism failing the aperture shutter can be closed by hand control.

Between the Cobalt source and the actual patient there is a uranium block and tungsten alloy disc—these in effect form a beam shaping system. Due to the careful shielding of the head the dose ray close to the surface would not exceed 1 milliroentgen per hour with a 5,000 curie source. This level is considered a lot better than that found in many X-ray plants. In addition it means that the treatment head can be loaded with a source of 10,000 curies.

Radio Active Source

It was briefly mentioned above that the safety of maintenance staff is a matter to be considered particularly as, at some stage, it will be necessary to replace the radio active source. For example, the Cobalt 60 has a half life of just over 5 years so that

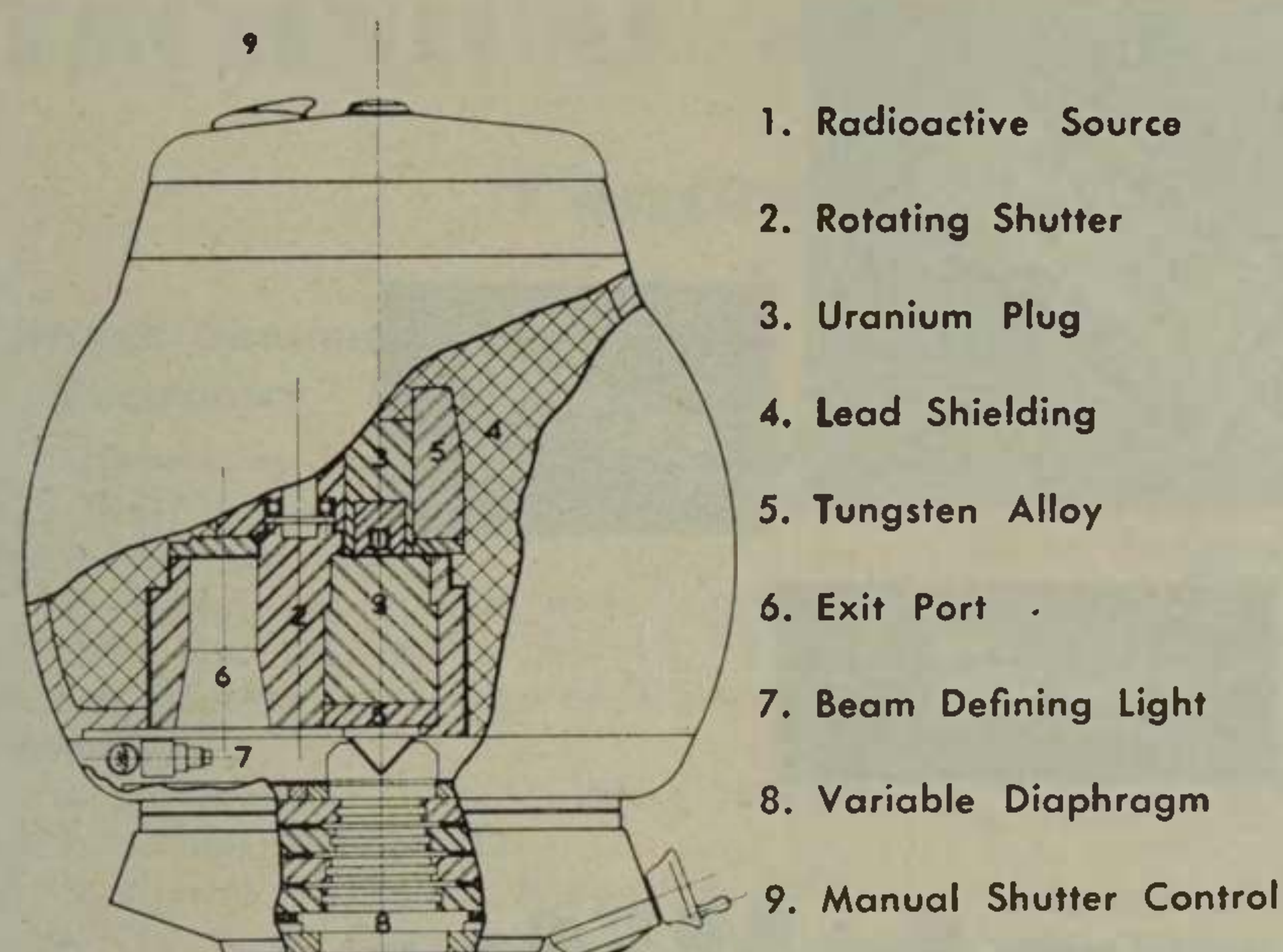
Cobalt Unit at Wellington Hospital

The Wellington Unit is a T.E.M. Mobaltron 11. Cobalt 60 Deep Therapy plant and comprises the treatment head, patient's couch and, integral with the Unit as a whole, the counterweight. In addition, there is the building to house the Unit. The whole machine weighs some 10 tons and the treatment head is about 2 tons weight. This weight in itself would be difficult to handle mechanically so that a counterweight is employed to obtain a balance—this can be seen in the cover photograph of this issue—and in addition to serving as a counterweight it also absorbs the primary beam after it has passed through the patient is shuttered off in an aperture and this shutter has concrete of 2 ft. thickness.

Mobile Treatment Head

Physically the treatment head is a steel container, spherical in shape, which contains a large quantity of lead shielding. Fig. 1 gives a general detail of the treatment head. The beam projected on to the patient is shuttered off in an aperture and this shutter is controlled from a remote panel with push button and electrical timing. The aperture shutter is spring loaded so that at the end of the exposure time the shutter is closed by a spring. In addition, safety measures are incorporated so that should the

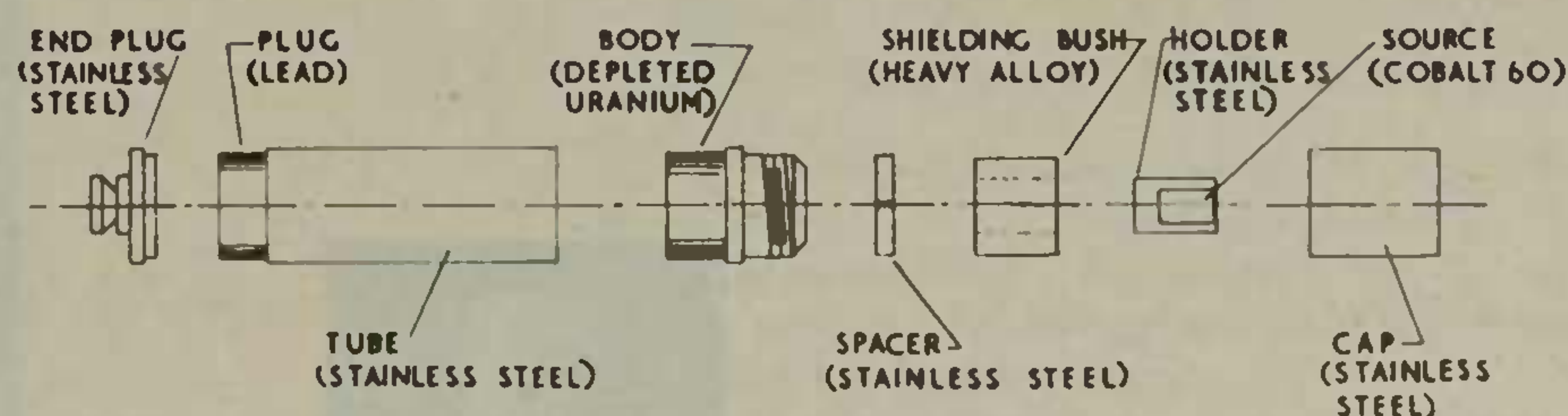
somewhere within that time it would probably be necessary to replace the source unless longer treatment times are used instead of replacement. Because of this the Cobalt radio active source should be encapsulated in some manner which gives a fair degree of shielding and can safely be transferred from a supplier to the actual Unit. If this can be done it is then possible to avoid the use of complicated handling tools and possible damage to the source itself. The Wellington Cobalt Unit uses a source "Pencil"—this is shown in Fig. 2. The source pencil is sealed by the supplier into the end of the cylindrical part by tungsten alloy and lead. Part of the source pencil is then let in to the transport container and the rear portion of the pencil forms a part of the shielding of the container. When it is required to let the source pencil into the treatment head of the Cobalt Therapy Unit the container is lined up with the head and by means of a rod passed through the top of the treatment head and screwed into the rear portion of the source pencil; the pencil is quickly pulled straight through into the head. This movement only takes two or three seconds and in that time the source moves from its shielded transfer container into the shielded treatment head and the operator is always protected through shielding. It will be seen that this method removes many of the



dangers found in earlier source containers and ensures that the actual radio active material cannot work loose, as happened early in June of this year in America.

