

RADIO *and* ELECTRICAL

TELEVISION — COMMUNICATIONS — SERVICE — SOUND

Vol. 15, No. 3

MAY, 1960

Registered at the G.P.O., Wellington as a newspaper.

Review

PRICE **2/3**

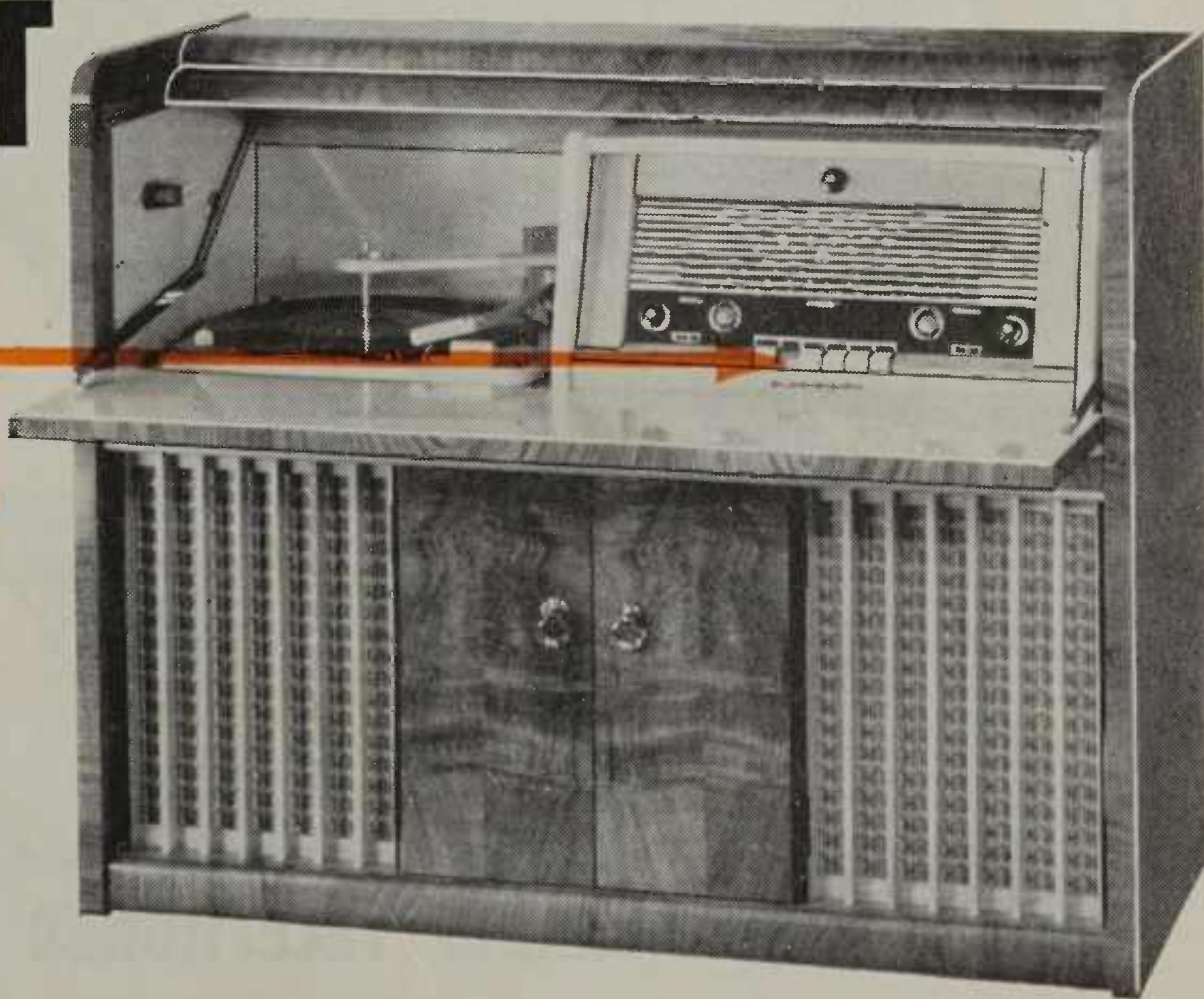
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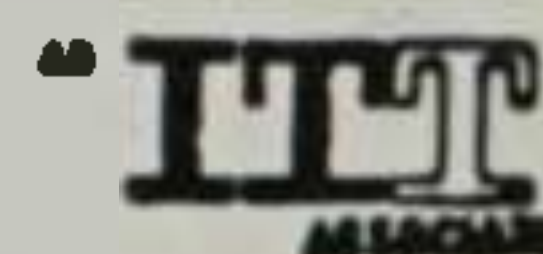
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Radio and Electrical Review

Vol. 15, No. 3

MAY, 1960

Official Journal of
The New Zealand Electronics Institute
(Inc.).
The New Zealand Radio and Television
Manufacturers' Federation.
The New Zealand Radio and Television
Traders' Federation.
New Zealand Radio, TV, and Electrical
Trades' Association (Inc.).

Managing and Technical Director:
W.D. FOSTER, B.Sc.

Subscriptions:

2s. 3d. per copy; 27s. per annum, posted.
Advertising Rates supplied on application.

CORRESPONDENCE

All correspondence and contributions should
be addressed to:

The Editor,
"Radio and Electrical Review",
P.O. Box 6361,
Wellington, New Zealand.

OFFICES AND LABORATORY:

48 Abel Smith Street, Wellington.
Radio and Electronics (N.Z.) Ltd.
Telephone: Wellington, 52-343.
Telegrams and Cables:
"Radel", Wellington.

SOLE ADVERTISING REPRESENTA-
TIVES for THE UNITED KINGDOM:
Cowlshaw and Lawrence (Advertising),
Ltd., P.O. Box 656, 14-16 Ludgate Hill,
London, E.C.4. Telephones: City, 3713.
Cables: Cowlawads, London.

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TRADING BY PUBLIC BODIES

It was reported recently in the Wellington newspapers that the Wellington City Council had decided to re-commence, after a lapse of some years, the trading in electrical appliances by the city's electricity department. This decision is one which will concern vitally radio and electrical dealers both in the capital and throughout the country. For some years now the retail trade in other centres has had to contend with this kind of competition, and at least one concerted approach has been made to the Government on the subject of prohibiting, or at least limiting its scope.

That there is some measure of unfair competition with the established retail trade when power boards and similar public bodies enter the trading field can hardly be denied. Indeed, the discussion of the resolution referred to above made it clear that some council members recognized this fact, but the weight given to the point cannot have been great, for it did not prevent the resolution from being carried. The question of degree of unfairness is a difficult one to resolve, and there are naturally those who contend that if any degree of unfairness can be proved, then the practice ought to be abolished. If any section of the trading community can show that its business is being adversely affected, it would seem that the case for legislation against trading by public bodies is a just one. The fact that some traders are less affected than others has no bearing on the justice of the case.

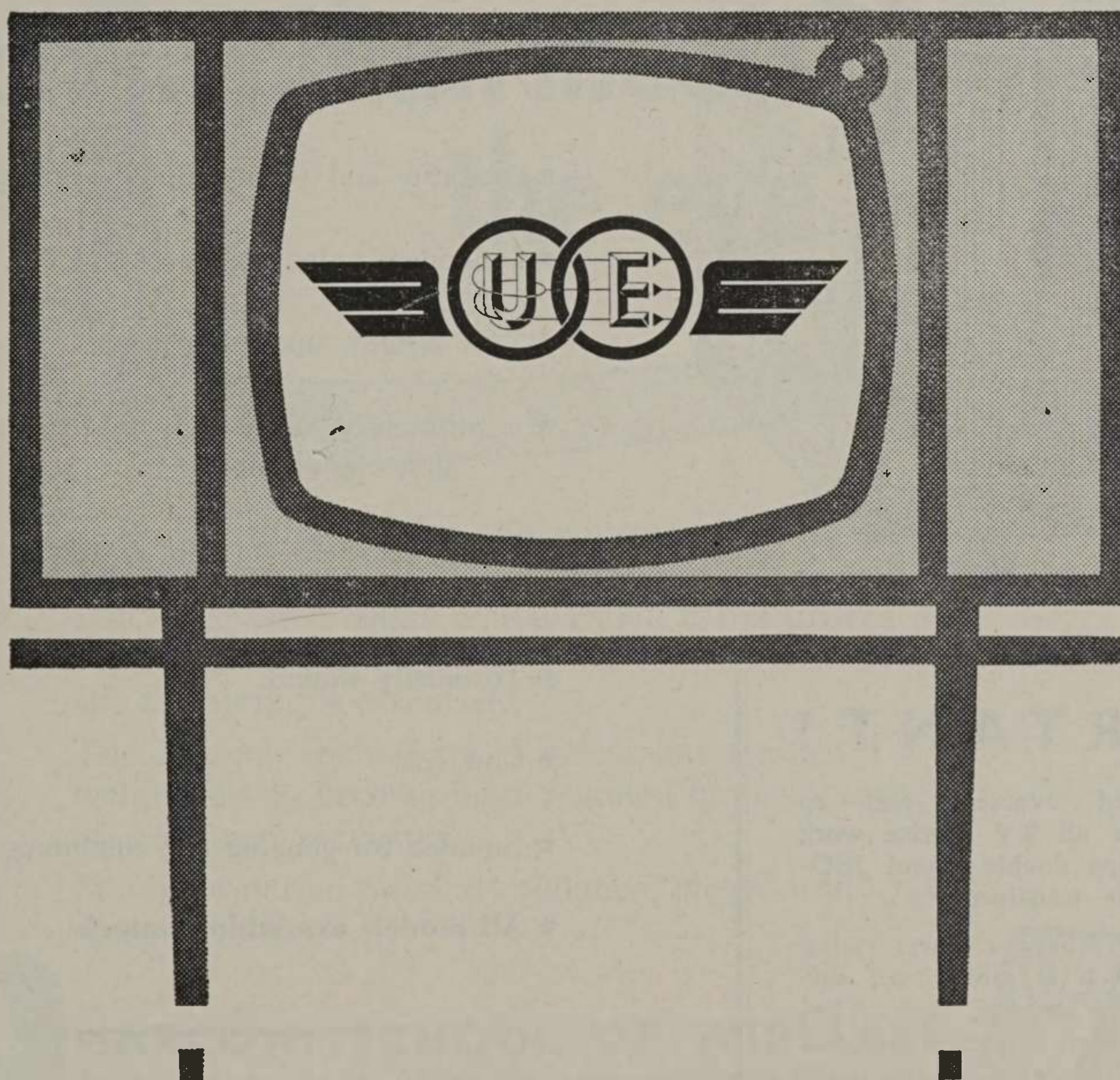
Wherein, then does the unfairness of public body trading lie? For one thing, in the fact that public bodies do not pay income tax or company tax. Their operations must therefore be inherently more profitable than those of the private trader. Another point that is often forgotten is that power boards, for example, are able to apply profits resulting from their overall operations to such purposes as building new premises, of a nature that only very large private businesses could afford, part of which are applied to the business of appliance sales. The power board trading in appliances is able, if it wishes (and some actually do this), to devote space to display purposes that few private businesses could afford—not because the board concerned has had to find the capital and run its appliance dealing as an efficient and separate business, but because no one can prevent it from appropriating to that purpose funds that have been made available to it for an entirely different purpose—the distribution of electric power to the community. It would take a fairly flexible imagination to conceive that the sale of appliances by the power distributing authority is necessary for the efficient carrying out of its functions.

There are other aspects of public body trading which add to the unfair nature of its competition with the established trade, but the above points should be enough to prove our point—namely, that there is more than an element of unfairness in the practice.

This being so, it is to be hoped that the Wellington electrical and radio dealers will not let the matter rest where it now is. It could do no harm, and may do a deal of good if those likely to be affected submitted a case to the City Council against the re-establishment of trading activities by their electricity department. Even if no immediate success were gained, the matter is one which should be ventilated. For example, the matter is one in which the recently constituted Trade Practices Commission should interest itself, but there is little likelihood of this if nobody brings it to their attention.

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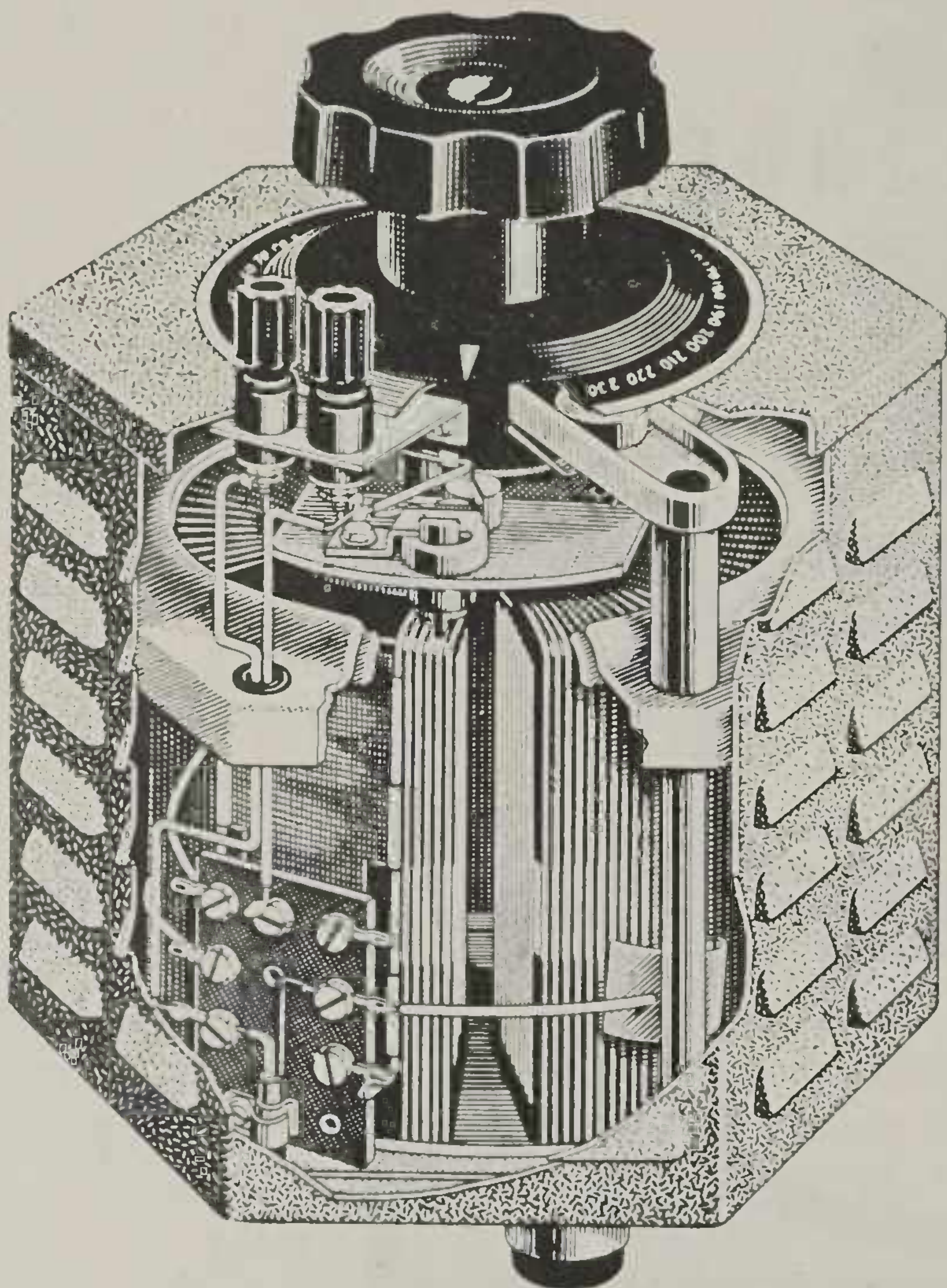
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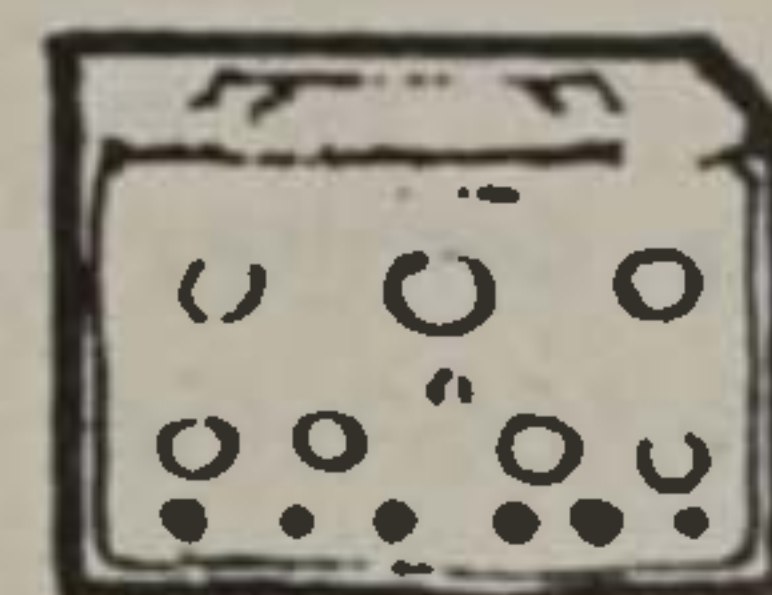
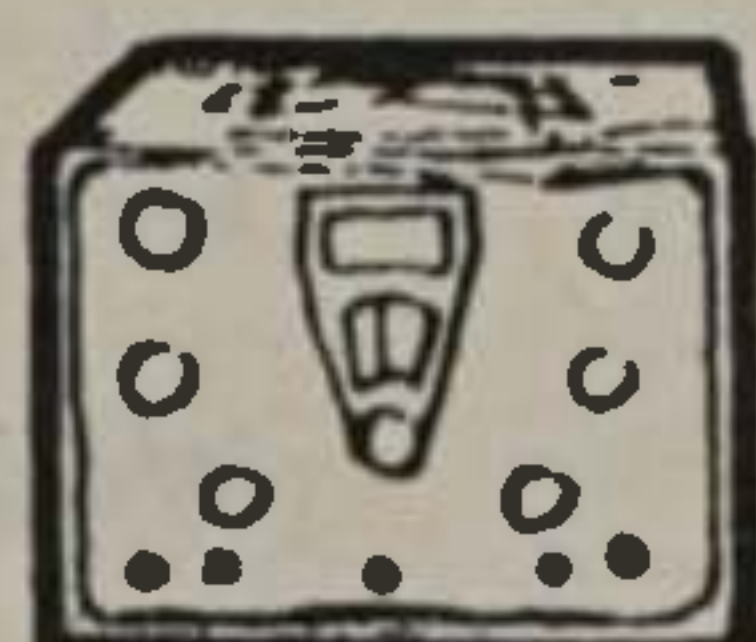
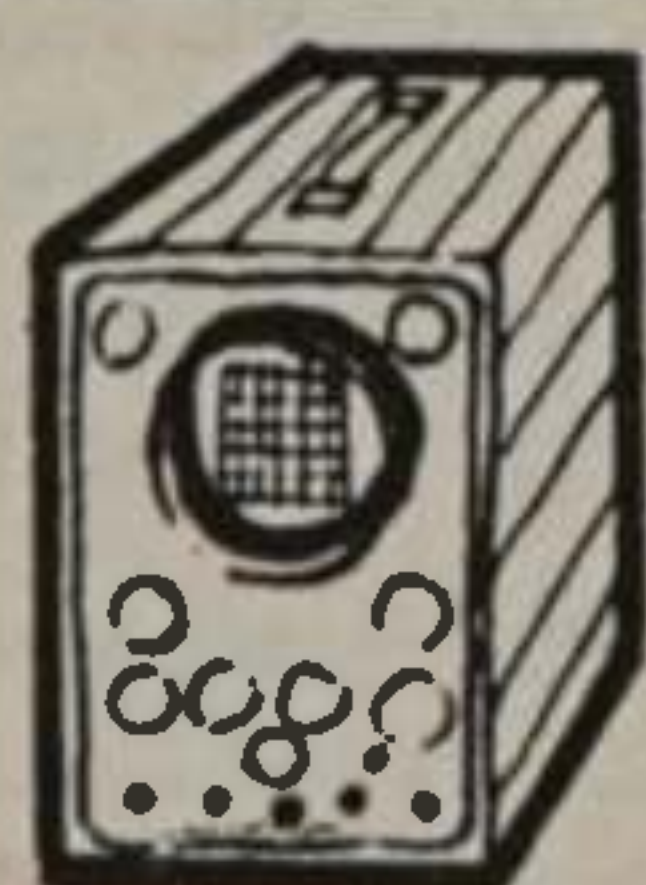
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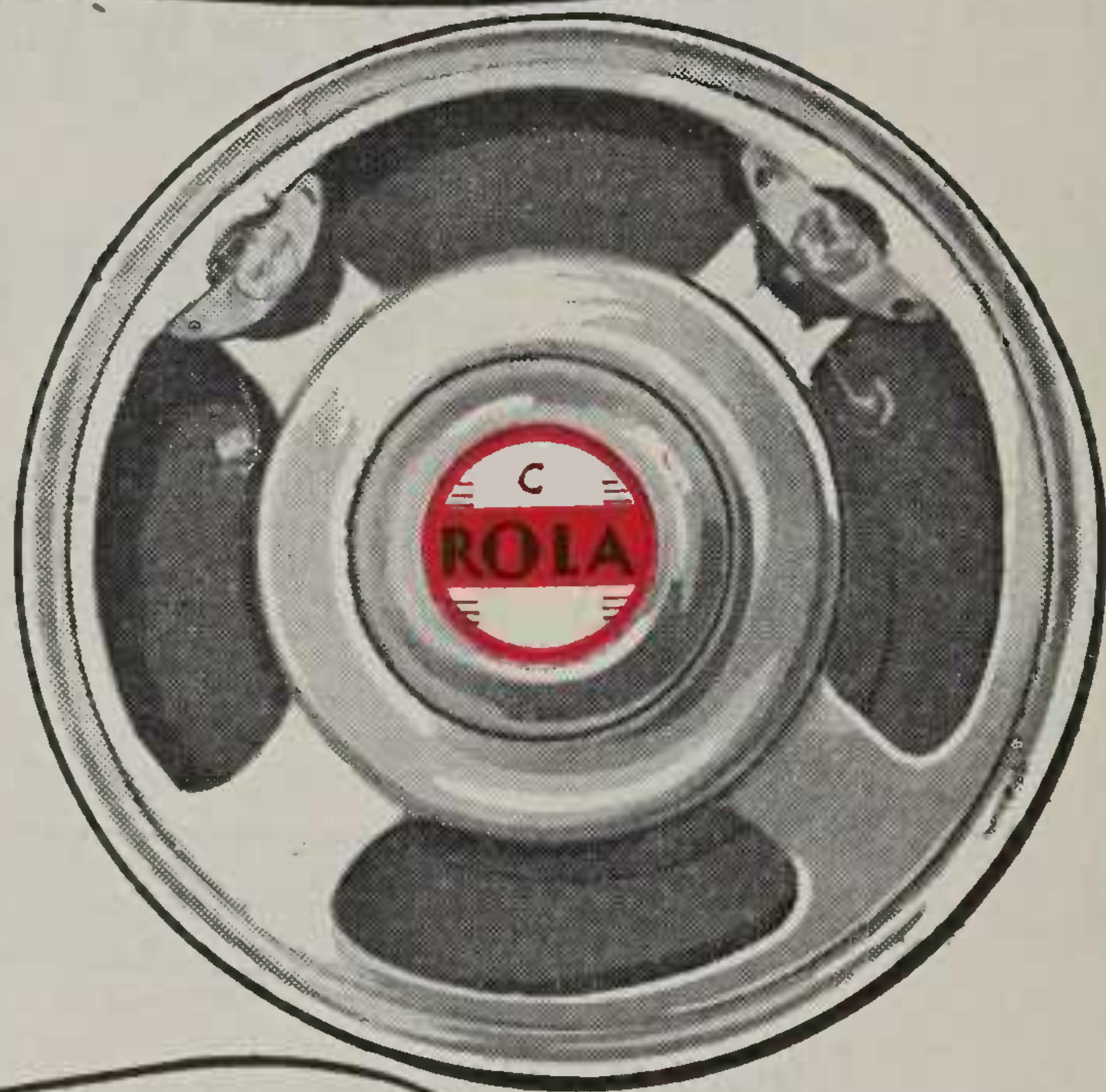


