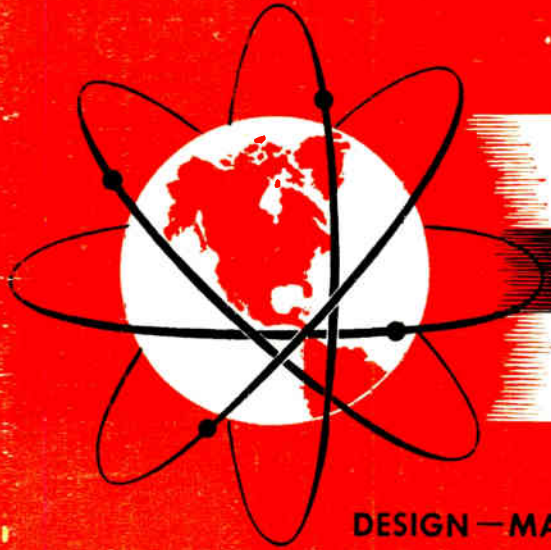


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# ELECTRONICS *and* COMMUNICATIONS

DESIGN — MANUFACTURE — ENGINEERING — DISTRIBUTION — APPLICATION

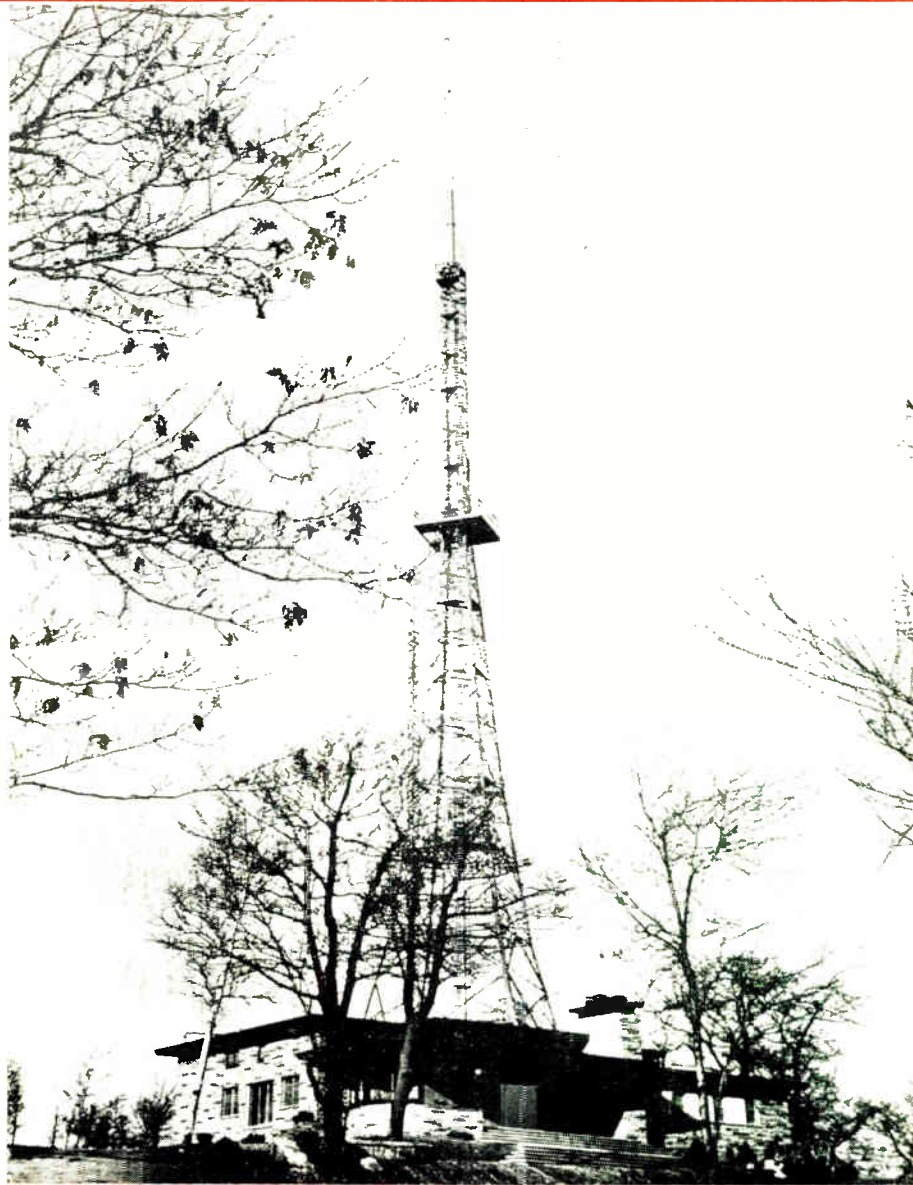
**Complete Program Studio  
Facilities Incorporated  
In Portable Console . . . . . 22**

**Low Band TV Amplifier  
Features Low Cost —  
Small Size — Easy  
Maintenance . . . . . 23**

**New Visual Effects For  
Color TV A Versatile  
New Technique . . . . . 29**

**Portable Communication  
Unit Uses Recent  
Advances In Components  
Materials And Circuit  
Techniques . . . . . 36**

**20,000 Assemblies In  
8-Hour Shift With New  
Automatic Equipment . . . . . 46**



CBC's Montreal Mountain-Top Transmitter Tower.

*April, 1956* ★ \$5.00 a year  
An AGE Publication, Toronto, Canada

Circulation Of This Issue Over 10,200 Copies



# COMPONENTS ARE MADE AND STOCKED IN CANADA

for immediate delivery to the Canadian electronic industry



RF Connectors

## 215 TYPES OF AMPHENOL RF CONNECTORS Made & Stocked in Canada

Amphenol are continually designing and building — in Canada — new RF Connectors for special Canadian requirements. This is in addition to the 215 Standard types stocked in our Toronto warehouse.

CAMESA approval has been obtained on the majority of AMPHENOL RF Connectors and further approvals are being obtained every week.

For COMPLETE information on all the various types of RF Connectors available, write for 66-page Catalog D-3.

## SUBMINAX RF CONNECTORS & CABLE

Available to carry low power circuits to match 50 and 75 ohm impedances. Designed to save both space and weight. These connectors have full size RF connector efficiency and are available in 27 different types — both push-on and screw-on. Made and stocked in Canada. Complete information, illustrations and assembly instructions in Catalog D-3.



Subminax RF Connectors



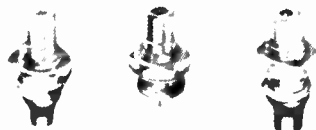
AMPHENOL Captivated Connectors contain a fixed center contact which remains engaged regardless of dielectric movement.

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The problem WAS to design a connector as good electrically as standard connectors and yet contain a fixed center contact which would remain engaged regardless of dielectric movement caused by extreme temperature change.

CAPTIVATED CONNECTORS, for use with RG-87/U Teflon dielectric cable and RG-8 U, 9/U and 10/U polyethylene dielectric cable, have eliminated this problem on these cables. VSWR characteristics are superior to standard N connectors.

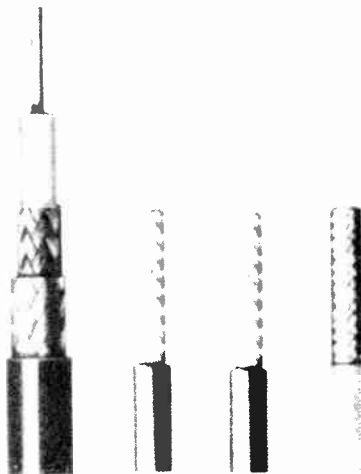
Plug, jacks and panel jacks available — in Canada — for H and HN series. Write for our Captivated Connector Bulletin giving complete information.



## 159 TYPES OF AMPHENOL CABLE STOCKED IN CANADA

For best results, match AMPHENOL RF Connectors with AMPHENOL Cable. RG- U types with polyethylene and Teflon dielectrics. Noise-Free. Coaxial, Tri-axial, Aljak and Miniatures cable are only some of the types available from our stock.

In the past three months considerable standardization has taken place by the authorities in Coaxial Cables resulting in elimination of some types and the addition of others. Write for the latest list of Standard Coaxial Cables.



Cable

### also available:

40-page W-1 Cable Catalog, containing information and illustrations on every type of AMPHENOL Cable. Complete technical information on cable jackets, conductors and dielectrics. Comprehensive wire chart on stranded and solid wire, Teflon and polyethylene properties. Complete Military RG- U Nomenclature.

Specify Amphenol RF Connectors and Cable. Competitively priced - Made and Stocked in Canada



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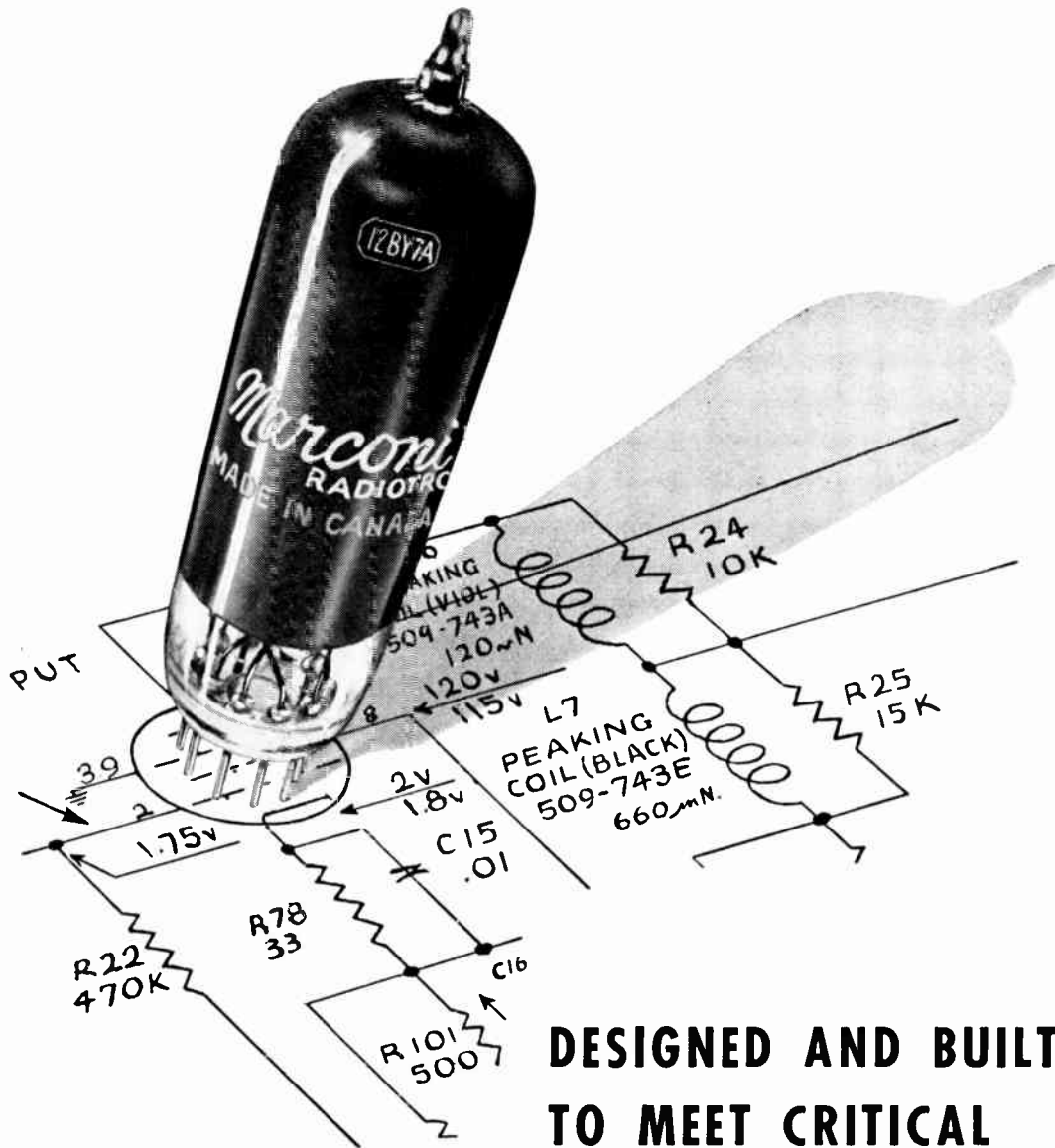
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Montreal, Que.

492 Somerset St. W.  
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Calgary, Alta.

For further data on advertised products use page 61.



## DESIGNED AND BUILT TO MEET CRITICAL OPERATING CONDITIONS

Rigid inspection at every step maintains the high quality engineered into Marconi tubes . . . assures complete satisfaction under the most critical operating conditions. Perfection in every unit is the traditional Marconi standard that means greater power, better tone and longer life to please your every customer.



# MARCONI RADIOTRONS

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN **Marconi** COMPANY

830 BAYVIEW AVENUE, TORONTO, ONTARIO

Branches: Vancouver • Winnipeg • Montreal • Halifax • St. John's, Nfld.

# NOW! Improved telephone service Lower operating costs . . .

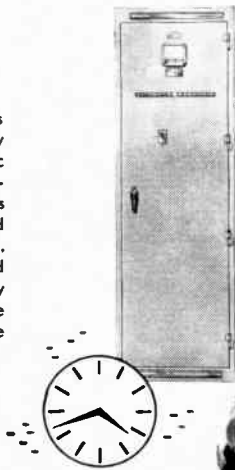
## with Automatic Electric Recorder Announcers

Now subscribers are getting any type of information, quickly and efficiently, *without calling the operator!* Recorder Announcers relay the messages in clear, lifelike tones, at the least possible cost to you.

There are four types of Recorder Announcers to provide every announcing service. They result in an improved service that builds goodwill. Operating costs are cut by replacing operators, or allowing them to deal with more pressing calls.

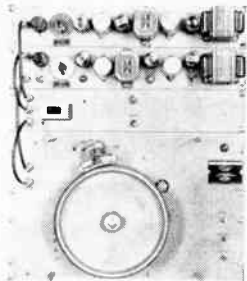
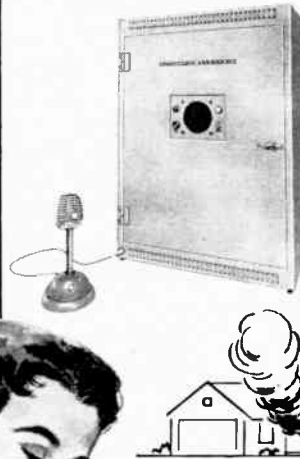
### AUTOMATIC TIME ANNOUNCER

"Broadcasts" time every 15 seconds automatically. Each "Broadcast" may be preceded by commercial or public service announcements. Up to 6 different announcements, each of 6 seconds duration, can be made and changed at will. 50 callers can listen at once. Sample: "See the First Building and Loan Company today about easy new homes savings plans. At the tone THE TIME will be 4:32 and one quarter."



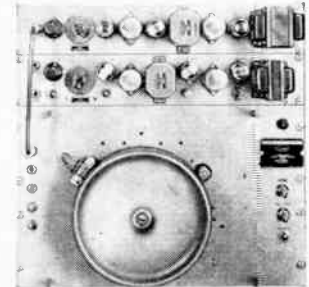
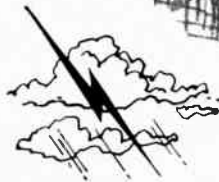
### TYPE FML

For installation with fire departments, theatres, transportation companies, etc. Takes 6½ or 12-second messages. 30 callers can listen at once. Batteries provide stand-by power. Sample: "Fire at Jones Service Station, Main and Centre streets . . ."