Treatment Couch

At first sight the treatment couch would seem to be a fairly simple device but in fact to give the required accuracy with regard to ray penetration,



EXPLODED VIEW OF SOURCE PENCIL

great care has been taken in its design. It should be rigid enough to take the heaviest patient without movement, but should present no means of absorbing the rays. The couch must have lateral movement on top of the pedestal and also be motorised for rotation. The couch for the Wellington Therapy unit has a longitudinal movement of about 30 inches but its pedestal and total lateral movement is 12 inches. The couch can be rotated either manually or by means of a motor.

The whole treatment head with its counterweight can be rotated about the treatment couch either at a quarter, half or one revolution per minute. In choosing the Cobalt 60 the Wellington Hospital Board have been careful in providing a Unit of advanced design which allows use of current techniques and in addition is capable of expansion to cover advances in this important medical field.

END



Design of Television Receivers *(Continued from page 15)*

honest interpretation of the instrument idea. It is, perhaps, significant that Eric Marshall's work for Ultra has been within the second of these two broad categories and has clearly established a case for further exploration of the instrument approach.

The lesson from all this seems to be that the industry needs to look more to outside designers who have gained experience in different but related spheres. With their help it should be possible to develop design policies as comprehensive and far sighted as that clearly demonstrated by Ultra in the last two years.

Stimulus Of Technical Development

Technical developments in the future are also likely to affect the appearance of receivers. Components are becoming smaller and so we can reasonably expect sets to become smaller and less dependent on mains power supplies. However, the aspect of sound reproduction both in radio and television needs consideration: in order to reduce cabinet size and hence costs, the quality of sound reproduction is often seriously debased. Apart from squashing speakers into an elliptical shape, little advance has

been made in basic design for 30 years. There is room here for research on miniaturisation of speaker systems to take advantage of the high quality sound transmitted on F'M and television bands.

With television sets the great bugbear is the depth of the picture tube. True, this has diminished with the introduction of wide angle tubes and integrally moulded implosion shields, but the potentialities of the flat tube have yet to be exploited. Colour television is going to create another headache for the designer, as the current size of picture tube is much larger than those for monochrome reproduction and the additional circuitry more complex. Two types of colour tubes have recently been announced known as the 'apple tube' (from America) and the 'banana tube' (from Mullard, but said not to be a commercial proposition). However, it is much too early to say how the new inventions will affect the design of TV cabinets should colour television transmissions be introduced to Britain; but it would not be out of place to suggest that if technical advances are round the corner, then their production should be accompanied by a more appropriate and positive attitude to cabinet design.



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"Selective Signalling Device," by L. Linn, W9LHF.

"The Trap Vertical," by C. C. Tiermeyer, V3RMD.

"Transistor Types for Amateur Applications," by K. M. Aitken, W2OUY, of Semiconductor Division, R.C.A.

LOOKING AT . . .

the Silicon Solar Cell

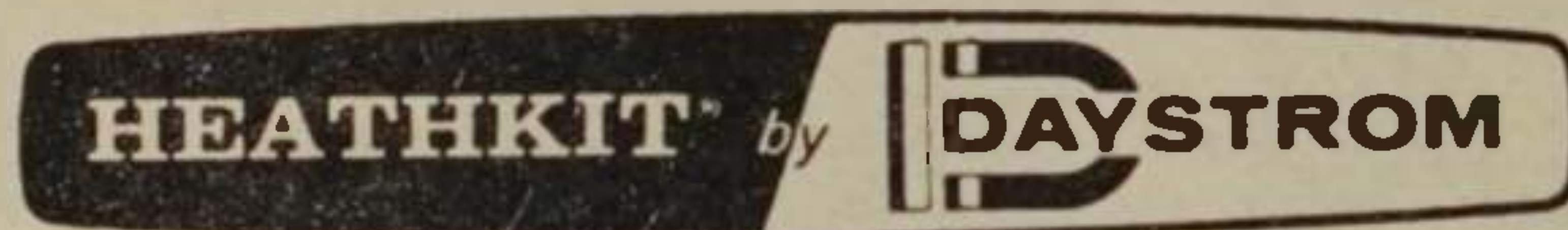
Continued from page 21.

in parallel to increase the current output. Power output depends not only on the number of series/parallel cells used but on the utilisation of the space available for the cells as well. One very popular method is to assemble the cells, slightly overlapped or shingled. This series connects the cells, gives the highest output for a given area, and is a convenient sub-assembly for manufacturing purposes. A typical 5 cell shingle will give about 2 volts output at 40 ma with optimum illumination. In such a series string, the cell

with the lowest output will determine the current available hence care must be taken to match the output characteristics of the cells used in such a combination.

Silicon solar cells are finding increased and varied application throughout industry for reading punched tape and cards, converting film sound track into electrical impulses, to be amplified, powering remote and unattended electronic equipment and navigation lights and beacons, controlling street lighting and machine tools

and hosts of other applications where their rugged simplicity, high output levels, indefinite life and non-ageing characteristics make them attractive. Probably the most glamorous role is to provide the power requirements of satellites and space vehicles. In such applications, the solar cells are used to charge storage batteries and supply power during that part of the orbit which is in sunlight, the storage battery providing continuity of supply for the instruments, telemetering equipment and the transmitters during the periods of darkness when the cells are inoperative. One example of such an installation is the weather observation satellite "Tiros" which has 9260 such cells to keep its nickel cadmium storage batteries charged.



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Electron Tube Interchangeability Guide

In this country we have electron tubes from many sources and duplication of types with differing numbers has been a major source of confusion. This chart is intended as a general guide for interchangeability for receiving and industrial tubes. Compiled originally by Mullard Ltd. and International Electronics, the chart naturally cannot be all inclusive but presents some of the more common tubes that are in general use both in New Zealand and Australia and also the Northern Hemisphere. A section of the chart will be published in the next four issues and could well be filed for future use.

U.S.	European	U.S.	European	U.S.	European	U.S.	European
1A3	DA90	6AT6	EBC90	6DA6	EF89	7AN7	PCC84
1AB6	DK96	6AU6	EF94	6DC8	EBF89	7DJ8	PCC88
1AC6	DK92	6AU6A	6AU6A	6DJ8	ECC88	7G7	EF22
1AH5	DAF96	6AV6	EBC91	6DL5	EL95	8A8	PCF80
1AJ4	DF96	6BA6	EF93	6DL5(MP)	6DL5(MP)	12AC5	UF41
1AN5	DF97	6BD7(A)	EBC81	6DR8	EBF83	12AT6	HBC90
1L4	DF92	6BE6	EK90	6DS8	ECH83	12AT7	ECC81
1M3	DM70	6BE7	EQ80	6EH7	EF183	12AU7	ECC82
1R5	DK91	6BL8	ECF80	6EJ7	EF184	12AU7A	12AU7A
1S5	DAF91	6BM8	ECL82	6ER5	EC95	12AV6	HBC91
1T4	DF91	6BM8(MP)	ECL82(MP)	6ES8	ECC189	12AX7	ECC83
3A4	DL93	6BN5	EL85	6ET6	EF98	12AX7A	12AX7A
3A5	DCC90	6BQ5	EL84	6EU7	6EU7	12BA6	HF93
3B4	DL98	6BQ5A	6BQ5A	6FG6	EM84	12BE6	HK90
3C4	DL96	6BT4	EZ40	6FY5	EC97	12S7	UAF42
3S4	DL92	6BX6	EF80	6GK5	6GK5	14K7	UCH42
3V4	DL94	6BY7	EF85	6GK6	6GK6	14L7	UBC41
5AR4	GZ34	6C4	EC90	6GM8	ECC86	15A6	PL83
5U4(G)	GZ34	6CA4	EZ81	6GW8	ECL86	15DQ8	PCL84
5V4(G)	GZ32	6CA7	EL34	6HG8	ECF86	16A5	PL82
5Y3	GZ30	6CD7	EM34	6J6	ECC91	16A8	PCL82
5Z4(GT)	GZ30	6CH6	EL821	6J6A	6J6A	17Z3	PY81
6AB4	EC92	6CJ5	EF41	6L6	EL37	19X3	PY80
6AB8	ECL80	6CJ6	EL81	6N8	EBF80	19Y3	PY82
6AG6	EL33	6CK5	EL41	6Q4	EC80		
6AJ8	ECH81	6CK6	EL83	6R3	EY81	25E5	PL36
6AK5	EF95	6CM4	EC86	6R4	EC81	21A6	PL81
6AK8	EABC80	6CM5	EL36	6S2	EY86	5881	EL37
6AL5	EB91	6CN6	EL38	6SL7(GT)	ECC35	6267	EF86
6AM5	EL91	6CQ6	EF92	6U3	EY80	6374	EY84
6AM6	EF91	6CT7	EAF42	6U8	ECF82	7025	7025
6AQ4	EC91	6CU7	ECH42	6U8A	6U8A	7025A	7025A
6AQ5	EL90	6CV7	EBC41	6V4	EZ80	7189	7189
6AQ5A	6AQ5A	6CW5	EL86	6X2	EY51	7189A	7189A
6AQ5(MP)	6AQ5(MP)	6CW7	ECC84	6X4	EZ90	7189(MP)	7189(MP)
6AQ8	ECC85	6DA5	EM81	6X5(GT)	EZ35	7247	12DW7

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perform these conventional types, they are being selected for use in more and more radio and TV receivers as well as hi-fi equipment. From present indications, novar should become the standard of the industry.