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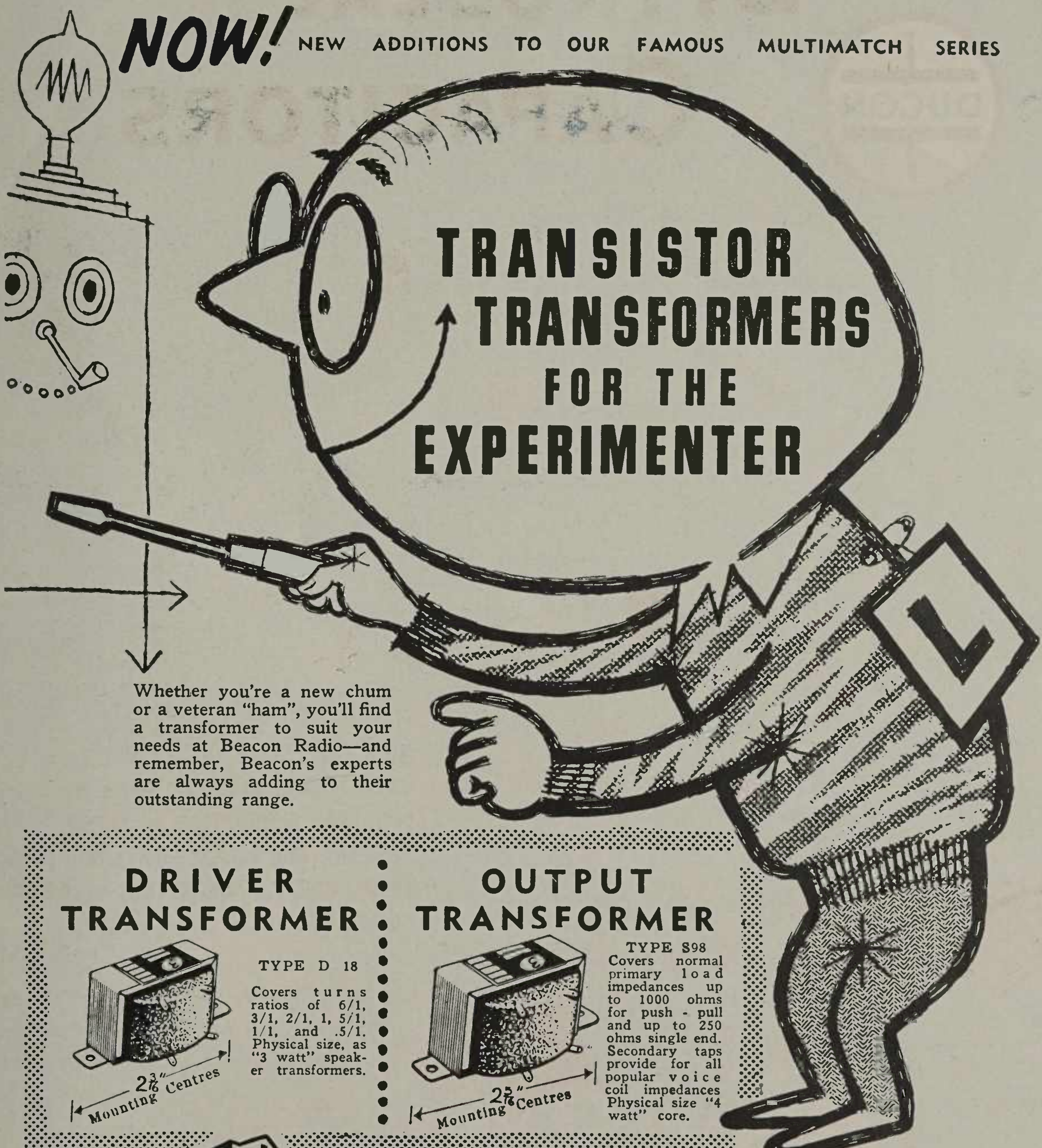
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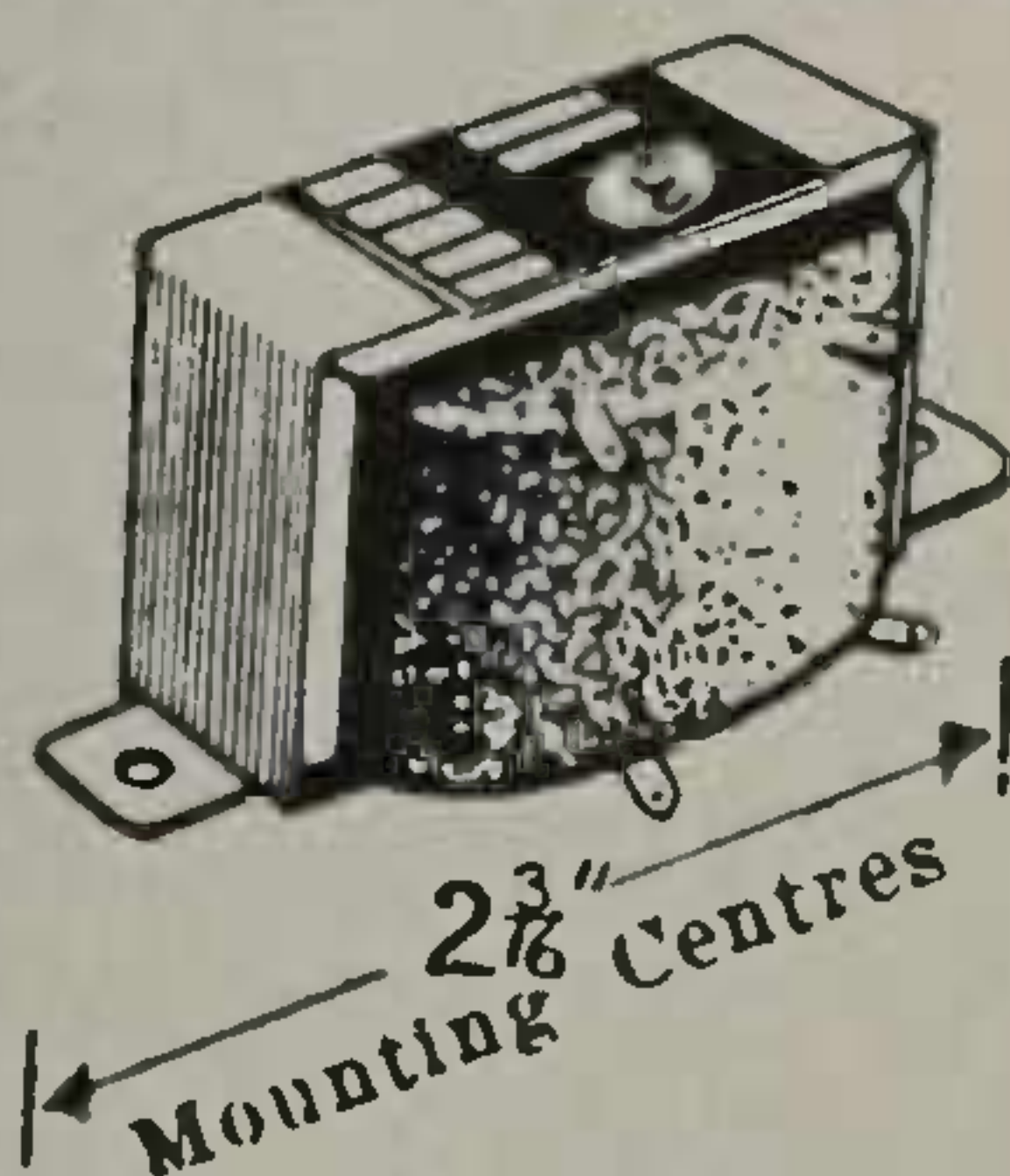
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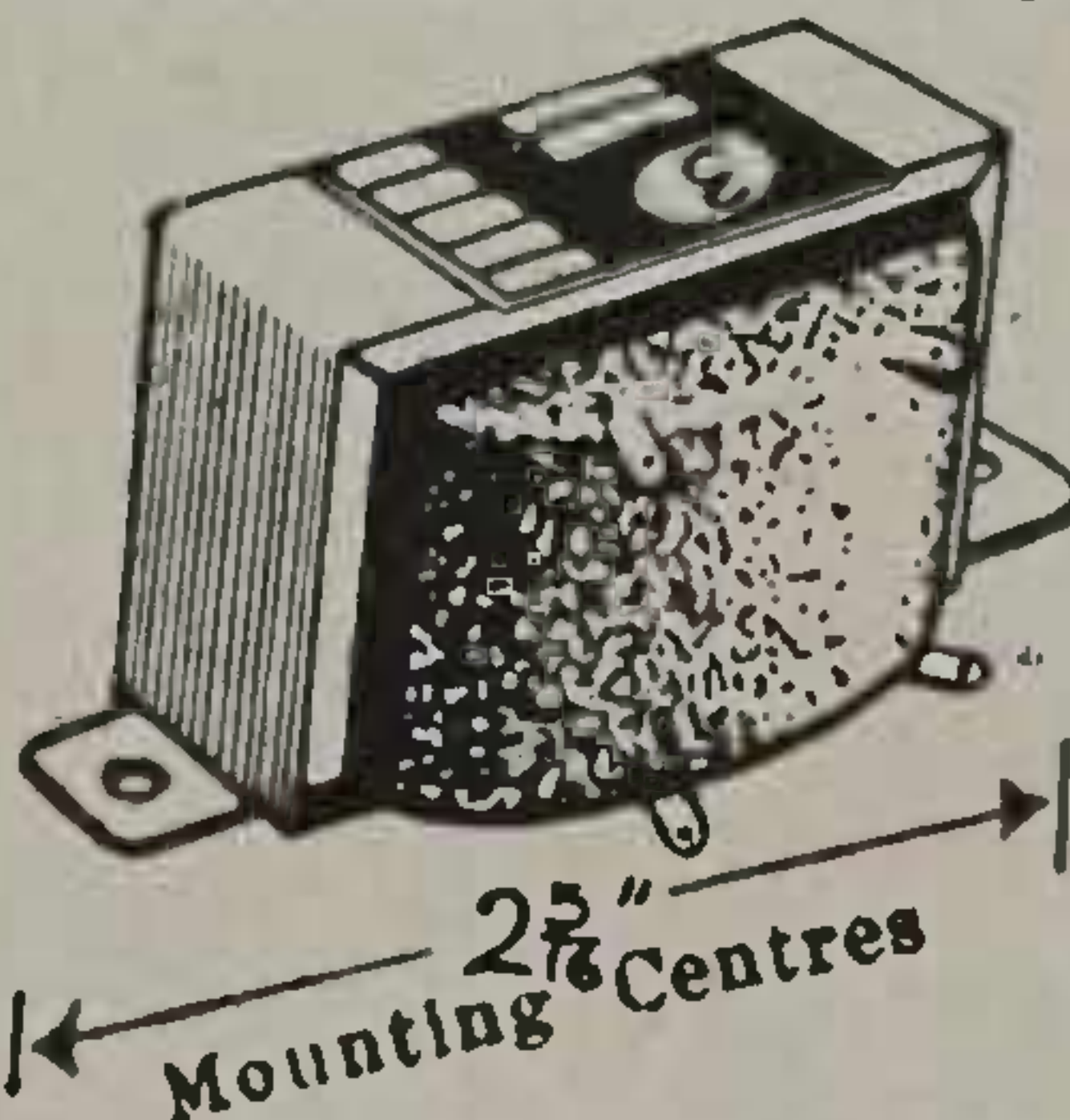


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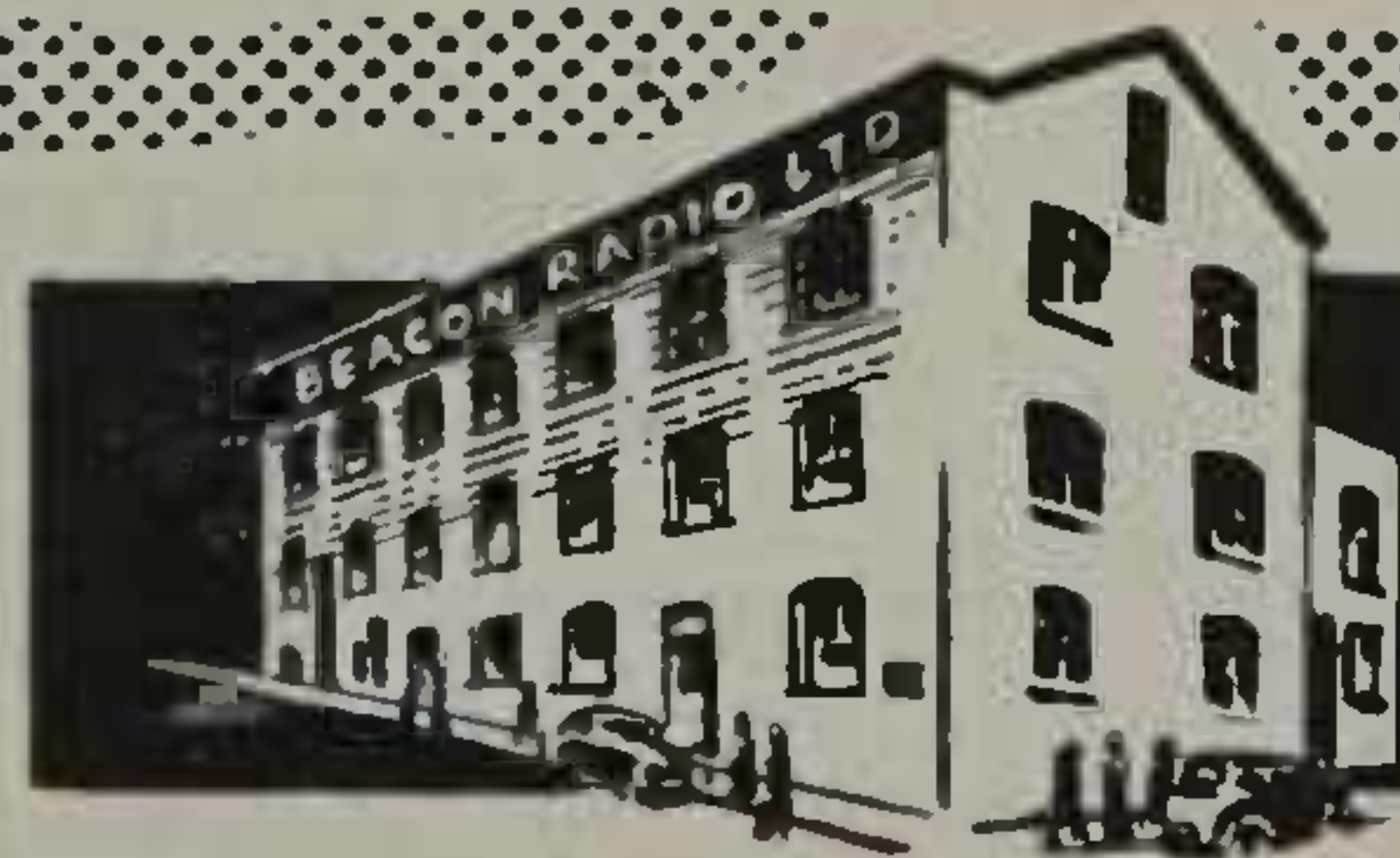
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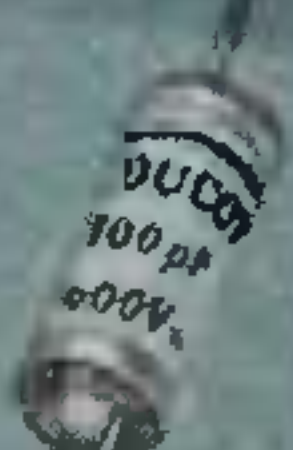
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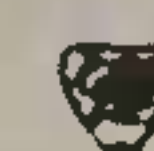
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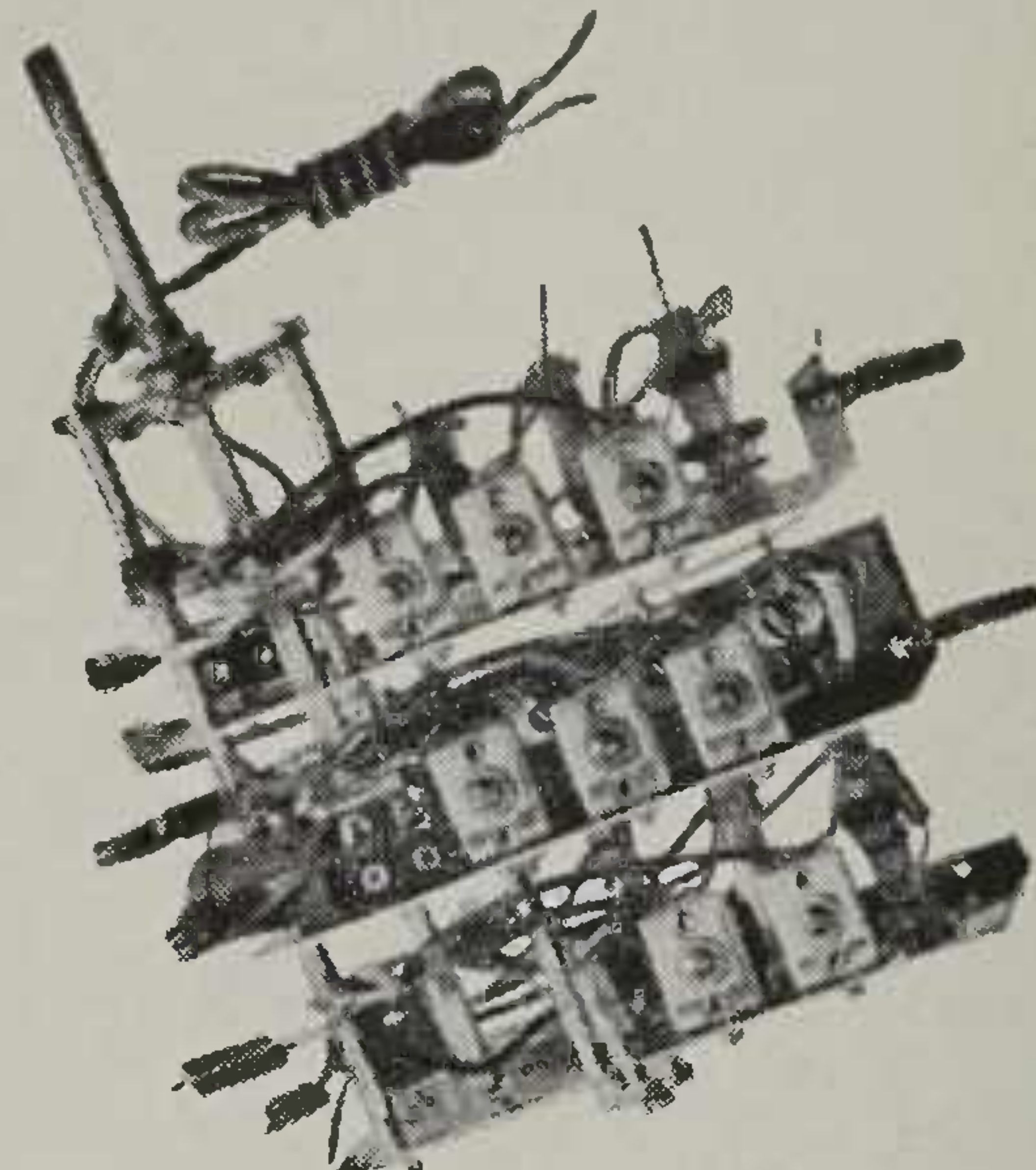
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IMPORTANT NEW RADIO AND RADAR EQUIPMENT

By DEREK HARVEY, writer on aviation, who was among the first pilots in Britain to test jet aircraft.

For some time now, the Royal Aircraft Establishment at Farnborough, in the English country of Hampshire, has been the site of the most famous display of aircraft and aero engines to be held anywhere in the world. Last year, no fewer than 8000 technicians, scientists, Press representatives, pilots, military leaders, and airline executives from overseas countries attended the show as official guests of the Society of British Aircraft Constructors, while public attendance exceeded 250,000.

But by no means all the visitors went to see the aircraft. The range of electronic equipment, which over the past few years has been playing such a rapidly increasing part in world aviation, attracted considerable attention. And at the Society's 20th Flying Display and Exhibition in September, 1959, as much emphasis was placed on radio and radar as on the aircraft and missiles they guide.

To Measure Wind Velocities

The largest exhibit of this kind—indeed, one of the largest radars ever taken to Farnborough—was the huge Decca H.F.200, a high-power ($2\frac{1}{2}$ megawatts) nodding height finder operating in the S-band (10 centimetres). With fast automatic slewing, an ingenious hydraulic nutation system which automatically restricts the sweep of the reflector to the minimum angle necessary to illuminate the targets, and with very high altitude coverage made possible by a maximum vertical sweep of some 36 degrees, the H.F.200 has been developed for either defence or civil use in conjunction with the new early warning, high cover, plan radars now coming into service.

Primary radar is also proving the most economical way of obtaining upper wind data for aviation and forecasting, and both Decca and Cossor showed operational equipments designed specifically to allow meteorologists to measure wind velocities at heights up to 25 miles (40 kilometres) and ranges as much as 125 miles (200 kilometres).

In the field of surveillance radar, Marconi exhibited a model of the well-known long-range Type S.247, which features two high-power transmitters back-to-



Ferranti airborne radar and fire control equipment known as AIRPASS was on view to the public for the first time when the annual Flying Display and Exhibition of the Society of British Aircraft Constructors was held at Farnborough, Hampshire, England. AIRPASS being loaded into the nose of a Canberra for test.

back, one ten centimetres and one 25 centimetres, feeding a combined aerial system to provide continuous cover on a target the size of a modern airliner up to a height of 75,000 feet (23,000 metres), with a range of 250 miles (400 kilometres).

Airfield surveillance radar was represented by the Cossor CR.787—an improved version of their successful CR.21, fitted with moving target indicator (M.T.I.) for cancelling permanent echoes so that aircraft can be observed even when flying over mountainous country or built-up areas, and also embodying a rain cancelling quarter-wave plate—and by two new Marconi 50 centimetres equipments developed from those currently operating at London and other international air terminals. These are the S.264 (50 kilowatts), one of which was recently installed at Jersey Airport, and a 500 kilowatts version embodying a high-gain power Klystron—the first to be available in production radar equipment—of the type which recently came into service at Rongotai, New Zealand.

New Surveillance System

Other radars shown at Farnborough last year included the component units of a new secondary surveillance system developed by Cossor, whose engineers

have played a leading part in securing its adoption by the International Civil Aviation Organization (I.C.A.O.) for Air Traffic Control purposes. The Type 4G ground interrogator-responder equipment meets all A.T.C. requirements, including sidelobe suppression, the omnidirectional and directional radiation being produced by a 30 ft (nine metres) aerial.

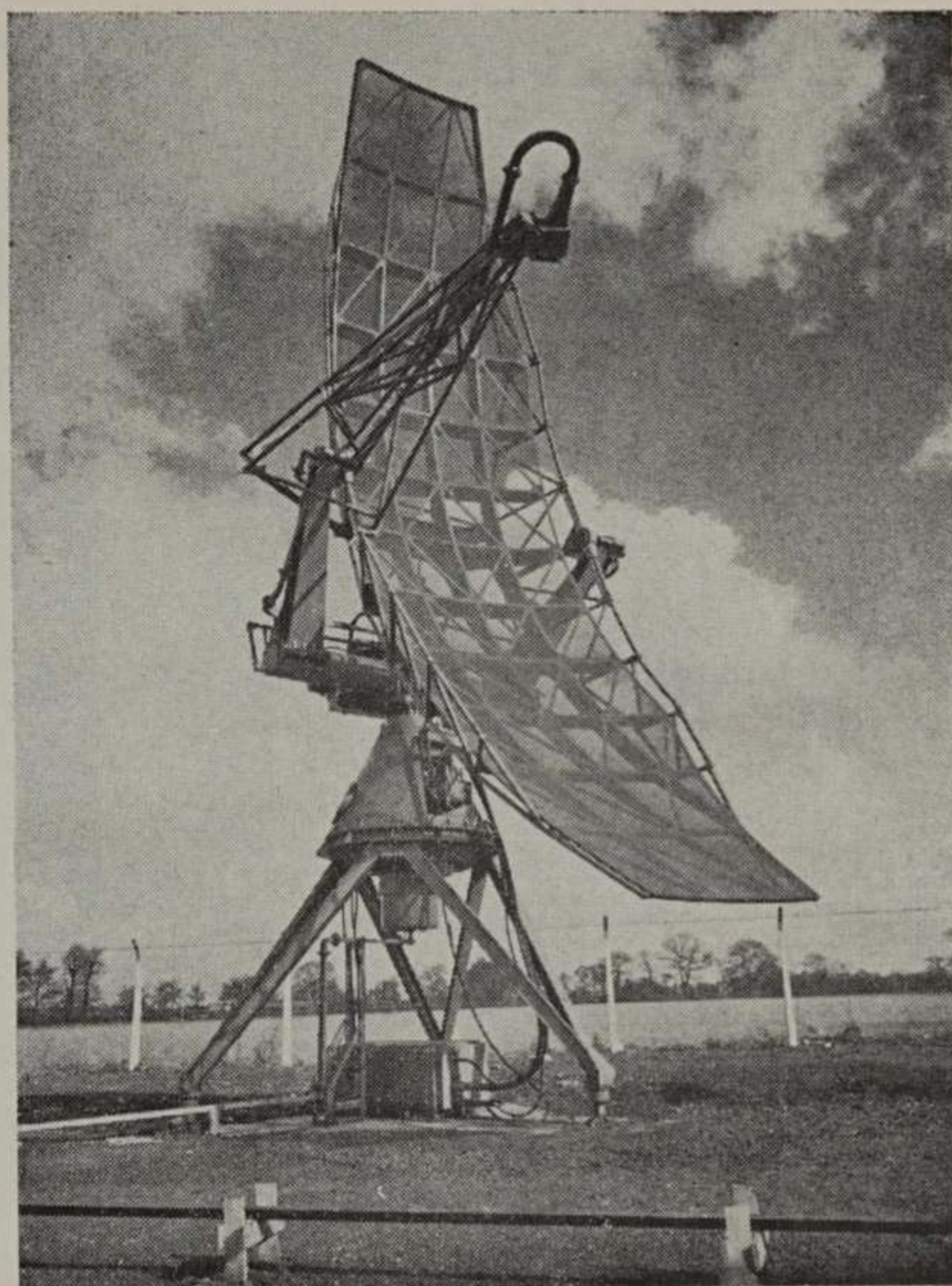
This can be either rotated independently or slaved to a primary radar, and similarly the transmitters can either be set to run independently or to accept a trigger from a primary radar. The airborne transponder in this system weighs only 21 pounds (9.5 kilograms), lightness and low power consumption having been achieved by the extensive use of transistors for the pulses-switching circuits and of magnetostriction delay lines for the encoding and decoding circuits.

Transistors are also used by Ekco in the new airborne weather radar, which made its first public appearance. With a range of 150 miles (240 kilometres), the complete equipment weighs just 56 pounds (25 kilograms), less than half that of previous systems of similar performance. Dispensing with the conventional synchronizer and control assemblies, it uses only three main units—an indicator using an angled polaroid filter and a five by three inches (13 by eight centimetres) tube operating at high voltage (18 kilovolts) to give high brightness, and displaying the full range throughout the 180-degree azimuth sweep; a 15 kilowatts "X"-band transmitter/receiver; and a scanner with a 24 inches (61 centimetres) fully stabilized antenna giving switchable pencil/cosec² beam distribution.

On Russian Test

Among the other airborne aids on show were the latest Decca Navigator Mark 10 receiver, which has been engineered to 1½ ATR specification for ARINC racking, without any major changes in components or constructional technique. This is the equipment which is now being fitted for a trial period to two TU 104 jet airliners of the Russian airline "Aeroflot", who have selected it on the grounds of its technical superiority over the American sponsored VOR/DMET system. Decca are also exhibiting a miniaturized receiver, the whole installation weighing less than 30 pounds (13 kilograms) which will, no doubt, interest light aircraft owners.

A further centre of attraction was the Marconi Doppler Navigator, which was mounted in a special display enabling the visitor himself to "fly" two legs of a track. Providing such information as ground speed, drift angle, miles (kilometres) to go, and steering instructions to the pilot's direction indicator or to the autopilot, the AD.2300 comes into operation at take-off and remains fully effective up to 50,000 ft (15,000 metres) and angles of bank up to 30 degrees, with a ground speed range from 80 to 900 knots (150 to 1670 kilometres per hour).



Some of the most exciting exhibits at the 20th annual Flying Display and Exhibition of the Society of British Aircraft Constructors at Farnborough, Hampshire, England (September 7 to 13) were the radar developments for navigational and blind landing purposes. This is the aerial system of the Decca nodding height finding radar which was on operational view.

The Crash Position Indicator from Ultra Electric is another example of the interesting equipments developed during the past year. Based on the well-known SARAH search and rescue homing transmitter already in service with Commonwealth and North Atlantic Treaty Organization air forces, the new device is constructed over a thin plate aerial and embedded in tough plastic foam, in the shape of an aerofoil, which becomes an integral section of the aircraft fuselage. Crash impact releases the aerofoil, which is hurled away from the aircraft and automatically begins transmitting, with a range of 70 miles (112 kilometres). It operates successfully immersed in water or marsh, and ensures that in fog or low cloud, searching aircraft or ships which at present sometimes pass close to survivors, cannot fail to locate their position.

Fully Automatic Landing

But, perhaps the most exciting exhibits of all were the various components of "Autoland", the fully automatic landing system developed by The Blind Landing Experimental Unit of Britain's Ministry of Supply,

(Concluded on page 26)

A TAPE RECORDER FOR USE WITH RADIO-GRAMOPHONES

Introduction

In our last issue, we printed a short article on how to integrate a tape recorder with the complete home audio system, comprising radio and gramophone playing facilities. The present one is a logical follow-on from that article, as it shows one method of actually doing the physical job of installing a tape deck and associated circuitry in an existing radio-gram cabinet. We have taken the unusual course, for us, of illustrating at the outset the complete equipment, rather than describing the circuitry first and the mechanical lay-out afterwards.

The reason for this is that many readers may wish to take advantage of the suggested mechanical arrangement of this recorder, without necessarily using the same deck, or even the same circuits. In short, the mechanical ideas presented are applicable to any deck or circuits, and could even be put into effect by dismembering a commercial tape recorder!

The Basic Idea

The idea behind this lay-out is that it is sometimes possible to build the tape recorder into existing equipment, by the simple means of doing away with some or all of the record storage space. At first this might not seem to be an attractive idea at all, because it involves finding somewhere else to house the records evicted from the cabinet, but a little consideration may easily show that housing the records separately, and building in the tape recorder is rather more logical and convenient than the other way about, namely, having the recorder separate from the rest of the equipment. If this is resorted to, there is the ever-present problem of flying leads, general untidiness, and inconvenience in operation. And, as we have remarked before, any device which is inconvenient to operate will simply become disused!