### TYPE VML

Up to 30 callers at one time can hear weather forecasts, advertising messages, bargain announcements, ship and plane clearances, sports results, etc. Messages, up to 2 minutes in length, are easily recorded and erased. Sample: "Fair with slowly rising temperatures. Low tonight, 64. High tomorrow, 78, with slight haze in afternoon."



### TYPE MCF

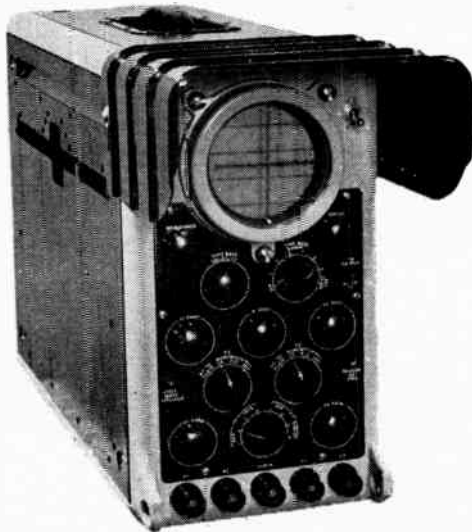
Provides repetitive interception of calls to disconnected lines, deal levels, etc. 30 callers can listen at once. Operates either continuously or on start and stop basis. Sample: "You have dialed the wrong number. Please look in your directory."



Power consumption is very low, maintenance easy, and there is no wear to speak of. In fact, nothing to cause trouble. For more information write today for Circular 1845. Address: Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches: Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton and Vancouver.

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(CANADA) LIMITED

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## The NEW

# COSSOR

# OSCILLOSCOPES

## For All Applications

### MODEL 1058

Single beam 4" tube  
Post deflection acceleration

Wide band D.C. Y amplifier  
Symmetrical X amplifier

Free running or triggered time base

Sweep expansion times 5

Automatic trigger and sync. control

Continuously variable trigger pulse attenuator.

#### Y AMPLIFIER

D.C. to 6 mc/s.

Sensitivity 25V to 125V per cm.  
Gain continuously variable.

#### X AMPLIFIER

10 c/s to 150 Kc/s.  
Sensitivity .5V to 50V per cm.  
Gain continuously variable.

Weight — 42 lbs.

### MODEL 1052

Double beam 4" tube.  
Frequency Range  
25 c/s to 3.5 mc/s  
Matched amplifiers.

Full screen deflection at all positions of T.B.

Sweep duration — 5 microsecs to 200 milliseconds.

Weight — 42 lbs — portable.

### MODEL 1056

Single beam post deflection acceleration.

#### Y AMPLIFIER

5 c/s to 40 mc/s.  
Rise time 10 millimicrosecs.  
Sensitivity — .2V to 60V per cm.  
Gain continuously variable.  
Signal delay 16 millimicrosecs.

#### TIME BASE

Triggered only  
10 millimicrosec. to 30 microsec per cm. Sweep amplitude two screen diameters.  
Timing wave 100 mc/s to 100 Kc/s

Weight — 65 lbs. approx.

### MODEL 1059

Double beam  
Post deflection acceleration.

#### Y AMPLIFIER

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Sensitivity .2V to 180V per cm.  
Gain continuously variable.

Signal delay 150 millimicrosecs.

#### Y1 PREAMPLIFIER

Gain 20 times over 20 c/s to 5 Kc/s.

#### Y2 AMPLIFIER

Same as Y1.

#### X AMPLIFIER

10 c/s to 500 Kc/s.  
Sensitivity 3V to 15V per cm.  
Gain continuously variable.

#### TIME BASE

Triggered with sync.  
Free running without sync.

.1 microsec to 50 millisc. per cm.

Expansion times 5.

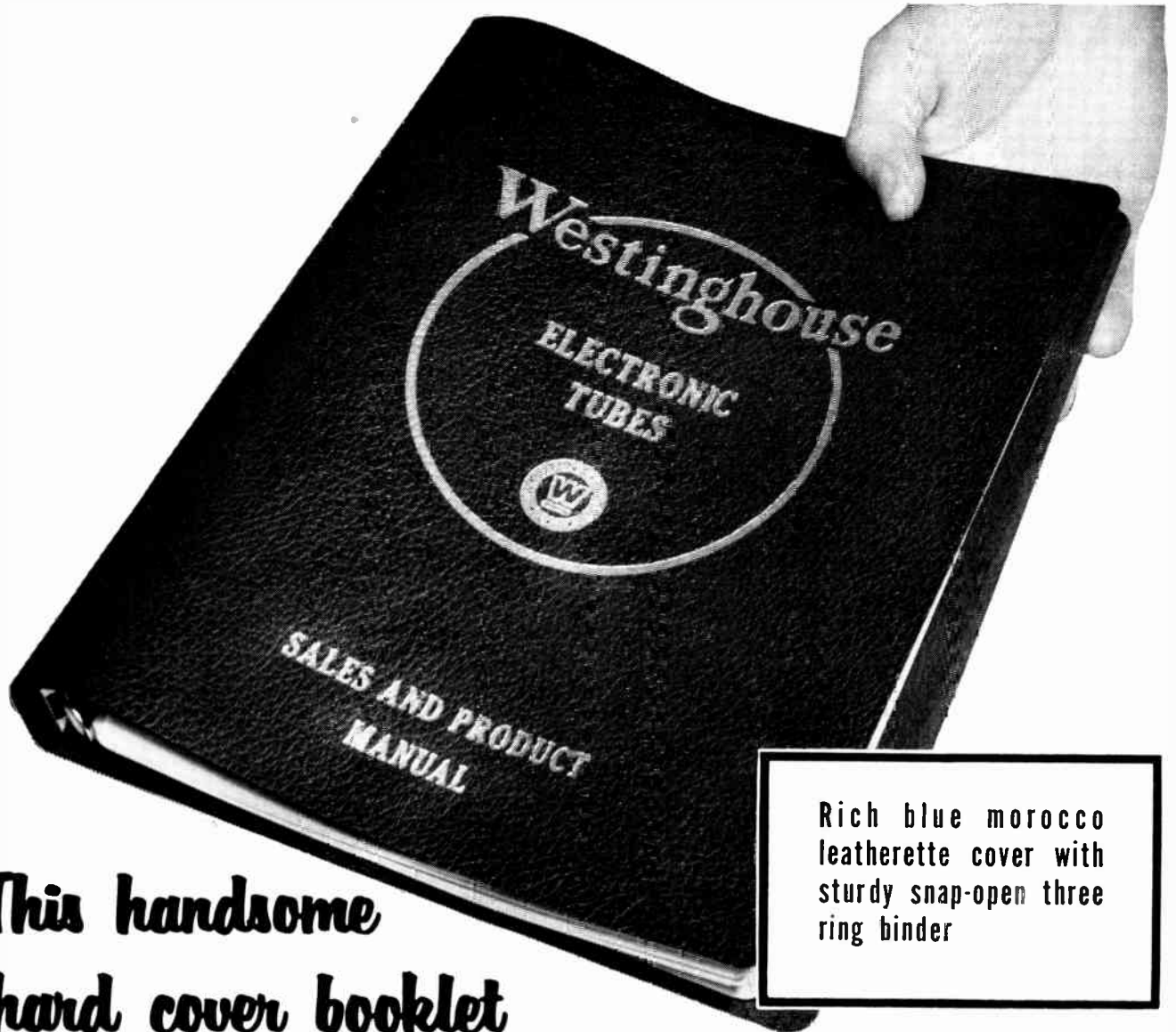
Weight — 65 lbs. approx.

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301 Windsor St.,  
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Rich blue morocco leatherette cover with sturdy snap-open three ring binder

## This handsome hard cover booklet

is yours for 50 Westinghouse tube carton tops

The opportunity of a lifetime to own a luxuriously-bound booklet that tells you everything to do to build sales!

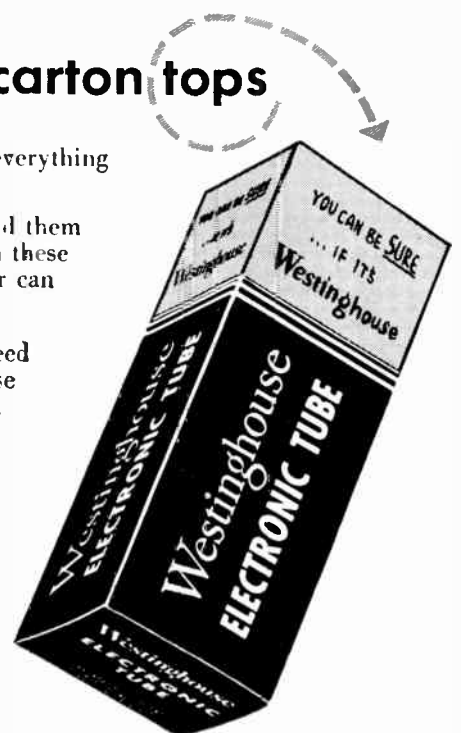
Right now, start collecting Westinghouse Electronic Tube Carton tops and send them in for the greatest catalogue of merchandising aids ever presented to dealers on these terms. Rich loose-leaf binding enables you to add additional sheets. No dealer can afford to be without one of these.

**Send No Money** — There are positively no charges of any kind, and you need send no money with your order. Simply tear off the tops from 50 Westinghouse Tube cartons, mail, and your booklet will come to you at once. First come, first served.

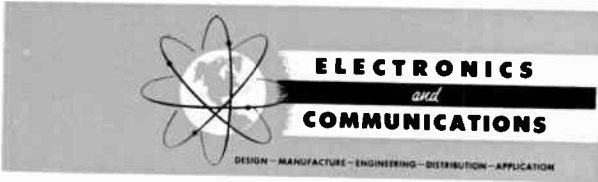
Start saving Westinghouse Tube Carton Tops right now! Mail to: Westinghouse Tube Division — Sales Promotion Dept., Hamilton, Ont.

**YOU CAN BE SURE...IF IT'S** **Westinghouse**  
**CANADIAN WESTINGHOUSE SUPPLY CO. LTD.**

Halifax • Quebec City • Montreal • Ottawa • Toronto • Hamilton • North Bay  
Fort William • Winnipeg • Regina • Saskatoon • Edmonton • Calgary • Vancouver



For further data on advertised products use page 61.



THE ONLY CANADIAN JOURNAL DEVOTED SPECIFICALLY TO THE APPLICATIONS OF COMMUNICATIONS AND ELECTRONICS

APRIL • 1956  
Vol. 4 No. 3

# EDITORIAL CONTENTS

## FEATURES

	Page
Portable Console PE-1000 . . . . .	22
<i>By N. J. Pappas.</i>	
Low Band TV Amplifier . . . . .	23
<i>New Unit Features Reduced Cost, Smaller Size and Ease of Maintenance.</i>	
An Assessment Of Broadcasting Station Operation . . . . .	24
<i>By Leslie L. Hill, Ph.D.</i>	
New Visual Effects for Color TV . . . . .	29
<i>A Versatile New Technique for the Telecasting Industry.</i>	
Portable Communication Unit Using Transistor Circuits . . . . .	36
<i>By D. W. Holdsworth and S. Kagan.</i>	
Miniaturized Dynamic Phasemeter And Plotter . . . . .	40
<i>A New Tracking, Positioning, Surveying and Navigating Instrument.</i>	
Automation With Flexibility . . . . .	46
<i>New Equipment Has Production Capacity of 20,000 Units Per Eight-Hour Shift.</i>	

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## DEPARTMENTS

Editor's Page . . . . .	9
RETMA Report . . . . .	11
Business Briefs And Trends . . . . .	15
Editorial . . . . .	20
News . . . . .	30
New Products . . . . .	32

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**SAVE up to 80%**  
on maintenance with the

**NEW** **DAGE** **320A**

**VIDICON CAMERA**  
LOOKS AND BEHAVES LIKE AN I-O CAMERA

- ★ Sweep failure protection for Vidicon pickup tube.
- ★ Removable Electronic Viewfinder. 5" tube. White phosphor.
- ★ 10 MC bandwidth with adjustable phase and aperture correction and adjustable peaking coils.
- ★ Overscan switch.
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You save on first cost and you save on maintenance with the great new Dage 320A Vidicon camera. Easy to handle, the 320A gives top picture quality with 600 line resolution—and there's no need for additional training of experienced operators. The Dage model 320A is the latest Vidicon camera, for studio, remote, film pickup and kinescoping.

**EXCLUSIVE NEW DAGE** master monitor Model 635A includes 10" aluminized picture tube inter-laced pulse-cross display, 5" wave-form monitor, built-in calibration pulse for level adjustments.

Dage produces a complete line of Television cameras—industrial, professional black and white and colour. Units range in size from small industrial models to complete television stations.

- ★ Four-lens turret operated from rear of camera.
- ★ Relay operated tally lights in hood and end panels.
- ★ Camera control consoles include 10" aluminized picture tube and 5" wave-form monitor. Built-in target calibration, regulated kinescope high voltage supply.

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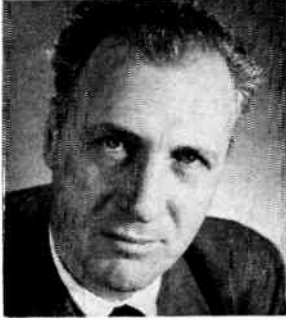
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World Radio History





*The*

# EDITOR'S PAGE

Among the recommendations contained in the brief of the Radio-Television Manufacturers Association of Canada submitted to the Royal Commission on Canada's Economic Prospects was the suggestion that the Department of Defense Production pursue to the fullest extent possible its overall policy of placing orders for electronic equipment in Canada. RETMA's brief pointed out that many orders placed with Canadian companies by the Department of Defense Production did not take into consideration that sometimes companies awarded business do not have manufacturing facilities in Canada, but in fact act only as sales offices for foreign companies.

Actually we cannot see anything wrong with this policy of placing orders outside of Canada as long as the material required cannot be obtained from a Canadian manufacturing source. If, however, equipment is available from a Canadian source, then it is considered that every effort should be made by D.D.P. authorities to see that the business remains in Canada, which we believe is in accordance with the policy of the Department.

Unfortunately, however, there are rumours to the effect that a considerable amount of material which Canadian firms are equipped to manufacture is being purchased from outside the country. That such a situation should exist is a little confusing in view of the proclaimed policy of government authorities to build up in Canada manufacturing plants capable of producing strategic materials and components that would be difficult to obtain in time of emergency. Several such plants have been established in Canada in recent years and it is difficult to compromise reports with proclaimed government policy that such firms are being bypassed and orders for material which they are capable of producing are being placed with other than Canadian manufacturers.

The excuse has been offered that these Canadian firms are not yet capable of competing price-wise with outside competition, an excuse which in our opinion is hardly tenable, observing the slight cost differentials which have been involved in cases that have been brought to our attention, and the fact that the firms concerned have established operations in this country with the encouragement of doing business with those authorities who now reject their services.