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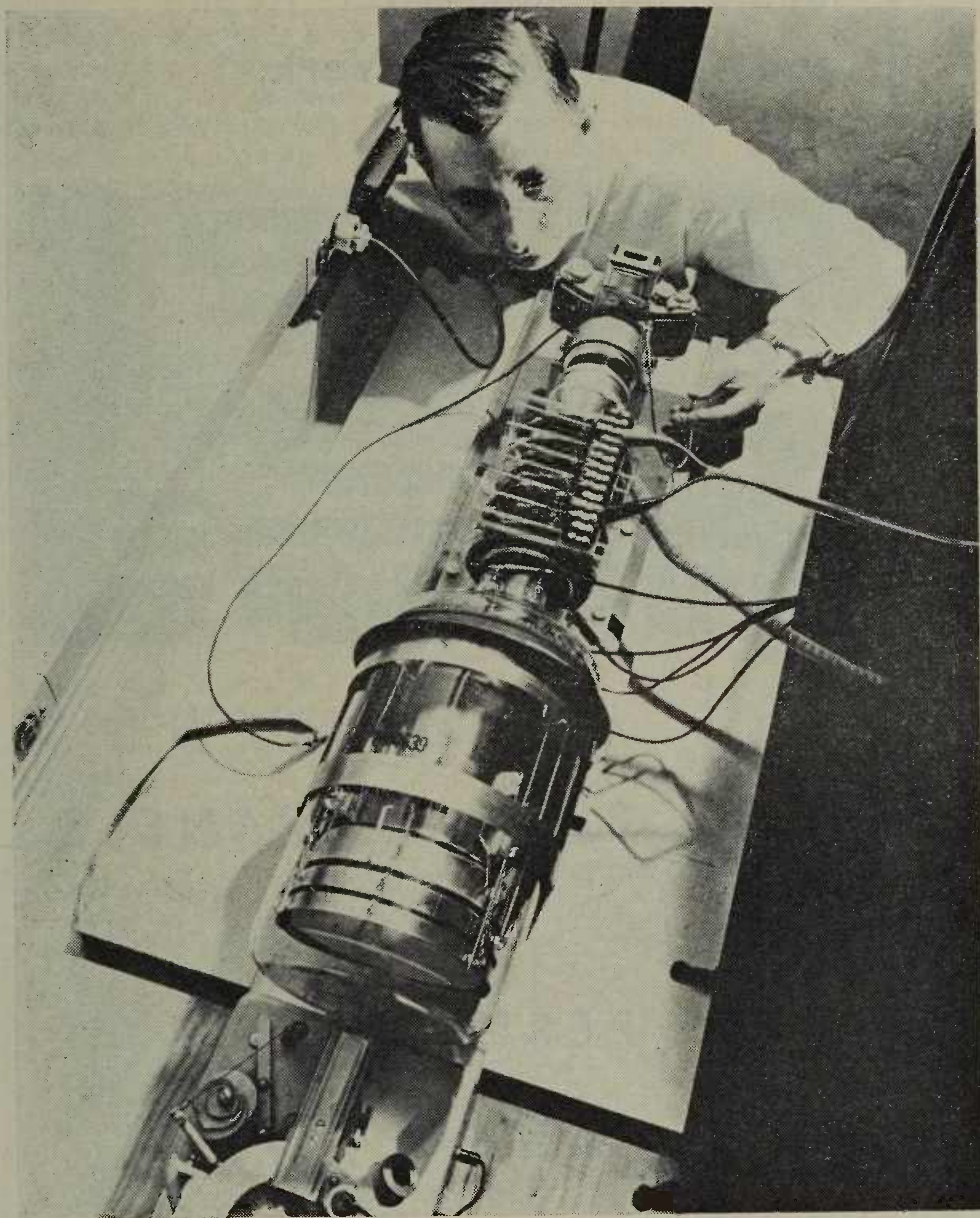
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WESTINGHOUSE SCIENTISTS 'SEE' INSIDE SOLID MATTER

Atomic Structure Revealed by Patterns



X-ray patterns, called Laue patterns, are formed when X-rays, in passing through a crystal, are bent, or diffracted, by the orderly arrangement of atoms composing it.

The atom locations show up as an array of spots which can be photographed on X-ray film. The spot patterns can be considered as a material's own unique "finger-prints."

These diffraction patterns establish with certainty the basic structure of matter; they posi-

tively identify unknown materials; and they give a means for selecting the precisely aligned crystals required by such modern solid-state devices as transistors, molecular electronic blocks and masers.

Westinghouse reported that the high-speed diffraction pictures were obtained by means of an experimental electronic intensifier system developed by Dr. Goetze and constructed by J. McCurdy of the Westinghouse electronic tube division. The system,

still in its research stages, is not available commercially.

X-Rays Are Converted To Electrons, Light

The new intensifier takes advantage of the electronic features of both tubes and works like this:

X-rays from a small portable X-ray source are beamed through a crystal to form a typical diffraction pattern. The image of this pattern is transferred directly on to a sensitive photosurface deposited on the input face of the combined Fluorex-Astracon tube. Here a pattern of electrons, exactly duplicating the X-ray image, is released.

Electrical voltages speed up these electrons and focus them on a thin film placed across the electron path near the rear of the tube. This film, only about one 10-thousandth of an inch thick, is a two-layer "sandwich" composed of a film of metal and another of an insulating material.

The film sandwich has the unique ability of ejecting from its rear surface up to 100 electrons for each one that smashes into its front surface. Thus, in effect, it strengthens the electron pattern 100 times.

The strengthened pattern is then electrically accelerated and guided into a sensitive output surface, or screen, similar to that on the viewing end of a television picture tube. Here the pattern of electrons is converted into visible light, producing a smaller, brighter, more clearly visible image of the original X-ray diffraction.

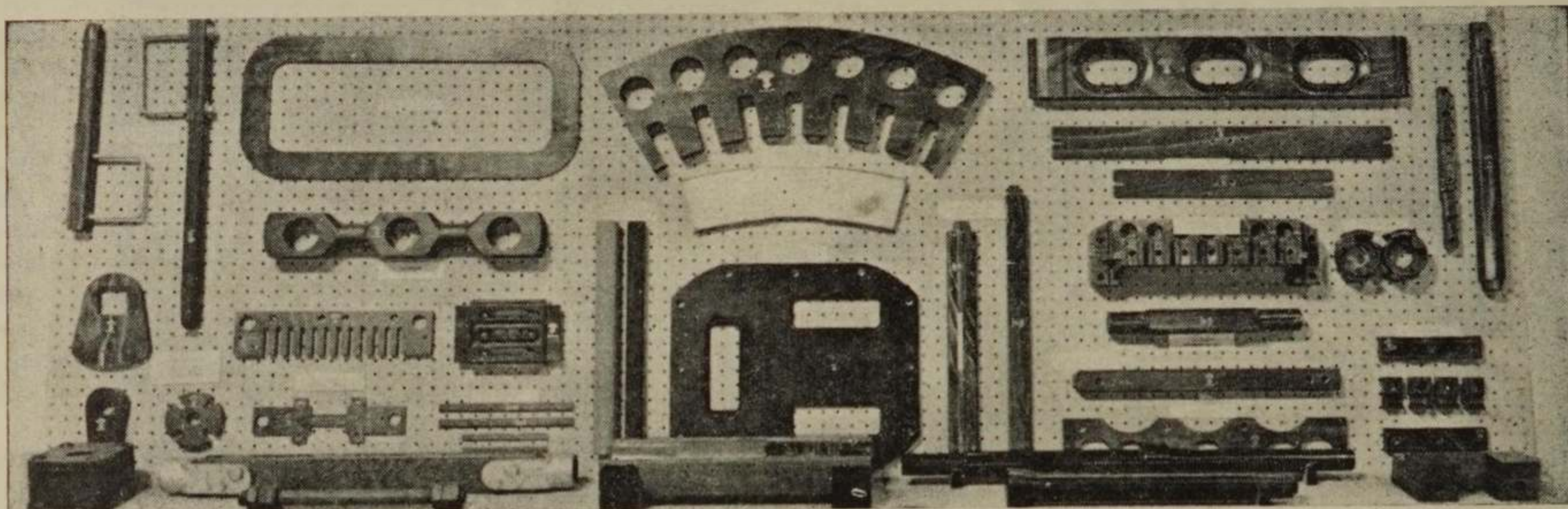
The whole system has so much sensitivity that brilliant patterns are clearly seen and made into snapshots or X-ray movies with only a small portable X-ray tube as the source of energy.