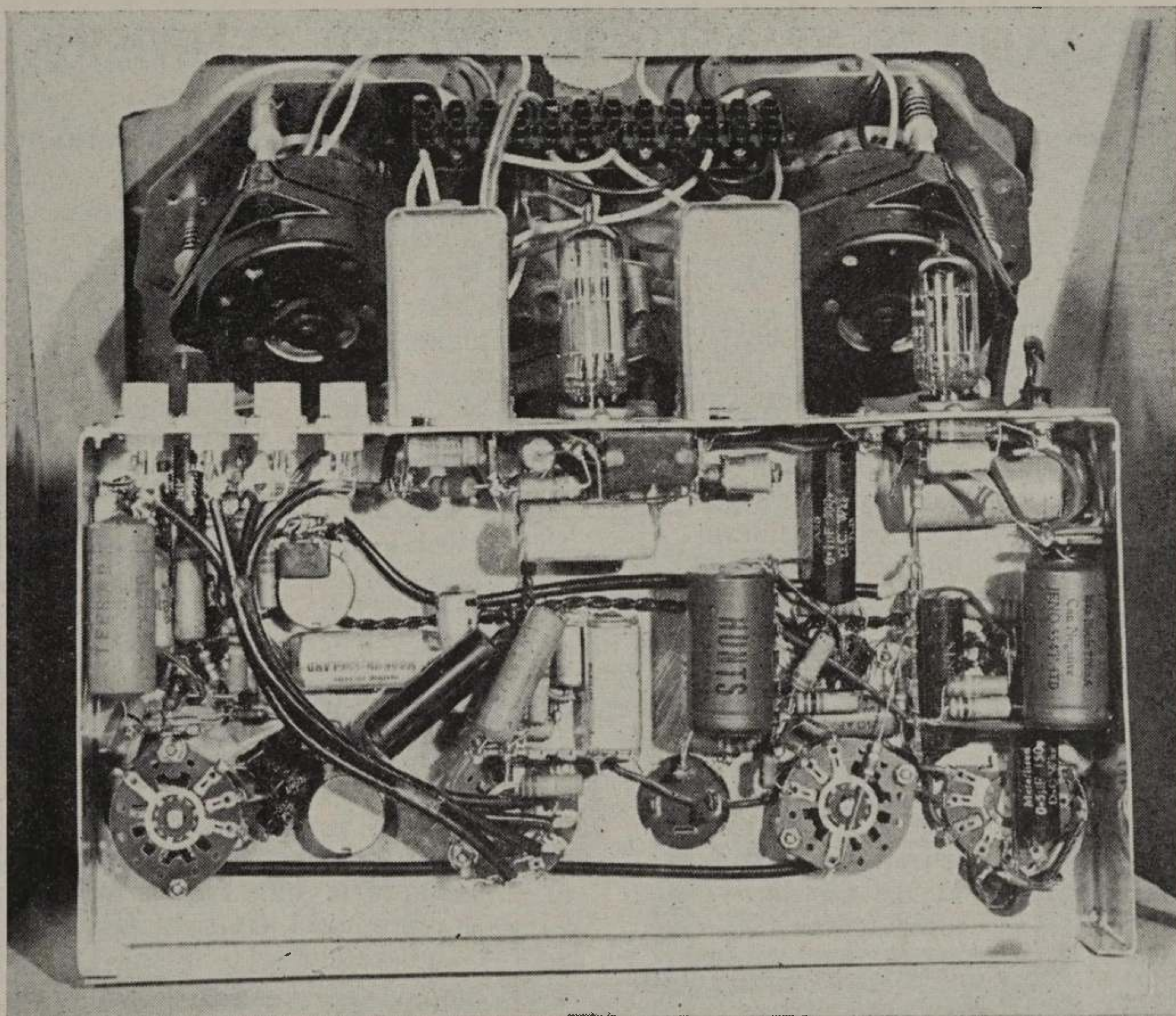
Some Sizes and Figuring

In order to bring the idea contained in the paragraph above a little nearer reality, it was decided to build an actual example, using a modern tape deck that has been fairly readily available of recent months. We refer to the new Collaro "Studio" deck. Unlike previous machines from this maker, this is a one-way deck, in which the reels must be turned over in order to play the second track. While the operating



convenience of this is less than when one only has to push the appropriate buttons to get either track, the complication of the necessary switching is eliminated altogether, which makes for a much easier constructional job for the builder. Naturally, too, the less complicated deck is not as expensive as the other.

How, then, do we get on if we take this (or another) deck, and try fitting it into a space in a cabinet originally intended for record storage? Needless to say, it depends more than anything on the size of the compartment concerned, but this answer is not very helpful! Unfortunately, the scheme illustrated here is applicable only to cabinets which have a fairly large record-storage space, of the kind in which the records are stacked on edge, in compartments usually made by subdividing the available space with plywood partitions. First of all, however, it should be pointed out that the playing deck illustrated is by no means as small as it could be. There are other tape decks that could be used which are actually smaller than the Collaro, but this deck itself has an unusual facility. The take-up motors, on whose spindles reels of tape can be accommodated entirely within the confines of the deck itself. This means that in operating condition, the maximum space taken up by the deck is 10½ in. x



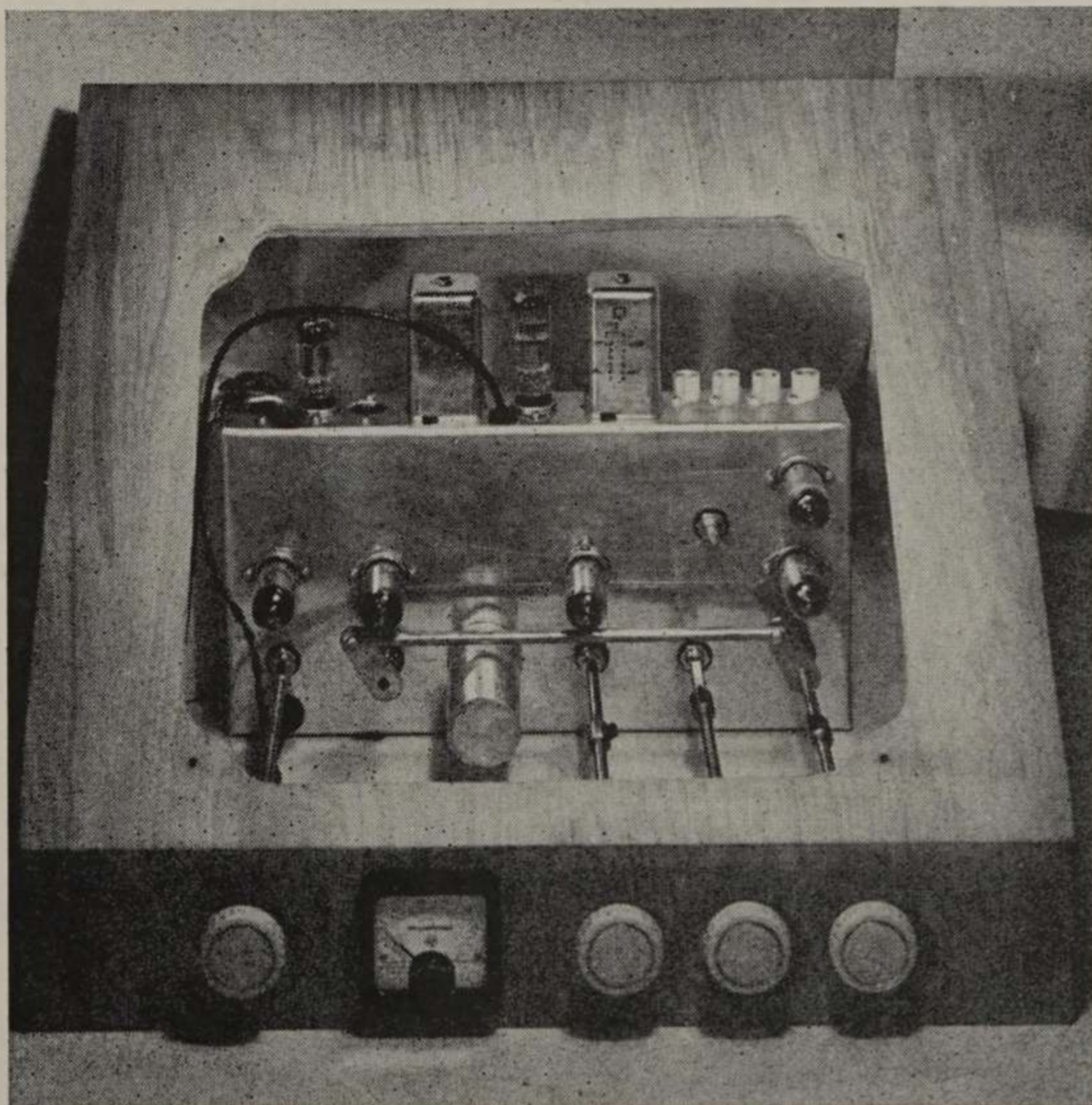
12½ in. Thus, the maximum width need not be greater than 12½ inches. The deck illustrated is a full 17 inches wide, not for any good reason, but because that was the space that had to be filled up in the prototype installation. With the reel spindles in the position shown, the deck will take 7-inch reels, which, however, overlap the deck by ¾ in. at both sides and at the back. In this condition, the minimum width is 14 inches, and the minimum depth 11¼ inches.

In the kind of record compartment we have described, the depth from back to front, and the height, is usually almost exactly 13 inches, since the space has to house 12-inch records, with some allowance for covers, and thickness of the plywood. Thus, there is plenty of room in these directions. The deck illustrated was exactly 13 inches high, but it is less than this from front to back, and the chassis containing the circuits does not go farther back than the wood of the deck. The main consideration, then, is that of width, since the other dimensions are more or less fixed.

Slope of the Panel

With the 13 inches of head-room that is available, it would be possible to mount

(Concluded on page 32)



ATLANTIC IS SPANNED BY BRITISH TELEVISION

Pictures of the Arrival of the Queen in Canada Test a New Invention

By a leading London radio technical writer.

The departure from London Airport of Queen Elizabeth II and the Duke of Edinburgh on their flight across the Atlantic to Canada to perform the opening ceremony of the St. Lawrence Seaway was used by the Engineering Division of the British Broadcasting Corporation to introduce a new system of transmitting television news pictures which it had successfully developed.

Secret of the new system enabled a circuit of the transatlantic telephone cable normally used for sound, to be used for television picture transmission. When the Queen left London Airport, television viewers in Canada and the United States saw pictures of her boarding her aircraft almost as soon as they were seen by viewers in Britain. Pictures of the arrival at St. Johns, Newfoundland were on view in Britain that evening only a short time after the aircraft touched down.

Because of the difference in time between Britain and Canada, the pictures of the departure were being viewed on the west side of the Atlantic earlier than the time shown on clocks when the pictures were taken. The new system has speeded up transmission of pictures 75 times over previous methods of sending still pictures by facsimile transmission.

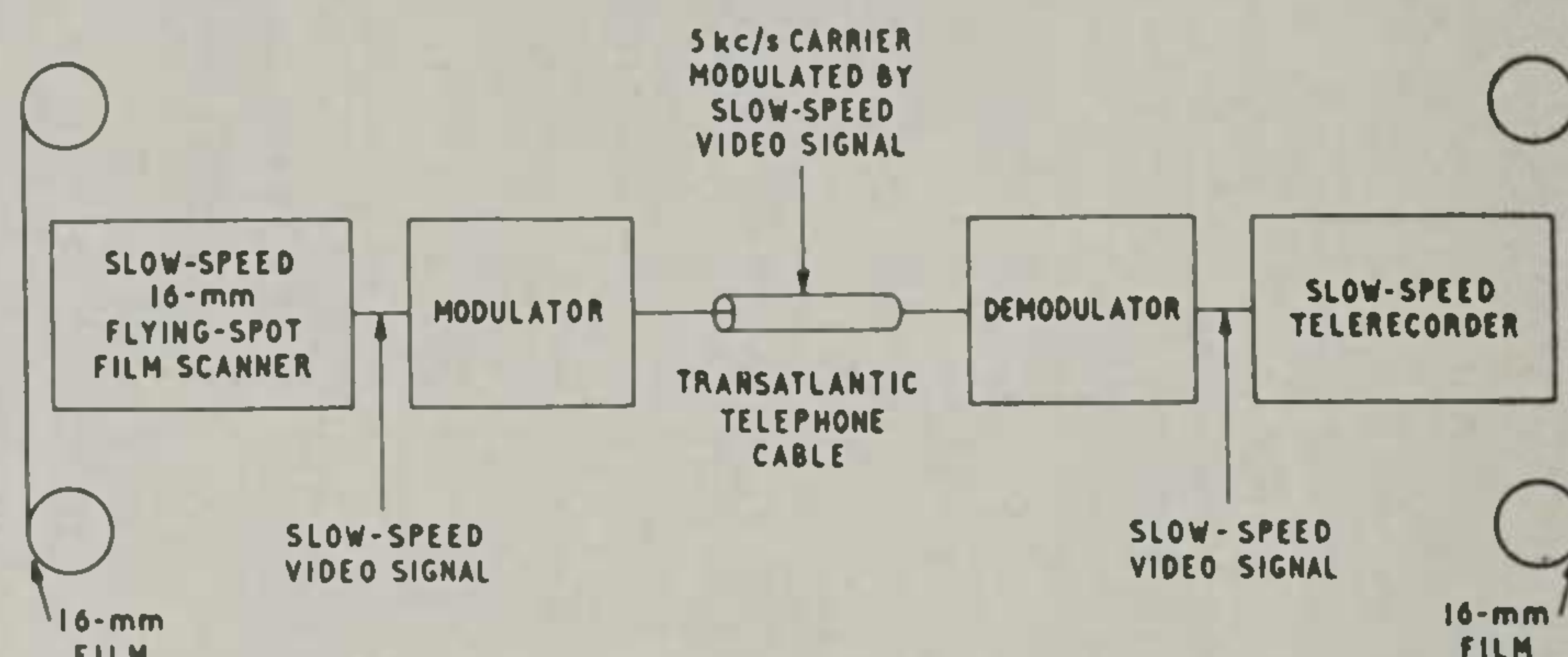
The system has been primarily developed for transmitting brief television news picture sequences and other short television film sequences of up to one minute's duration.

The process employs a slow-speed flying-spot film scanner, the video signal from which is used to modulate a carrier for transmission over the cable. At the receiving end the signals are demodulated and used to operate a slow-speed film telerecording equipment.

Design Problems

Consideration of the characteristics of the Atlantic cable indicated that a maximum video frequency of 4.5 kc/s could be used. It was therefore necessary to effect as many economies in the bandwidth of the video signal as were compatible with acceptable picture quality. The economies made were:

- (i) Restriction of the horizontal definition to that corresponding with a bandwidth of 1.75 Mc/s in the 405-line television system.
- (ii) A reduction to 200 lines using sequential scanning.



The arrangement of the equipment used by the Engineering Division of the British Broadcasting Corporation for its new system of transmitting television pictures by transatlantic telephone cable.

- (iii) The scanning at the transmitting end of only alternate film frames with each frame-scan reproduced on two adjacent film frames at the receiving terminal.

These measures result in reducing the 3 Mc/s bandwidth of the British television system to approximately 450 kc/s, the remainder of the bandwidth reduction being obtained by a decrease of the scanning speed until the maximum video frequency corresponds with the available 4.5 kc/s upper limit. The time required to scan the film is approximately 100 times normal and thus a half-minute news flash takes approximately 50 minutes to transmit.

Sixteen millimetre film was chosen because it is almost universally used for television news. The average length of television newsreel sequences is less than half a minute and the new system makes it possible to transmit facsimiles of these sequences in much less time than it would take to fly them across the Atlantic.

The effective picture repetition frequency of $12\frac{1}{2}$ per second resulted in satisfactory reproduction of most material excepting that in which rapid movement occurred. Special provision was made for the transmission of every frame of the original film. This doubled the transmitting time.

Transmission Over the Cable

The new system used a channel of the type normally used for transmitting music over the cable; such a channel having a nominal bandwidth of 6.4 kc/s. To limit the variation in the group delay/frequency characteristic to a value which could be corrected, it was necessary to restrict the usable video bandwidth to 4.5 kc/s.

Vestigial sideband transmission was used with a special form of negative-going amplitude modulation. The carrier frequency was 5 kc/s and the whole of the lower sideband was transmitted, the vestige of the upper sideband extending from 5 kc/s to 5.5 kc/s.

An additional problem resulted from the need to remove from the circuit the volume-range compressors and expanders normally used. This made it more difficult to achieve a satisfactory signal-to-noise ratio and therefore a special form of amplitude modulation was used in which the maximum depth of modulation considerably exceeds 100 per cent. That part of the modulation envelope which extended beyond the normal 100 per cent. or zero carrier, condition was "folded back" in a positive going direction. This method of modulation resulted in an increase in the effective depth of modulation and also in the signal-to-noise ratio of the system. In order to achieve the synchronous detection needed with this type of signal it was necessary to use a re-generated carrier at the receiving terminal and this had to be locked in phase to the original transmitted carrier. The necessary bursts of carrier which occurred during the synchronizing signals were used for this purpose.

Another problem which necessitated careful design in the equipment came from the fact that the line scanning frequency of 25 c/s made it impossible to reduce the effects of mains hum by means of clamping circuits. It was therefore necessary to keep hum throughout the system at an extremely low level. Where trouble from hum on the transatlantic circuit was experienced some benefit was achieved by a further reduction of line scanning frequency at the cost of a slight increase in transmission time. The precise choice of frequency depended upon whether the hum was predominantly 50 c/s or 60 c/s.

As in other television systems, a synchronizing signal was transmitted at the beginning of each line-scanning period, the full amplitude of the video signal being utilized for the triggering edge of the synchronizing signal. The field synchronizing signal consisted of four similar pulses and protection was provided against these pulses interfering with the bursts of reference carrier which were used for oscillator locking.

Film Scanning Equipment

Negative film is normally used at the sending terminal but the equipment can deal with either negative or positive film.

Identical film equipments were used at both terminals of the system. At the sending end this apparatus operated as a flying-spot scanner while at the receiving end it functioned as a telerecording channel. The same cathode-ray tube was used for both purposes and was enclosed in a double mu-metal shield in order to minimize mains frequency interference.

The time required for each field scan was approximately eight seconds; a separate monitor tube with a

long persistence phosphor reproduced a recognizable picture.

The special film traction mechanism, which was operated by the synchronizing signal, pulled down two film frames at a time. Twin optical systems were needed to telerecord simultaneously on two adjacent film frames and very small lenses with a focal length of one inch and an aperture of f/8 were developed specially for this purpose.

In this new development by the B.B.C. Engineering Division the General Post Office, the Canadian Overseas Telecommunications Corporation, and the American Telephone and Telegraph Company co-operated in putting transatlantic cable circuits at the disposal of the B.B.C.

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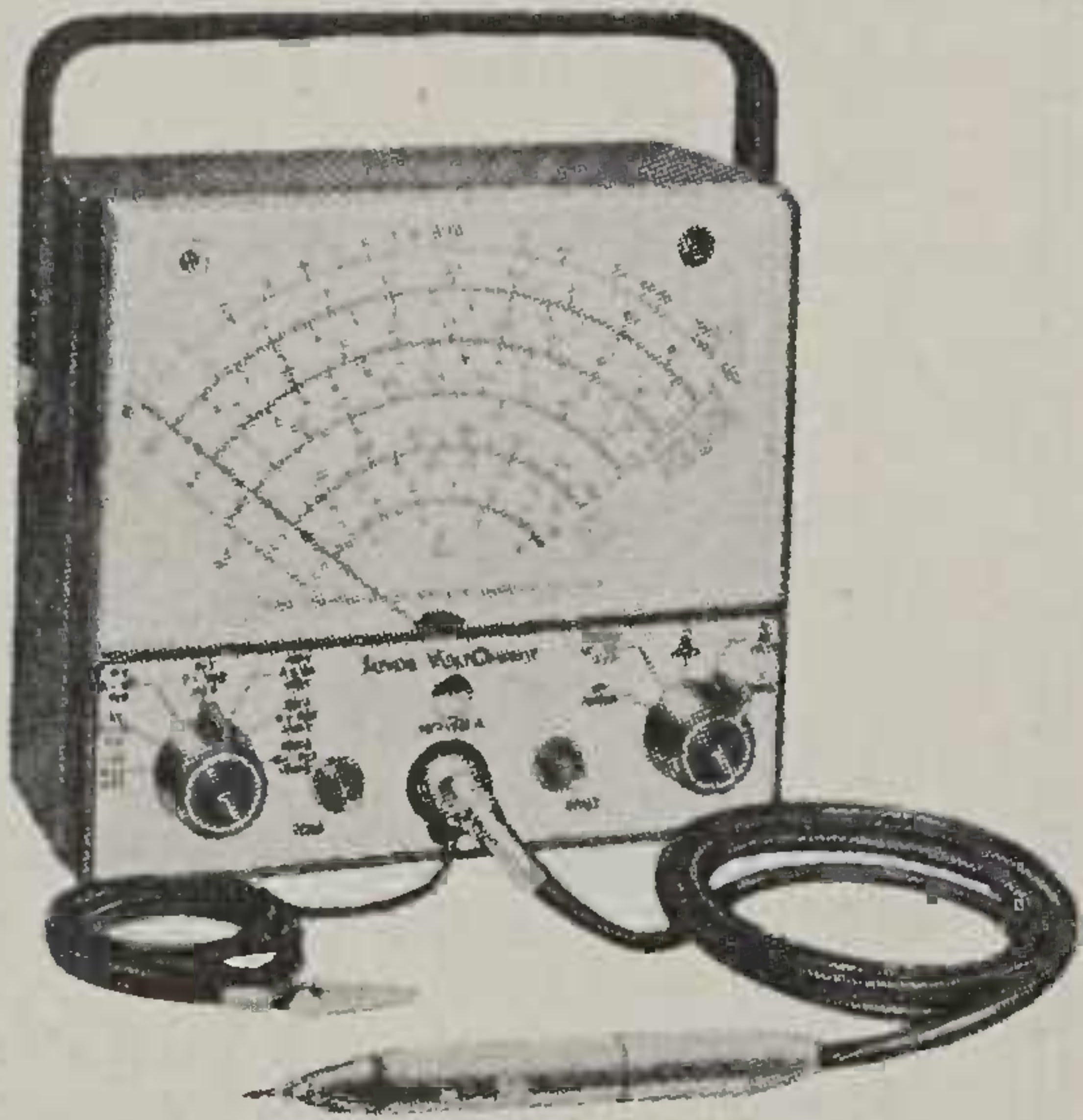
TELEVISION

MASTER VOLTOHMYST WV87B



The WV-87B Master VoltOhmyst is a de luxe instrument useful for television, radar and other types of pulse work. It has facilities for the direct measurement, on separate scales, of peak-to-peak voltage values of complex wave forms and the rms voltage values of sine waves. It also reads dc voltage resistance, and direct current. Vacuum tubes are employed in all functions except current measurement to ensure excellent sensitivity and stability.

SENIOR VOLTOHMYST WV98A



The WV-98A Senior VoltOhmyst provides direct peak-to-peak measurement of complex wave shapes up to 1400 volts and is especially useful for television signal tracing and industrial servicing. Quantitative measurements of practically all of the important complex waveform voltages found in video, sync and deflection circuits can be obtained with the instrument. The WV-98A has such refinements as seven non-skip ranges on all functions, wide frequency range and extended voltage range. It is provided with Type WG-299B DC/AC Ohms Probe and shielded cable. Available as accessories are a slip-on crystal probe, WG-301A, which permits rms measurement in r.f. circuits up to 250 mc, a high voltage probe, type WG-289, and a multiplier resistor, WG-206, which extended the dc voltage range of the instrument to 50,000 volts, and multiplies all scales by 100 times.

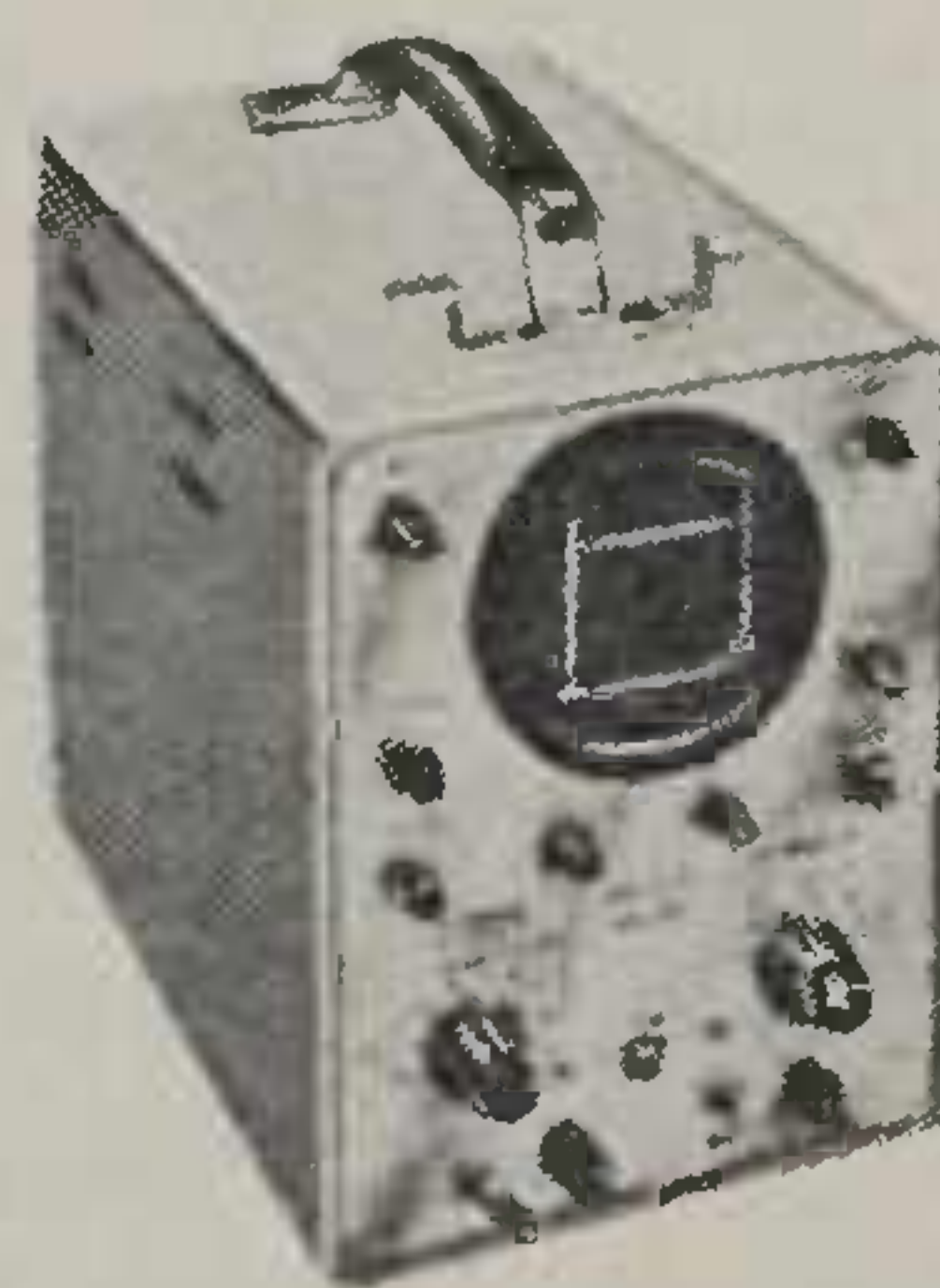
A NEW RCA VOLTOHMYST WV77E(K)



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- Famous RCA Volt-Ohmyst circuit means excellent stability under conditions of line voltage fluctuation—PLUS—special circuit to minimise effects of contact potential change.
- Easier, faster to read scales—meter colour coded to match range switch.
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- Case completely shielded for protection against r.f. fields.
- Voltage divider networks use 1% tolerance deposited carbon resistors.
- Front panel is brushed aluminium—all lettering is acid etched to last the lifetime of the unit.
- Both wired and kit unit available.