In the July-August, 1955 issue of *Electronics and Communications* we editorialized to a considerable extent on the report that the Canadian Broadcasting Corporation had decided to do something about bringing color television to Canadians. So sorry! The story was wrong. It originated with reports that the C.B.C. had included an appropriation in their estimates for equipping a portion of the C.B.C. network with the necessary apparatus to re-telecast color programs originating in the United States. It now appears that this particular appropriation has been included in the C.B.C.'s estimates for some time, but so far as can be ascertained nothing has been done about purchasing the necessary equipment to provide Canadian viewers with color programs. So now

we are back where we started from and it looks as though the old question of who should act first in providing Canadian viewers with color programs will be trotted out, namely, should the television manufacturing industry act first by producing color receivers, or should the C.B.C. make the first move by making color programs available? If the C.B.C. has some valid reason for delaying the transmission of color programs, we suggest that it grant permission to the Department of Transport to issue private television stations the authority to carry color programs. We have a feeling that the management of private television stations would not take as long to make up their minds.

\* \* \*

In a brief submitted to the Royal Commission on Canada's Economic Prospects by the Canadian Marconi Company, it was suggested that the Royal Commission should urge the Canadian Government to give consideration to the early and appropriate revision of the British Commonwealth Agreement of 1931 before foreign shipowners complete their plans for Great Lakes service on completion of the St. Lawrence Seaway.

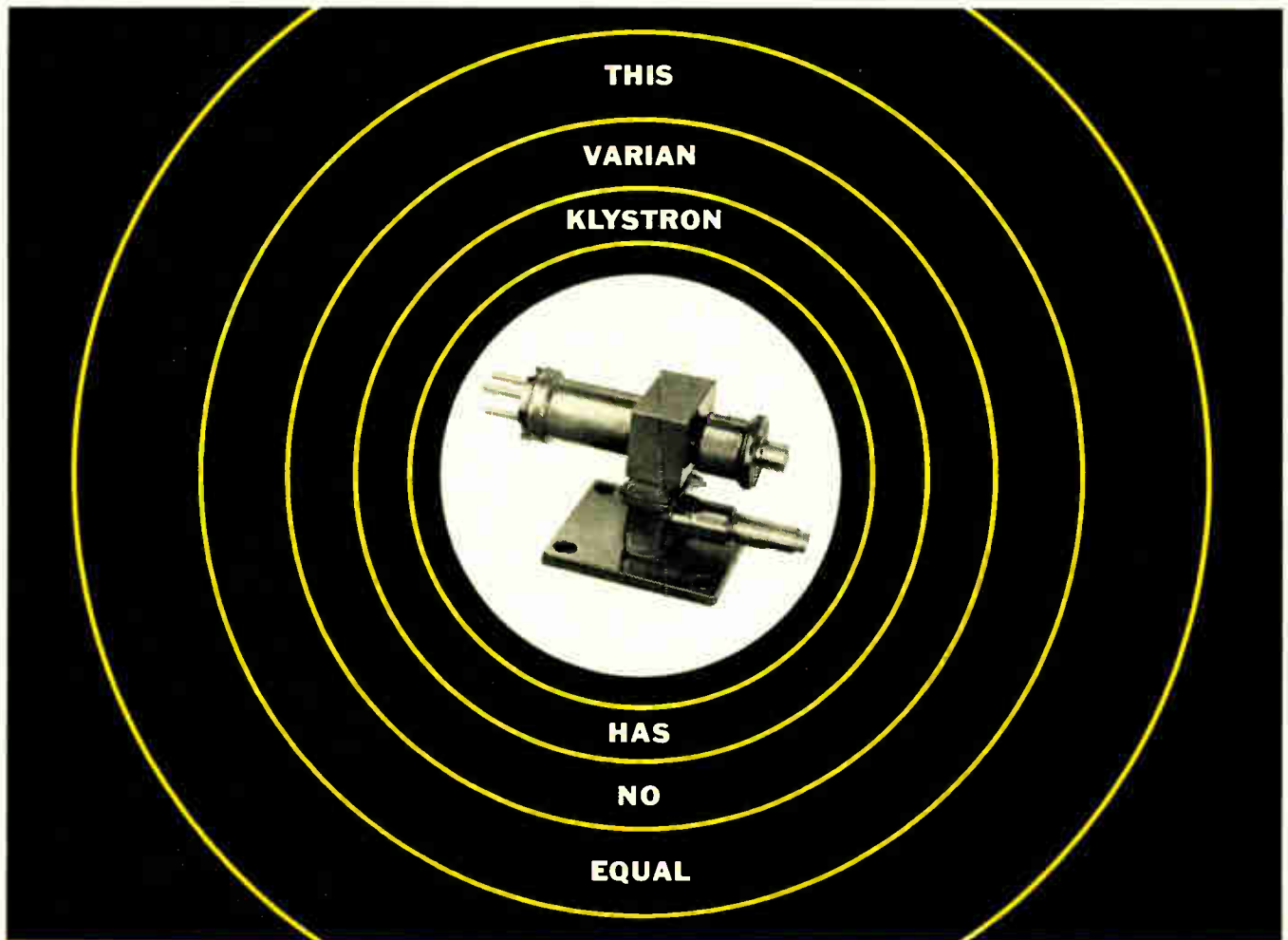
The brief also urged that changes be recommended in the Canadian Shipping Act of 1934 to preserve the vital Canadian shipping and shipbuilding industries and any other measures that may be deemed advisable for their full implementation. We heartily agree with the suggestions contained in the Marconi brief and trust that the Canadian Maritime Commission in Ottawa, which seems to have been strangely silent on the possible problems that the seaway will produce, are sufficiently interested in the matter to be concerned with the protection of Canadian enterprise.

\* \* \*

Recent reports indicate that 76 companies have contracted for roughly 85 per cent of the exhibition space at the Canadian IRE Convention and Exposition to be held in Toronto this fall. Observing that the convention is still six months away, the early and enthusiastic response of so many firms engaged in the electronics industry to secure exhibition space at the convention augurs well for the success of the enterprise. We hope, however, that the magnificent support of the industry in giving the convention its wholehearted backing in the matter of exhibiting its products at the Show will also be backed up by a recognition of the importance of sending adequate representation from their technical and engineering branches to the convention.

As pointed out by Dr. George Sinclair, head of the technical papers program, the convention will afford Canadian engineers the really first opportunity they have had to describe to a widely representative audience of fellow countrymen the technical advances made by them in the field of electronics. To attend the convention, therefore, is an opportunity that all engineers should take advantage of and an occasion to which engineering management should lend every assistance in the matter of personnel in attendance.

# where frequency stability is a "must"...



## FOR X-BAND RADAR RECEIVERS

**IT'S THE LOW COST RUGGED VA-203B** . . . most advanced reflex klystron ever developed for radar and beacon local oscillator service. The exclusive brazed-on external tuning cavity provides frequency stability obtainable in no other klystron. This construction provides outstanding stability during shock, vibration and temperature cycling . . . takes punishing 50 to 100 G shocks and provides absolutely reliable operation at high altitude **WITHOUT** pressurization.

**FOR SUPER-RUGGED SERVICE** (Shocks to 250 G) . . . Varian offers the VA-201 klystron. This tube is equipped with integral molded silastic leads, is similar to the VA-203B and performs with the same absolute reliability.

**ALL THESE EXCLUSIVE VARIAN FEATURES** . . . • Unique brazed-on external tuning cavity assures exceptional frequency stability • Reliable operation at low voltage and from poorly regulated power supplies • Negligible microphonics • Slow tuning rate . . . long tuning life . . . single shaft tuner adapts easily to motor tuning • Withstands 50 to 100 G shocks (up to 250 G's for the VA-201) • VA-203B weighs less than 4 ounces. Both tubes mate directly to standard waveguide flanges.

### GUARANTEED SPECIFICATIONS

8500 to 9600 mc	VA-203B	VA-201
Resonator Voltage	300 V	300 V
Heater Voltage	6.3 V	6.3 V
Heater Current	0.45 Amp	1.2 Amp
Power Output	20mW, Min	40mW, Min
Electronic Tuning Range	30 Mc, Min	20 Mc, Min
Vibration FM at 10 G	1 Mc, p-p, Max	0.2 Mc, p-p, Max

*Get complete technical data and specifications on the outstanding VA-203B and its companion VA-201 . . . finest klystrons made for modern radar. Write to our Applications Engineering Department today.*

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For further data on advertised products use page 61.

# RETMA REPORT

*A Monthly Bulletin Of Association Activities  
Prepared For Electronics And Communications*

By

**BASIL JACKSON**



## **New General Manager of RETMA**

Carl A. Pollock, President of the Radio-Electronics-Television Manufacturers Association of Canada, has announced that Fred W. Radcliffe has been appointed General Manager and Secretary, effective April 16.

The position became vacant when Stuart D. Brownlee, who held it for ten years, resigned to become Executive Vice-President of Canadian Admiral Corporation Limited.

In accepting the appointment, Mr. Radcliffe relinquishes his position of Commercial Vice-President of RCA Victor Company Limited; he has been in the Commercial and Administrative Departments of RCA Victor for the past thirty-six years. He is very well-known in the electronics industry and has been actively engaged in the work of RETMA of Canada for a long time. He has served as a director for twenty years and has, in addition, been very active on a number of committees.

Originally studying for the teaching profession before World War 1, at the outbreak of war he enlisted in the Canadian Army and later transferred to the Royal Flying Corps. After demobilization in 1919 he joined the RCA Victor Company and has held executive sales and administrative positions in Toronto, Winnipeg, Calgary, Vancouver and Montreal; he has been a Vice-President of RCA since 1943.

## **Royal Commission On Broadcasting**

RETMA has decided to present a Brief to the Royal Commission On Broadcasting in view of the significant part that products of the electronics industry play in the development of the television and radio services of Canada. The hearings begin on April 15 and the Royal Commissioners consist of chairman Robert M. Fowler, President of the Canadian Pulp and Paper Association, Edmond Turcotte, Canadian Ambassador to Colombia, and James Stewart, President of the Canadian Bank of Commerce. Before the public hearings begin, the Royal Commission will initiate its own studies within its terms of reference. These include examination of the finances of public and privately-operated broadcasting operations, for both radio and television, and other problems within the orbit of interest of the Commission.

## **Technical Publications Available**

The RETMA Office has a few spare copies of technical publications it has recently made available to engineers and other technical personnel in the industry. These are: Summary of Registered Crystal Diodes (JETEC Publication No. 3A) and Basing Diagrams For Electron Tubes - including Supplemental Index. (JETEC Publication No. 2A).

Both of these publications can be supplied, at nominal cost, by the RETMA Office, 200 St. Clair Avenue West, Toronto 7, Ontario.

## **Electronics Division Name New Section**

The name of the new Section in the Electronics Division has been decided upon - "Instrumentation And Data Handling". The scope of this new Section will include industrial, scientific, medical, computing data processing and similar electronic applications.

(Continued over page)

# RETMA REPORT

The Electronics Division of RETMA of Canada is one of the fastest growing of the three Divisions. It now has twenty-two member-companies, the same as the Receiver Division. The Parts and Accessory Division, with seventy-two member-companies, is the largest Division of RETMA.

## Excise Tax On Radio And Television Receivers

On March 1 a delegation from RETMA of Canada was received by the Minister of Finance, the Hon. Walter E. Harris, and an appeal was made, on behalf of the electronics industry, for the abolition of the 15% excise tax currently levied against all radio and television receivers.

This tax, when added to the 10% sales tax, places a total tax of 25% on the manufacturers' selling price on these products.

The spokesmen for RETMA, consisting of Carl A. Pollock, President, W. H. Jeffrey, Chairman of the Government Acts and Regulations Committee, and Stuart D. Brownlee, Chairman of the Color Television and UHF Committee, pointed out to the Minister of Finance that the 15% excise tax actually discriminates against the Electronics Industry because the Excise Tax has already been reduced to 10% on automobiles and because, of all durable consumer products, only radio and television receivers are taxed at 15%.

It was also stated that the original reason for paying for the development of a national television service from the proceeds of the 15% excise tax was now no longer valid. The idea, in the first place, was that those relatively few owners of television receivers, in 1953, should pay directly, through the tax, for the cost of developing and maintaining the CBC's television service: now, with over 80% of the Canadian population within range of Canadian television stations, this argument was not logical.

The amount derived from the tax has increased over the years.

In 1953, when it was calculated by the Government that the CBC would require \$6,000,000 for the then-current year, in actual fact over \$11,000,000 was collected. This amount, of course, was in addition to over \$5,000,000 collected by the same 15% excise tax on radio receivers and phonographs for the same period. During the fiscal year ended March 31, 1955, the total excise tax collected on radio and television receivers amounted to \$21,500,000.

The table below shows the extreme variances in the excise tax since it was first introduced as a "temporary measure" in 1940.

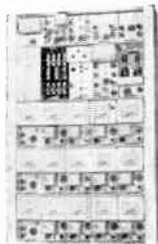
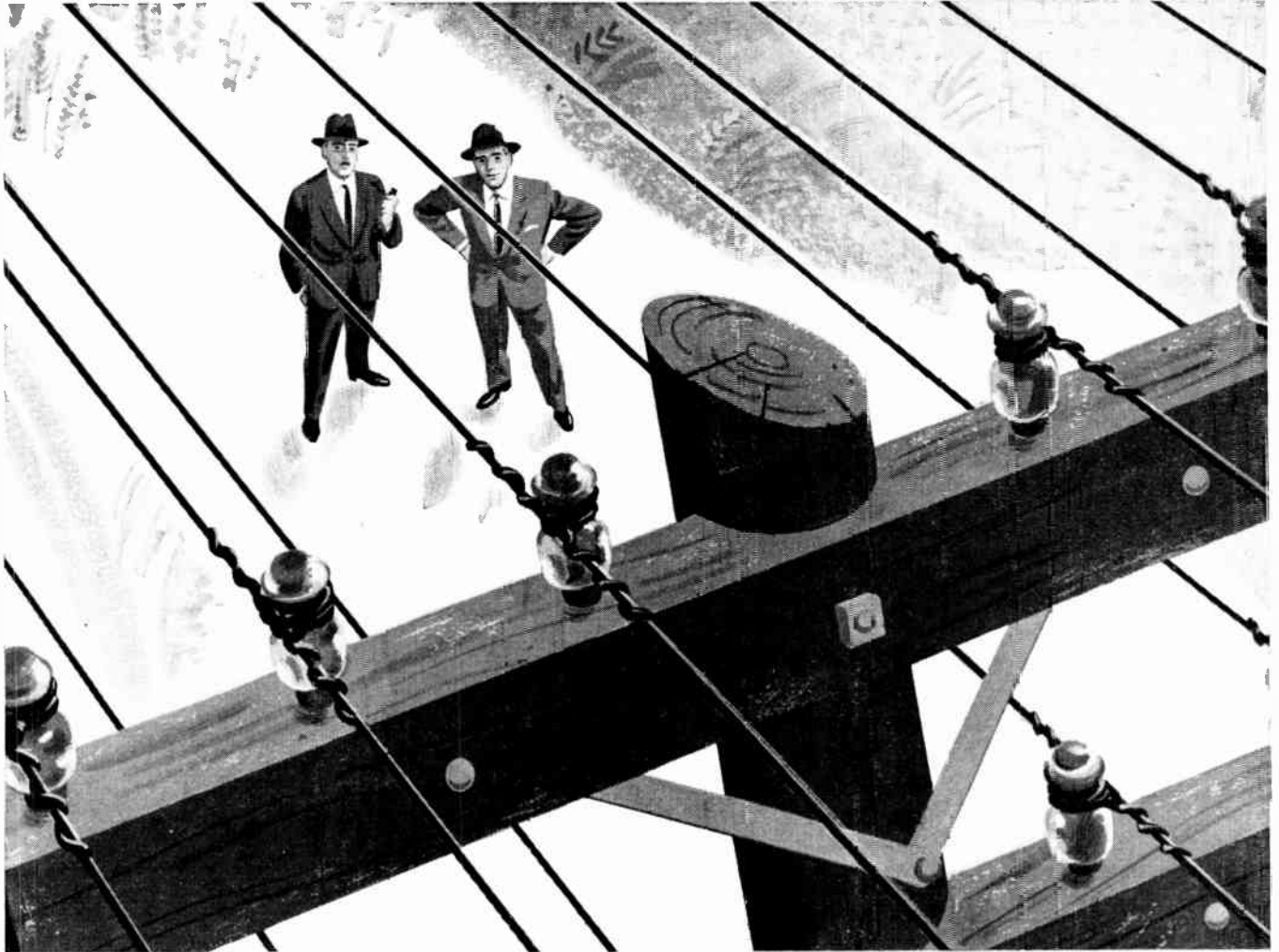
### EXCISE TAX FLUCTUATIONS

#### ON RADIO AND TELEVISION RECEIVERS (1940 to 1956)

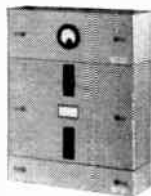
June 24, 1940.....	NIL	.....	10%
Dec. 2, 1940 .....	10%	.....	25%
May 11, 1945 .....	25%	.....	10%
Nov. 18, 1947 .....	10%	.....	25%
July 31, 1948 .....	25%	.....	10%
Sept. 8, 1950 .....	10%	.....	15%
*April 11, 1951 .....	15%	.....	25%
April 9, 1952 .....	25%	.....	15%
to present (1956)			

\*Sales Tax Increased From 8% to 10%.