Further experiments under way for exploiting the new method include powder diffraction studies (which use reflected rather than transmitted rays) and studies of continuous phase transformations in metals and semiconductor materials. The apparatus may also prove useful for high-speed radiography, for example, in X-ray studies in ballistics.

Information from Westinghouse Electric International Corporation, 40 Watt Street, New York.

PERMALI

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AUCKLAND

Shortwave Survey

by MIKE BUTLER

A Listeners' Guide to Broadcasts in English

Greenwich Mean Time is used—frequencies in kilocycles.

† Denotes especially good reception recorded. * Means reception was inferior due to weak signal strength and/or interference. Reported from Auckland, N.Z.

* * *

RADIO SOUTH AFRICA is now audible using 15085 between 1800 and 1900. English is spoken on Wednesdays, Fridays and Sundays (Australasian date). A radio play has been frequently featured prior to 1845 while a musical programme has been heard up to 1900 when the signal fades. Afrikaans is spoken on the other days. However, at 1800 an English identification is given: "This is the African Service of Radio South Africa." The choice of 15085 has meant that the signal is entirely free from interference, although at times rather "jittery."

Other stations enjoying this clear spot on the edge of the 19 metre band are the BBC on 15070 heard strongly in the mornings between 1815 and 2015 and CHINA on 15055 at 0830. WWV and WWVH, the Frequency Standard Stations on 15000 are commonly used by your correspondent for frequency comparison at all times except the half hour after 1900 when no signal is received on this frequency at my location. The WWV Transmission on 10000 is then used.

For more details of Frequency Standard stations I should recommend reference to Mr. L. S. Spackman's excellent article on Page 17 of the November issue.

* * *

The BBC announces all frequencies used to the different

areas when the General Overseas Service commences its day's transmission at 0900. The programme for the forthcoming broadcast is then outlined. The frequencies currently used at this time are 15070, 15435 (best), 17790, 21470, 21550, 21710.

* * *

The prefix HLK of the call signs used by the KOREAN BROADCASTING SYSTEM in transmissions from Seoul, South Korea, has been changed to HOK. Accordingly, the call sign of the station reported in the December notes is now HOK52. The frequency used is 6035 from 0900 to 0930. Another station, HOK5, which broadcasts to Asia is heard strongly through some interference on 9640 from 1030 to 1100 when it closes down.

* * *

"DX Jukebox" from HOLLAND is well received on 9590 and 11730 from 0710 to 0745 on Thursdays. DX news is usually given between 0715 and 0720.

VOICE OF AMERICA

1800 – 2215 15205†	0100 – 0130 17735 17770*
1800 – 2100 17710	0100 – 0115 21745
1800 – 1830 15230†	0115 – 0130 15155* 17745 17855
1815 – 1930 21610	0200 – 0230 17855
1815 – 1830 11780† 17830 21485†	0315 – 0330 Sat only UNO Programme 9755*
1830 – 2045 7205*	0500 – 0600 9770†
1845 – 1900 6170* 6185* Sat only UNO Programme 21510	0515 – 0530 9555
1900 – 1915 17795 21510	0530 – 0730 6025 6080
1915 – 1930 11900†	0530 – 0600 7215
2000 – 2100 11900†	0600 – 0930 6185†
2000 – 2030 6080	0630 – 0730 6115
2015 – 2030 17795 17825	0630 – 0645 9555†
2030 – 2100 Sat only UNO Programme 21510	0700 – 0730 5960*
2045 – 2100 9640†	0715 – 0730 6155* 6170 7215 9545*
2100 – 2130 21610	0730 – 0745 5955* 9680*
2200 – 2230 11900† 21460* Sat and Sun only UNO Programme 21510	0830 – 0900 6145 9545
2215 – 2230 17795 21610*	0845 – 0930 5985† 9700†
2230 – 2245 17760*	0900 – 0930 9650 15125*
2300 – 2330 15185* 17735 17770* 21745	0915 – 0945 9545
0000 – 0030 15130 15155 17735† 17745 17770†	0915 – 0930 7235*
0000 – 0015 21745†	1000 – 1100 15185 15330
0015 – 0030 11960* 15360*	1000 – 1030 9650
0100 – 0145 15130*	1015 – 1030 6075
	1030 – 1100 9535 9665
	1045 – 1100 6145 9545 UNO Programmes



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ARMED FORCES RADIO AND TELEVISION SERVICE (AFRTS)

1800 — 1845	17780
1900 — 2115	11890
2015 — 2115	9740
2300 — 0200	21460
2330 — 0045	17815
0130 — 0200	15185
0315 — 0630	15210†
0415 — 0630	11900
0600 — 1100	6040†
0700 — 1100	9560
0730 — 0800	11830†
0815 — 1100	5965

SURVEY BY COUNTRY

AUSTRIA. A short announcement in English was noted on 7170 at 1815 during an otherwise foreign language broadcast.

CANADA. 9630, the frequency which carries the CBC's session beamed to Australia and New Zealand from 0825 to 0905, is now being heard for at least half an hour commencing 2100. Reception has been very good indeed.

CUBA has replaced its 13 metre channel reported last month with one on the 16 metre band: 17875. Heard weekly between 1815 and 1845, it is received concurrently with 15285.

GT. BRITAIN. The BBC outlet on 9600 has been followed continuously from 0345 to 0730. During this period the signal has often been one of the best received from the Corporation. In the morning a further transmission has been received at only fair strength on 11860, 1830 - 1900. A further five frequencies can be added to the schedule included last month: 9510, 9580, 11750, 15070 and 15140 are used between 0600 and 0800.

HOLLAND. The Happy Station can be heard here on Sunday evenings during a session later than the one previously reported. From 1030 on 21625 a fair signal is received in a clear channel.

INDIA has returned to a frequency used prior to October last year: 17705. It carries an excellent signal from 1030 which is transmitted parallel to that on 17855.

ISRAEL is still heard at quite good strength during the broadcast from 2015 to 2045 on 9009.

PAKISTAN. Radio Pakistan has discarded 7010 which we heard so well during the winter months last year, perhaps in deference to the Amateur Service. Although a recent announcement from the station still mentioned the 41 metre band, the frequency has in fact been replaced by 9740. This new channel provides satisfactory reception between 1845 and 1915 when the frequency of 11672 is also used.

PORTUGAL. "This is the 'Voice of the West' which has been speaking to you from Lisbon, Portugal," is the closing announcement of the re-styled broadcasts from this country heard on two new frequencies, 6025 and 6185 from 0400 to 0430 to North America. The 6025 outlet arrives at the better, and surprisingly good, strength for the time of reception on this band. The transmission ends with the picturesque words, "The West can and will win," and the playing of the famous theme from Beethoven's Fifth Symphony with the rhythm of the morse "v" (presumably for victory!) symbol.

RUMANIA. At 0430 on 11810 a signal from Radio Bucharest has become barely intelligible through heavy interference. This is the first reception of this country at my listening post since last December.

U.S.A. WRUL, "The Voice of Freedom" has been heard on three new frequencies. 15385 and 15440 are used 1930 - 2000. Reception of 15385 is at good strength while the other is poor. Both are free of interference. 21495 is heard between 2115 and 2145 at excellent strength. On Sundays at 2115 this station broadcast a World Tape Pals programme illustrating the working of an organisation devoted to international communication between private individuals via mailed tape recordings.

U.S.S.R. Further new frequencies used by Radio Moscow are: At 1815 on 7370, fair; 1930 - 2000 on 9610, good; at 0545 on 7320,

fair; 0730 - 0800 on 17745, fair; at 0700 on 9675, good; 0730 - 0800 on 17755, poor; at 1045 on 9730, fair; closes 1100.

* * *

In these notes we adopt an "order of time" approach to the setting out of multiple broadcasts from one country or organisation. This aids easy selection of frequency at the time you find most convenient to listen. We begin at 1800 GMT (6 a.m. N.Z. Time) through 0000GMT (Noon N.Z. Time) and through the N.Z. afternoon and evening in which the GMT numerals can be directly translated to N.Z. Time, i.e. 0430 GMT = 4.30 N.Z. Time. To find the equivalent Australian Eastern Time, deduct two hours from N.Z. Time.