MARCONI TV ALIGNMENT OSCILLOSCOPE TF1104/1

The TF1104/1 is designed primarily for frequency response measurements on television and f.m. receivers operating in v.h.f. bands I, II, and III. It comprises a frequency-swept generator for connection to the input of the r.f., i.f., or video stages of the receiver, and a c.r.o., synchronised to the sweep frequency, for viewing the receiver output. Internally generated calibration 'pips', can be superimposed on the display, enabling tuning and bandwidth adjustments. Other important applications include the adjustment of discriminators in f.m. receivers and the matching of aerials to transmission lines. Can also be used as a conventional oscilloscope.



WO-33A (K) OSCILLOSCOPE

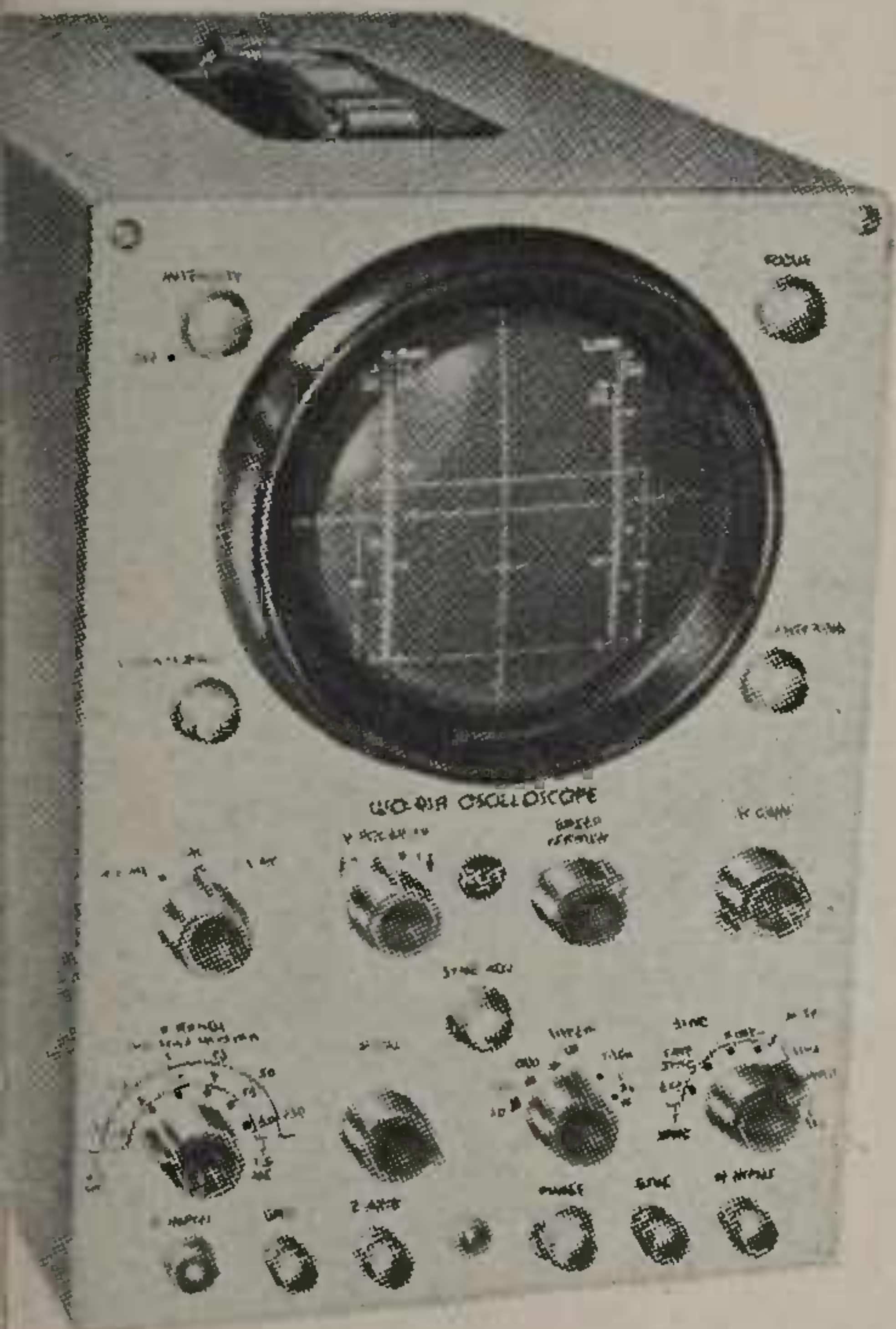
Whether you're a ham, an Electronics hobbyist, a TV Technician, or an engineer the new WO-33A (K) Oscilloscope will help you solve those tough servicing problems. Here's a 'scope that's good for PA work—so sensitive you'll get a clear trace display from the lowest level pickups, microphones, and other low level electronic equipment. It has gain comparable to an aural-visual signal tracer and is the only 'scope available that gives you high gain and excellent bandwidth at such an economical price and compact size. The WO-33A (K) can be used in PA systems servicing, radio troubleshooting general servicing and alignment work in black and white and colour TV applications.

VERTICAL AMPLIFIER: Wide band position Sensitivity—100 rms millivolts/inch
Bandwidth—within -3db, 5.5 cps to 5.5 Mc.
Narrow band position Sensitivity—3 rms millivolts/inch
Bandwidth—within -3db, 20 cps to 150 Kc.

SWEEP CIRCUIT: Sawtooth range—15 cps to 75 Kc. Sync—external + internal
Line sweep—160° adjustable phase. Sync range—to 4.5 Mc.

VERTICAL CIRCUIT INPUT IMPEDANCE:
At Lo-Cap Cable Input—10 megohms, 10 micromicrofarads (approx.)

SERVICING



RCA WO-91A

The WO-91A is a new, low-cost, 5 inch oscilloscope designed for use in production and servicing of both black and white, and colour TV sets. Essential for trouble shooting in chrominance circuits, the WO-91A can be used to observe and measure colour-burst signals and is equally useful for signal tracing and aligning wide band video amplifiers. The WO-91A is equipped with a multi-scale graph screen, scaled directly in volts for all scales, which makes direct measurement of peak-to-peak voltages as easy as with a VTVM.

CHOICE OF WIDE-BAND OR HIGH-SENSITIVITY OPERATION:

A front panel switch gives the user a choice of wide-band or narrow-band (high sensitivity) operation of the vertical amplifier.

Frequency response: (reference frequency 10 kc) Wide-band position, within ± 1 db from 10 cps to 4.5 Mc; Narrow within ± 6 db at 1.5 Mc.

Sensitivity: 0.05 peak-to-peak volt per inch (0.018 rms volt) in narrow band position; 0.15 peak-to-peak volt per inch (0.053 rms volt in wide-band position).

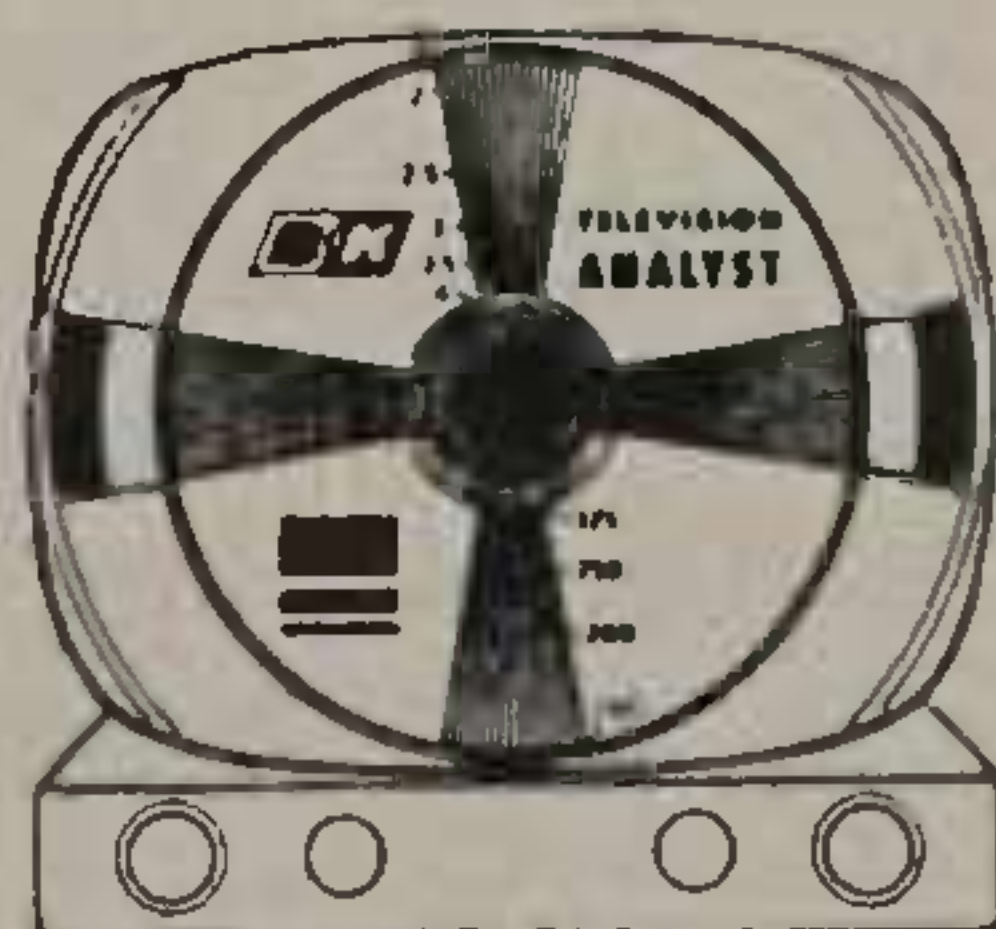
MULTIMETER WV38A(K)

Alt-Ohm-Multimeter has special ranges for transistor tests. You'll do a more professional servicing job with highly accurate, versatile and stable VOM—a world leader in electronics. Never so many features packed into a VOM. Ohms-divider, net-protected. Easy-to-read scales. Extra-large $5\frac{1}{4}$ inch polarity reversal switch. Improved frequency response. Full bridge rectifier. Less circuit loading. Standard features. PLUS—modern styling—it's an instrument you'll be proud to show off in home or shop. New handle clips update probes and test leads for extra carrying convenience. Extra 1-volt and 0.25 volt (25 Omv) dc ranges for servicing transistor equipment.



B & K TV ANALYST

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PRICE LIST

TYPE No.	DESCRIPTION	PRICE
WO-33 (K)	3" Oscilloscope kit	£49
WO-33	3" Oscilloscope wired	£69
WO-91a	5" Cathode-Ray Oscilloscope	£115
B & K	Analyst	£150
TF1104/1	Marconi TV Sweep Generator	£198
WV-77e	Junior Voltohmyst	£25
WV-77e(K)	Junior Voltohmyst Kit	£19.15
WV-87b	Master Voltohmyst	£63
WV-98a	Senior Voltohmyst 230v.	£35.10
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WV-38a	Multimeter wired	£22
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WG-291	Demodulator Probe	£4. 9
WG-293	Low Capacitance Probe	£4. 4
WG-295	Video Marker	£14.18
WG-299c	DC/AC ohms Probe and Cable	£4.17.9
WG-300b	Direct/Low Capacitance Probe and Cable	£7.18
WG-301a	Crystal Diode Probe	£4. 7.9
WG-302a	RF/IF/VF Signal Tracing Probe	£4.19

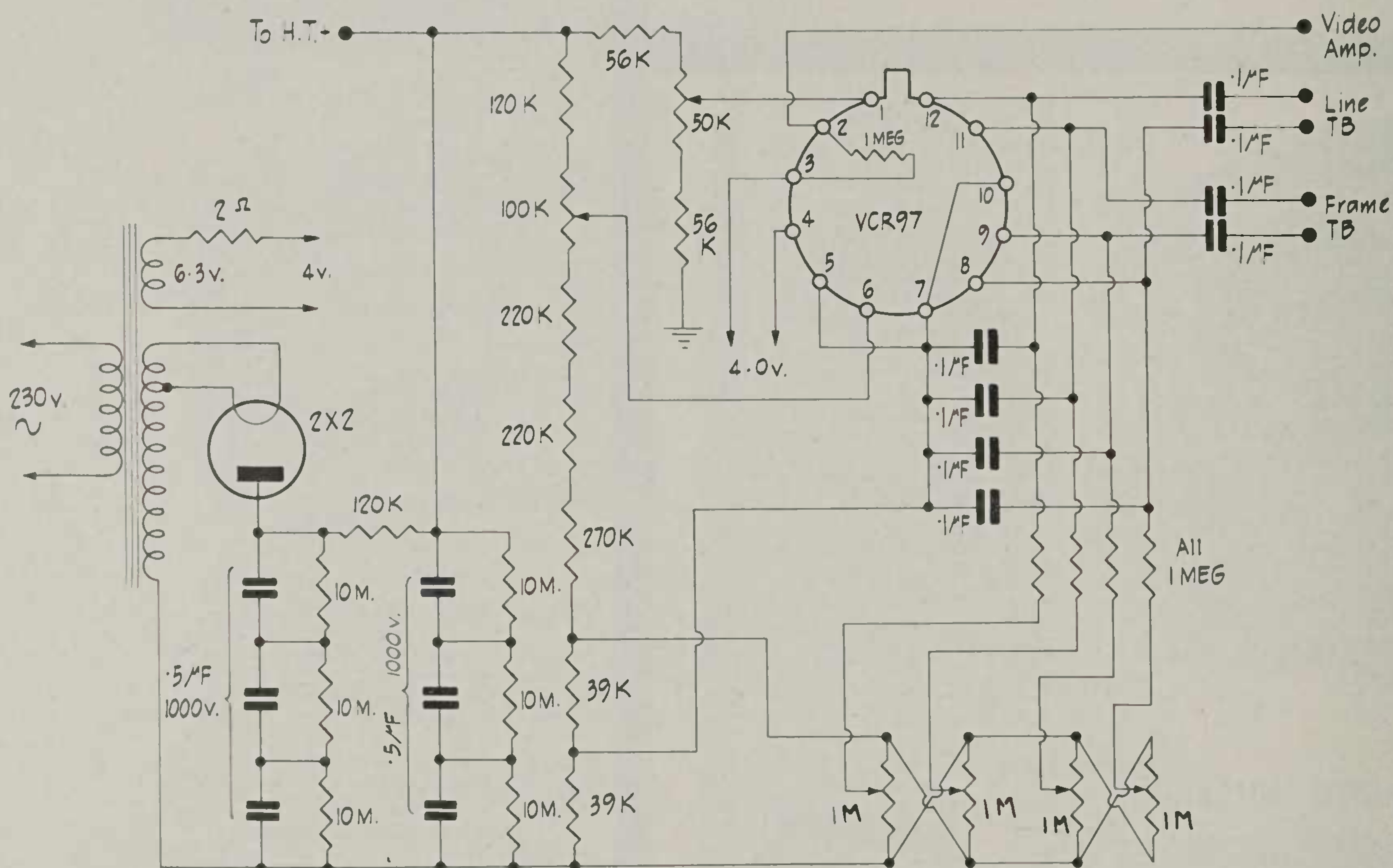
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Television

AN EXPERIMENTER'S TELEVISION RECEIVER—Part 2: E.H.T. and Cathode-ray-tube Circuit



In this month's instalment, we give the circuit of the cathode-ray tube and its E.H.T. supply, and provide details of the chassis and other mechanical components that have to be made by the builder.

The E.H.T. Supply

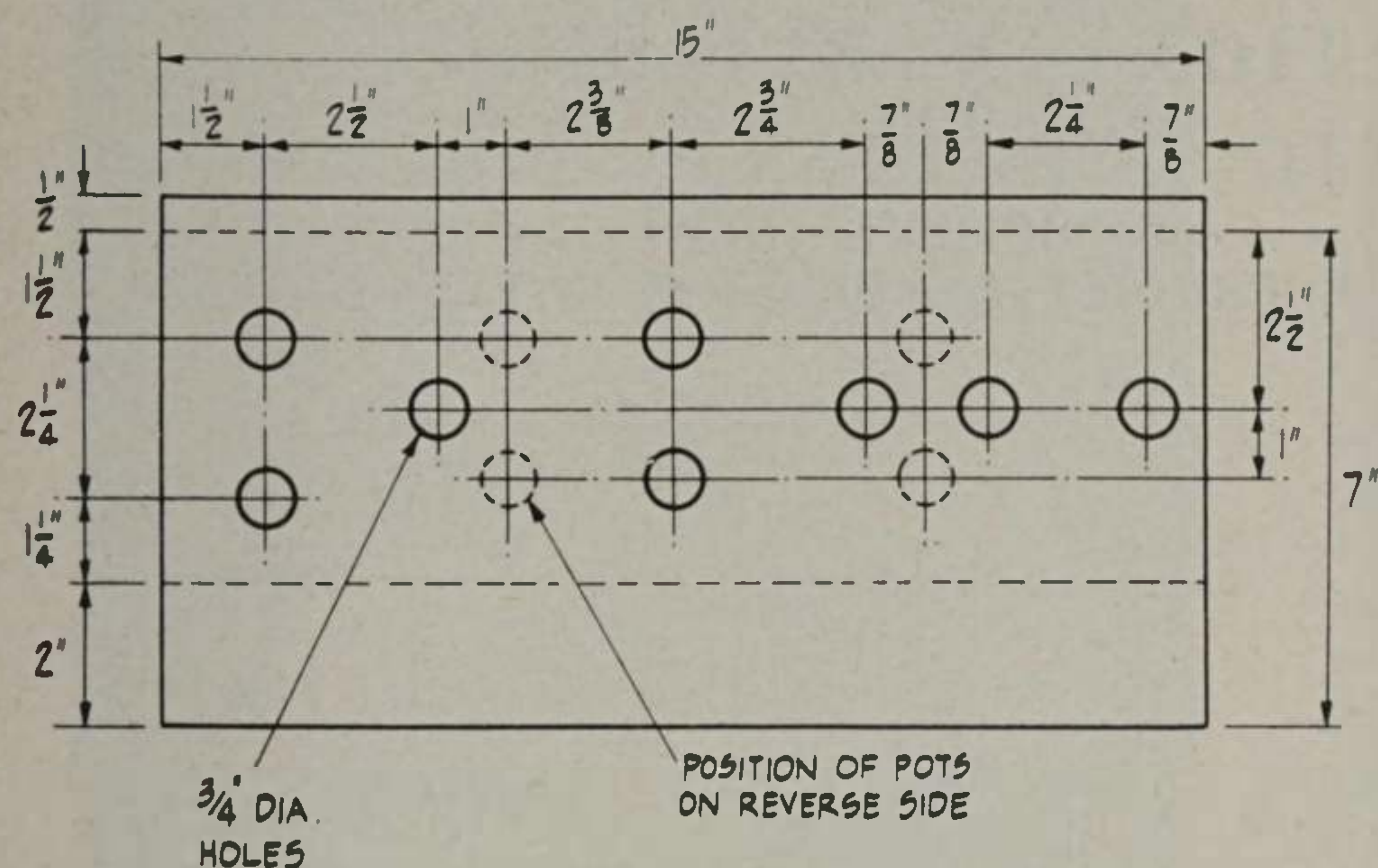
This is made from a conventional transformer and half-wave rectifier, fed from the 50-cycle mains. We did consider the alternative methods that could have been used, such as the ringing-choke method, and the R.F. oscillator method, but in spite of the advantages these methods have, it was decided not to use them, mainly because of the special components which either of them would have required, which would have been difficult for some people to obtain. As it is, the parts situation is such that difficulties of supply were encountered even when building up the conventional circuit illustrated. It will be seen that the smoothing condensers have been shown as made from three separate 1000-volt condensers in series. This was done only because single condensers of the right capacity and voltage rating could not be found anywhere. The 0.5 μ fd. 1000 v. units that were finally used represented war surplus oil-filled condensers that we located, but

not everybody presumably, will be able to obtain these. Smoothing will not suffer very much if each smoothing capacitance is reduced to 0.1 μ fd., so that if anyone has or can find some oil-filled capacitors of 0.1 μ fd., and 2500-volt rating or better, these can be used in preference to the arrangement drawn.

However, we should point out that the series arrangement, with the 10 Meg bleed resistors, is inherently sound electrically, and does give an acceptable answer in cases where no capacitors of the right size or rating can be discovered.

Watch for the Earth!

To those sharp-eyed readers who have noticed that we have not connected either end of the E.H.T. supply to earth, we would say that the circuit, as drawn is correct. The negative end of the E.H.T. supply is connected to the positive rail of the H.T. supply which will feed the valves in the receiver, other than the C.R.T. itself. This means that the control grid of the VCR97 will be somewhat less positive than the potential of the positive H.T. rail, and so, therefore will be the C.R.T. cathode, though this must be more negative than the grid, in order that there may be a net negative



potential between control-grid and cathode, in the ordinary way. The reason for making this somewhat unusual connection is that in the finished set, the cathode of the VCR97 will be directly connected to the anode of the video amplifier valve. Connecting the negative rail of the E.H.T. supply to the positive of the H.T. supply enables this to be done without difficulty.