The fluctuations in the amount of money collected by the imposition of the 15% excise tax show that the most logical way to finance the CBC television service would be to grant that organization a specified amount each year from general revenue.



**LENKURT 33A CARRIER SYSTEM** A stackable, single-sideband suppressed carrier system, with maximum flexibility to allow a wide range of applications. Provides toll quality transmission and economical facilities for short and medium haul circuits. The operating range for the three channels of this system is between 3.5 and 35 kilocycles. For maximum economy one or two channels may be installed initially and the remaining channels added as needed.



**LENKURT 45A CARRIER SYSTEM** Using standard single-sideband suppressed carrier operation, this system provides up to 12 channels in the 40-150 kilocycle range. Suitable for both long and short haul applications, the 45A is designed to co-ordinate with other carrier systems. Numerous mechanical and electrical innovations in the 45A reduce maintenance, complexity of equipment, cost and space.

## Make full use of the wires you have

If your present lines are crowded and overworked the logical and *most economical* step is towards Lenkurt carrier. Increase your service capacity to 16 circuits—without stringing another wire!

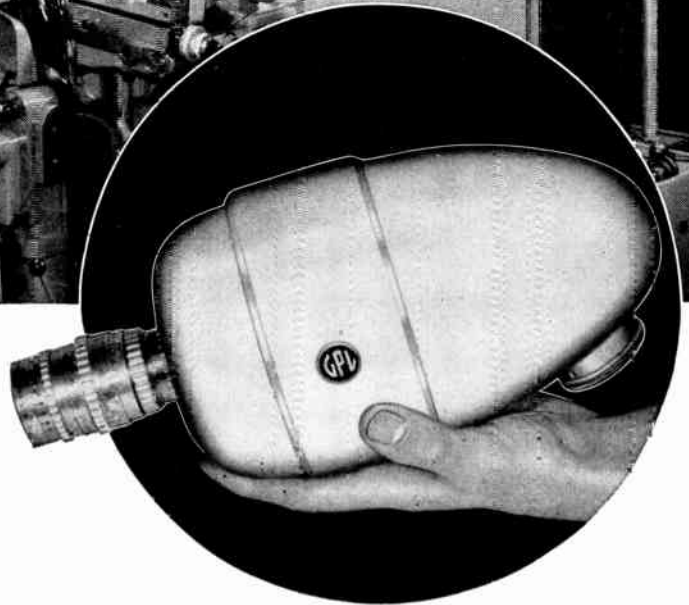
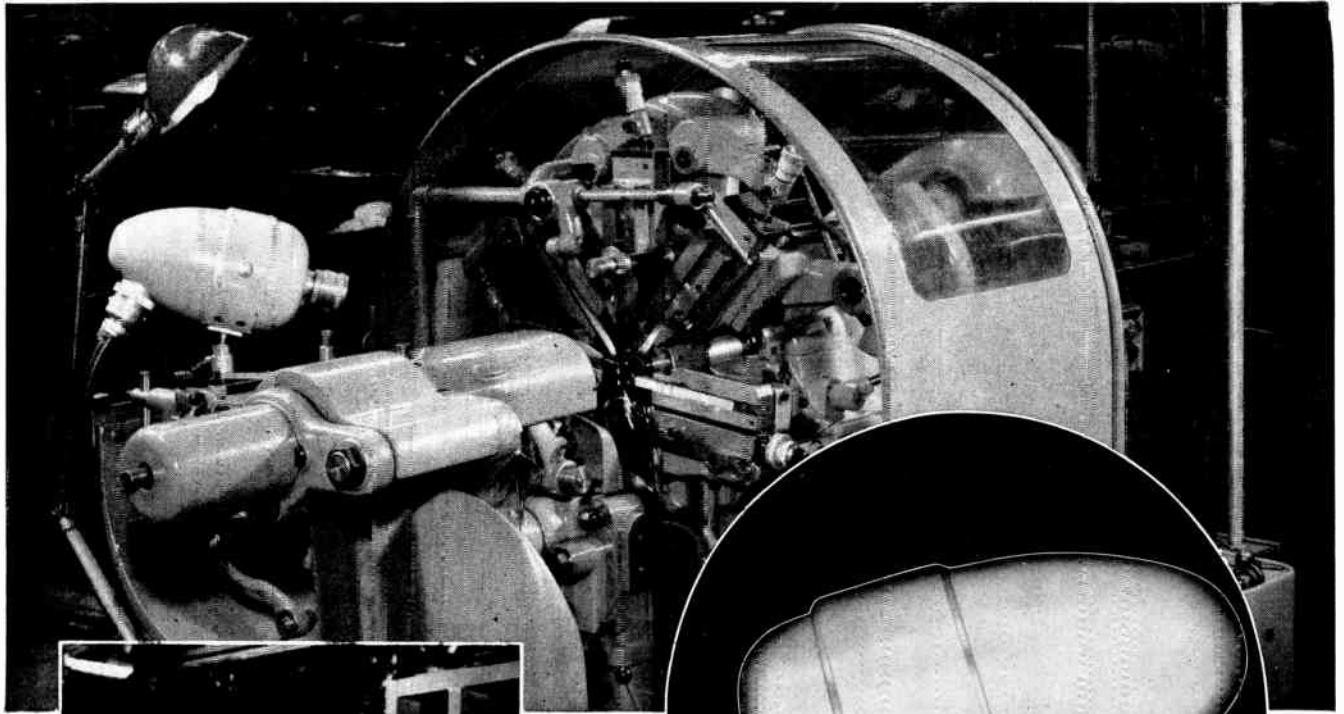
With the Lenkurt 33A system you can provide up to three channels for each open wire pair. Or by using the Lenkurt 45A system, up to twelve new channels can be added. A maximum of 15 carrier channels may be provided for each pair, if both systems are used together!

*Learn how Lenkurt Carrier systems can economically help solve your communication problems. Contact Automatic Electric Engineers for their specific recommendations. Address: Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.*

5621

# AUTOMATIC ELECTRIC

SALES (CANADA) LIMITED



**YOU ARE THERE**  
 with the  **TV camera**  
 ... smaller than a football!

A lightweight camera that fits into your hand and a suitcase-sized control unit now bring the advantages of industrial TV within reach of every institutional and industrial operation. Cumbersome equipment and complicated wiring are no longer necessary. Remote supervision speeds inspection, and reduces accidents, operating costs, and capital investment.

- Camera operates on low light levels
- All camera controls are remote
- Complete line of remote lens controls available
- Several cameras can be operated from one control unit with a simple push-button switch
- High definition
- Low maintenance cost.

**For a demonstration, contact your nearest Westinghouse Branch Office.**

## **CLOSED CIRCUIT TELEVISION** by **Westinghouse**

CANADIAN WESTINGHOUSE COMPANY LIMITED, *Electronics Division*, HAMILTON, CANADA

Halifax • Moncton • Quebec • Montreal • Ottawa • Toronto • Hamilton • London • Windsor  
 North Bay • Fort William • Winnipeg • Regina • Calgary • Edmonton • Lethbridge • Trail • Vancouver

56A745

SEE TELEVISION'S FINEST HOUR. **"STUDIO ONE"** MONDAY NIGHTS, 10:00 P.M.

For further data on advertised products use page 61.

## business briefs & trends



★ The Minneapolis-Honeywell Regulator Company Limited have announced their plans to build a 70,000 square feet manufacturing plant to house the aeronautical division of the company which was formed less than a year ago. When the building is completed, the company expects to occupy 300,000 square feet of space in their Toronto operation.

★ RETMA of Canada officials estimate that 5,000 color television sets will probably be sold in Canada in 1956, and that, as volume increases and programming spreads, improved manufacturing techniques will make possible a price reduction for this commodity.

★ A \$3,000,000 addition to Motorola's military electronics, engineering research and production facilities at Phoenix, Arizona, has recently been announced by Paul V. Galvin, Motorola's president.

★ At the recent U.S. Nuclear Congress Exposition held in Cleveland, Ohio, 20 per cent of the exhibitors were in the electronics industry. At the Geneva Atomic Exposition, held last August, approximately 40 per cent of the exhibitors were engaged in the electronics industry.

★ K. R. Patrick, president of Canadian Aviation Electronics Limited, in a brief presented to the Royal Commission on Canada's Economic Prospects, said that it is essential that the Canadian engineering force be supported by skilled technicians at the rate of 10 to 1, and that an active program at all levels of government should be immediately pursued to double the rate of technical training throughout Canada.

★ Representations made to the Customs and Excise Branch of the Department of National Revenue by RETMA of Canada have resulted in two rulings on the payment of a 15 per cent excise tax to be reversed. Manufacturers of television tubes will no longer be obliged to pay excise tax on tubes purchased for use in tuners sold to receiver manufacturers, and excise tax will not be charged on television monitors.

★ According to spokesmen for the inter-com and dictating machine industry, the future holds good possibility for expanded sales. A survey of U.S. prospects shows that the surface has only been scratched for sales to over 4,000,000 business establishments.

★ Multiplexing equipment for the longest private commercial microwave system in Canada is being supplied by the Stromberg-Carlson Division of the General Dynamics Corporation. The microwave system is being built for the Quebec Hydro-Electric Commission by the RCA Victor Company of Montreal.

★ Banks, insurance companies and other financial institutions now lead all other businesses in the use of closed-circuit television. About 15 per cent of industrial television installations are in use in financial businesses and are being utilized mainly to permit centralized bookkeeping and record filing.

★ A recommendation has been submitted to the District of Columbia Commissioners that the fire alarm box system be replaced by an emergency telephone system. The Washington Taxpayers' Association, which presented the recommendation, claims that a telephone emergency system would save the taxpayers' money.

★ RETMA officials in the United States report that 3,646,802 transistors were sold by manufacturers last year. This figure is nearly three times as large as the previous year's sales for transistors.

★ The Canadian Board of Transport Commissioners have approved an application of the B.C. Telephone Company to issue an additional 200,000 ordinary shares at a par value of \$25.00 each. The additional 200,000 shares brings the total outstanding to 1,000,000, and the total issued capital to \$49,000,000 of an authorized capital of \$75,000,000.

★ The American Federal Communications Commission has authorized the Sun Canadian Pipeline Company of Waterdown, Ontario, to operate mobile radio facilities in the United States. The pipeline company employs base station facilities of the Bell Telephone Company of Canada.

★ The U.S. Corps of Engineers have announced the establishment of a computer branch which will be used to speed the solution of scientific problems through the use of digital computers.

★ Industry officials estimate that Americans will spend 300 million dollars for new television picture tubes in 1956. It is also estimated that more than 150 million small vacuum tubes in television and radio sets will be bought by Americans this year.

★ J. D. Ryder, Dean of Engineering, Michigan State University, says that automation and scientific industry have been the cause of a shortage of engineers that will likely be with us for years to come.

★ The anticipated demand for color television sets in the United States is considered by industry officials as being great enough to cause a shortage of color tubes. At the present time RCA's production of color sets at their Indianapolis plant approximates 960 per day.

★ Transistorized car radios are now in general use in the United States with General Motors, Chrysler and Ford all using them for installation in their factory-installed car radios.

★ Computer manufacturers have turned their attention to selling their equipment to small business concerns and are concentrating on the design of small, less expensive type computers to meet the requirements of small business concerns. Units which have been produced for sale in this market range in cost from \$32,500 to as little as \$17,000.

★ According to figures recently released, at least ten Canadian companies and government organizations have placed orders for high speed computers in the price range of from \$100,000 to \$200,000.

# UTILITIES DEMAND THE STRENGTH AND PERMANENCE OF FABRICATED STEEL

Utilities and particularly electric utilities are always in the news because they are so closely identified with our economic wealth. For example this generating station for the Saskatchewan Power Corporation at Saskatoon. Here Central Bridge erected 529 tons of structural steel—with speed and permanence. Central fabricates and builds bridges, ship bottoms, communication towers and tanks in addition to commercial and industrial structures.