* * *

MAJOR BREAKTHROUGH IN MERCURY LIGHTING

The most significant breakthrough in mercury lighting since the introduction of mercury lamps 61 years ago has been achieved by scientists of the Westinghouse lamp division. Their engineers have successfully developed a new type mercury lamp whose light output is 150 per cent of that of present-day lamps. Only twice before in history has the lamp industry achieved an efficiency breakthrough of 50 per cent in a single step—this was at the time of the original introductions of mercury and fluorescent lamps.

Westinghouse advise that the new mercury lamp produces 78 lumens per watt compared to 54 for an ordinary mercury vapour lamp and only 17 lumens per watt for incandescent lamps.

The mercury lamp breakthrough came with the discovery that a rare metal element, thallium, could be added to the mercury to form a highly efficient transducer to convert electrical energy into light. As a result, the new lamps produce more than 31,000 initial lumens compared with 21,500 for present type mercury lamps of the same wattage.

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Record Review

by Professor C. G. F. Simkin

★ ★ **STRAUSS, Richard: Don Quixote and Till Eulenspiegel**; played by Paul Tortelier (cello) and the Berlin Philharmonic Orchestra, conducted by Rudolf Kempe. World Record TZ 157.

This is a splendid disc. Don Quixote is the most successful of Strauss's efforts to raise programme music from the expression of simple emotions, or the depicting of scenes to the delineation of complex character. It succeeds wonderfully in suggesting the fluctuations of Quixote's mind between comically absurd exploits and sublime reflections on chivalry; and, at the end, when he is dying, in his right mind, brings out a spirituality enriched by previous fantasies. Till Eulenspiegel, a symphonic tone poem in rondo form, is a slighter work than the variations, but gives a gay, rollicking account of a famous prankster.

Kempe's mastery over such material is evident from the first bars of the beautiful introduction to Don Quixote. Throughout the work he avoids over-emphasising any single variation, no matter how dramatic, in the interest of the general unity of the music and its basic theme. The moving pathos of the quiet finale thus emerges as a superbly appropriate epilogue. Tortelier gives a matching performance, one which subdues abundant virtuoso skill to musical requirements, yet rich and expressive. The orchestra also plays extremely well. It keeps a fine balance with the soloist, and both strings and winds give good accounts of their separate roles, especially the solo violin, oboe and horn.

Till Eulenspiegel is for the orchestra alone and is also handled faultlessly. The performance is precise but vigorous, most musical and completely successful in realising the composer's aims.

Nor would it be easy to better the recording. This captures both Tortelier's fine playing in the high registers and the rich sonority of the orchestra's bass passages. It also manages, uncommonly well, to preserve a natural tonal balance between soloists and orchestra.

* * *

★ **MOZART: Concerto for Oboe and Orchestra in C Major, K314; and Symphony No. 34 in C Major, K388**; played by Leon Goossens (oboe) and the Sinfonia of London. World Record, TZ 150.

Mozart's fondness for wind instruments is well known, but his only oboe concerto was long lost in its original form until Paumgarten succeeded in reconstructing it. It is a beautiful work, showing Mozart's exceptional qualities of delicacy, serenity and gaiety. Goossens gives a most artistic performance that can be criticised only as being too refined. Rather slow tempi make for expressive playing but also tend to rob the work of vigour.

KEY:

- Not recommended because of poor performance or recording.
- ★ Recommended although the performance or recording has faults.
- ★ ★ Strongly recommended because both performance and recording are excellent.



The Sinfonia plays both works stylishly and well, and in the Symphony is allowed to be properly buoyant. The rather military character of the first allegro is opened splendidly by the brass and then developed by the orchestra in fine balances and contrasts of strings, winds and percussion. Bassoon and strings also combine very satisfactorily to bring out the stately grace of the andante. The rollicking final movement is played with great verve under a conductor who has been not improperly compared to Beecham.

The recording is good, although it does not quite attain the rich warmth of the Strauss disc. Mozart fans have good value in this interesting and acceptable coupling of two contrasting works that are typical of his versatile genius.

* * *

★ ★ **SIBELIUS: Symphony No. 2 in D Major, Opus 43**; played by the Sinfonia of London, conducted by Tauno Hannikainen. World Record TZ 142.

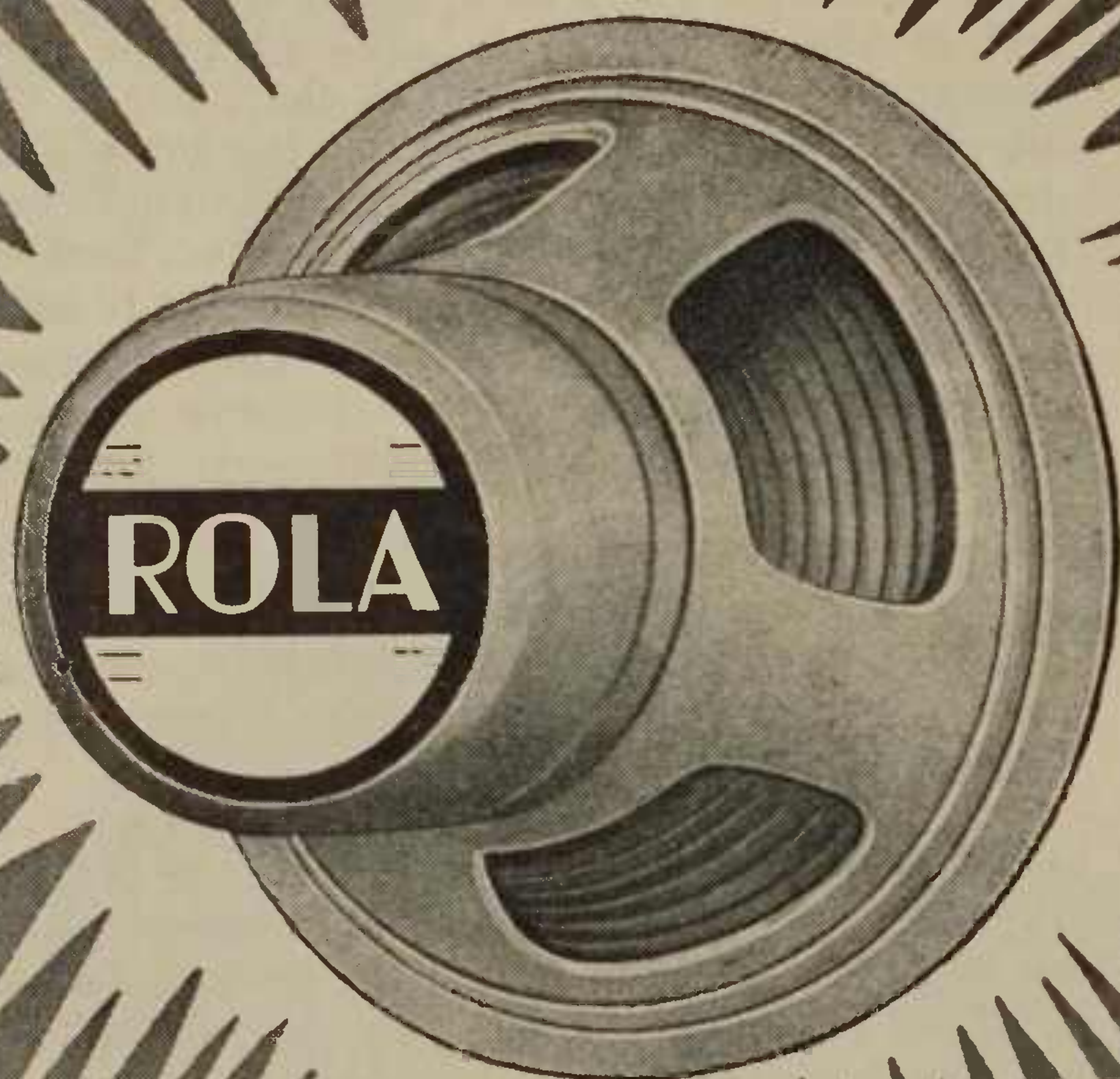
Many people are repelled by the inhuman quality of Sibelius's symphonies, and by his mosaic pattern of somewhat fragmentary themes. Others find them a powerful appreciation of natural forces, highly original and satisfying. The second symphony is the most popular of the seven he wrote, perhaps because it is his first major advance towards his own distinctive style.

The disc offers an authoritative interpretation by a conductor who was approved by the composer himself. He brings out the structure of the work admirably, but also its warmth and excitement. The Sinfonia is completely responsive to his demands and gives a magnificent performance, especially of the lively scherzo and the stirring final allegro. All sections are excellent and combine brilliantly.

The recording engineers here, too, have shown great competence. They give us a reproduction which is clear, warm and free from any distortion.