E.H.T. Supply Built Separately

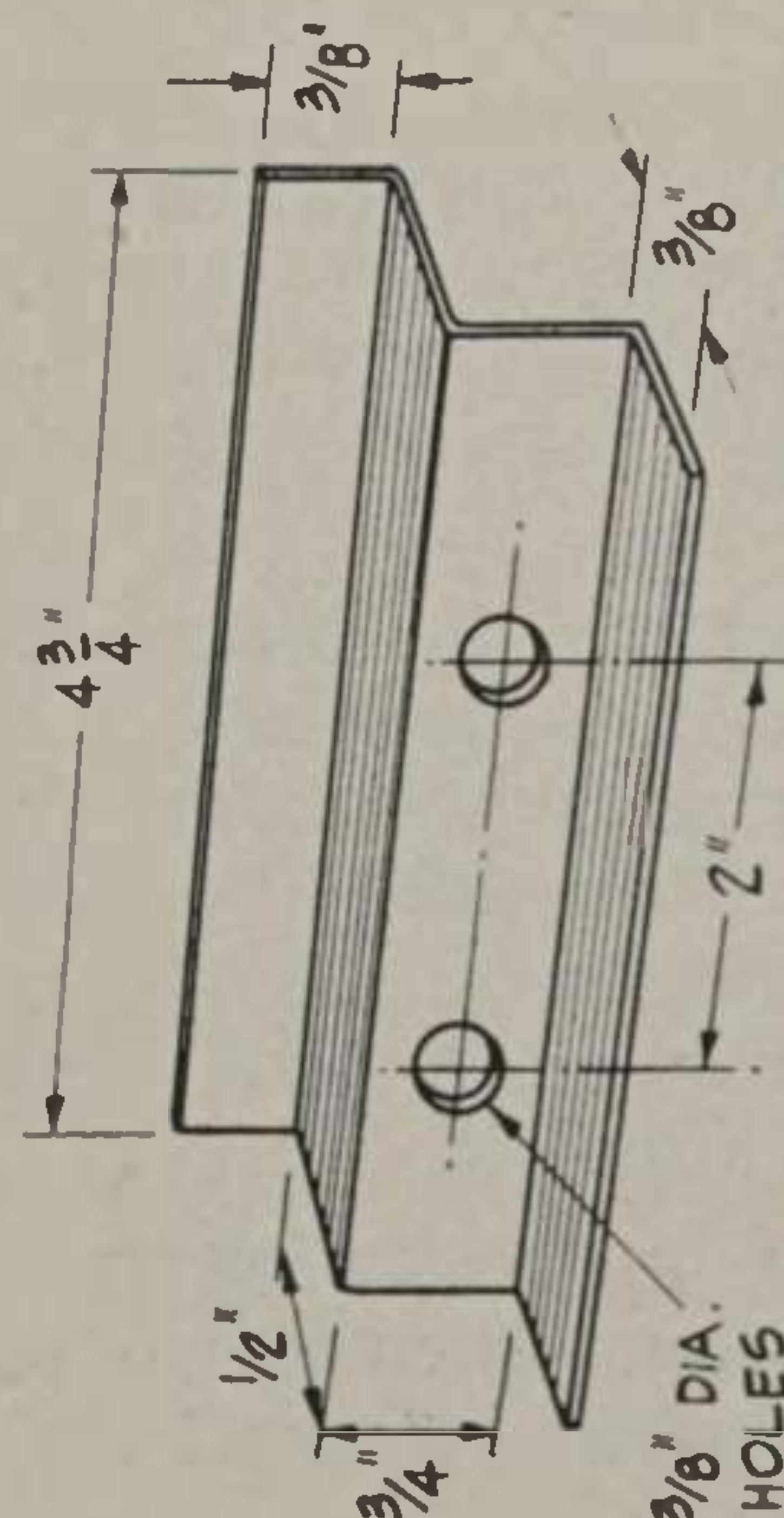
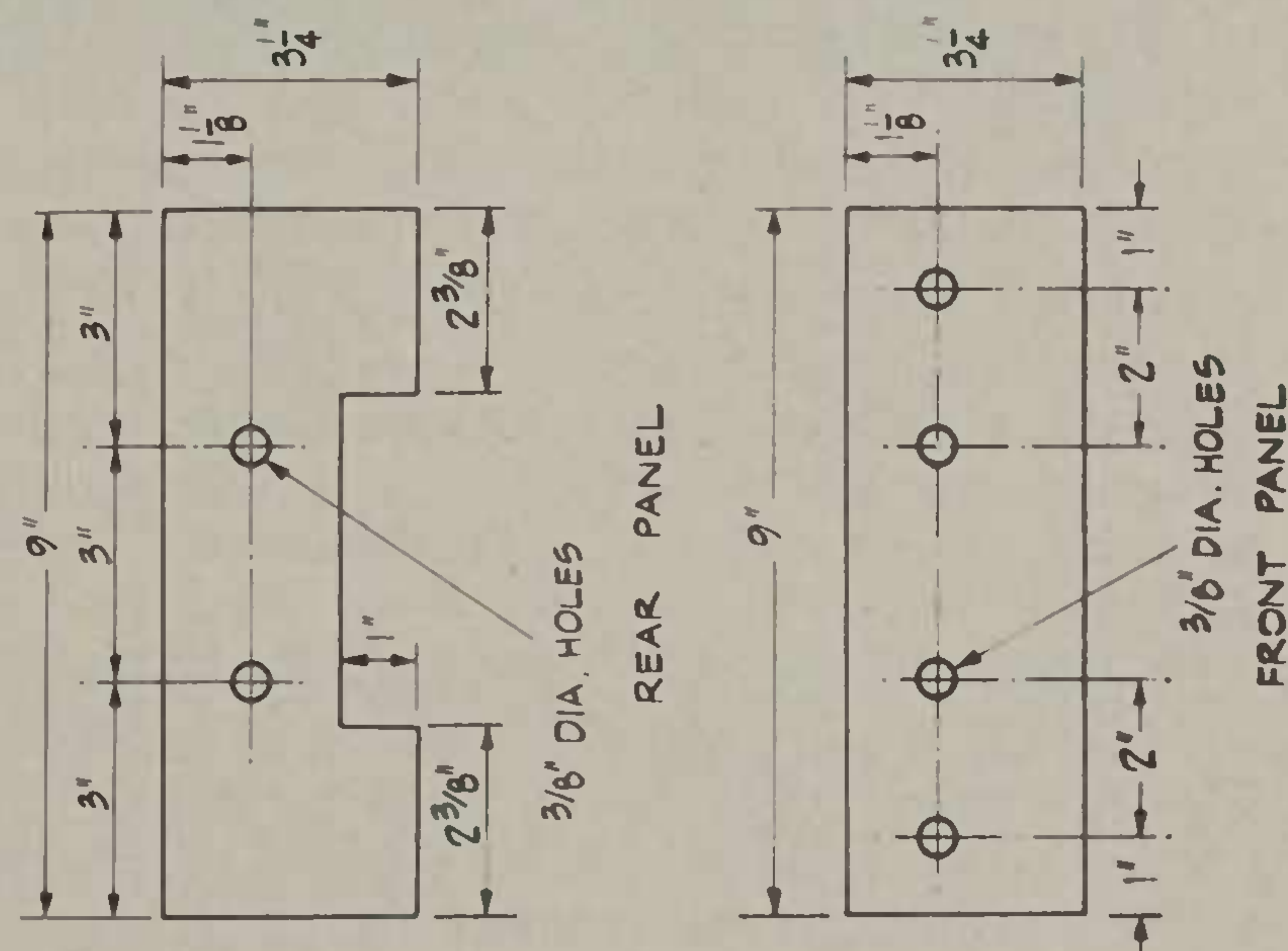
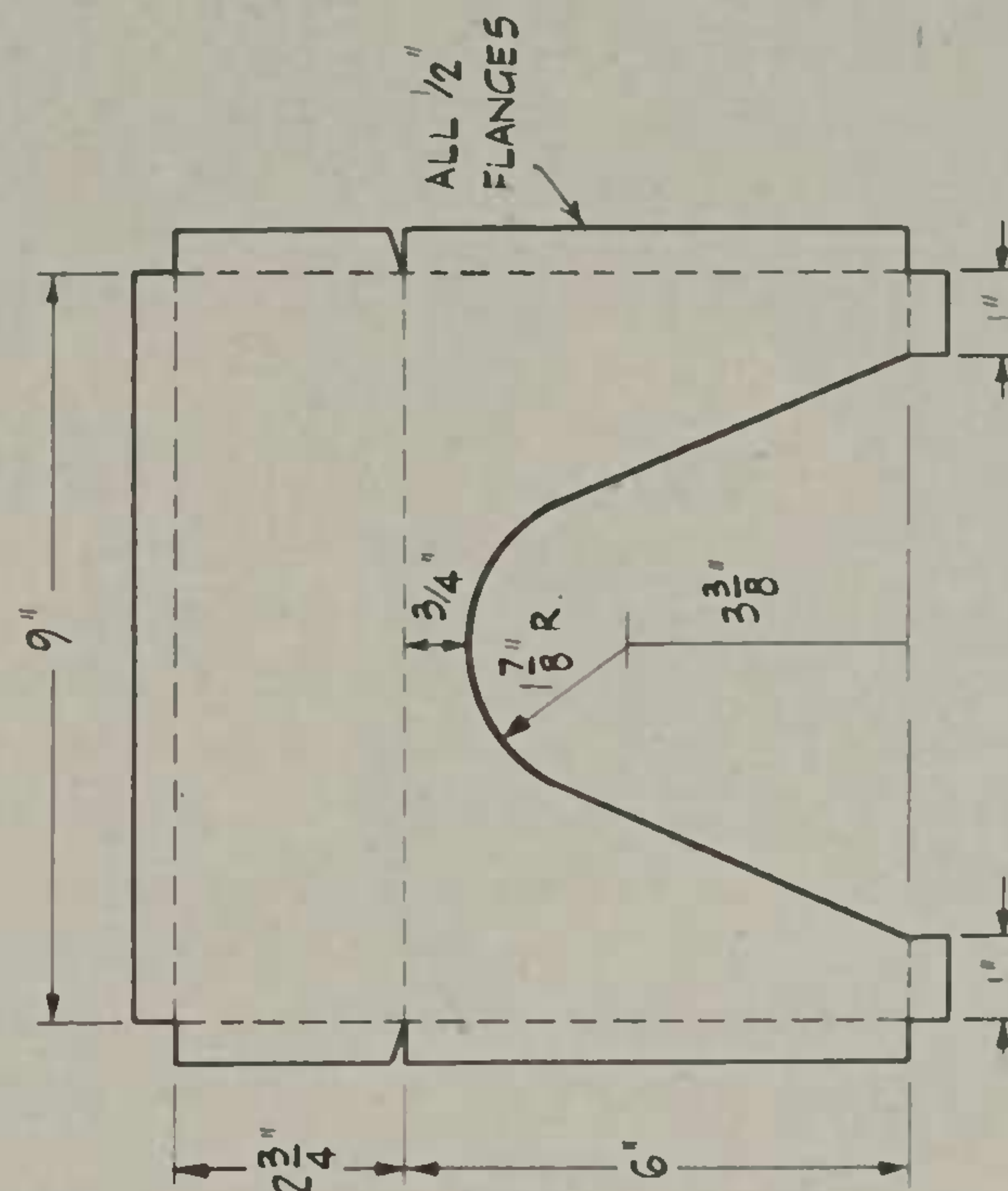
Since this is an experimenters' set, we have had no compunction in making the E.H.T. and even the H.T. supplies as separate units. Although this may look messy, it removes at one stroke the difficulty of power supply hum finding its way into the deflection circuits, or, what is more troublesome still, directly affecting the cathode-ray beam. The voltage divider which supplies the potentials for the centring and focus controls is actually built as part of the set, and is not included in the power supply unit, which contains only the transformer, rectifier, smoothing condensers, and their associated resistors.

On the circuit, the 100 k. potentiometer near the top of the diagram is the focus control, while the two-ganged potentiometers are the centring controls. The pair at the left is the horizontal centring control, while that on the right is the vertical one.

Deflecting Plate Blocking and Decoupling Condensers

There is an unfortunate error in the circuit of the deflecting plates, in that there are shown 0.1 μ f.d. condensers from each deflecting plate to the final anode of the C.R.T. These four condensers should actually connect to the opposite ends of the four 1 Meg. leak resistors, and so should decouple their lower ends.

The actual E.H.T. voltage of the unit is approximately 2500 volts. Thus, the four coupling condensers to the deflecting plates from the amplifier valves should have at least this voltage rating, as should the de-



(Concluded on page 27)

A NEW CONCEPTION IN BUILDING ELECTRONIC CIRCUITS

U.S.A. AIR FORCE AND WESTINGHOUSE PREDICT REVOLUTION IN ELECTRONICS

WASHINGTON, D.C., January 21.—The United States Air Force and Westinghouse Electric Corporation today demonstrated how the startling new concept of molecular electronics may revolutionize the electronic industry and extend man's reach into space.

In taking the wraps off a status report made only today to the Department of Defence, Westinghouse and Air Force representatives showed a variety of working sub-systems which are vastly more reliable and as much as 1000 times smaller than the most advanced electronic devices in use today.

New systems, employing these concepts, they said, could be operational in missiles or satellites in three to four years to perform such functions as telemetering light intensity or radiation levels back to Earth, and providing infrared detection and reconnaissance information, flight guidance, and communications.

Colonel W. S. Heavner, U.S.A.F., chief of the Wright Air Development Divisions Electronic Technology Laboratory, Dayton, Ohio, said that "we expect Westinghouse will accelerate work on this programme to prove the feasibility of a "molecularized" radio receiver.

"In the initial stages of research we hope to uncover new functions and capabilities applicable in electronics. The Air Force hopes to find ways for molecular electronics to contribute to bio-electronics—this being the ability to simulate the superior biological capabilities found in the animal kingdom. For instance, we may be getting a step closer to duplicating the magnificent performance of the human brain."

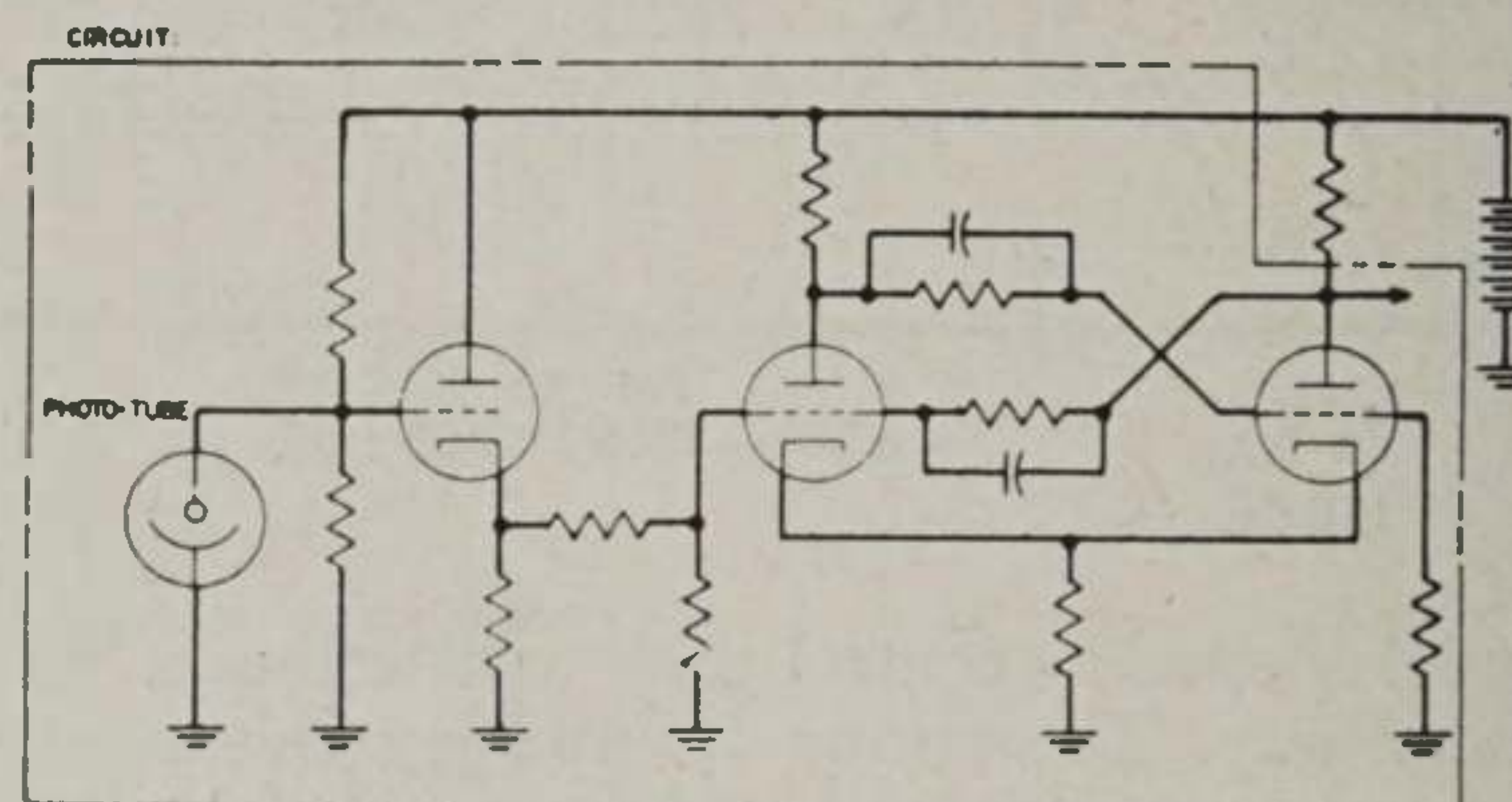
To show the feasibility of a molecular electronic amplifier sub-system, Dr S. W. Herwald, Westinghouse vice-president in charge of research, demonstrated an amplifier used in a high-fidelity phonograph in which the preamplifier was the size of a match-head and the power amplifier was smaller than a dime.

"If this can be accomplished now, it isn't difficult to foresee development of a complete communications receiver the size of a pea within a few years," he said. Later he showed a "countdown switch," a sliver of germanium the thickness of a toothpick which would make it possible to monitor more effectively the pre-launch checkout of a missile.

"The concept of molecular electronics, in effect, 'leapfrogs' over current attempts to make electronic systems smaller and more reliable," Dr Herwald said.

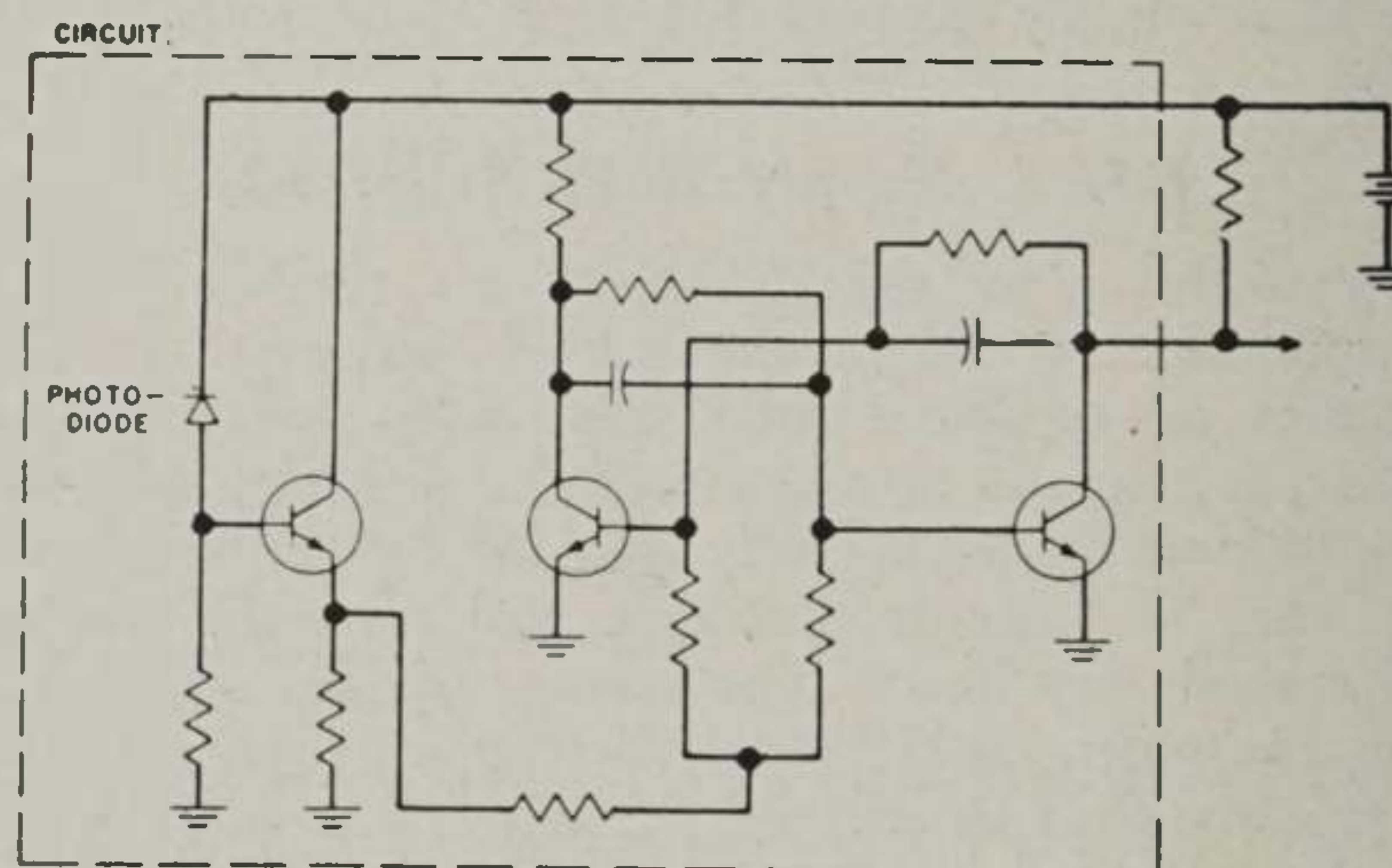
Colonel Heavner pointed out that "it appears that the majority of present day military electronic equip-

YESTERDAY'S PHILOSOPHY OF CIRCUITS
(LIGHT TELEMETERING SUB-SYSTEM)



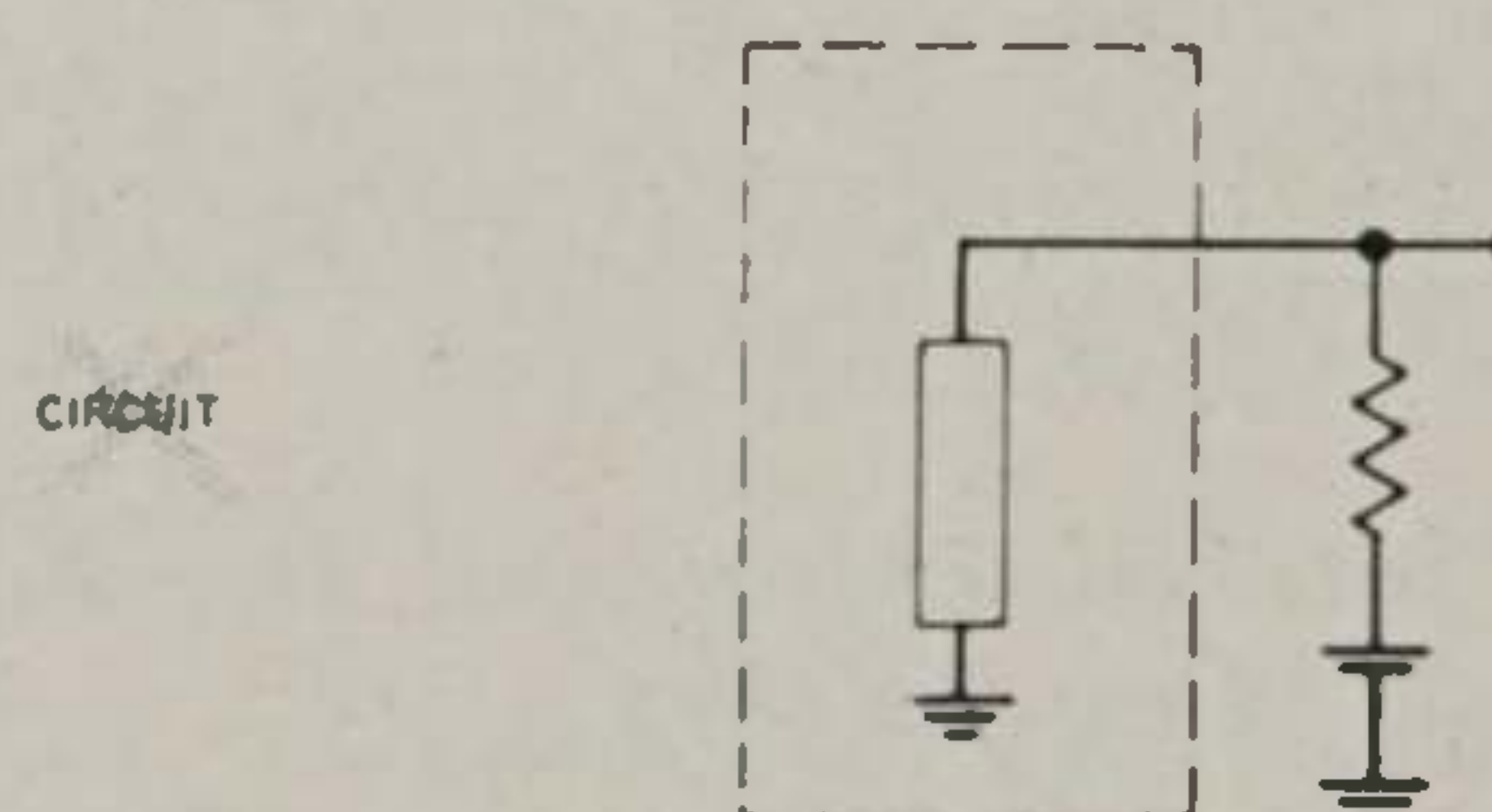
DATA (APPROXIMATE)	VOLUME 4 CU IN	WEIGHT 26 GRAMS	INPUT POWER 5 WATTS	NUMBER OF COMPONENTS 16	NUMBER OF SOLDERED JUNCTIONS 18
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TODAY'S MODERN PHILOSOPHY OF CIRCUITS
(LIGHT TELEMETRY SUB-SYSTEM)



DATA: (APPROXIMATE)	VOLUME 1 CU IN	WEIGHT 7 GRAMS	INPUT POWER 0.75 WATTS	NUMBER OF COMPONENTS 14	NUMBER OF SOLDERED JUNCTIONS 18
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TOMORROW'S MOLECULAR ELECTRONIC SYSTEMS CONCEPT
(LIGHT TELEMETRY SUB-SYSTEM)



DATA (APPROXIMATE)	VOLUME LESS THAN 0.001 CU IN	WEIGHT 0.02 GRAMS	INPUT POWER 0.06 WATTS	NUMBER OF COMPONENTS 1	NUMBER OF SOLDERED JUNCTIONS 2
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Schematic drawing of light telemetry sub-systems showing extent of circuitry required for systems using (1) electronic tubes, (2) transistors, and (3) molecular electronic element.

ment requirements can be satisfied with molecular electronics which will reduce size and weight and improve reliability."



The button-like object, smaller than a United States 10-cent piece, being held with a pair of tweezers, is actually a molecular electronic amplifier which performs the same function as the conventional amplifier on the table.

"When this happens," he declared, "the use of many low-power conventional, standard component parts will greatly diminish and eventually disappear because molecular electronics demonstrated today has eliminated such components as resistors, capacitors, diodes, and transistors."

Colonel Heavner also said, however, that "as revolutionary and dynamic as this new technology seems to be, it probably will not replace all of the present conventional electronic component parts."

To construct molecular electronic sub-systems, Dr Herwald said Westinghouse scientists first determine the desired electronic functions to be performed and then build these functions into a single piece of semiconductor material such as silicon or germanium. By such techniques as plating, etching, and alloying, the structure of the tiny solid piece is arranged to perform the identical functions that now require many individual components which have to be soldered together.

"For example, this phono-amplifying system has only eight soldered connections between the turntable and the speaker," Dr Herwald explained. "A conventional phono-amplifier has perhaps ten times that number. Any one of these soldered connections can be a source of failure."

"Today, we are dealing with a technological paradox," he continued. "As we add electronic equipment



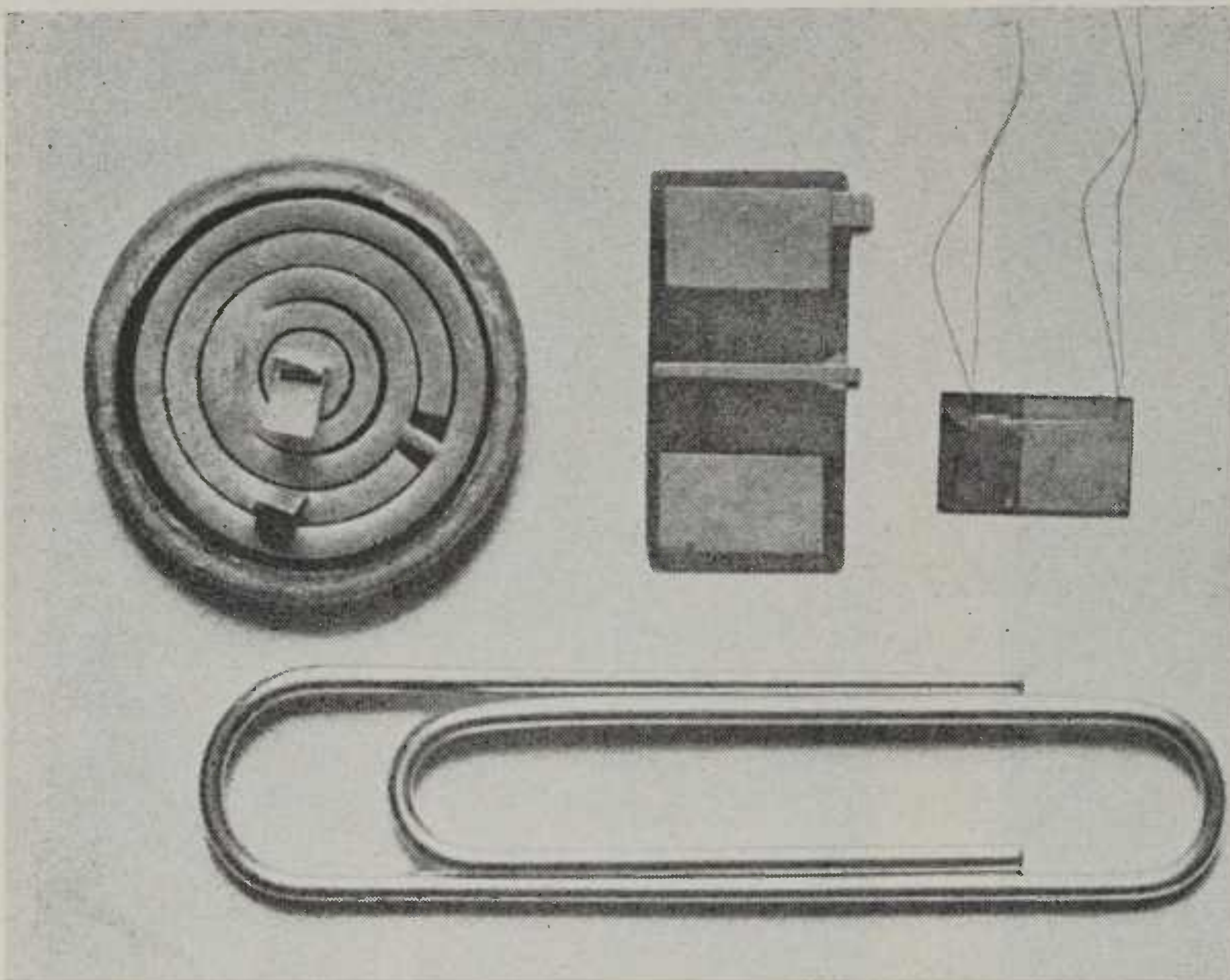
Demonstration of molecular electronic function block as audio amplifier in conventional phono system. Frequency range is 0 to 20,000 cycles, output is 5 watts when heat sink is used. Amplifier itself (at right in black mounting) is tiny device whose volume is about 0.001 cubic inch. Device to the left is a molecular electronic pre-amplifier.

to air and space craft to make these vehicles more versatile and intelligent, the risk of failure among their components and connections increases. Furthermore, it becomes more and more difficult for the designer to meet the weight and volume requirements for the necessary electronic gear.

"And once you have a system in orbit, let me pose the logistic question of how do you send out a repairman."

The Air Research and Development Command awarded Westinghouse a \$2 million contract last spring that made possible the rapid development of sub-systems demonstrated today. At the time of the contract announcement, A.R.D.C. said the project was to demonstrate feasibility of inherently reliable electronic equipment requiring greatly reduced amounts of power and taking up very little space. The drastic reduction in size, weight, and power would allow space vehicles to perform a greater number and wider range of functions, officials of A.R.D.C. said.