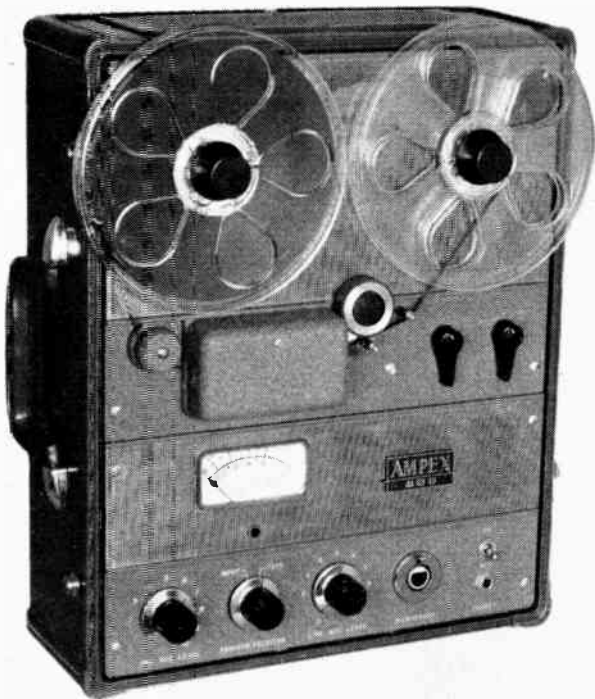
**CENTRAL BRIDGE** *Company, Limited*  
*Trenton, Ontario*





# AMPEX

## TAPE RECORDERS

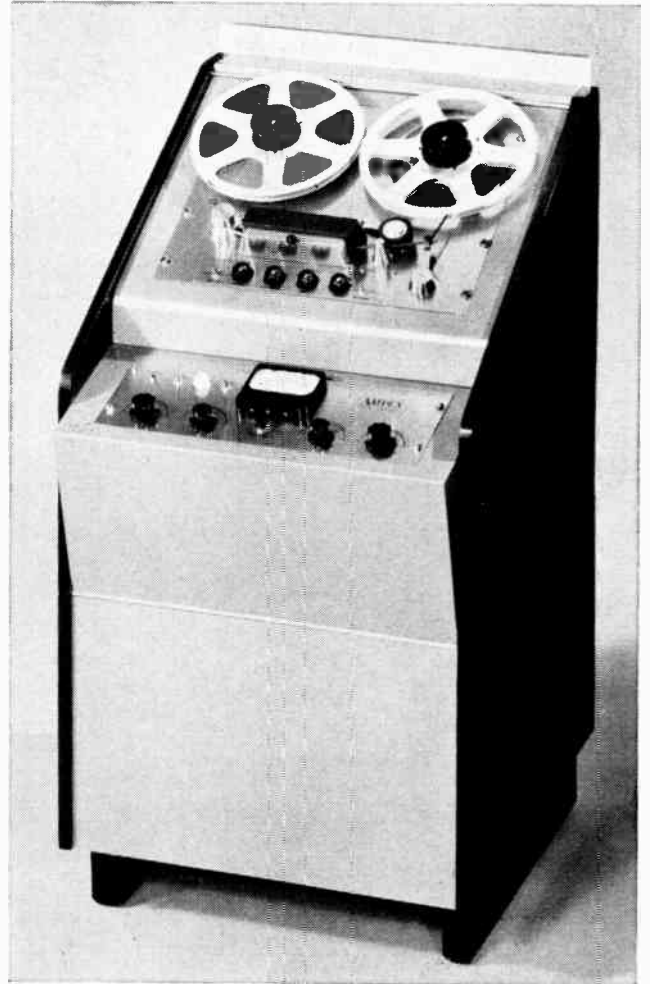


### MODEL 600

Portable magnetic tape recorder for broadcast use. Combines high fidelity, accurate timing and durability with low noise and distortion. Available with full or half track heads. Weighs only twenty-eight pounds.

### SPECIALIZED SERVICE DIVISION

McCurdy's have established a separate division, expressly for the servicing of Ampex recording equipment. It is staffed with highly skilled technical personnel — fully experienced in all phases of repair and maintenance. We hope you will make use of this service. Our specialist-engineers are fully qualified to discuss *your* specific needs.



### MODEL 350

A professional type recorder, unrivalled in its class. Designed for broadcast stations, recording studios and educational institutions. Incorporates many new features, making for easier operation and maintenance.



**mcCurdy radio industries limited**

22 FRONT ST. WEST, TORONTO 1, ONT. PHONE EM. 6-6531

**Collins New 66J heat reduction tube shields\***

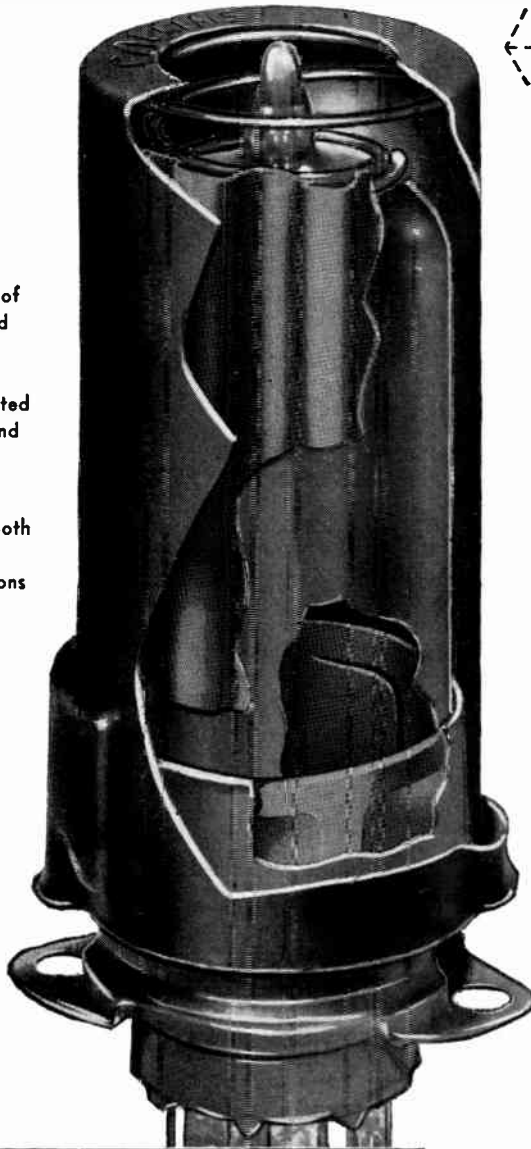
**Increase equipment reliability**

**by reducing bulb temperature to 55% of former values**

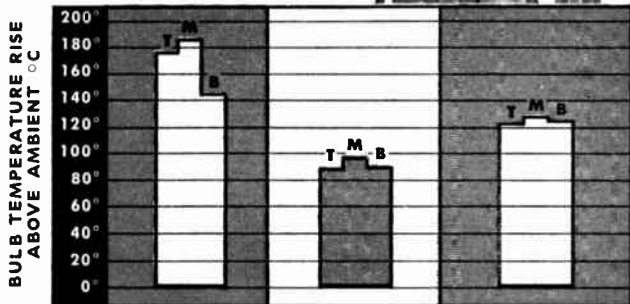
**DESCRIPTION**

Collins 66J consists of an outer case coated with a conducting black finish, a corrugated liner of plated beryllium copper and a base liner of the same material.

It is available for both backfitting and new equipment applications in 7-pin and 9-pin short, medium and long miniature tube sizes.



**COMPARISON**



Shiny JAN Shield    Collins 66J Shield    Commercial Shield A  
 7.4 watts dissipated free  
 T—envelope side near top    M—envelope middle    B—envelope side near base

More than half of equipment failures are attributed to tube failure, a primary cause of which is heat.

Now you can buy reliability insurance at a practical cost with Collins new 66J Heat Reduction Tube Shield, which reduces bulb hot spot temperature rise above ambient to 55 per cent of the value obtained with JAN shields. The 66J not only protects at the top and middle of the bulb, but also in the critical base area where electrolysis occurs.

The shield is interchangeable with the standard JAN shield, and therefore can be used in current designs and on a retrofit basis without modification. Due to the resiliency of its beryllium copper liner, it provides improved protection against shock and vibration — another guard against failure.

*Write for price and technical data.*

\*Patent Pending

**COLLINS RADIO COMPANY OF CANADA, LTD.**

11 Bermondsey Road, TORONTO 16, ONTARIO



For further data on advertised products use page 61.

# See if YOU can qualify at C.D.C.

as an **ENGINEER** - **PHYSICIST** - or **MATHEMATICIAN**

If you are confined to one minor aspect of an overall programme and want to get away from job limitations, there is room at Computing Devices of Canada Limited for your creative thinking . . .

C.D.C. is an independent, privately owned, all-Canadian Company, specializing in custom built electronic and electro-mechanical equipment. Operations are mainly in the fields of aircraft instrumentation, simulation, guided missile analysis, electronic computers and semi-conductor applications . . .

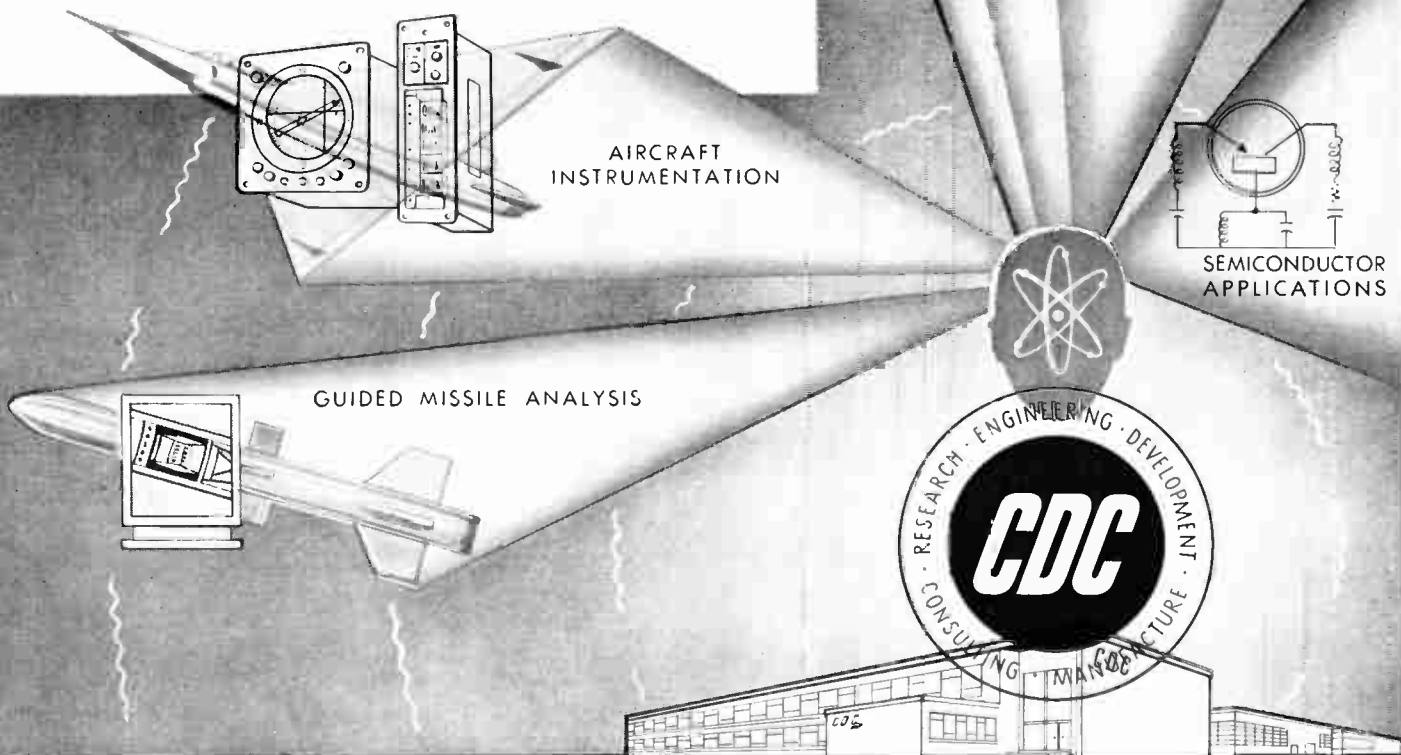
Being a medium sized Company, mainly engaged upon widely diversified development projects, engineers have outstanding opportunities for creative work in a new modern plant where **FULL RECOGNITION** is accorded . . .

Personnel have excellent opportunities to advance by continuing their **PROFESSIONAL EDUCATION** . . .

At C.D.C. you receive excellent wages, paid vacations, holidays and sick leave, retirement plan and group insurance for the whole family. Housing is readily available in the delightful Ottawa Valley where the per family income is the second highest of all large Canadian cities . . .

For further information and employment brochure, write in confidence to the Personnel Manager, giving details of experience and qualifications. All replies will be held in strict confidence.

5606



**COMPUTING DEVICES OF CANADA LIMITED**

P.O. BOX 508

OTTAWA

CANADA

World Radio History

# TV Could Be The Answer---

*There is no gainsaying the fact that there is a shortage of school teachers in Canada, in both the elementary and secondary schools and, to some extent, a shortage of instructors and professors in our colleges and universities. One of the reasons for the shortage, presumably, is the unattractiveness of salaries paid to this category of help and there is no reason to doubt that educational authorities have, to the best of their ability, paid as much in salaries as their budgets will permit. Unfortunately, however, the level of salaries permitted by educational budgets is not sufficient to attract additional recruits to the teaching profession, and the situation has developed into a stalemated problem with no apparent compromise in sight.*

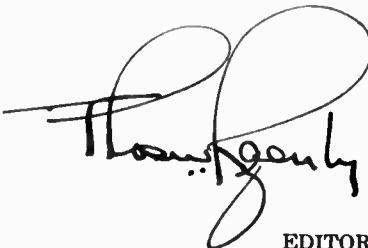
*The lack of adequate teaching staffs for our schools is a problem of paramount importance and one which, if not remedied, may well have an adverse effect on the future of the country. The situation is not peculiar to Canada alone. A similar problem has confronted educational authorities in the United States too and, in an effort to overcome the problem, forward thinking groups are looking to the use of closed circuit television as a means of combatting the shortage of teachers.*

★ *Recently in Pocatello, Idaho, Governor Robert E. Smylie conducted a class in political science at the Idaho State College, which was witnessed simultaneously over television by eleven different elementary schools in the nation's first demonstration of a completely televised public school system. Also televised was a fourth-grade reading and social studies class watched both by fourth graders and student teachers. The closed circuit educational network was set up at a cost of \$7,500.*

★ *Though many universities have experimented with closed circuit television within their own campus buildings, Idaho State is the first college in the United States to install a complete public school network. This new network makes it possible for a few specialized teachers, who formerly travelled from school to school, to reach a much larger student body by broadcasting from the Idaho State College studio.*

★ *The use of closed circuit television for educational purposes would, of course, present some problems. Broadcasting from a central studio to classrooms in a whole school system would still necessitate supervision of individual classrooms, but supervisory personnel for classrooms working under such a method of teaching need not be comprised of highly qualified teachers of whom is demanded set academic qualifications. The ability to answer student queries or elucidate on televised lectures should surely be within the capacity of less highly trained personnel. It is quite conceivable that, as an outgrowth of classroom instruction by television, there may be born a new category of classroom supervisor to take the place of the fully qualified teacher required under the present system of individual classroom instruction.*

*Although there are many problems that would have to be ironed out in establishing a system of educational instruction with the aid of closed circuit television, none surely would be insurmountable, and the strong possibility that such a system would overcome the shortage of teachers is ample reason why educational authorities should devote some serious thought to this method of teaching, at least in the elementary schools.*



EDITOR

A LETTER FROM STATION CFAC,  
CALGARY, ALBERTA



E. C. CONNOR  
Technical Director  
Broadcast Station CFAC  
Calgary, Alberta

# AN AMPEX FALLS -AND PROVES ITSELF!

An accidental fall really proved the ruggedness of one of our Ampex 600's. It had had to be located on a narrow shelf four feet above a cement floor in an industrial building. Despite precautions someone pulled on the microphone cable at precisely the wrong moment and the recorder landed on one corner on the floor. The Ampex continued to record, and to the surprise of all concerned, it was impossible to detect the spot on the tape where the machine had fallen off the shelf. The only damage to the recorder was a displaced hold-back tension spring.

At present we have in service two Ampex 401's, two 403's, two 350's and two 600's. Required servicing has been much less than anticipated, and all are within specifications. To say that we are enthusiastic about the performance of our Ampex recorders could be considered an understatement.