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Bench Power Supply AS 1165— With Decade Voltage Selection

A recent addition to the Solartron range of laboratory power supplies, the AS 1165 is a general-purpose bench-mounting unit providing h.t. heater and bias supplies to thermionic valve circuits.

The unit provides two individually stabilised and electrically isolated h.t. (OP1 and OP2) which may be used independently or in series. A low current output (OP3) is derived from OP2 by means of a cathode follower. Three decade switches enable OP1 voltage to be set in 1 V increments to any value between 0 and 500 V. This supply has a maximum current rating of 350 mA, and a regulation of 0.025%. OP2 provides a fixed potential of between 200 V



and 250 V, as pre-selected by an internal control. The maximum available output current is dependent upon the delivered voltage and varies linearly from 100 mA at 250 V to 75 mA at 200 V, with a regulation of 0.01%. The output voltage obtainable from OP3 can be varied continuously between 0 V and (OP2 - 10) volt with a maximum load current of plus or minus 3mA. The ripple and noise component on all three supplies is approximately 1 mV pk-pk. An overload cut-out, tripping at a nominal current of 420 mA, is provided on the OP1 output, visual warning of operation being given by a panel-mounted indicator lamp. The OP1 and OP2 + OP3 supplies are independently switched, and the load currents monitored on a dual-range meter. Two independent a.c. heater voltages of 6.3 V at 5A each are provided, and may be operated in series or in parallel. The insulation between supplies and from each supply to chassis is tested to 2000 V. The unit will operate from 100 - 125 V/200 - 250 V, 50-60 c/s, a.c. mains input and has a power consumption of approximately 575 VA at maximum output. Attractively housed in a two-tone case, the instrument measures 18½ inches wide x 9¾ inches high x 16½ inches deep. The weight is 55 lb.

Enquiries should be addressed to E. C. Gough Ltd., P.O. Box 873, Christchurch.

New Transistors From Mullard

Mullard recently announced 4 new transistors of the alloy-diffused type—types AF114, AF115, AF116 and AF117, intended to replace gradually types OC169, OC170 and OC171.

Because of their high gain value and low noise figure these new transistors are a valuable addition to the Mullard range. They are all hermetically sealed in metal cans and are absolutely moisture-proof.

The AF114 is a p.n.p. germanium alloy-diffused transistor for use as an R.F. amplifier. The high gain value and the low noise figure, both at 100 Mc/s., will give the R.F. stage a very high sensitivity. This transistor is a direct substitute for the OC171.

The AF115 is a p.n.p. germanium alloy-diffused transistor for use as a mixer-oscillator in F.M. receivers, and as an R.F. amplifier and mixer-oscillator in short wave receivers, up to a frequency of 26 Mc/s. The main feature of this type is a high conversion gain up to 100 Mc/s. The AF115 is a substitute for the OC171 when used as a mixer-oscillator in F.M. receivers, and for the OC170 when used as a mixer-oscillator in short wave domestic receivers.

The AF116 is a p.n.p. germanium alloy-diffused transistor for use as an intermediate frequency amplifier in A.M. and F.M. receivers, and as an R.F. amplifier and mixer-oscillator in short wave receivers up to a frequency of 16 Mc/s. Special features of this transistor are low output conductance and low collector capacitance at 10.7 Mc/s., low noise and good a.g.c. performance at high ambient temperatures. The AF116 is a substitute for the OC169 and OC170.

The AF117 is also a p.n.p. germanium alloy-diffused transistor and is for use as an intermediate frequency amplifier in A.M. receivers and as an R.F. amplifier and mixer-oscillator in A.M. receivers up to a frequency and 6Mc/s. This transistor also features low collector capacitance, low noise and good a.g.c. performance at high ambient temperatures. The AF117 is a substitute for the OC169 and OC170 when used as an intermediate frequency amplifier in A.M. receivers.

Full technical details on these, and all other transistors in the Mullard range, are available upon request from EDAC Ltd., P.O. Box 6415, Wellington, and P.O. Box 9338, Auckland.

Westinghouse Electronic Tube Division in Production on Frame-Grid Receiving Tubes

Manufacturing facilities recently installed at the Westinghouse electronic tube division are now in production on two types of frame-grid tubes—a 6DJ8 twin-triode primarily for industrial use and a 6GK5 triode whose main use is as an R-F amplifier in t-v tuners. Other frame-grid types scheduled for production soon will serve in I-F amplifiers of television sets and in industrial applications where uniformity of characteristics is more important than high gain.

Employed to eliminate conventionally wound grids as the tube elements that are most vulnerable to failure, frame-grid construction employs a rectangular grid-support structure formed by welding molybdenum straps across molybdenum side rods. Because of the strength of this structure, grid wires under great tension can be wound on the frame within very close tolerances, achieving dimensional control which results in great uniformity of tube characteristics despite the close spacing between cathode and grid.

New Air Cleaner Removes Cooking Smells

This new "Freshenair" air cleaner fits over the kitchen stove to trap cooking fumes and recirculate purified air.



It contains a fan which sucks in cooking smells, deodorises them through an element made of specially treated charcoal, and recirculates fresh air.

The only maintenance required is to occasionally boil the charcoal filter for about fifteen minutes. A light on the underside of the cleaner illuminates the top of the stove.

Pye Electric Ltd., 9 Upper Brook Street, London, W.1., England.

Overseas Notebook . . .

Marconi Cameras For Egypt

The United Arab Republic Broadcasting and Television Service has placed an order with Marconi's Wireless Telegraph Company Limited for the supply of five Mark IV camera channels and associated equipment. English Electric Valve Company Limited 4½-inch image orthicon camera pick-up tubes will be incorporated.

The cameras, to be installed in the latest of a series of new television studios in Cairo, will be used in the production of plays and theatrical shows and, in general, for any programme which involves audience participation. The studio covers an area of 9720 square feet (900 square metres), including a theatrical stage.

The Marconi Mark IV camera is now in use in many parts of the world; last year this British equipment gained a premier American award for its design and performance.

* * *

Moon May Get New Power Devices Before Earth

HONOLULU—The present pace of research could make it possible for the United States to have a new method of power generation operating on the moon before one is operating full-time on a power company's lines, according to Dr. John A. Hutcheson, vice-president of engineering at Westinghouse Electric Corporation.

In a talk before the Pacific Coast Electrical Association in Honolulu, Dr. Hutcheson pointed out that of the 13 billion dollars spent on research and development in the United States in 1960, the electrical industry alone was responsible for nearly one-fifth of this total.

"I have no reservation on predicting that the electrical manufacturers will soon be building these 'exotic' power plants for space just as routinely as they build conventional plants for land-based installations," he declared.

"With the present pace of space research, we could have one of these systems generating power on the moon before we have one operating full-time on a power company's lines."

Dr. Hutcheson said the industry will need every technological advance at its command to meet the staggering increase in demand for electric power foreseen in the next 20 years, which, at 3500 billion kilowatt-hours will be 4½ times the total output of 765 billion kilowatt-hours in 1960.

He explained that if today's research can save just one-tenth of a cent per kilowatt-hour in the generation of electricity, the savings in the nation's electric bill by 1980 will amount to three billion dollars.

Looking ahead, Dr. Hutcheson said the next 20 years also will bring the dis-

appearance of overhead wires from our city and suburban streets; transformers will go underground, and household electric motors will telemeter their readings to a computer centre, where charges will be figured and bills sent out automatically.

Inside homes, Dr. Hutcheson predicted an end to the present system of separate appliances for heating, cooling, cooking and lighting.

"The home of the future will be built around a single power centre," he said. "Modules of this unit will comprise the systems that perform the integrated functions essential to home living. For example, a single module, perhaps ultrasonic, might launder the clothes, dry clean them, wash the dishes, and clean the rooms. It might even cook the food, de-bug the roses, and replace the electric drill as the number one tool in the home workshop."

Dr. Hutcheson also foresaw a substantial increase in home heating electrically.

By the end of 1961 there will be more than a million American homes heated electrically," he said. "By 1980, some 40 per cent, or 30 million of them will be so heated."

* * *

Australia's Largest Set of Traffic Signals

Australia's largest set of traffic signals, supplied and installed by Amalgamated Wireless (Australasia) Limited, at Crows Nest, North Sydney, is now in operation.

The signals were switched-on recently by the N.S.W. Minister for Transport, Mr. J. M. A. McMahon, M.L.A., in the presence of the Managing Director of A.W.A., Sir Lionel Hooke, and others.