Achieving these objectives came as the result of new basic knowledge of semi-conductor materials. This knowledge has enabled Westinghouse scientists to develop a method of growing semi-conductor crystals in which the basic material will be used. The new technique, a radical departure from existing methods,



Three of eight molecular electronic function blocks demonstrated as sub-systems. Device bearing concentric arcs is an audio amplifier, at centre is a free-running multivibrator, and at right, a two-stage video amplifier.

grows the crystals in the form of long, thin, near-perfect ribbons, or dendritic strips. The dendrites can be incorporated into finished semi-conductor devices without intermediate material processing of any kind.

"By this new technique," Dr Herwald declared, "our scientists have 'grown' multi-zone crystals, which provide the basic building blocks required in molecular electronic systems. We call such basic units 'functional electronic blocks,' each one of which is a complete functioning electronic sub-system. Eventually, we believe it will even be possible to automatically and continuously produce actual electronic equipment, such as radio receivers and amplifiers, starting from a pool of molten semi-conductor materials."

The "countdown switch" demonstrated today is a decision-making, or logic, element, which shall find widespread application in computers. Because of its minute size and high reliability, it could make a significant contribution to the effort to put more and more intelligence into space vehicles, Dr Herwald said.

A typical application of this switch might be in a countdown for a missile launching. Failure of any one of the functions under its surveillance would halt the countdown and alert all other stations or circuits that a failure has occurred in a given area.

Once the fault is corrected, the logic switch would again re-check all circuits before allowing the process to resume. The "countdown switch" could handle many possible factors in arriving at its decision.

"Conventional circuitry to perform the same function is complex and requires many electronic components," Dr Herwald said.

To illustrate another amplifier application, the Westinghouse vice-president demonstrated a direct-current amplifier operating in conjunction with a solar cell. Together, they form a control sub-system that will govern considerably larger amounts of power in direct proportion to the intensity of the light shining on the cell.

The Westinghouse air arm division at Baltimore holds the management contract for molecular electronics development work. Working with the air arm division on the programme are scientists and engineers from the company's central engineering laboratories, Pittsburgh, and semi-conductor department, Youngwood, Pa.

NEW RADAR AND RADIO EQUIPMENT

(Continued from page 15)

in conjunction with three United Kingdom firms. The system was displayed pictorially on the Smiths stand, an autopilot and Flight System forming an essential part of the equipment. During an "Autoland" approach, the aircraft follows the usual Glide Slope pattern down to about 150 feet (50 metres). From this point onwards, it is held by autopilot in a fixed attitude, descending at the average rate which has been maintained during the preceeding phase.

At 60 feet (18 metres), when the aircraft is over the runway, the Radio Altimeter (Standard Telephones) takes control and provides the information (to within an accuracy of two feet (60 centimetres)) to complete the landing in an exponential flare-out curve. And, finally, a Murphy magnetic leader cable system buried in the runway completes the "hands-off" landing. This is the equipment scheduled for the next generation of airliners. Farnborough gave visitors a glimpse into the not-so-distant future: the era of electronically regulated, fully automatic flight.

COMPLETE YOUR GEAR WITH *Heathkit*

AN INTERESTING TRANSISTOR RECEIVER FOR 80 AND 40 METRES

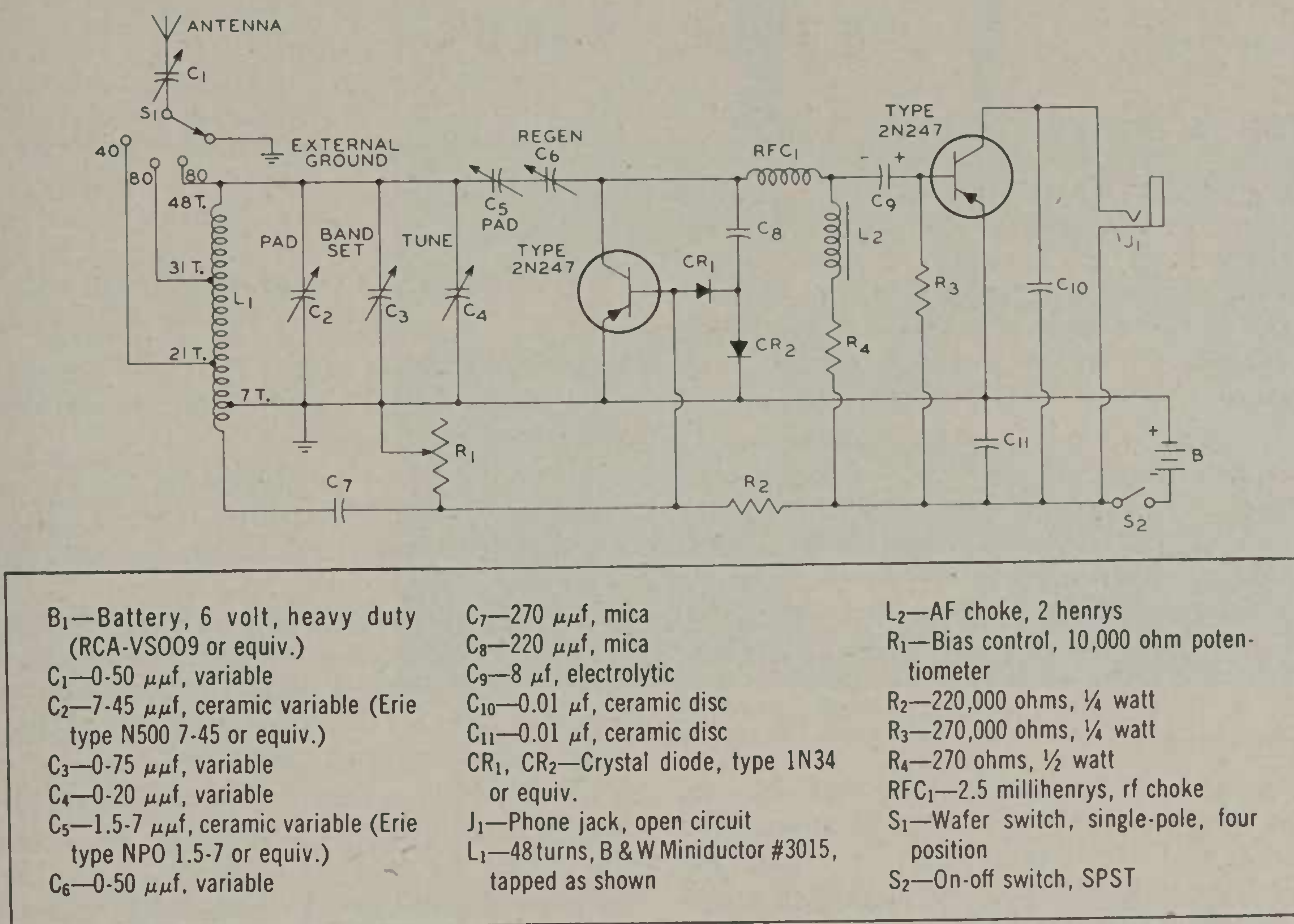


Figure 1: Schematic diagram and parts list of W2RG's two-transistor 40- and 80-meter receiver.

The circuit above will interest "hams" who are keen on transistor devices. It comes from a recent copy of R.C.A. "Ham-Tips" and was designed by W2RG. Note that the detector acts as an audio amplifier as well, giving the equivalent of three stages altogether. If any New Zealand "hams" are interested in more details of such a set, this journal could easily be persuaded to try out a locally-built equivalent, and to publish the resulting practical details.

AN EXPERIMENTER'S TELEVISION RECEIVER

(Continued from page 23)

coupling condensers just referred to above. Here again the supply position is not the easiest, but in our case, was solved by using some condensers labelled "0.1 μ fd. 5000 v. test". Just what this means in terms of actual D.C. working voltage, is anybody's guess, but trial and error has shown that these condensers stood up to 2500 volts D.C.

While the wattages of the resistors in the voltage dividing chain do not need all to be as great as 1 watt, *it is important to use these, nevertheless.* This is because the larger resistors have a longer insulating path than the smaller ones, and are therefore less

likely to give trouble when they have fairly high voltages across them, as they do in this circuit.

Drawings for Chassis-work

The drawings show the form of the chassis for the deflection circuits, the bridge structure supporting the tube, and the insulating panels fitted to the bridge, upon which the controls are fitted which are "up in the air" to D.C. The four control potentiometers on the back of the chassis are mounted on the brackets shown, with their shafts pointing outwards instead of through the chassis. As the chassis is drawn, the three valve socket holes at the left are for the line circuit, while the three in a line at the right are for the frame circuit. The two in the middle of the chassis are for the synch separator and a buffer stage, whose circuits have not yet been given; in wiring up the deflecting circuits, note that these should start towards the middle of the chassis and progress outwards, so that in both cases, the output stages are at the extreme ends of the chassis.

(To be Continued)

ELECTRICAL AND TRADE SECTION

TRADE WINDS

COLLIER & BEALE-ADMIRAL TIE-UP

At Wellington on May 17th, 1960 a long-term technical assistance agreement was signed between Admiral International Corporation of Chicago and Collier & Beale Ltd. of Wellington. This covers the supply of engineering data and design styling covering ADMIRAL television receivers which are to be made in New Zealand.

Admiral Corporation, which is the world's largest television manufacturer, has plants in Chicago, Mexico, Canada, Italy, Australia, and elsewhere. Commencing operations in the nineteen-thirties, Admiral was 53rd in the list of radio manufacturers, but after one year they had risen to third place. In addition to refrigerators and other domestic equipment, Admiral Corporation is involved with atomic energy apparatus. Recently, Mr J. R. Oberly, the vice-president, visited the Wellington factories.

Collier & Beale Ltd., founded in 1926, has occupied a prominent position in the communications and domestic radio field. In recent years, electrical appliances have been added to their list of products. The company first displayed television in 1952/53 when transmitters, camera, and receivers were put to use in public telecasts. Most of the designing was undertaken by the then managing director, Mr P. C. Collier.

With the association with Admiral, Collier & Beale Ltd. will be making TV sets using the most advanced overseas techniques. An interchange of staff will be immediately instituted, said Mr T. M. Kimble, the general manager.

The distribution of Admiral products will be handled by H. W. Clarke (N.Z.) Limited.

* * *

NEW "DOUBLE FLUX" FLUORESCENT LAMP

A five foot fluorescent lamp with a loading of 125 watts and almost double the light output of the standard 5 ft lamp has been designed and is in production at Philips factory in Holland. This lamp is an ideal installation where very high lighting levels are required.

It is slightly different in appearance from the normal lamp as it has a protruding bulge half way along the tube. This protrusion, which remains cooler than the rest of the lamp, determines the pressure of the mercury vapour. The very high wattage loading excludes this lamp from being operated in enclosed fittings as

good ventilation is necessary for the most efficient operation.

* * *

OVERSEAS CONTRACT FOR C. & B.

Collier & Beale Ltd. of Wellington have been awarded a contract calling for the export of thirty-two (32) multi-channel walkie-talkie sets and sledge carried transmitter/receivers.

These are being purchased by the Arctic Institute of North America following observation of the very successful operation of C. & B. equipment in the Antarctic.

Similar apparatus was previously designed for the New Zealand Trans-Antarctic Expedition. The severe conditions imposed stringent quality controls on components, and at the same time called for minimum weights and operating convenience.

Mr Kimble expressed pleasure in gaining this latest American contract and said that the units would be shipped in the next few months.

Active since 1926, Collier & Beale Ltd. makes, in addition to radiotelephone equipment, electrical appliances and domestic radios.

* * *

"REMOTE EYE" TELEVISION AT LONDON AIRPORT



Picture shows a close-up of one of the cameras as mounted on an existing lighting stand.

Marconi's Wireless Telegraph Co. Ltd. have completed an experimental installation of closed-circuit

television at London Airport to enable the authorities to determine whether the control of aircraft parking can be improved.

At present a marshalling supervisor, situated in the main passenger arrival and departure building, relies on radio-telephony for reports of aircraft parking movements because his view of the parking area is restricted to that portion which lies in front of the building.

A closed-circuit television system is a possible means of improving control in that it could give the marshalling supervisor visual information as to the numbers and disposition of the aircraft. To this end, two Marconi BD781 television cameras have been installed at the top of lighting stands, one at either end of a main parking area—an area chosen because it is out of the marshalling supervisor's direct line of vision.

The signals from the cameras are fed, via control units installed at the bases of the lighting stands, to television monitor screens at the marshalling supervisor's position, to give him a view of the parking area from either end.

For the past six months the cameras have been on test, during which period they have been exposed to the winter weather without suffering ill-effects. Further tests are proceeding to determine the most effective method of utilizing the equipment.

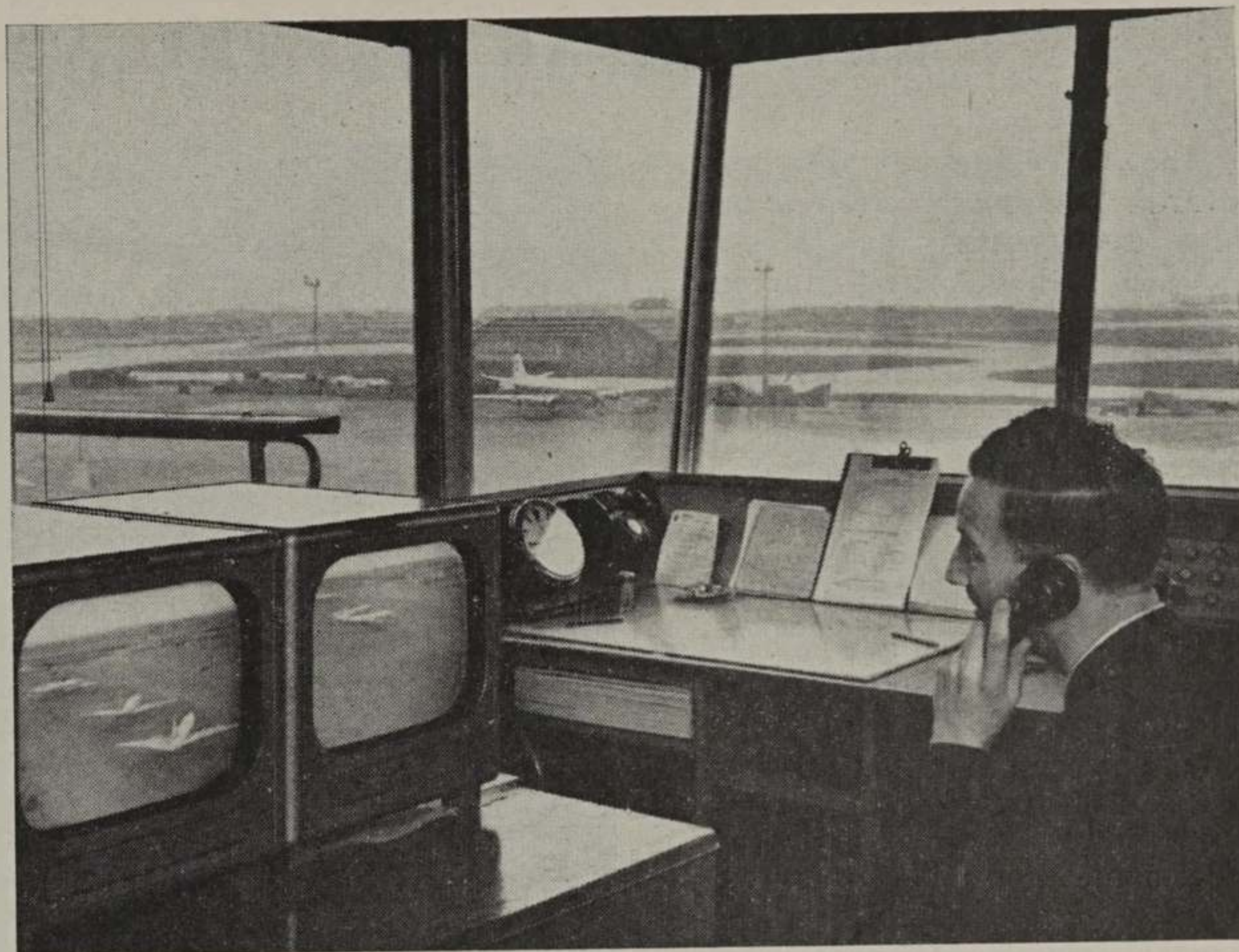
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INCREASED USE OF VIDEO TAPE RECORDING IN THE UNITED STATES

At the moment about 100 stations are equipped with monochrome video tape recorders, all of Ampex manufacture, while 14 per cent. of these stations have more than one. Inquiries among users elicited the following:

- (1) Seventy-eight per cent. of users thought that V.T.R. simplifies the production of "commercials".
- (2) Sixty-six per cent. said that it allows a more efficient use of studio space.
- (3) Fifty per cent. said that it made better picture quality possible (presumably in comparison with film recording and reproduction).
- (4) Thirty-eight per cent. said that the use of tape recording meant a saving in production time and personnel, since no processing is required, and the tapes can be played back immediately.

The costs of recording TV programmes on tape are



In this view we see the control tower and two of the monitor screens that assist the controller.

also said to be much lower than those of filmed programmes.

Particular use of tape is made in recording newsreels and actuality broadcasts. It was stated that 85 per cent. of interviews and discussions, and 45 to 75 per cent. of local news and sporting actualities are taped.

Although as yet only 1 per cent. of American homes are equipped with colour TV receivers, both R.C.A. and Ampex are paying much attention to recording colour on tape. R.C.A. have already installed one colour recorder. The R.C.A. price for one of these is about 63,000 dollars, while Ampex calculates a price of 64,000 dollars for theirs.

COPYRIGHT WARNING

The unauthorized re-recording or copying by any means whatsoever, including magnetic tapes, of records subject to copyright, constitutes an infringement of copyright subsisting in such records and renders those responsible liable to an action at law. Permission to re-record can only be granted by the individual manufacturer. Licences to publicly perform records subject to copyright can be obtained from Phonographic Performances (N.Z.) Limited, P.O. Box 2885, Wellington.

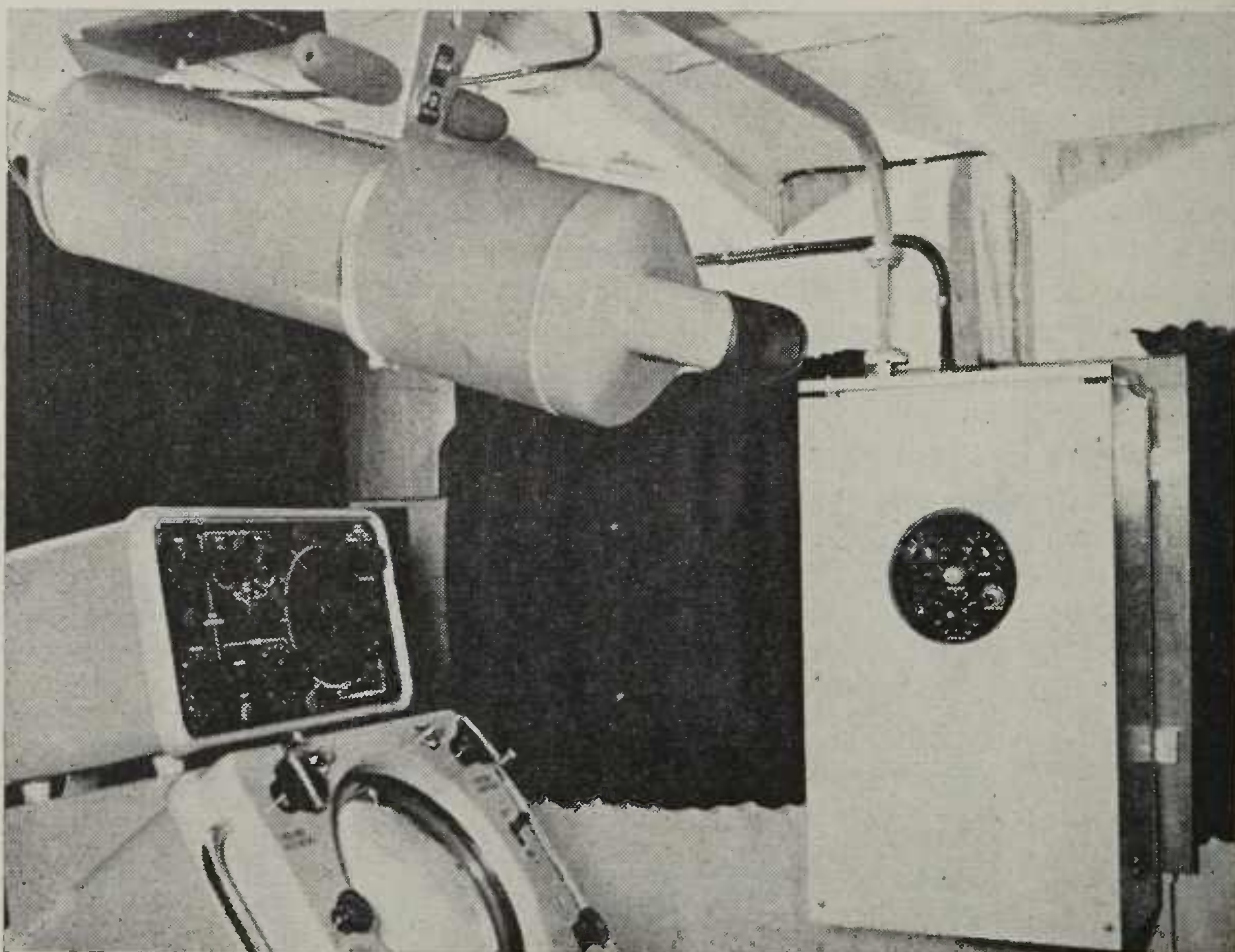
NEW RADAR ON THE "ARAHINA"

The Wellington Harbour Board's pilot-launch *Arahina* has just been fitted by Messrs A.W.A. with the latest Marconi radar set, designed specially for small craft. The set, called by the makers the "Consort" model, is extremely compact, and has a very low power consumption, making it especially suitable for small vessels, in which power economy is important. This journal was privileged to be taken for a demonstration run on the *Arahina*, during the course of which the performance of the radar set was demonstrated under varying conditions. For applications like this, extremely high transmitter power is not essential, since ranges are not expected to be great. The P.P.I. display is switchable for maximum ranges varying from 0.6 mile to 14 miles. Minimum range is only 25 yards or so, and with a horizontal beam-width of $3\frac{1}{2}$ degrees, discrimination is excellent, and a very detailed picture is given.

While out in the harbour, we were able to watch a ship detach itself from the Clyde Quay Wharf, and follow its subsequent movements even more easily in some ways than by visual observation. The set has on it devices for reducing the amount of wave clutter, and for reducing the effect of rain on the display.

As unusual technical feature is the manner in which the scanning coil of the P.P.I. display is driven in synchronism with rotation of the antenna. Usually, this is done by means of selsyns, either by direct drive, or by feeding the scanning waveforms to a special selsyn which provides outputs for a four-coil fixed scanning yoke. In this set, however, the simple device is used of driving the rotatable scanning yoke directly from the antenna, through a flexible drive cable! This probably constitutes the limitation on the bearing accuracy on the

(Concluded on page 32)



In the upper photo is the superstructure of the "Arahina" showing the totally enclosed aerial, which rotates inside a plastic housing that is transparent to radio waves.

Below is a view showing the main equipment rack, and the tubular structure containing the display tube, which is viewed through a magnifying visor. The handles are for the observer to steady himself by when a sea is running.

TV ROUND THE GLOBE

UNIQUE TELEVISION SYSTEM FOR "ORIANA"

Special Installation Gives Full Internal and Off-Air Facilities Throughout the World

Passengers in the Orient Line's new 40,000-ton luxury liner *Oriana* will be able to enjoy local television programmes at ports of call throughout the world, and closed-circuit telecine and live television programmes while the ship is on the high seas.

Oriana, launched by Her Royal Highness Princess Alexandra last November from the Barrow-in-Furness yard of Vickers-Armstrongs (Shipbuilders), Limited, will be the first passenger vessel in the world to be equipped with a completely co-ordinated internal and off-air television service. The order for the entire system has been negotiated by The Marconi International Marine Communication Co., Ltd., acting on behalf of Marconi's wireless Telegraph Co., Ltd., who have designed and engineered a unique marine television installation, enabling standard and unmodified television broadcast receivers to be used for reception of local transmissions in any part of the world.

The installation provides for the reception of television broadcasts employing the 405-line system used in Britain, the 625-line system used in Australia and the greater part of Europe, and the 525-line system used in the United States, Canada, Japan, and some South American countries.

Wherever alternative programmes are available, viewers can change from one channel to another by using the normal channel selector switch on the receiver. Thus, while the ship is in the United Kingdom area, either B.B.C. or I.T.A. programmes can be selected at the receiver; and elsewhere the same switch will select any of the local stations operating in Bands 1 and 111.

Initially, some sixty receivers will be installed in public rooms and first-class cabins and provision is being made for increasing the number up to a maximum of nearly 400 at a later date, without any alteration to the basic installation.

A major feature of the system is the use of standard proprietary receivers, the incoming broadcast programmes being processed as appropriate in a central television control room adjacent to the radio office before distribution to the receivers.

The processing equipment includes two Marconi Vidicon camera channels which also form part of *Oriana's* closed-circuit installation. While the ship is on the high seas this provides internal programme facilities mainly derived from a library of 16 mm. films.

Still pictures and captions can also be shown, and extempore captions and announcements can be made up on caption boards and inserted in the programme. Simple live studio sequences, interviews, and outside shots can be arranged by employing either camera as a remote unit outside the control room. A commentator's microphone is also provided.

Each of the two camera channels is associated with a separate 16 mm. film projector and a separate slide projector. Indexed turntables allow the cameras to be rotated to view either the film or slide projector.

This comprehensive telecine system is not intended to replace the liner's cinema; telecine programmes will supplement the regular film shows which still form an important and popular part of the entertainment provided for passengers and crew. But local television programmes can reflect the life of a city far better than any guide-book, and *Oriana's* passengers will be able to enjoy the unique experience of "looking in" at every station along the liner's route.

* * *

COMMERCIAL TV IN SCANDINAVIA FROM PLANE AT HEIGHT OF 7000 METRES

While for the time being the governments of three Scandinavian countries, Denmark, Norway, and Sweden, are contemplating whether in some form or other commercials can be incorporated in the official TV programmes, a Swedish-Danish syndicate has announced that from the beginning of next year it intends to send every night commercial TV programmes from a plane which is to circle somewhere over Scandinavia at a height of 7000 metres. The planes are to start from Hamburg, and the owners stated that they have been licensed to send TV by a non-European TV corporation. At the same time they stated that the German authorities cannot prevent the planes from starting, because the transmission equipment has not been nailed to the plane and consequently must be considered as being ordinary freight.

The price for one minute advertising has been fixed at 65 (Engl.) pounds.

As a direct result of these plans the official Danish TV has hastened its work regarding a decision of the possibility of having one quarter of an hour with commercials every night from quarter past eight to half past eight.

Heathkit QUALITY COSTS NO MORE

A TAPE RECORDER FOR USE WITH RADIO-GRAMOPHONES

(Continued from page 17)

the deck horizontally, but this would make loading and unloading most inconvenient. The "Studio" deck can be mounted at an angle, and so after due consideration, it was decided to slope the deck at forty-five degrees, and to provide a vertical control panel below it, three inches in height. This allows room for a two-inch meter, which was used as a level indicator instead of the more usual magic-eye circuit.