Sincerely,

BROADCAST STATION CFAC

*E. C. Connor.*

E. C. Connor  
Technical Director



## THE AMPEX 600 WAS DESIGNED BOTH FOR USE AND ABUSE

When the 600 was first developed, Ampex engineers performed a test similar to CFAC's accidental drop—not by accident, but quite intentionally. Also, the Ampex 600 was given running

tests equivalent to an estimated 10 years of service. These are reasons why the price you pay for an Ampex buys both the finest performance available and the most hours of service per dollar.



For descriptive literature, write Dept. SS-2304

SIGNATURE OF PERFECTION IN SOUND

70 Grenville Street • Toronto, Ontario

Complete Program Studio Facilities Including  
 Monitor Amplifier — Talk-Back Microphone Pre-  
 Amplifier — Speaker Cut-Off Relays — Studio "On-  
 The-Air" Light Relays And Head-Set Intercom Feeds  
 Incorporated In Canadian Designed - - - - -

# Portable Console

## PE-1000

By N. J. PAPPAS

FOR some time there existed a demand for a portable console suitable for handling large remote broadcasts, but due to the limited Canadian market for this type of equipment it was not considered economical to design a unit for this function alone. By combining the needs of several other related fields, however, a unit was produced that would serve this purpose in addition to serving several other functions with the result that a larger market demand was created for the more versatile unit and thereby made the project practical.

The net result of the project was the production of a console unit known as the PE-1000, an instrument that may be used in medium sized studio operation or disconnected and taken to the scene of large scale remote broadcasts. This versatile console is ideally suited for semi-permanent installations at exhibitions and forums, for TV mobile units and for professional sound reinforcing systems.

All the necessary functions of switching, mixing and amplifying the signal output of 11 microphones and four program lines is accomplished in this single unit. When required, it could simultaneously supply one standard program line, one monitor line, two headsets and one public address feed, and contains a 1000 cycle oscillator for level checks.

The 11 microphone inputs are terminated on receptacles mounted on the rear panel, from where they are led to telephone type keys for selection to the six pre-amplifiers. The pre-amplifiers consist of a shielded input transformer, a two stage amplifier and a step type potentiometer which is inserted between the first and second stage. By inserting the potentiometer between these two stages and by connecting all the pre-amps together in

a fixed mixer, the need for output transformers is eliminated without the resultant fader interaction found in high impedance mixing circuits. From the mixer the program is fed through the line amplifier whose gain is controlled in the same fashion as the pre-amps, to a splitter pad for program and monitor line feeds. The output can be monitored visually with a standard vu meter which is connected ahead of the 6 db line pad. The output rating, after the pad, is + 18 dbm with less than 1 per cent harmonic distortion from 50-15,000 c.p.s.

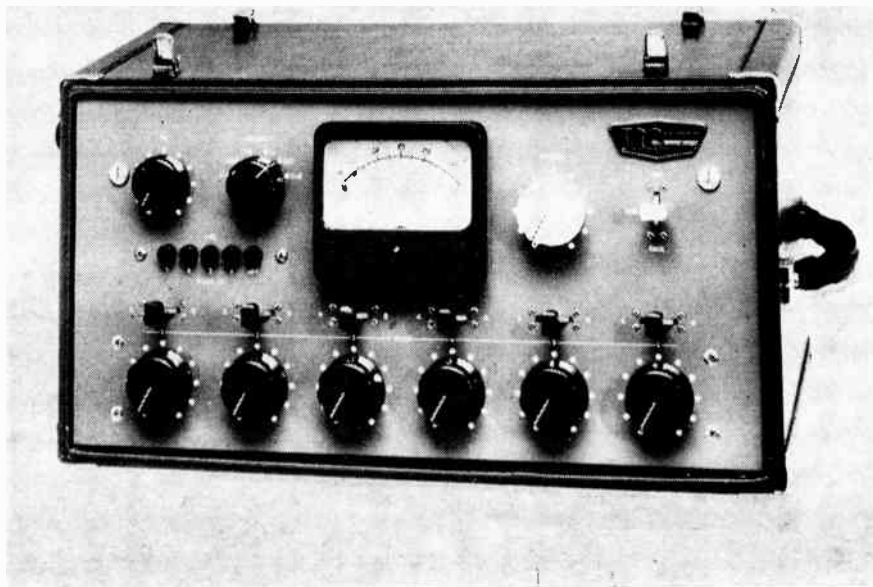
In addition to the program channel this unit includes a second channel which can be used to feed and control a public address system. It may also

be used for fold-back operation in recording and television studios. When used as a PA channel an individual microphone may be chosen on the PA selector and accentuated to the audience. For instance, if a program consisted of an orchestra and a vocalist, the vocalist's microphone may be selected and reinforced through the PA system. When individual reinforcement is not required, the mixed output can be fed to this channel. When an individual channel is chosen, the selector is connected ahead of the final stage of the pre-amplifier. Consequently a turntable can be fed into a particular channel mixed with microphone outputs from a live studio and at the same time, the output can be used for background music in the studio without any fear of feed-back.

A tone oscillator is included for line level checks which has a sine wave output that prevents cable crosstalk. Equally important is the fact that the oscillator will not operate if any microphone or line has been turned on, thereby preventing program disruptions.

The complete console can be housed in a leatherette carrying case or a metal cabinet. All the important controls are located on the front panel and all the secondary controls, receptacles and terminals are on the rear panel. Both panels are hinged for easy access to all components, and engineers responsible for the design of the unit have chosen all components with an eye to maximum dependability.

When the PE-1000 portable console is plugged into its power supply and companion producer's unit, complete program studio facilities are realized, including monitor amplifier for control and studio speakers, talk-back microphone and pre-amplifier, speaker cut-off relays, studio "on the air" light relays and headset intercom feeds.



● Front panel view of the Portable Console PE-1000.

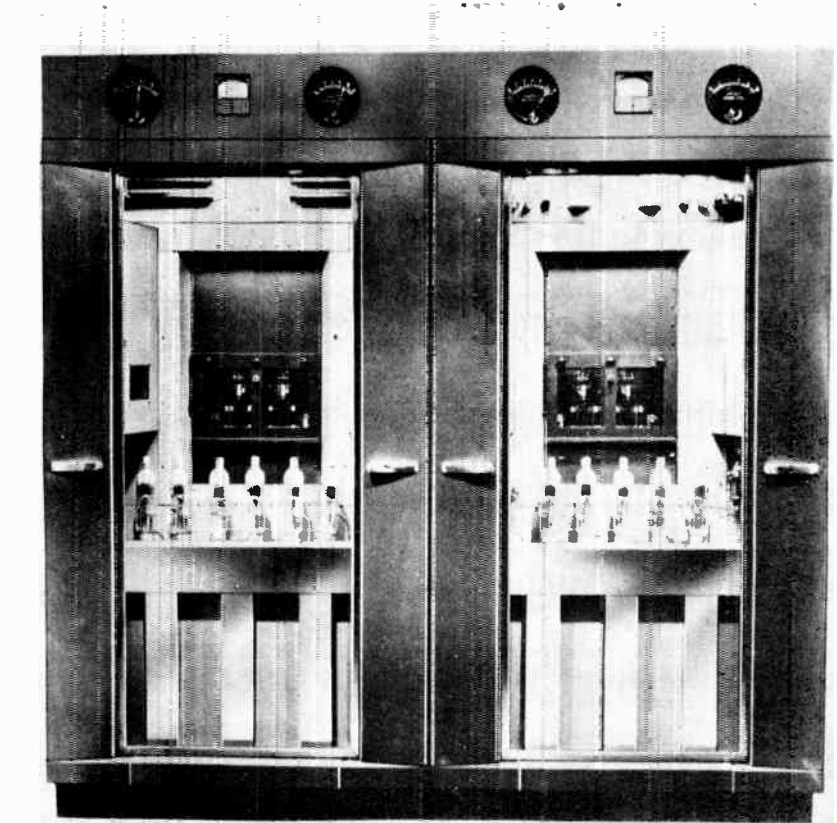
**A** NEW, compact, inexpensive 25 kilowatt television amplifier for Channels 2 and 6 is one of the latest developments in the manufacture of low-band television transmitters and amplifiers for use in high-band television transmission. The new amplifier, which has been produced as quality equipment, has also been engineered with an eye to purchase price.

Builders of the equipment state that by the incorporation of recent technological and design advances, the new amplifier possesses numerous practical and beneficial features. Among the unique characteristics are included: considerably lower investment cost than any available competitive make; smaller floor space requirements, 2 cabinets occupying a total of 23.5 sq. feet; reduced weight, 4,000 pounds total, or approximately 170 lbs./sq. ft.; low power consumption, 63 k.w. at 90 per cent power factor at black level; full-length glass doors to permit visual inspection of all tubes even when the amplifier is being operated; meets and exceeds all applicable FCC requirements for monochrome and color transmission.

The equipment has been designed to give highest quality performance with any make driver so that replacement or obsolescence of existing equipment is unnecessary when going to increased power operation. The instant patchover feature permits utilization of any driver unit for standby service, eliminating the need for an entire transmitter lineup solely for standby.

As a result of self-contained unitized design, where all components are housed in the two amplifier cabinets, the equipment is adaptable to any station layout; thereby providing maximum flexibility and minimum building alterations. Location of components within the frames are so placed to facilitate maintenance, and the overall size of the frames permit movement through standard doorways and elevators.

The visual and aural amplifiers, each housed in a single standard cabinet containing an amplifier and a high power rectifier unit, when combined constitute a complete TV amplifier, the output of which may be fed into a suitable antenna. In the visual amplifier cabinet are contained a coaxial input circuit, a four tube cavity, a coaxial output circuit, a rectifier unit, power supply and blowers. The input circuit consists of a shorted quarter wave line which provides a means to tune the input for flattest impedance match. A second shorted quarter wave line is incorporated in the top of the cavity and becomes the center conductor of the cavity. Tuning this quarter wave line raises the cathodes of the four triodes in the cavity above rf ground potential and drives them with the signal from the driver. The inverted cavity above the triodes appears as a resonant circuit between the grids



● New 25 k.w. (low band) v.h.f. t.v. amplifier which features greater adaptability, low power consumption, and ease of maintenance.

**An Amplifier Designed To Give The Highest Quality Performance With Any Make Drive So That Obsolescence Of Existing Equipment Is Unnecessary When Changing Over To Increased Power Operation**

## Low Band TV Amplifier

and the plates. The triodes operate in a grounded plate circuit. The output is capacitively coupled from the hot side (grid side) of the cavity circuit to a shorted resonant line which is tapped to accomplish an impedance transformation. The tubes are operated as Class B linear amplifiers and their operating points are maintained essentially at projected cut off by a bias voltage, applied between cathode and grid of individual tubes from individual bias regulators.

The aural amplifier is generally similar to the visual amplifier. While the cavity is mechanically identical with that in the visual unit, the circuitry uses cathode and grid resistor biasing in place of bias regulators. Also, the input circuit is similar to that in the visual unit, but the output is different by reason of being capacitively coupled from the hot side of the cavity circuit directly to the antenna

line.

The rectifier unit, in both visual and aural amplifier cabinets, supplies high plate voltage by means of a three phase full wave circuit which utilizes six mercury vapor rectifier tubes. A complete system of interlocks, overload circuits and relays, time delays and safety switches protects the equipment from overloads and power transients.

Because a minimum of tube types are used in the equipment, the investment in spares to meet FCC requirements is minimized. And, due to the long life of final amplifier tubes, the operating cost is likewise minimized. Large faced meters and controls on the amplifier which have been "human engineered" for facility in handling, complete a product design which is virtually as easy to operate as AM broadcast equipment of comparable power rating.

## Broadcasting Efficiency---

# An Assessment Of Station Operation

By LESLIE L. HILL, Ph.D.

**A**LTHOUGH the predominant problems in high quality recording and reproduction are purely mechanical, the majority of broadcasting technicians are specialists in the electrical and acoustical fields, a fact which leads to certain difficulties and very often to undesirable compromises. Great strides, however, have been made by both producers and program planners to overcome the shortcomings and difficulties arising from this situation.

Very often faulty transmission is the result of deficiencies in broadcasting studio arrangements. It is expected however, that current experiments will result in closing more of the gap between a performance before a live audience and the audience listening to a radio transmission.

It should perhaps be noted that at the same time there is a distinct tendency on the part of broadcasters to dispense with skilled human labor, since it is generally believed that expert personnel can be replaced by modern equipment. It is true that the progress of electronics has contributed to reducing the amount of physical and mental effort on the part of studio operators, but one of the industries, where the individual still retains his full value, is the broadcasting industry. Even with the most modern equipment, it cannot be stressed too emphatically that properly trained personnel will continue to be a "must" in the broadcasting industry.

It is well known that the broadcasting studio presents numerous problems in acoustics. The walls, the floor and the ceiling are faced with materials offering considerable damping to sound waves in order to avoid objectionable echoes and allow such control of reverberation as will promote naturalness of the signal and allow effective emphasis on certain sound frequencies. Movable drapings are provided so that compensation may be made for the sound-absorbing effect of varying numbers of persons who may be present. The artists and the microphone must be placed in such relative positions that there is no concentration of sound waves or blasting in the microphones.

A great number of electronic novelties have been introduced into the broadcast industry and have greatly improved the range of broadcasting, automatic operation and the quality of sound. Nevertheless highly skilled and trained engineers will always be required to operate and maintain the equipment in working condition. Large broadcasting corporations

and the master station networks, such as the CBC and BBC, continuously strive to improve the quality of their broadcasts in the interests of the general public by maintaining highly skilled technical personnel. It is, of course, realized that private station owners are confronted with financial considerations which may prevent them from hiring highly paid technical personnel, and they must be given credit for their efforts in improving broadcasting efficiency to the best of their ability as they have done over the past years. However, it is considered that an assessment of private station operation in Canada would do no harm and some of the points which come to mind in this respect are as follows:

1. Based on comprehensive system testing, it is considered that an acceptable standard of sound quality is seldom achieved.
2. It is believed that private station owners, in an effort to operate as economically as possible, in many cases do not have adequate equipment or qualified personnel.
3. In order to achieve minimum lost air time, which means lost revenue and lost audiences, it is considered that small stations would benefit

from the use of two separate transmitters.

It is generally considered that many studio installations tend to be a makeshift with the exception of basic equipment, such as consoles and turntables. Such an installation can hardly be expected to produce efficient broadcasting results.

Another neglected aspect of broadcasting in the smaller stations is the lack of inter-communication and talk-back facilities. Many installations are operating with outmoded equipment of this type. It is unfortunate that many of today's broadcast stations are years behind the times with respect to modernization. Most of their equipment has been in operation for ten years or more with no new replacement. On the other hand, those stations which have installed modern equipment have tended to operate without the use of properly qualified personnel.

In conclusion it may be said that most of the privately owned stations are of the utmost importance to the smaller towns and distant centers in Canada to which they are providing a service, which should be supported in every possible way by the listening public.

---

**New Television Projection System Intended For Use In Hotel Banquet Rooms And Auditoriums Produces Well Defined Image For Audience Of Several Hundred Persons.**

## 16 Foot TV Pictures

**A** TELEVISION projection system that provides pictures up to sixteen feet in width is one of the latest developments in the fast moving field of video. The new system provides advances in compactness, convenience and performance over earlier types used in pioneering tele-session activities and proving closed-circuit television to be a valuable commercial, industrial and educational tool. It picks up a TV signal, amplifies it and feeds it to a projection kinescope — a high voltage, high intensity picture tube. Electronics engineers forecast that the linking together of large audiences in several cities will become an accepted practice in Canada before long.