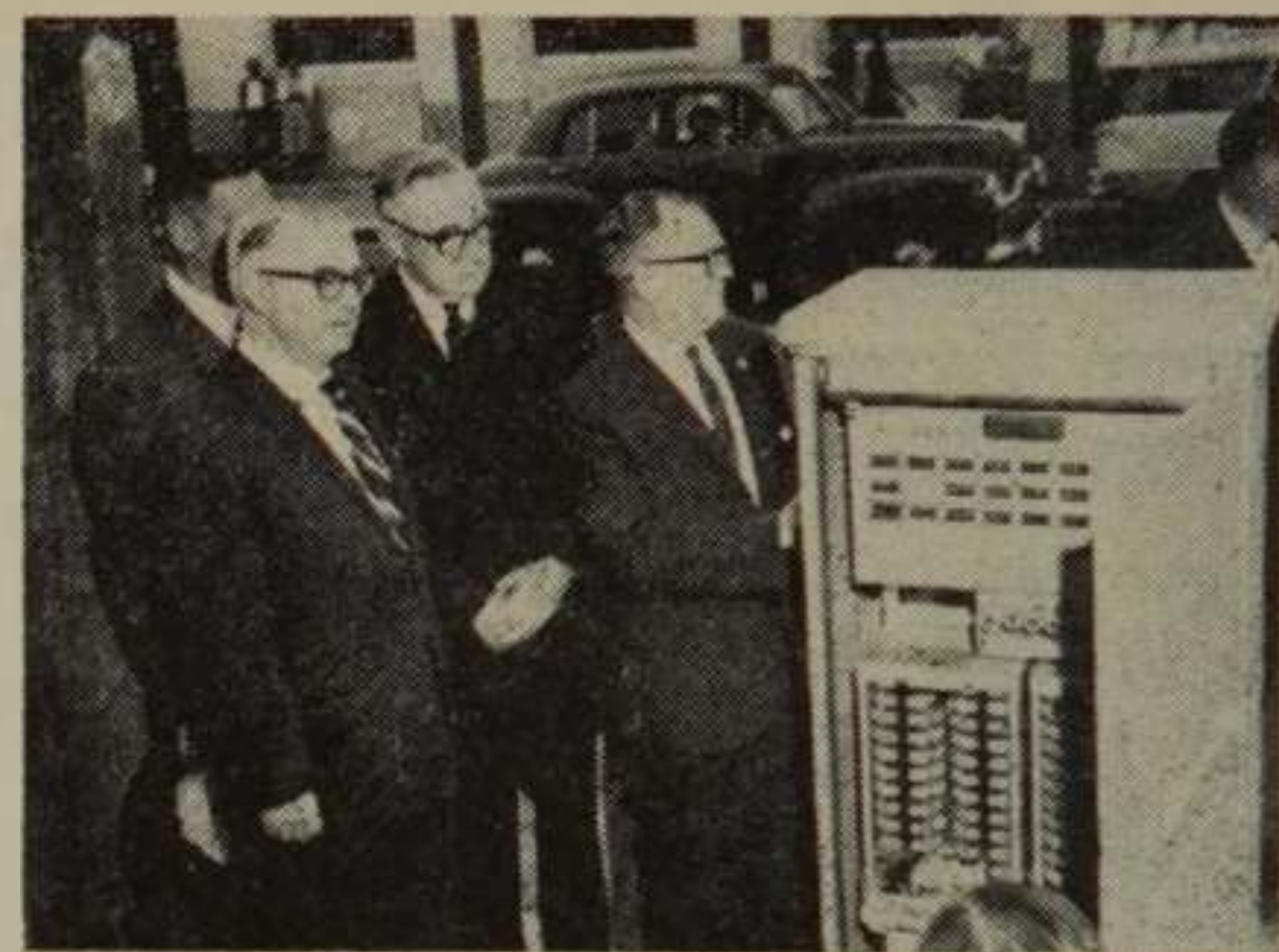
The second largest traffic signal unit to be supplied and installed by A.W.A. was placed in service at another North Sydney intersection last September.

The Crows Nest control scheme consists of 16 signal pedestals, 32 sets of lights and 11 pedestrian call push-buttons.

A special feature is the introduction of a "flashing" pedestrian indicator during the clearance period. Pedestrians who leave the footpath when the green "WALK" indication is showing and are crossing the roadway may continue to do so during the flashing of the red "DON'T WALK" signal. The "DON'T WALK" indication will "flash" for the time needed by pedestrians to complete their walk across the roadway before conflicting road traffic is released.

The new electronic traffic-actuated controller at this junction is the second of an improved design to go into operation in Sydney.

Vehicles and pedestrians control the signals. The granting of right-of-way



Photograph shows the New South Wales Minister for Transport, Mr. J. M. A. McMahon (right) switching-on the controls which set the signals in operation. He is watched by A.W.A. Managing Director, Sir Lionel Hooke (centre) and the Speaker of the New South Wales Legislative Assembly, Mr. R. Maher, M.L.A. (left).

and the period for which it is given to each approach is automatically determined and varied by the electronic controller. This is governed by the volume and density of approaching traffic and the demands for right-of-way received from pedestrian call buttons. While giving the green indication to traffic on one approach, the controller "takes note" of the number of vehicles arriving on the other halted approaches. It pre-determines the minimum "green" period required to clear the volume of traffic known to be waiting within the controlled area. Should pedestrians wish to cross parallel with the road traffic, the controller will ensure that they are given adequate time in which to cross.

* * *

All-Australian TV Stations

"Another landmark has been reached in the history of electronics in Australia—the initial operation of the first Australian-built transmitters," the Managing Director of Amalgamated Wireless (Australasia) Ltd., Sir Lionel Hooke, said recently.

"The three stations which will have the distinction of being the first in Australia to operate from transmitters wholly-designed and built in Australia are BCV Channel 8, Bendigo; GLV Channel 10, Traralgon; and GMV Channel 6, Shepparton.

They are also the first of the 13 country television stations authorised by the Government in November, 1960.

Designing and production of such substantial and intricate equipment with its ancillary apparatus for these stations called for skill and experience of the highest order. Completion of these stations in little more than a year demonstrates that an Australian organisation is capable of competing successfully against the world in a highly technical and restricted field."