As can be seen from the photographs, the chassis with the circuits on it is mounted vertically on one edge, and all the controls are brought to the front panel by means of long extension shafts. This having been decided, it was found possible to save chassis space by mounting the bias and erase circuit on the upper edge of the chassis, together with the input sockets, the output socket, and the meter valve, with the flying lead to the meter itself. Note also the levers, and connecting rod by means of which two of the switches are ganged. This control is worked by the knob on the extreme right, and is the switch for altering the electrical compensation to suit the operating speed of the deck, which in this case can be varied from $7\frac{1}{2}$, to $3\frac{3}{4}$, to $1\frac{7}{8}$ inches per second.

Next month, we will be presenting the full circuitry that has been used with this recorder. It is similar, basically, to previous circuits we have published, but embodies several modifications of interest.

FOR SALE

Plessey Type PBI T.V. Turret Tuners, Pre-aligned for New Zealand T.V. Channels 1 to 10; 100 μ fd. 350 v. electrolytic condensers; 200 μ fd. 350 v. electrolytic condensers; all potentiometers to suit R & H T.V. Circuits; complete Kitsets if required. Discounts to all "hams".

RADIO & TELEVISION SERVICES LTD.,

239a Upper Symonds St.

P.O. Box 5493, Auckland

RADAR ON THE "ARAHINA"

(Continued from page 30)

radar, but is well worth-while in that it saves a great deal of complication, and results in no small measure in the small overall size of the equipment.

Another innovation is the use of transistors in the power supply section of the set, where a transistor D.C. converter is used for obtaining the high-voltage supplies from the 24-volt D.C. battery in the ship.

The aerial is mounted on the upper deck on a small tripod tower, but the rotating scanner is completely hidden inside an opaque radome. Altogether, this set is a beautifully engineered piece of equipment. Inside

the main unit which houses practically all the circuitry, one finds that extensive use is made of printed circuit boards, and that the accessibility of everything is first-class, in spite of its compact nature.

Perhaps the most noteworthy feature of this radar set is its price, which is under £1000, and brings the outfit within the economic range of smaller ships than have hitherto been fitted with radar.

SURPLUS STOCKS . . .

This month we offer surplus stocks both ex our own stock discovered during stocktaking and ex Govt. surplus auction held recently. Space does not permit the full line to be given but a **stamped addressed envelope** will ensure you receive a list. Here are some items to whet your appetite:

ARC 5 resilient Mounting Racks	2s. 6d. ea. 25s. doz.
ZC 1 Hammers, new good ones, Look	4s. 0d. ea.
Bulgin 7-pin, key-type plugs and sockets	3s. 6d. pr.
17.5 pf, double-ended variable, ceramic air trimmers, silver plated, small, new	6s. 0d. ea. 62s. doz.
100 pf Polar differential ditto	6s. 0d. ea. 62s. doz.
20 pf Polar, small, silver plated	6s. 0d. ea. 62s. doz.
3-pin Screenector Belling Lee plugs and sockets	2s. 6d. pr. 24s. doz.
Arcoelectric push-on, push-off, 5 amp., 250 v.	2s. 0d. ea. 20s. doz.
100 pf dual IF air trimmers	5s. 0d. ea. 50s. doz.
Meter Switching Preamp, complete on rack and panel cabinet, meter, 0-1 ma DC 2x, 6 push-button switch, ex N.Z.B.S.	£3 10s. 0d. ea.
Switching Unit Panel and Cabinet, ceramic 2 bank switch, 4-pole, 2 pos knob, etc.	15s. 0d. ea.
Meter Switch Rack Panel Cabinet, 6-pole pb switch 0-1 ma DC meter cords, relay, transformers, 3 x EF 37 2 x 6L6, one only	£4 10s. 0d.
Line Equalizer cased by Daven, U.S.A. mumetal transformers parts, etc. The lot gift at	5s. 0d. ea.
Equalizer Amplifier Transformers Panel, etc	£2 10s. 0d.
Power Mercury Solenoid Relays, 1 kW load, 10 ohm coils easily rewound, cost £8 8s. 0d. @ yours for	10s. 0d. ea. £5 doz.
P/U Arms EMI with Magnetic Cartridge, can be changed bargain	7s. 6d. ea.
Noval Cord Plugs and Sockets, Metal Covers, etc.	2s. 0d. pr.

Other lines too numerous to mention.

Drop us a line, send a telegram, we will send you a list if you send a stamped addressed envelope.

There are not many opportunities like this so be in while the going is good.

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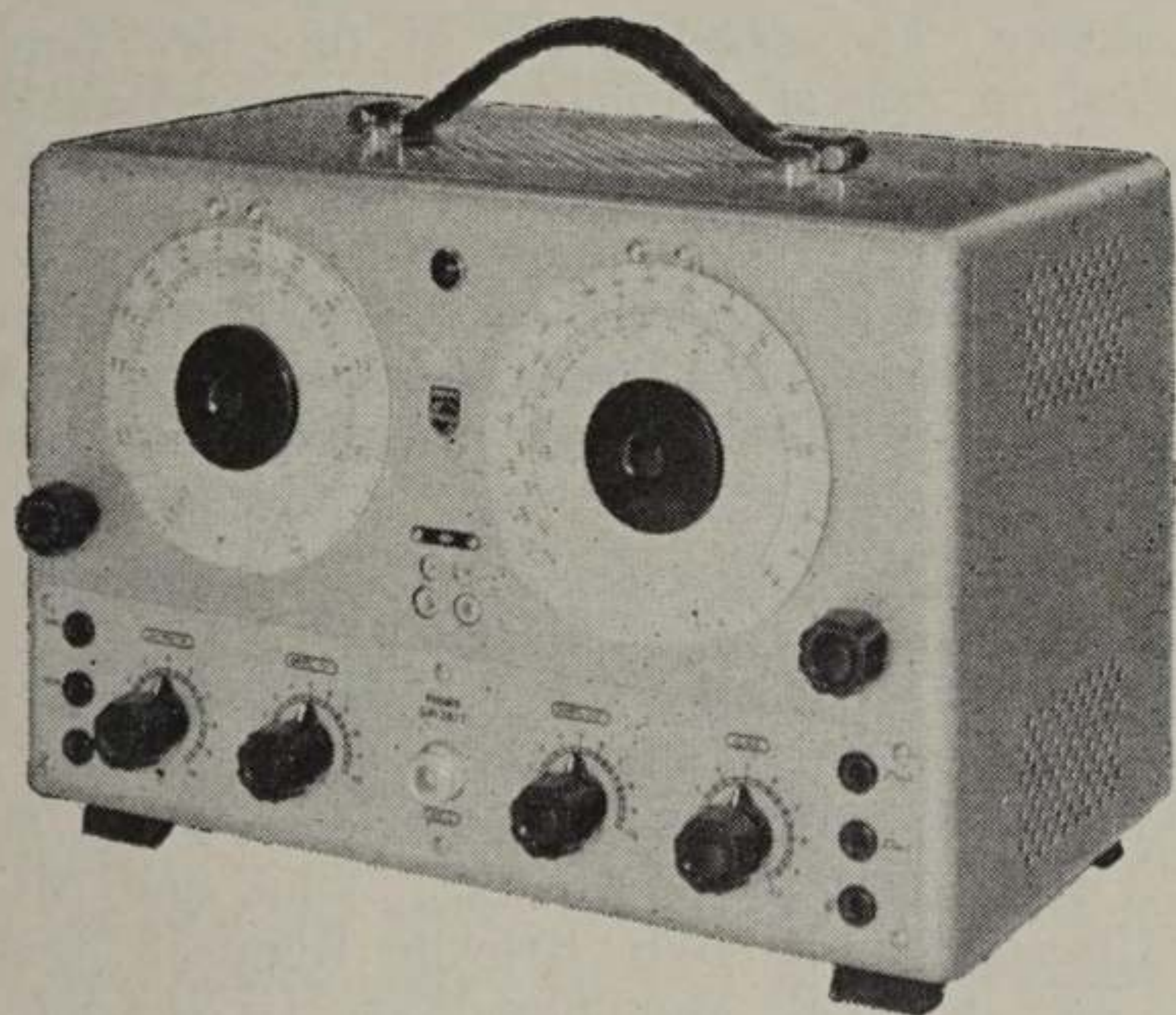
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NEW PRODUCTS:

LATEST RELEASES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

This section of our paper is reserved for the introduction of new products and space preference is given to our regular advertisers. For further particulars, contact Advertising Manager, "R. & E.", Box 6361, Wellington.

NEW SERVICE WOBBULATOR



The Philips' range of TV service instruments has been extended with the new universal wobulator, type GM 2877. The instrument is easily portable and contains the complete circuitry for generating the signals required to check frequency response curves of both TV sets and wind-band amplifiers. These curves can be displayed on the screen of any suitable oscilloscope.

The extended frequency range of the main oscillator of the wobulator includes all TV transmission frequencies in bands I, III, IV, and V.

Accurate frequency calibration is facilitated by the display of a marker pip on the response curve. The marker signal is mixed with the output signal of the equipment under test and amplified by means of the built-in marker amplifier. Consequently the amplitude of the marker pip is entirely independent of its position on the response curve.

High precision frequency calibration of the main oscillator signal is obtained by means of the incorporated crystal oscillator.

Full details of this and all other Philips instruments are available from EDAC Limited, P.O. Box 6415, Wellington and P.O. Box 3186, Auckland.

* * *

NEW "WESTINGHOUSE" COFFEE-MAKER

Pictured above is Miss G. Dwyer, an attractive 17-year-old Australian, chosen as Sydney's most sport-minded teenager and who recently won a trip to New



Zealand in a TV programme sponsored by Westinghouse, in company with E. A. Paulin, Auckland manager of H. W. Clarke (N.Z.) Ltd., displaying the new sensational Westinghouse fully automatic coffee maker.

This beautifully styled coffee maker is completely automatic, thus maintaining the coffee at piping hot temperature so long as it is required. The revolutionary spoutless design eliminates collection of residue and complements the modern styling.

Specifications: Capacity, 2 to 8 cups; body, bright anodized aluminium; elements, 750 and 60 watts, 750-watt, corox-type element and 60-watt, wound-wire warming element; basket, perforated aluminium; valve and pump assembly, aluminium; bubbler, glass; handle and base, phenolic plastic; cord, 6 ft detachable cord; thermostat, unitherm bi-metallic type operating both elements.

The first release of these ultra modern coffee makers is expected to be made in the Auckland province on the 6th June, 1960 by H. W. Clarke (N.Z.) Ltd., 10 Teed Street, Newmarket and at Wellington, Christchurch, Dunedin, Invercargill, and Nelson.

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FOOL-PROOF DICTATION MACHINE INTRODUCED

After many years of research Philips have introduced to the New Zealand market the "Memorandum" Dictation Machine which incorporates features making it almost fool-proof in operation. The machine is being marketed by Automatic Telephone & Electric Co. and is available either on a weekly rental basis or as a straight-out purchase.

This machine was introduced on the highly competitive American market some little time ago and has achieved fantastic sales. Some of the features are:

- (1) Cassette loading of tape obviating any possibility of tape twisting or damage.
- (2) Forty minutes playing time on twin track tape.
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- (4) Fast wind and rewind—200 ft in 8 seconds.
- (5) Complete weight only 8 lb.
- (6) Three playback systems—microphone/speaker for quick checking of dictation and for corrections—lightweight stethoscope type headset—unobtrusive plastic earphone for typist's use.
- (7) Built-in programme indicator scaled in minutes and quarters of a minute of dictating time.
- (8) Volume automatically regulated when recording.
- (9) Two types of typist control—panel which fits underneath typewriter keyboard, or three-position foot control.
- (10) Tape can be used hundreds of times.
- (11) Wide range of accessories including two cassettes with two 3 in. reels and 220 ft of tape, plastic dust cover, carrying case (optional extra), extension speaker (optional extra).

* * *

NEW LAMP FOR 8 mm. CINE PROJECTORS

Philips have recently introduced a fundamentally new type of lamp for use exclusively in 8 mm. cine projectors. It is Type 1311C/04, an 8-volt, 50-watt, class A1 projector lamp.

This lamp is designed with an elliptical mirror incorporated in the bulb. The filament, which is carefully controlled, is of small dimensions and is located at the principal focus of the mirror. When the lamp is used with an 8 mm. cine projector the secondary focus of the mirror occurs in the position of the gate so that an image of the filament is produced on to the gate area. No condenser lenses are employed in this type of projector.

Generally, 500-watt, class A1 projector lamps are used with 8 mm. projectors, and these, of necessity, dissipate a great amount of heat. In the case of the 8-volt, 50-watt lamp, however, the screen illumination is at least the equivalent to that of the 500-watt lamp, but it is achieved with one-tenth of the wattage and, therefore, approximately one-tenth of the heat.

The conventional projector, moreover, projects only a small proportion of the lamp's output of light on to the screen. The development of this new lamp has resulted in optical efficiency so improved that comparative screen brightness is achieved with a very much lower wattage.

It should be noted that the 13113C/04 is not suitable for substitution in a conventional 8 mm. projector and is not available for any other projector size (i.e. 9.5, 16 or 35 mm.).

The following projectors have been designed to take advantage of this new technique: ZEISS IKON, Movilux 8A and 8B; NIEZOLDI & KRAEMER, Cinemator 8; SIMMERMAN, Cimalux; FOTON, Elektor Boy and Elektor 8 Automatic; AGFA Movecator 8 and Sonector 8; CIRSE, Nilus and Missouri and Ciresound; KODAK, Brownie Eight-58; Beaulieu, P 8; HEURTIER, Monofilm PS 8; CINECEL, G 8; DOMINUS, P 8; EMEL, Miami; BRIMBUEF, MIG 8; PATHE, Baby 8 and Europ 8.



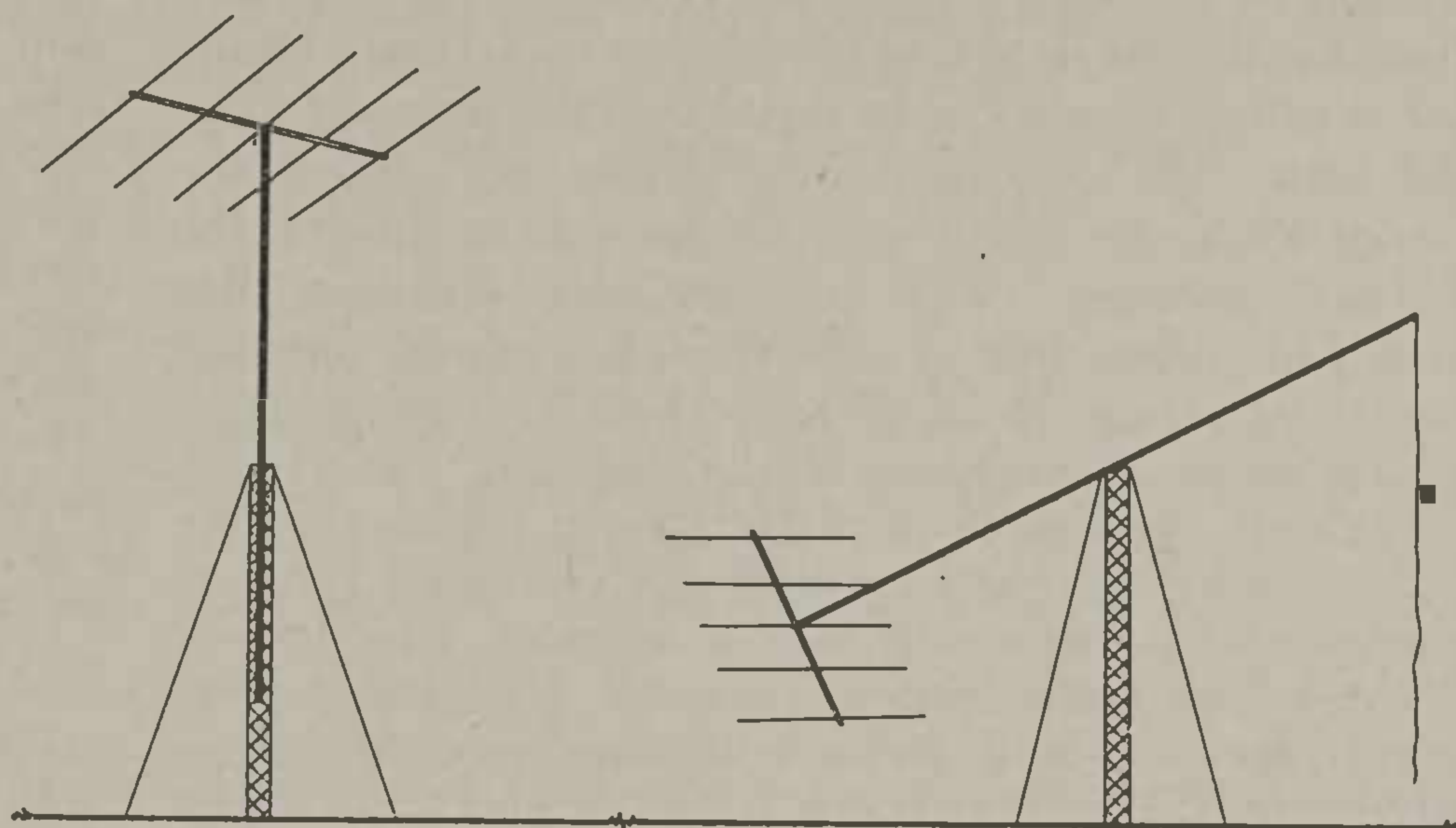
PROFITABLE TV SERVICING—Part 10: THE AERIAL

By P. E. CLEMENT

Erecting modern lightweight aerials should present few problems. An experienced rigger with his boy helper can easily put up ten or eleven a day without seriously endangering their "smoko". Whenever possible, a full-time aerial rigger should be employed. Obviously, a much slicker and more professional job will be executed by a man who does nothing else than if the engineer or delivery man is given the job. The same applies to the risk of accidents or damage to customer's property. In a small concern, where the number of sales does not warrant a full-time rigger, it is better to give one man all the aerial jobs, or, better still, to farm them out to a firm doing aerial erecting to the trade. Another argument in favour of the full-time aerial rigger is that, working in one area, he is able to judge exactly what will be required for any particular location; obviating the need for trial and error. Where this is not known and trials are needed, some form of rapidly erected mast is an asset. It is to be regretted that British aerial firms did not adopt the American idea of the swing-over tower. This consists of a triangular sectioned lattice tower with another lattice section or a tubular mast pivoted at the top. When the securing guy wire is released the aerial can be lowered to alter the angle of shoot or try another type of aerial unit. Thus, once the tower is up several aerials can be tried in quick succession. Once the most suitable has been selected it can be mounted on a less expensive type of mast and the tower removed. Another American trial mast consists of a three- or four-section telescopic mast incorporated in a small trailer behind the van. The trailer is trundled into position, the legs let down and the mast cranked up. Very nice but a little on the expensive side.

The usual charge for erecting a new aerial or repairing an old one is about £1 or 30s., plus the cost of materials. It is a bad mistake to overcharge for aerial jobs. This tends to encourage the customer to have a shot at putting up his own aerial, often with very unsatisfactory results. The poor picture will be blamed on the new set for sure, and the outside engineer will have several fruitless calls before he finally convinces the customer that the fault lies in his handiwork and not the set. I can recall more than one instance when I have had to ship the set (and the customer) back to the shop and demonstrate it on our aerial before I could convince him that his set was O.K.

In the U.K. prices of aerial installations and cables have tumbled to about half of what they were seven or eight years ago, and the ease with which the modern unit can be erected has resulted in cuts in the fitting



costs. The average price for a combined aerial of five elements band III and single element band I, including fitting, is £7 or £8.

If the station or stations to be received fall in the high number channels (say above 70 mc/s) care must be exercised in choosing a good quality air-spaced cable. It is assumed that aerial inputs in New Zealand are patterned on the European standard of 80 ohm co-axial, and not the American 300 ohm open feeder. Losses in aerial cables increase very sharply with frequency and it is false economy to use cheap cable unless the signal is very strong. When the I.T.A. first started transmissions on channel 9 in England the firm with which I was associated carried out comparative tests with the various aerials and cables then available. It was found that a simple 3 element aerial with one brand of cable produced better results than a 6 element with another cable.

In extreme fringe areas much more complex aerials will be required. Ten and 12 element single channel Yagi arrays are available but the author does not advise any larger than 8 element. Although these 12 elements look very good on the maker's leaflets it is not always easy to obtain the results specified. The trouble is that increasing the number of director elements not only improves the gain, but also narrows the angle of acceptance. Thus extreme accuracy must be achieved in siting the aerial if it is to give good results. In some cases this angle is less than two degrees. Aligning the direction that accurately on a weak fading signal is a tedious and well nigh impossible task. Even when set up the chances are that it will shift a degree or so in the next gale. Remember, a 12 element aerial 4 degrees out of line may give inferior results to a 6 element also 4 degrees out. If the gain of an 8 element is insufficient I would advise two 6 element units double stacked rather than

a 10 or 12 element single. Because of matching difficulties it is advisable to buy a double stacked unit rather than try and match up two singles yourself. As stated in an earlier article a good reliable field strength meter tunable to all the channels used in your locality should be considered essential. Without it the engineer faced with a weak grainy picture has no accurate means of deciding whether it is aerial trouble, poor set gain, or both. All too often the engineer will blame the aerial while the rigger says it's the set. In the end the service manager (with the customer breathing fire down his neck) has to send them both down together with orders not to come back until it is fixed. How much more satisfactory if the engineer can report, "I'm only getting 25 microvolts from that aerial, the XYZ model needs at least 100." Or the rigger can say, "my aerial is delivering over a millivolt, pass to you Fred." The enthusiast who cannot get good results from his home-built set will be impressed when you arrive with a field strength meter to check his aerial first; and word will go round the club, "Browns are an efficient firm." Lastly, that obstinate "do it yourself" character mentioned earlier who, having erected his own aerial, refuses to hear anything said against it. Show him the meter reading. It gives weight to your words (I was going to say "argument" but a good engineer never argues with a customer) if you can quote accurate figures. A good field strength meter costs £28 to £40 in the U.K. Admittedly you *can* knock up a field strength meter out of a second-hand turret, an old I.F. strip, and a micro ammeter, but it is doubtful if it will be as accurate or as reliable as the commercial article. Neither will the home-made job impress the customer.

Communal and community aerial systems are a specialized subject hardly within the scope of this article. These vary from simple amplifier systems where four or five apartments in one building are fed from a single aerial, to vast concerns where whole cities in the fringe area are fed with a piped signal.

Treading Warily

From time to time a situation may arise where your engineer diagnoses aerial trouble, and finds that the aerial (either single or a communal aerial system) was put in by another firm. Great tact is called for here. On NO account should he run down the work of another firm even if he is sure of his facts. Firstly, he must make quite sure that it is the aerial, and here again the field strength meter shows its worth. Next, after a suitably vague excuse to the customer, he should contact his employer and the competitor's service manager. Usually the matter will be straightened out quickly and quietly to everyone's satisfaction. It is quite a good plan to have the aerial rigger mark each new aerial job with a tiny sign known only to the firm. The engineer encountering a fault on an instal-

lation not so marked will know that it is another firm's job and tread warily.

Aerial Fixing Method

It is interesting to note how aerial fixing methods vary from country to country. In Britain over 90 per cent. of all outdoor aerials are of the chimney lashing type. In Belgium and Holland a much lighter mast sits on the roof ridge and is held in place with guy wires. Americans use various methods but a rather interesting one is as follows: one roof tile is removed and the mast run up through the hole. The lower end is firmly clamped to a beam or rafter in the loft. The tile is replaced by a metal or plastic plate which clamps firmly round the mast making a watertight and rigid joint. The cable can be run down through the mast, but the latter must be watertight at the top to prevent water running down inside.

Any broken tiles or other roofing defects that are noticed during an installation job should be pointed out to the customer at once. You are sure to be blamed for them later otherwise.

A final word about lightning. To those unfamiliar with the subject, a TV aerial, consisting of metal rods and situated high above the house, would seem to constitute a very grave risk where lightning was concerned. One visualizes a violent flash resulting in small smoldering pieces of television scattered about the room. In practice this never happens. (What, never? Well hardly ever!) Of about 2 to 3000 sets that pass through my hands each year perhaps one will be lightning damage. In all cases the damage was slight. As even the most rabid viewer only uses his set for 7 or 8 hours out of the 24 the chances are that the lightning will strike when the set is switched off. The small ceramic capacitors isolating the aerial from the set will very likely be annihilated and the lightning escaping to earth via the mains will shatter the ON/OFF switch. In one case the mains point was blown clean out of the skirting board but the set unharmed except for the aerial capacitors. I did once see a set in which the channel 1 aerial coil had vanished completely leaving a small brown stain. Of course, the aerial stands to suffer more damage than the set. Sometimes the cable will vanish leaving just a black line on the tiles.

Some Americans guard against lightning by fitting small gas-filled spark gap arrestors. The British tend to consider the risk too slight to bother about. One firm, Messrs Belling Lee Ltd., give a free lightning insurance with each aerial. They state that they have had less than 3 or 4 claims per million aerials sold.