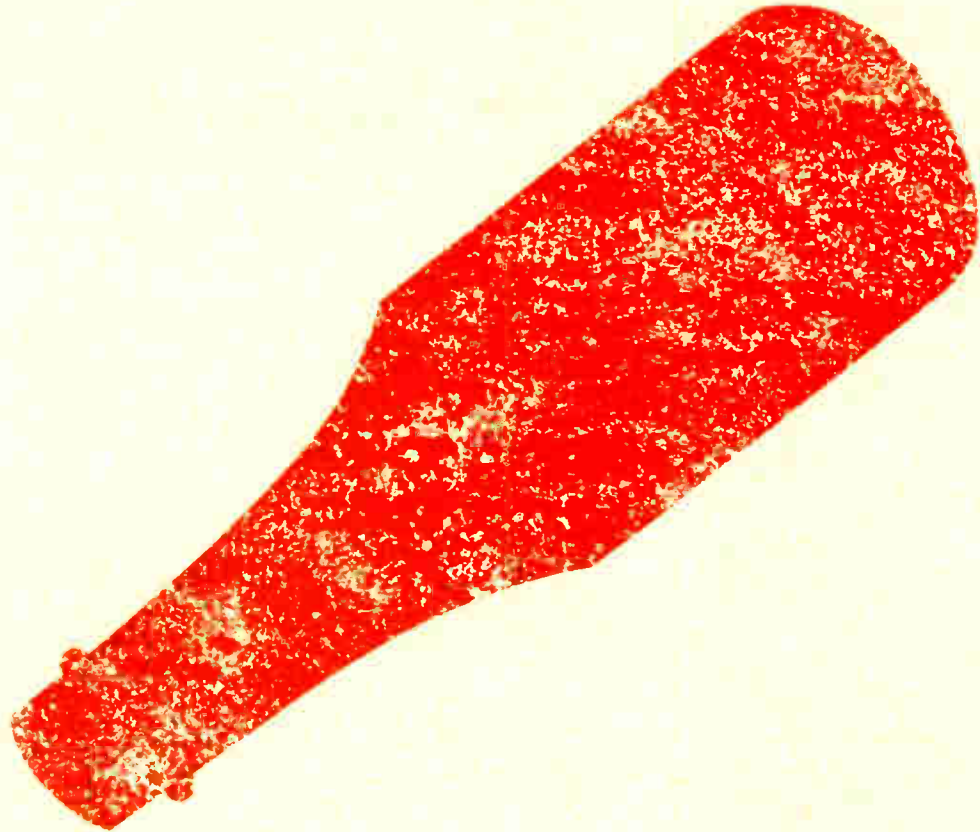
The television projection system is intended primarily for use in hotel banquet rooms and auditoriums, where its bright, sharp pictures can easily serve an audience numbering several hundred persons.

In large industrial plants, innovations in machine shop practice involving complex operations can be demonstrated to entire groups of personnel concerned, eliminating the necessity for individual instruction. In this application, a significant saving in time and money will be possible by minimizing non-productive time.

The equipment can also be used by the medical profession to carry the most minute details of surgical opera-

(Turn to page 41)





## no ketchup needed

When a predestined steer meets a dedicated chef . . . man, that's steak!  
 If steer or chef is bad (and double trouble if both) . . . ketchup can't help.  
 Now comes the commercial.

Take the best available materials (sifted by unrelenting research).  
 Season with the same inventiveness used by Dr. A. O. Beckman to develop  
 the precision potentiometer in 1940 (we've never switched brands).  
 Add assembly-line economies without compromising quality. Test and  
 retest in the industry's most complete lab. Inspect a dozen times  
 (too many cooks can't spoil *this* broth). Pack well. Ship on schedule.  
 Man, that's a HELIPOT precision potentiometer . . . no ketchup needed!



836 REG. U.S. PAT. OFF.

*first in precision potentiometers*  
 a division of BECKMAN INSTRUMENTS, INC.  
 Canadian Factory: No. 3 Six Points Rd., Toronto 18,  
 Ont.  
 Sales Representative: R-O-R Associates, Ltd.,  
 290 Lawrence Ave. West, Toronto 12, Ont.

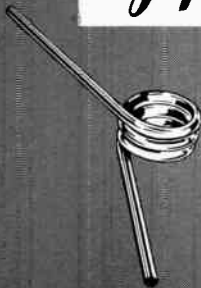
*Helipot makes precision potentiometers . . .  
 linear and non-linear . . . in the widest choice  
 of sizes, mounting styles and resistances.  
 Many models are stocked for immediate  
 shipment . . . our engineers will gladly adapt  
 standard models to your requirements . . .  
 or design entirely new HELIPOT\* precision  
 potentiometers for you.  
 For information and specifications . . .  
 write for data file 407.*

# BOHNE



COMPRESSION

*Precision*



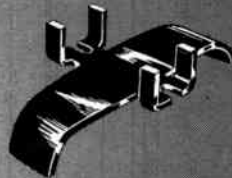
TORSION

*Made*



TENSION

*Springs*



FORMED

Send blueprint,  
specifications or  
sample for quotation

**BOHNE INDUSTRIES LIMITED**

1153 QUEEN STREET WEST, TORONTO 3

Hints For - - -

## Better Broadcasting

The Editors of *Electronics and Communications* magazine will be pleased to publish suggestions from the technical and management personnel of radio stations outlining ideas for Better Broadcasting. Articles should be kept as short as possible.

### Image Orthicon Connections

By A. G. Day P.Eng., Chief Engineer  
CKCO-TV Kitchener, Ont.

Anyone familiar with the principles of operation of an image orthicon camera tube could have nothing but great admiration for the ingenuity shown by the designers and manufacturers of this tube. That this erstwhile laboratory freak can be manufactured in quantity, even at such a high cost, is in itself, a remarkable achievement.

It is unfortunate, therefore, that one further modification was not made to this tube. The annular ring connections to the tube are brought out behind the shoulder of the image section, facing the rear. The socket contacts required for these connections are wholly contained within the encircling coil assembly, and cannot be serviced without complete dismantling of the tube carriage. Broadcasters will agree that sooner or later contact trouble does occur at these connections, and that the loss of the camera for from two to four hours is the result.

Were the annular ring connections to have been brought out to the front of the orthicon, the annular socket itself could have become the front indexing surface for the tube, with all socket contacts readily available for service through the front of the coil assembly. Lead dressing from the contacts of the front socket would have to be controlled so that leads cleared the image on the optical faceplate, and the faceplate would have to be inserted inside the annular ring, but neither problem should be insurmountable.

Please, Mr. Manufacturer, on new camera and orthicon designs, think of the broadcaster, and turn those connections to the front!

### Film On The Iconoscope Without Shading Problems

By A. G. Day P.Eng., Chief Engineer  
CKCO-TV, Kitchener, Ont.

Many television stations are equipped with iconoscope film cameras. Those that are can solve a major shading difficulty on film programs by a rather simple trick which we have applied here at CKCO-TV.

The technique was evolved when we realized that the operating parameters of the iconoscope were changed radically by the effect of the light application pulse during vertical retrace. The light application pulse is of course blanked out of the video by vertical blanking, usually in two locations, but even with beam retrace blanking, the video level of the pulse before video blanking will wander from positive to negative, with tremendous relative amplitude compared with the video. This pulse can be almost completely eliminated leaving an almost stable level of video, by operation of the backlight control alone. We therefore monitor the video before it reaches the first blanking amplifier, and keep our backlight adjusted to nullify the excursions of the application pulse either positive or negative.

We bolted a second-hand, two inch "Pocketscope" to the side of the iconoscope control unit, and connected it to the unused polarity output of the film camera head, ahead of any blanking amplifier. The video operator, having adjusted controls for a normal slide, which, with a constant light source, has no light application pulse, then need only adjust his backlight control as the scenes change on a film program. Occasional adjustment of contrast may be required, depending on the film, but normal control of shading is achieved with almost the ease associated with that of the vidicon.

It was a simple move, costing us about 25 dollars, but it has permitted us to broadcast good quality film pictures with very little effort on the part of the video operator.

(Turn to page 44)

For further data on advertised products use page 61.

# are you fighting space?

*connect  
with  
cannon!*

Are you looking for complete electrical circuit dependability in a very, very small space?

If so, you should use Cannon carefully engineered miniature and sub-miniature multi-contact connectors. In  $\frac{1}{2}$  or  $\frac{1}{3}$  the usual space, they give you up to 50 contacts, the same number as a standard connector, and still retain all the factors of utility, reliability, and mechanical strength found in Cannon's standard size connectors. They are very rugged, easy mating, unusually versatile, neat and compact.

Miniatures—Maximum Dimensions Only 1" x 2"!



High-dielectric insulation. Rack, panel, chassis types . . . receptacles and plugs, standard, pressurized, or hermetically sealed . . . box, wall, or cord mountings . . . For audio, control, and instrument use. D and U sub-miniatures have steel shells. DPA and K miniatures have die-cast shells. Five-ampere gold plated contacts are found in all miniatures and sub-miniatures, excepting U receptacles, which have steel contacts. Larger contacts having higher current ratings, and co-ax contacts, are in process of development.

Sub-Miniatures—Only 2-5/8" x 39/64"!



*first in connectors*

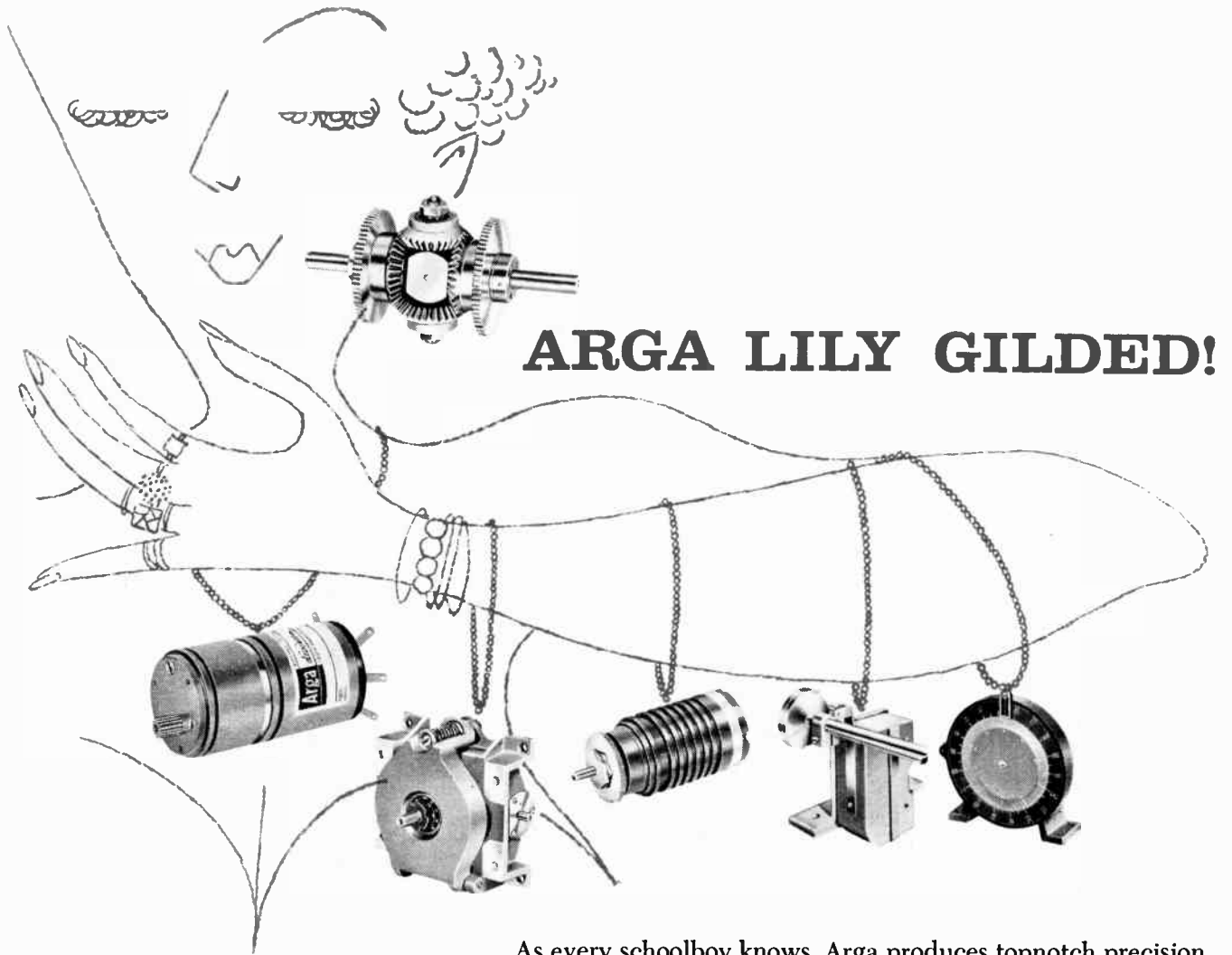
## **GANNON PLUGS**

Write for Cannon Miniature and Sub-Miniature Bulletins

**CANNON ELECTRIC CANADA LIMITED, 160 Bartley Drive, Toronto 16, Ontario.  
Montreal Office — Trans-Atlantic Bldg., Montreal Airport, Dorval, P.Q.**

Factories also in Los Angeles, East Haven, London. Licensees in Paris, Tokyo, Melbourne.

5512



## ARGA LILY GILDED!

As every schoolboy knows, Arga produces topnotch precision electrical and electronic components . . . for power generating and monitoring . . . for analog computer, control, and data transmission applications.

Drunk with the heady wine of success, this division has added a new line of components that includes: low-inertia differentials, high-speed magnetic clutches, ball-and-disc integrators, gear heads for servo motors, dial assemblies, limit stops, reducers, grid plates, hangers, couplings, cranks, shafts, terminal blocks and brackets.

With the addition of these handsome new products, Arga's line of servo components is complete . . . making this division *the* place to go for all your requirements.

The new Arga line is illustrated and fully described in a new special data file, which also presents inspirational thoughts beautifully rendered in Sanskrit. Write for one! It's No. 405.

*precision electrical and electronic components*



**Arga** Division of Beckman Instruments, Inc.

South Pasadena, California

Sales Representative: R-O-R Associates, Ltd.  
290 Lawrence Ave. West, Toronto 12, Ont.

# New Visual Effects For Color TV

Courtesy R.C.A. Radio Age.

A SERIES of visual effects new to live television programming added spice to a number of recent NBC major color programs, marking the debut of a versatile new tool in telecasting.

The results appeared dramatically for the first time in "Alice in Wonderland", when Alice seemed to shrink in size before the camera while surrounding objects remained unchanged. In the Sadler's Wells Ballet production of "Sleeping Beauty", Margot Fonteyn, as the princess, appeared in one scene to float before the camera as a vision brought to Prince Charming and his retinue in the magic forest.

Behind these and other novel effects in other major programs, lay an ingenious NBC system known as the "color video inset", employing two cameras in a way which permits the foreground of a picture to be controlled independently of the background. The system was developed by the NBC Engineering Department, and was one of the last projects carried out under supervision of Robert E. Shelby, Vice-President and Chief Engineer of NBC, before his death on December 8th.