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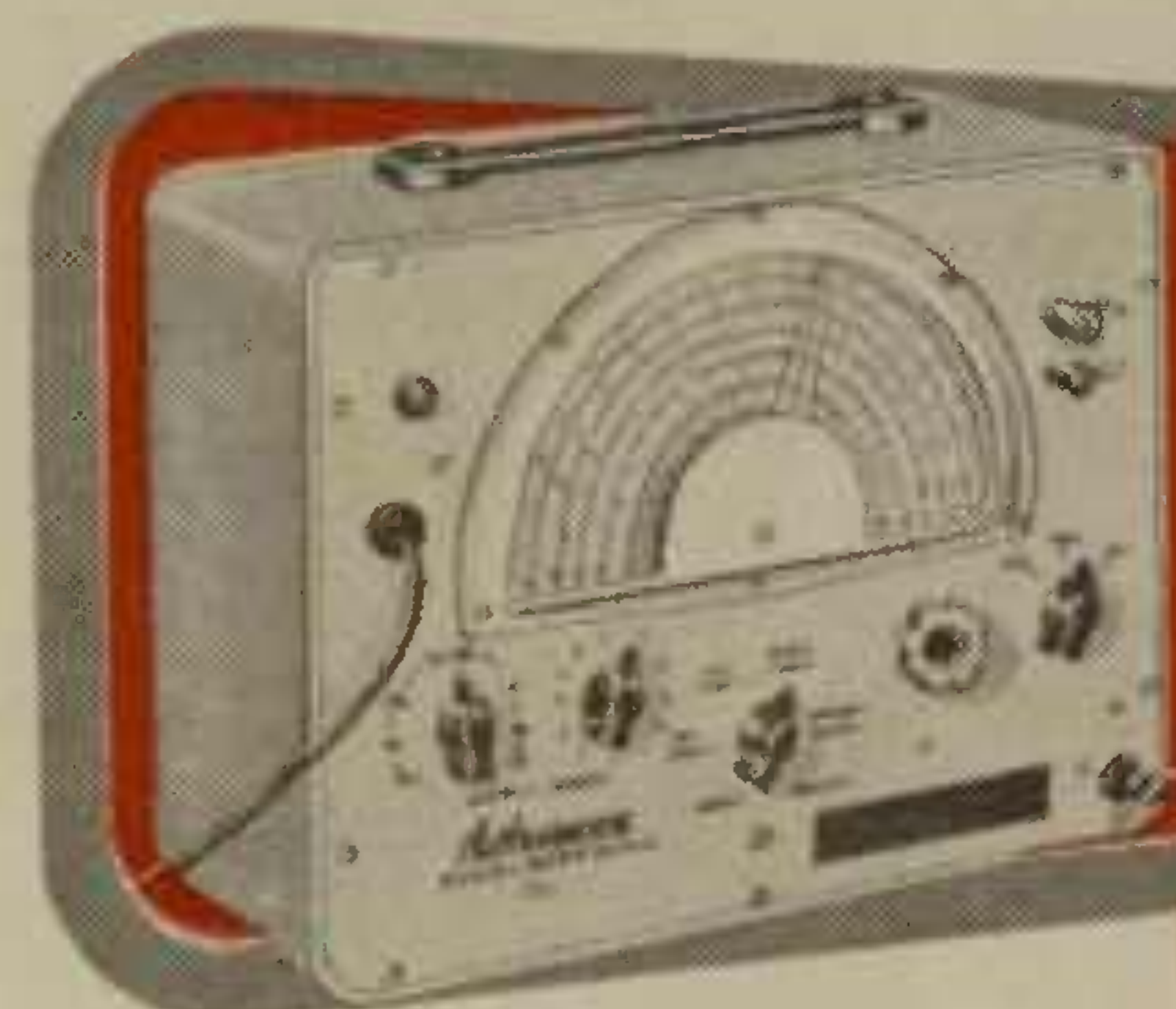
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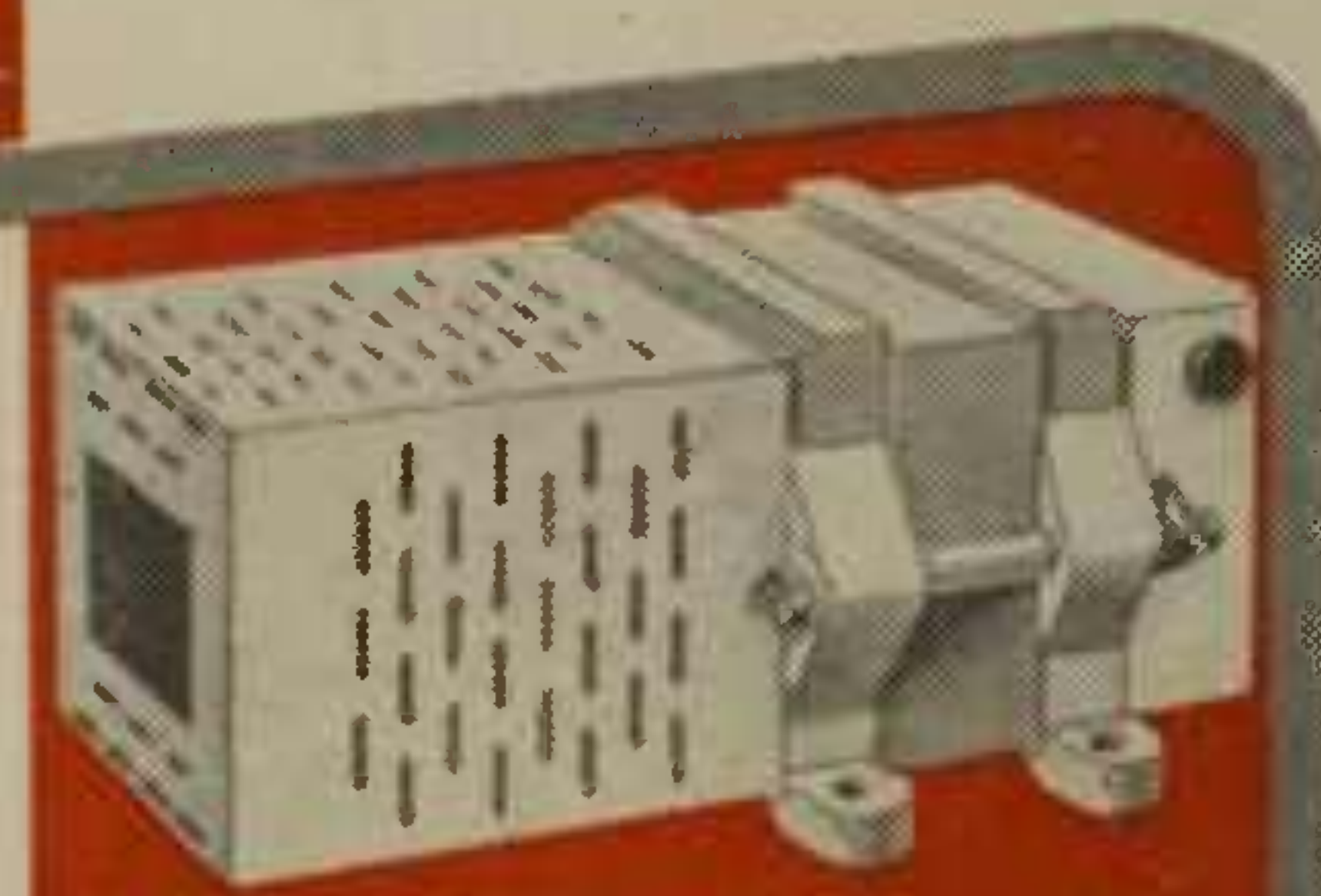
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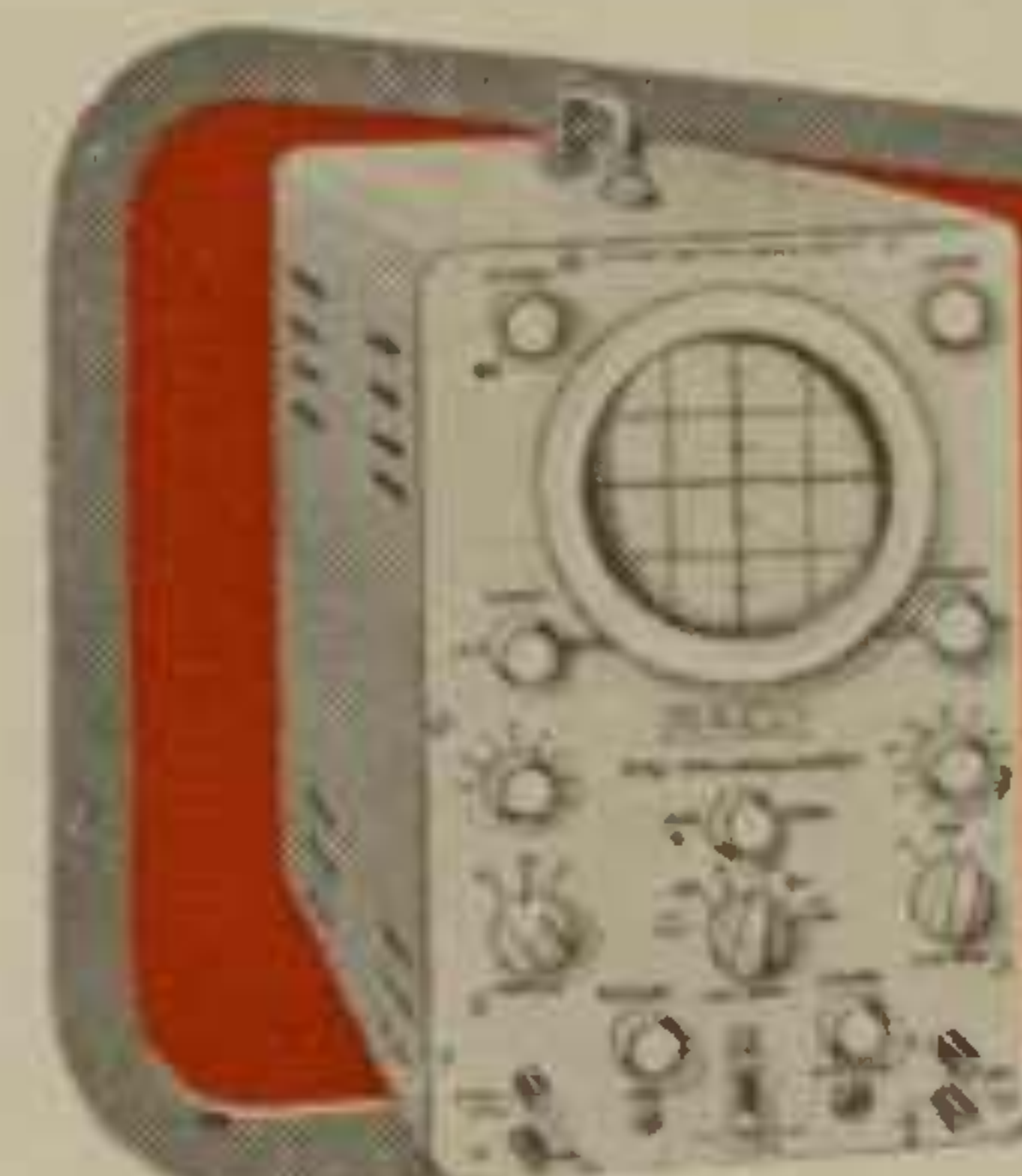
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