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Over 4 Years	12 10 10	13 5 5	14 4 1	15 2 2
Cpl.				
On appointment	13 11 10	14 6 5	15 5 1	16 3 2
Over 2 Years	13 18 10	14 13 5	15 12 1	16 10 2
Over 4 Years	14 5 10	15 0 5	15 19 1	16 17 2

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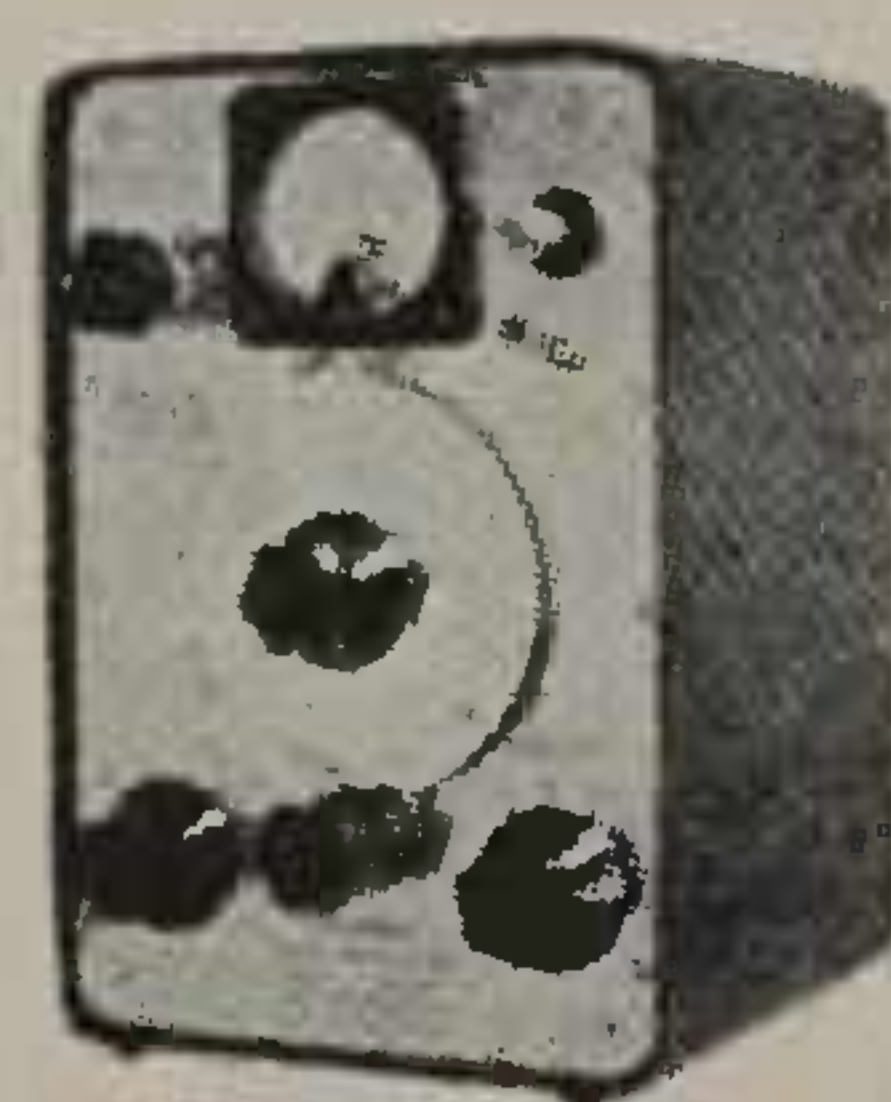
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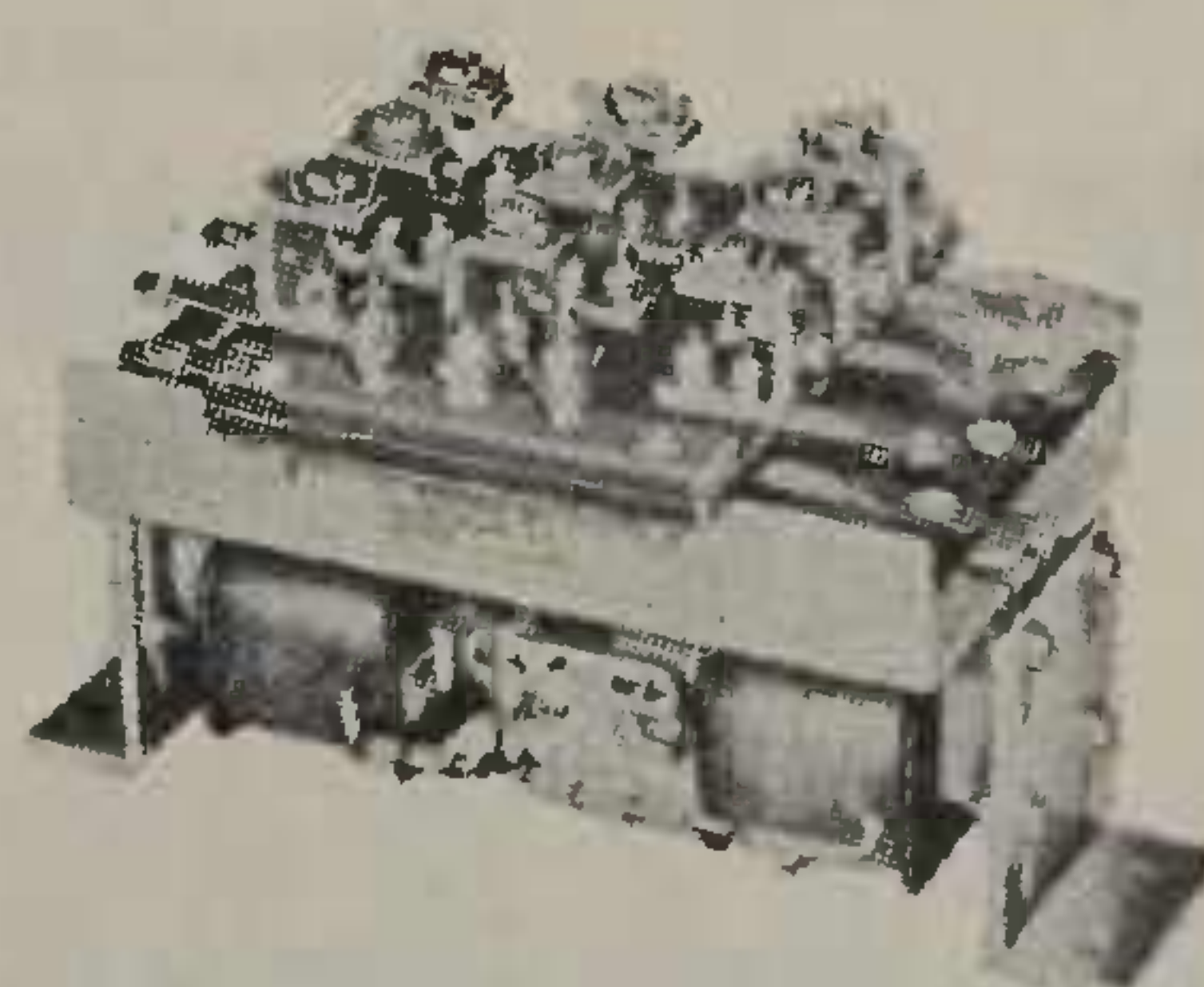


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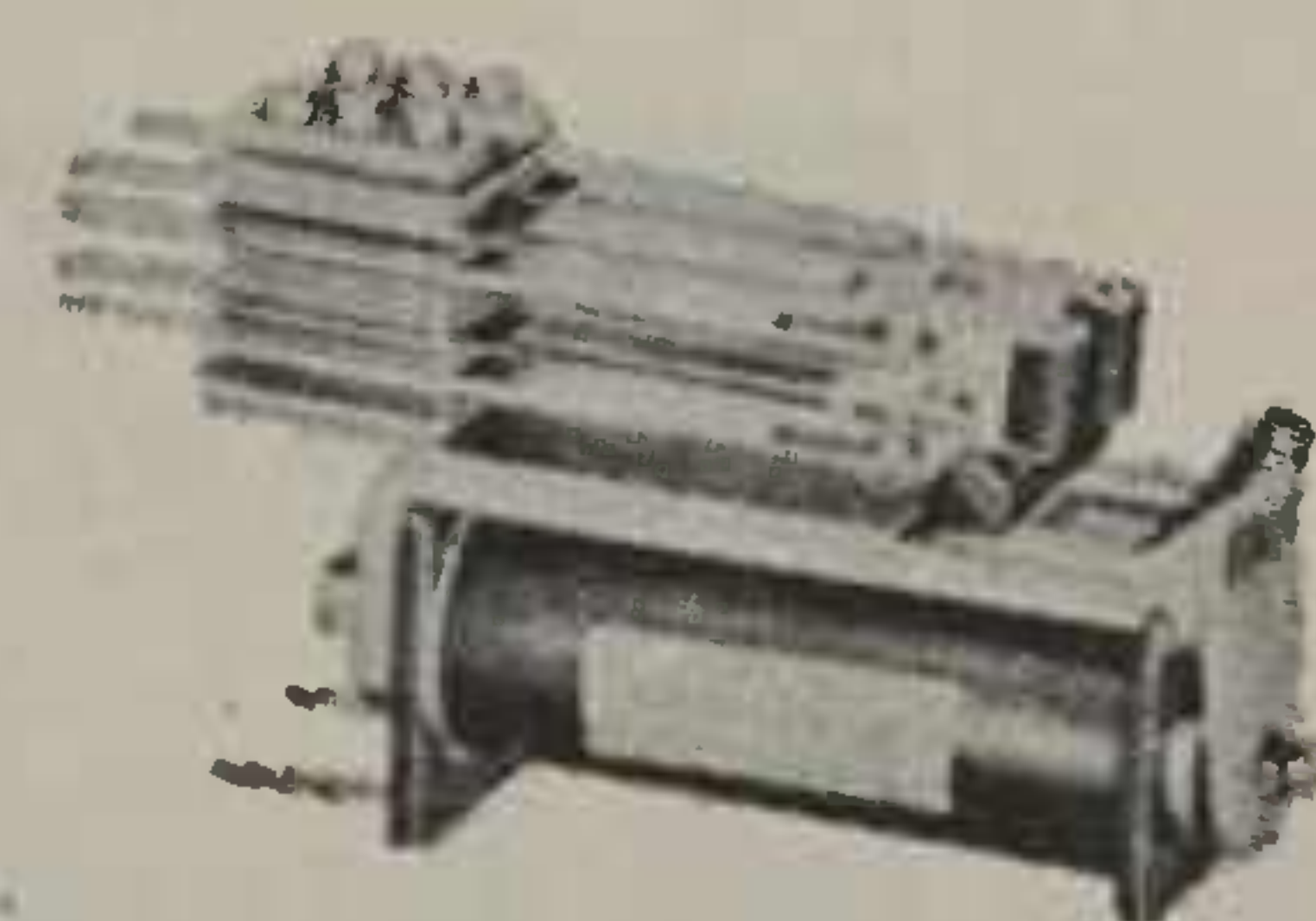


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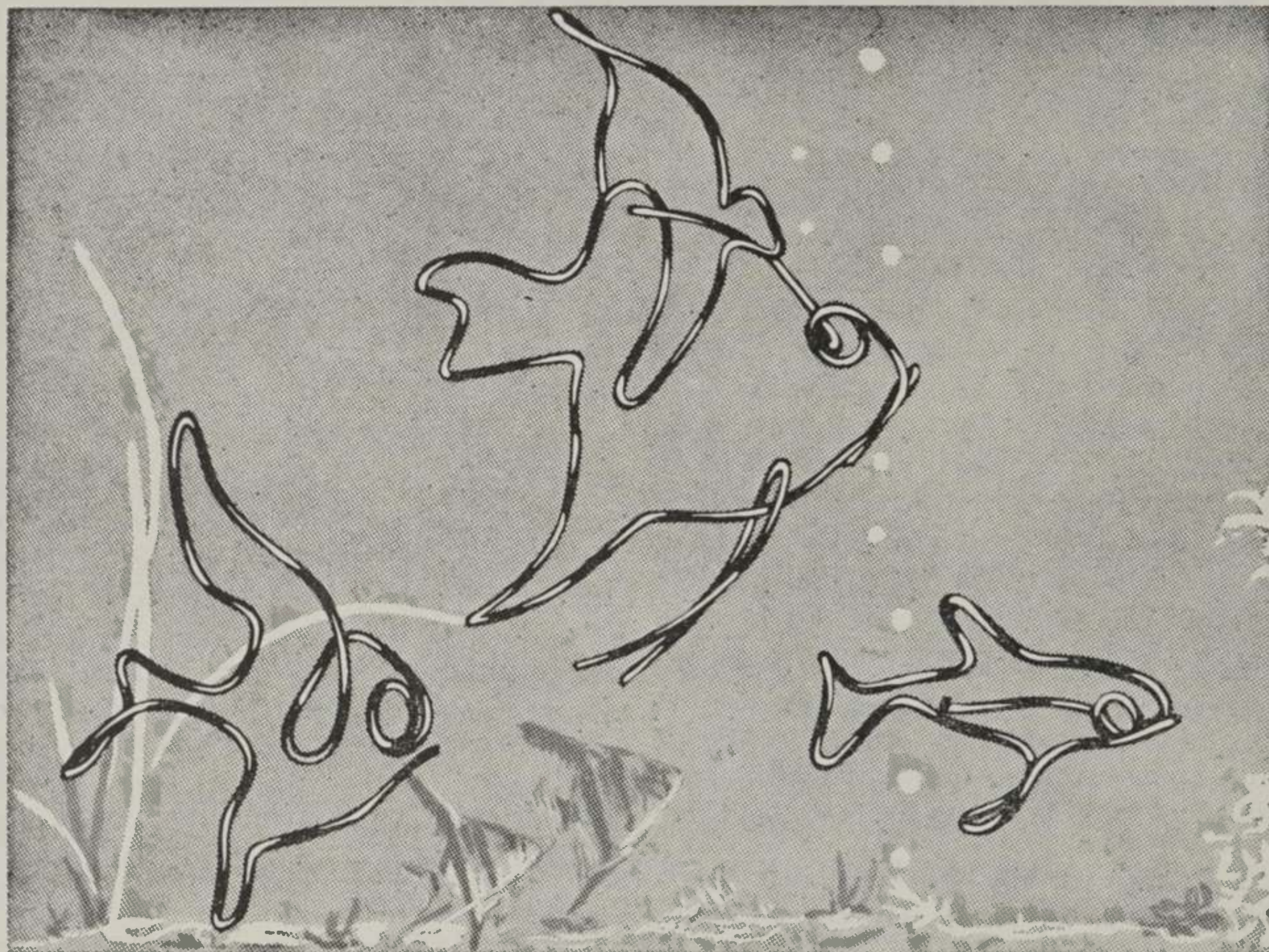


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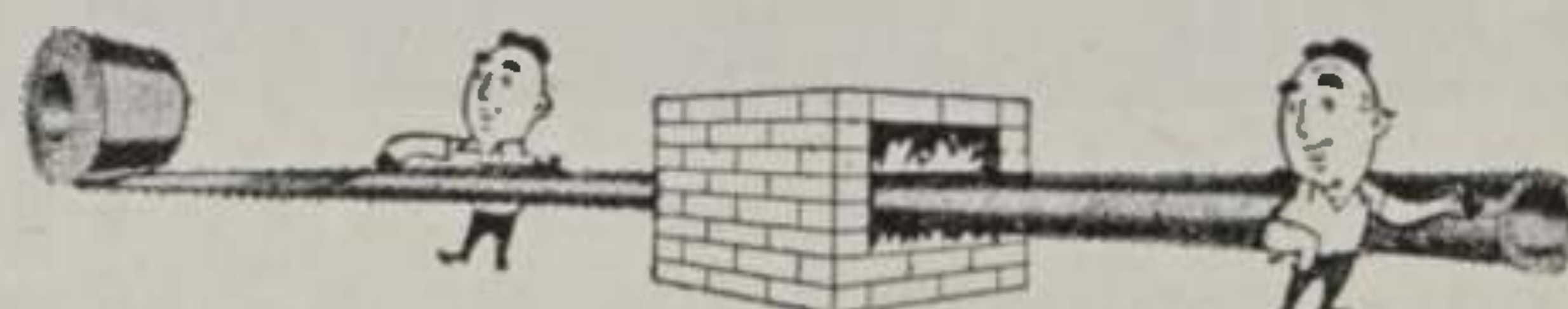
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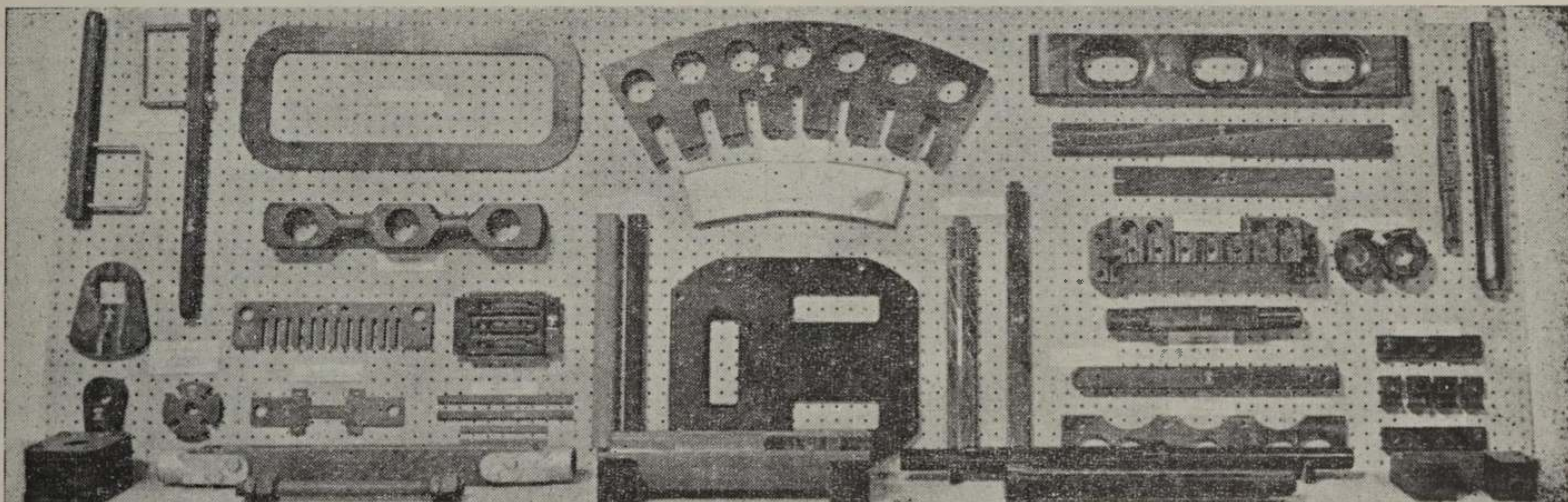
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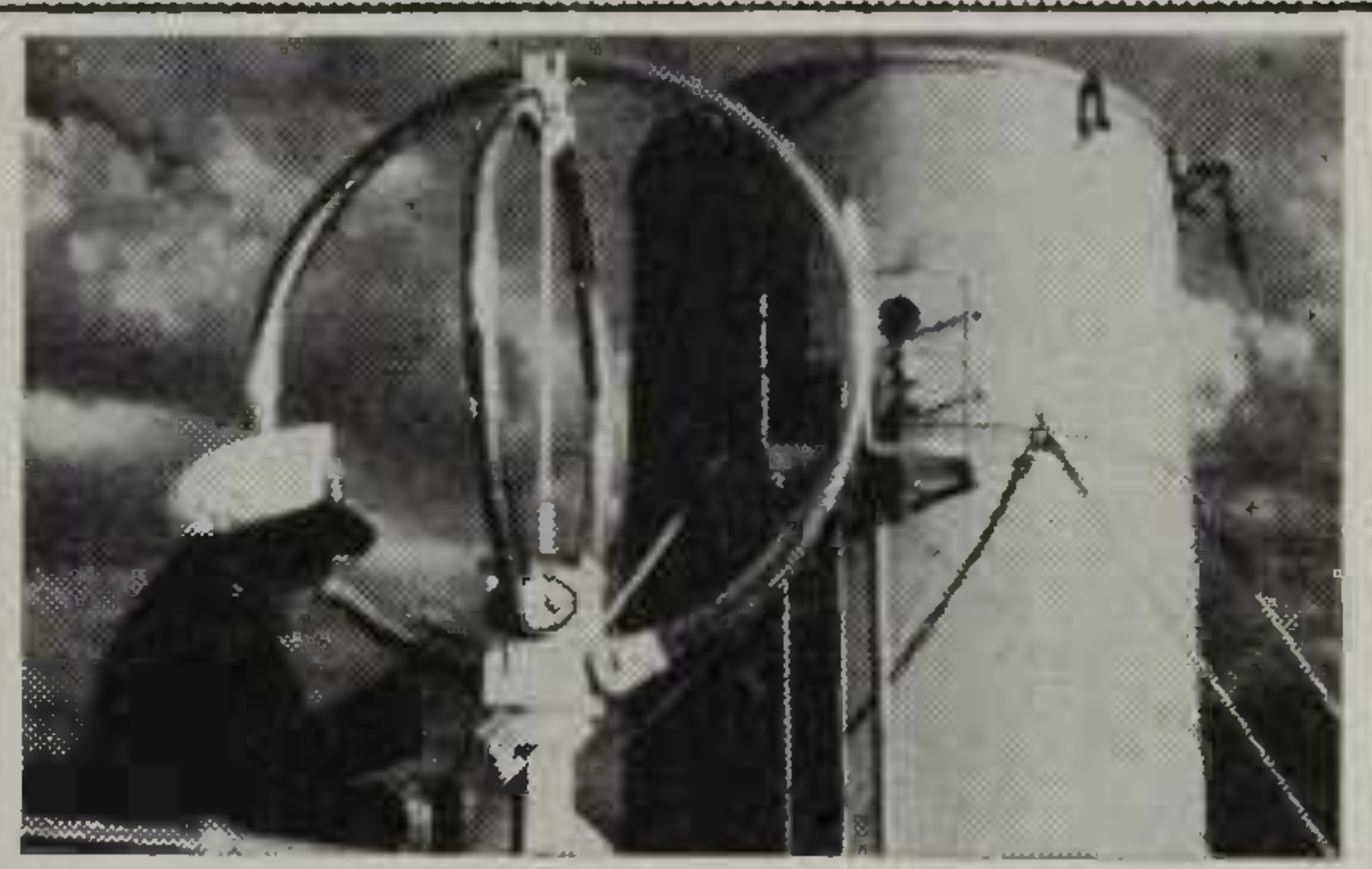
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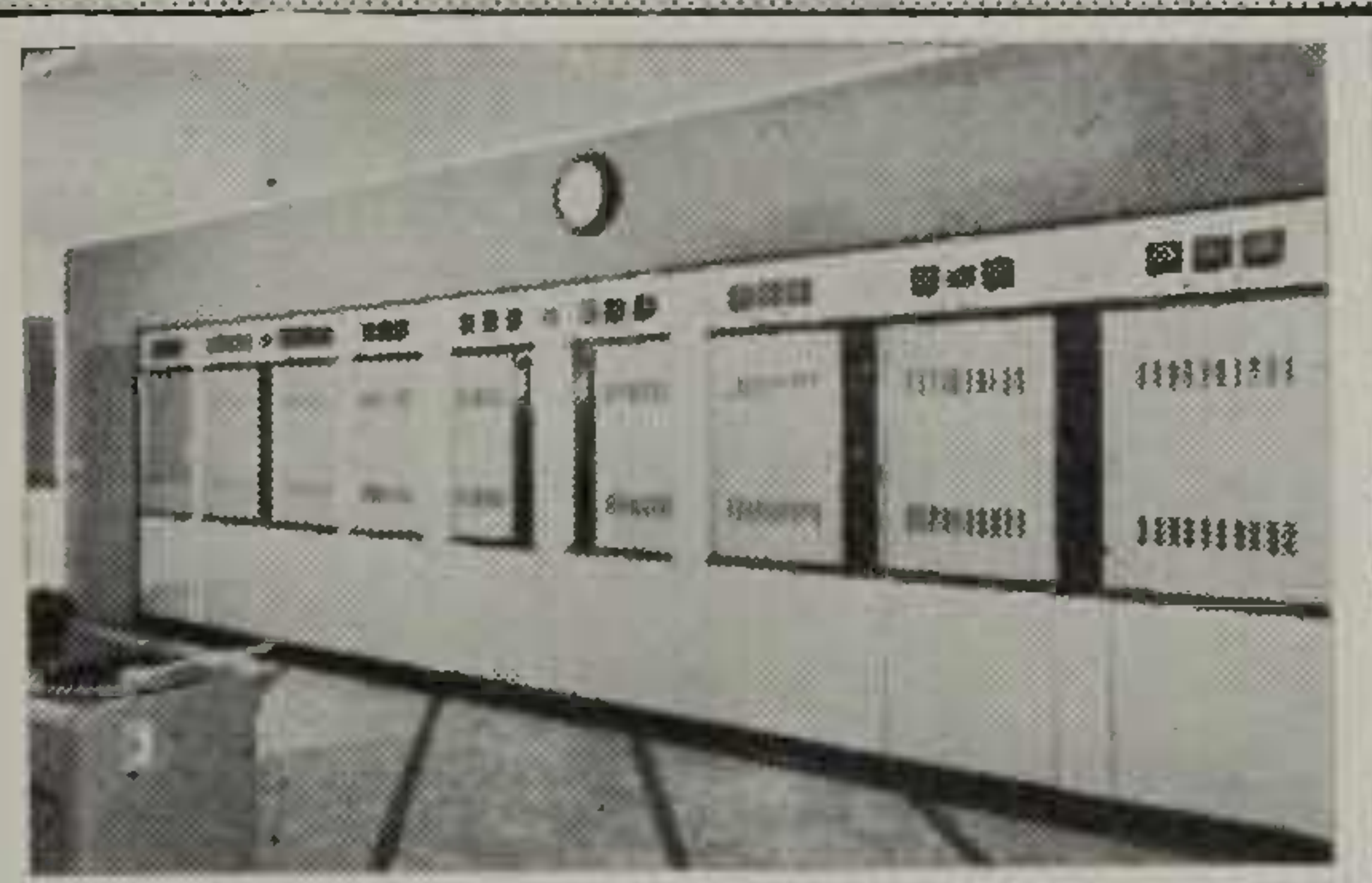
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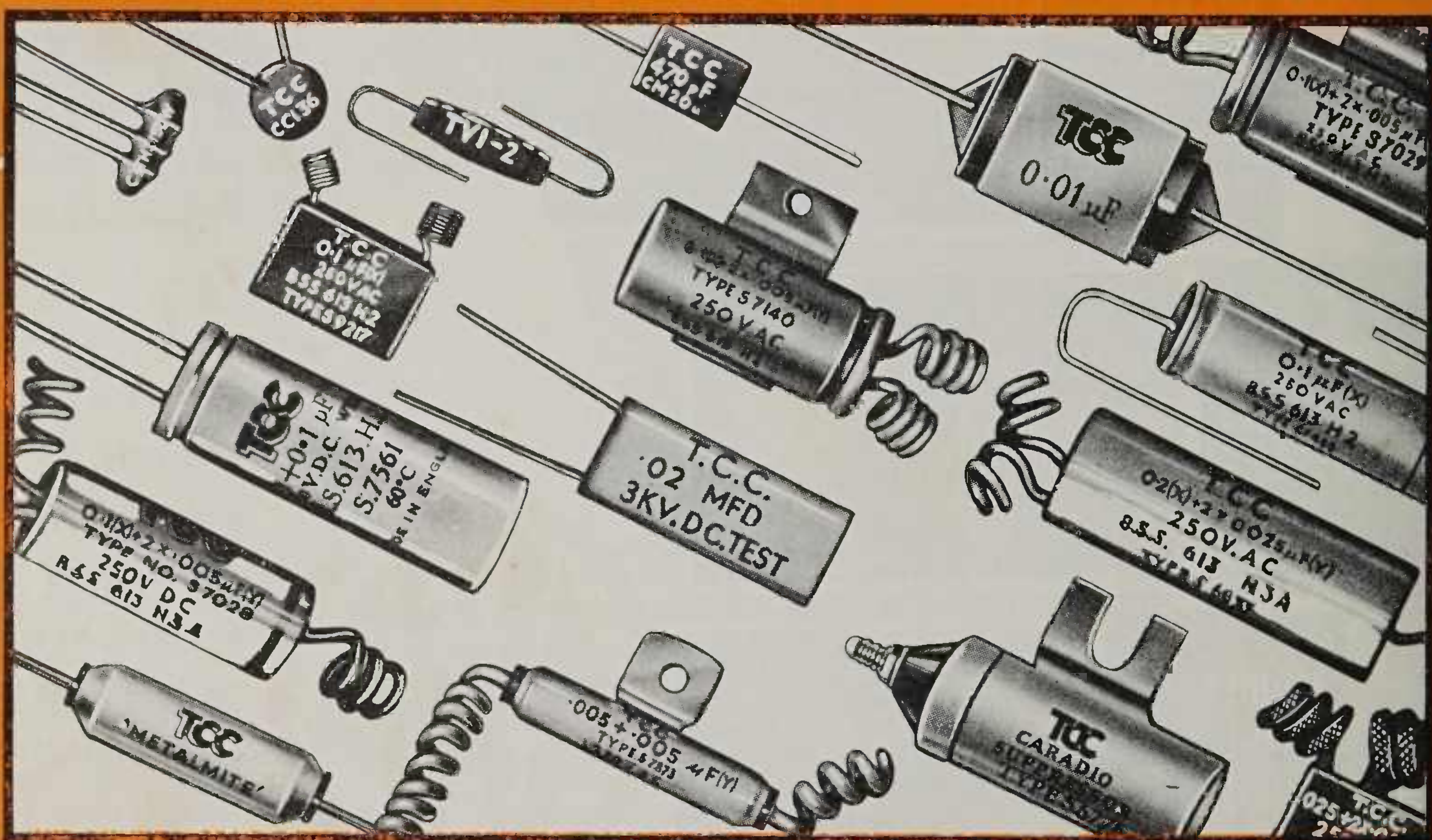
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