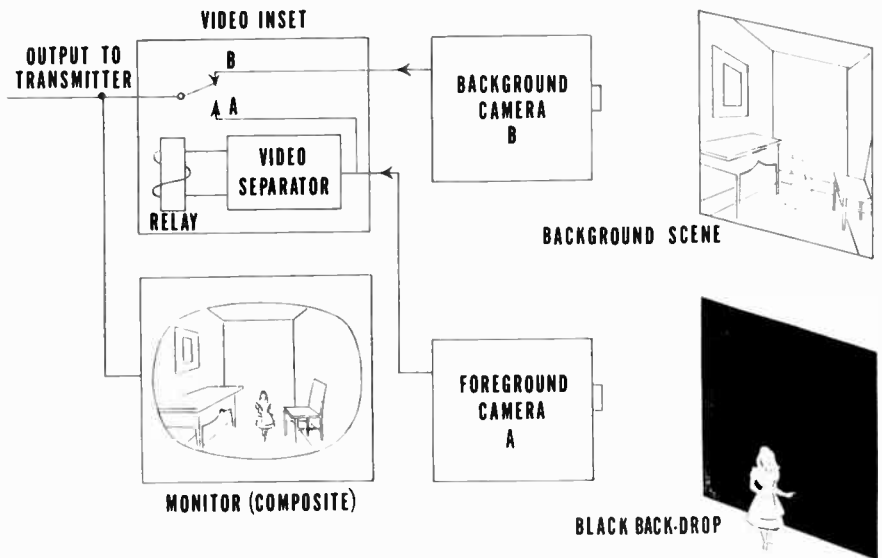
In announcing the successful use of the new system, Mr. Shelby had declared: "This is one of the most important developments to come out of the NBC Engineering Department. With the new system, producers can use camera techniques heretofore impossible in live color television. They can, for example, create giant 'spectacles' in relatively small studios, and they can bring a live outdoor scene into the studio to be used as a background."

## How It Works

The "color video inset" works this way:

Two cameras are used simultaneously, one scanning a background scene, and the other scanning the inset object, which is placed against a black backdrop. An electronic mixing device automatically records a silhouette of the inset object (Alice, for example, in the shrinking scene), then "cuts" a correspondingly shaped hole in the background and makes the insert. The process requires precise control in production work as well as in electronic timing, which must be accurate to one ten-millionth of a second.

The effect of the inset, unlike that of a superimposed television image, is to



● Sketch shows how NBC's new color video inset employs two cameras to control foreground of a TV picture independently of the background to achieve novel effects.

present a solid picture without overlapping or transparency. In this respect, the new system is similar to the matting process in film, which requires complex lighting and processing work. Thus the inset permits the instantaneous use of live camera effects which could be achieved formerly only with the use of processed film.

NBC engineers have pointed out that the color video inset broadens the whole scope of color television production. With its use, an actor may be placed against the background of a mountainside, a city street, or a seashore, brought into the studio "live"

from any location that can be reached with a television camera.

Or, doing it the other way around, actors may be placed in spectacular settings which may be set up in miniature in the same studio, or even in another studio — the inset system reducing the apparent size of the actor to fit the background.

The color video inset is an extension and refinement of the black-and-white video inset. Both techniques were pioneered by the Development Group of the NBC Engineering Department, which interprets and adapts the laboratory research of RCA to the broadcasting uses of NBC.

## For Operator Safety - - -

# Remote Controlled TV

CLOSED-CIRCUIT TV installations can now be remote controlled to provide operator safety in hazardous locations, assure undetected operation in security and surveillance work and permit quick and accurate viewing of widely spaced objectives by a unique remote control TV system.

Called the "285-A Servo System", it includes a multi-lens TV camera which is entirely directed by a separate monitor-console. Simply by turning an appropriate knob on the console, any function of the TV camera can be achieved.

Lenses on the camera are changed, focusing is set, and the camera is directed up or down, right or left, all by remote control.

A built-in "memory" in the control console also makes it possible to automatically point the camera in up to

three different "pre-set" directions simply by pushing a button.

These "pre-set" positions, which may be readily changed to meet varying observational tasks, greatly facilitate repeated viewing of more than one area or operation.



● Complete remote control operation of closed-circuit television cameras is provided by this unique "servo pan and tilt" system shown at right.



## More Electronic Engineers Needed With Combined Skill And Knowledge

Dr. John T. Henderson, of the National Research Council of Canada, was the featured speaker at the 44th Annual Meeting of the Institute of Radio Engineers in the Grand Ballroom of the Waldorf-Astoria Hotel, New York City, during the week of March 19-22.

The subject of Dr. Henderson's address was "Borderline Engineers", whom he defined as those who work in an area where skill is required not only in engineering but also in some allied subjects. He cited such examples as ultrasonic and neural studies, electronic computer applications to transportation problems, electronic control of machine tools, and electronic applications to medicine, surgery and dentistry.

Dr. Henderson stressed the need for more electronic engineers who are equipped with "a combination of engineering and scientific skills and knowledge".

It may be desirable, the speaker pointed out, for an engineering student to pursue more than four years as an undergraduate and obtain two or more degrees; or his broadening experience may be obtained by taking specially selected graduate courses in "outside" fields while actively working along conventional lines.

According to Dr. Henderson, "those men who contribute most to the development of any intermediate field will be those most likely informed in the two relevant subjects."

The IRE, Dr. Henderson said, had already recognized some important "borderline" areas by establishing professional groups in nuclear science and medical electronics, and he forecast that further scientific developments could very well give rise to other intermediate areas of interest to electronic engineers.

Dr. Henderson declared that in all humanistic applications of engineering there is insufficient communication between the various interested parties. Considering that natural phenomena recognize no political boundaries, he suggested that IRE members, when travelling abroad, could do much to promote international understanding and co-operation and thus help themselves by helping the IRE.



Dr. J. T. Henderson

## Stuart D. Brownlee To Be Guest Speaker At Chicago Show

Announcement is made by Canadian Electronic Sales Representatives that Stuart D. Brownlee, executive vice-president of Canadian Admiral Corporation Limited, will be the guest speaker at the Annual Canadian Luncheon to be held in the Conrad Hilton Hotel, Chicago, on Wednesday, May 23rd, during the 1956 Electronic Parts Distributors Show.

Mr. Brownlee is well known to the Canadian Radio and Electronics Industry, having recently relinquished his position as general manager of the Radio-Electronics-Television Manufacturers Association of Canada, and president of Canadian Radio Patents Limited, to join Admiral.

### CORRECTION

In the article Monitor For Aircraft Take-Off by Leslie L. Hill published in the March issue of *Electronics and Communications* the formula on page 32, paragraph 3 should read:

$$\lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$$

## C. P. Clare & Co. Opens Canadian Sales Office

A new Canadian branch sales office was opened April 1st by C. P. Clare & Co., Chicago relay manufacturers.

Ronald W. Price, formerly with Measurements Engineering Ltd., and with wide experience in the Canadian electronics industry, is in charge as District Sales Manager.

The new branch office is located at 659 Bayview Avenue, Toronto 17, Ont.

## Tenatronics Ltd. To Represent Bud Radio In Canada

Bud Radio, Inc., of Cleveland, Ohio, manufacturers of electronic components and sheet metal products, announces the appointment of Tenatronics, Ltd. as exclusive Canadian representatives.

Tenatronics, Ltd., is located at Davis Drive East, Newmarket, Ontario.

In addition to acting as distributors, Tenatronics, Ltd., will carry a large stock of Bud products to facilitate delivery to their many customers in Canada.

## Additional Equipment Increases Bohne's Production Capacities

The latest machinery for precision spring manufacturing is now in operation at Bohne Industries Limited, Toronto. New spring coiling and multi-slide forming equipment has resulted in greater production and service facilities for the manufacture of precision springs — compression, tension, torsion and formed.

## Stokes Establishes Canadian Subsidiary

F. J. Stokes Company of Canada, Ltd., has been established as a subsidiary of F. J. Stokes Machine Co., Philadelphia, Pa.

Francis Dougherty, Jr., president of the American company, will also head the new Canadian subsidiary. Its other officers will be Francis J. Stokes, Jr., and Allan A. Hutchings, vice-presidents; David E. Stokes, secretary; and Erwin R. Scott, controller — all of whom hold corresponding positions in the parent company. J. William Robinson, a native Canadian who has been manager of the Stokes Canadian sales office in Montreal since it was opened in April, 1953, will continue in charge of all Stokes Canadian operations under the new company. Headquarters of the company are now located at 27 Wellington St. East, Toronto.

## J. M. Mackrory Press Information Head For Canadian Westinghouse

C. W. Hale, public relations manager, Canadian Westinghouse Company, has announced the appointment of J. M. Mackrory as manager, press information services.

Formerly supervisor of technical publicity, Mr. Mackrory now assumes responsibility for all press information services at Westinghouse, covering both technical and general information to press, trade publications, radio and television.

As manager of press information, Mr. Mackrory will plan and prepare press releases and technical articles as well as provide photo publicity services for all divisions of the company.



J. M. Mackrory

(Turn to page 34)

*announcing*  
**CANADA'S FIRST FULL SCALE  
 ELECTRONICS and  
 NUCLEAR SCIENCE  
 CONVENTION**  
*and exposition*

AUTOMOTIVE BUILDING, EXHIBITION PARK  
 TORONTO, CANADA  
**OCTOBER 1<sup>ST</sup>, 2<sup>ND</sup> and 3<sup>RD</sup>, 1956**



**RESERVE YOUR EXHIBIT SPACE NOW!**

On the occasion of the 30th Anniversary of the Institute of Radio Engineers in Canada, this Convention and Exposition will be a milestone in the development of the Electronics Industry.

A comprehensive programme of exhibits and technical papers by leading experts will be presented in the superb accommodation of the Automotive Building at Exhibition Park in Toronto, Canada. The addition of exhibits and symposia on the industrial application of nuclear science will be an important feature of this scientific assembly.

The 1956 Canadian I.R.E. Convention will be a must for thousands of engineers, technicians and buyers from Canada, the United States and abroad.

Now is the time to plan your company's exhibit participation in this great event. Write today for your copy of the brochure giving detailed information.

## **CANADIAN I.R.E. CONVENTION**

Office: 745 Mount Pleasant Rd., Toronto 12, Canada  
 Telephone HUDson 8-7768

**30<sup>th</sup> Anniversary in Canada**  
**The Institute of Radio Engineers**

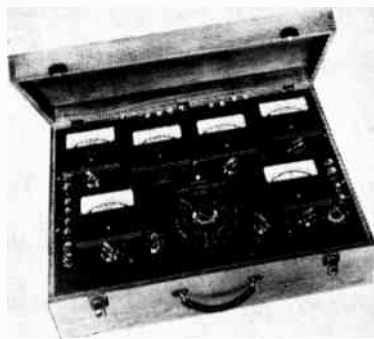
# NEW PRODUCTS

New Product specifications published in *Electronics and Communications* have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our Readers' Service, Page 61. Just mark the products you are interested in on the coupon on Page 61 and the information will be in your hands within a few days.

## ● Universal Magnetic Testing Set

### Item 1043

The new Universal Magnetic Testing Set is a complete unit designed to make measurements that conform to the methods and specifications of the American Society for Testing Materials as described in their specifications on "Standard Methods of Testing Magnetic Materials". The price of the set, which includes the Epstein frame, makes it within the financial reach of any small laboratory doing core loss testing.



### Magnetic Test Set Functions

- The determination of BH curves.
- The determination of hysteresis loops.
- Core loss testing using Epstein frame or standard "F" and "I" cores.
- Measurements of total flux of hard magnets.
- Measurements of magnetic field strength.
- A.C. and d.c. permeability tests.

### Instrumentation

- D.C. Ammeter: Ranges .03; .075; .15; .3; .75; 1.5; 3; 7.5; 15; 30 amperes.
- A.C. Ammeter: Ranges .05; .1; .2; .5; 1; 2; 5 amperes.
- RMS Voltmeter: Ranges 15; 30; 75; 150; 300 volts, 500 ohms per volt.
- Flux Voltmeter: Ranges 15; 30; 75; 150; 300 volts, 3333 ohms per volt.
- Low Power Factor Wattmeter — down to 5 per cent power factor: Ranges 2.5; 5; 10; 20; 40; 80 watts.
- Multirange Fluxmeter: 10,000 lines per division, 50,000 lines to one million lines full scale.
- Epstein Frame: 25 centimeter Epstein frame as specified by A.S.T.M.

**Special Features:** All instruments have 4" hand-drawn mirrored scales and are temperature compensated. Accuracy of the individual instruments is 0.5 of 1 per cent, and 0.75 of 1 per cent on the thermocouple types. Frequency limit up to 1000 c.p.s. The complete test set is compensated so that core loss measurements may be made in watts per pound by reading the wattmeter directly and dividing through by the weight of the sample.

## ● Bulletin On Printed Circuitry

### Item 1044

Just reprinted is a bulletin covering the advantages of printed circuitry for electrical and electronic systems. The bulletin, "Mechanize Your Wiring . . . With Copper-Clad Phenolite," was first offered last win-

ter and proved so popular supplies were soon exhausted.

Now again available in a 2nd edition, the 12-page, 2-color bulletin uses photographs, schematics and tables to illustrate the advantages of printed circuitry over conventional hand-wiring methods. It also includes a discussion of the economies of printed circuits and a description of the ways in which printed circuits are produced.

Complete specifications are presented on the types and grades of Copper-Clad Phenolite most widely used as base material for printed circuits. Included among these is a new glass cloth epoxy resin with properties which recommend it for circuits requiring high heat resistance and excellent electrical properties under high humidity conditions.

## ● Precision Glassware

### Item 1045

A four-page, two-color brochure featuring the use of precision glassware for electronic applications has recently been released.

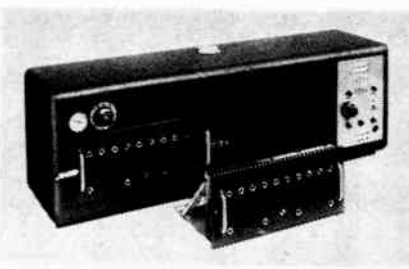
The brochure describes in detail precision bore tubing which can be supplied with I.D. tolerance down to  $\pm .0002$ ". In certain sizes the wall thickness can be made between .015" and .3125". Precision bore capillary tubing is also described. It is available in a range which runs from .004" I.D. to 1255" I.D. with tolerance limits set at  $\pm .0002$ ".

Also available are special items in the electronics field made of Vycor Brand, Pyrex Brand and most of the electronics glasses.

## ● Portable Temperature Test Chamber

### Item 1046

Production of a new Temperature Test Chamber, Model TC-2A, has been announced. Completely portable and self-contained, the new model is a low cost unit especially designed for production line tests of small products such as basic instruments, electronic sub-assemblies, mechanical components, etc.



Key features of the new model include a new anticipator-type thermostat which provides extremely accurate temperature control; three-heat selection switch; rugged welded aluminum construction and glass fiber insulation.

## ● High-Alumina Ceramic

### Item 1047

Type R-95 ceramic, a new high-alumina material has been developed for use in insulators and hermetic ceramic-to-metal seals. Custom-designed shapes of this material are now available to the electrical, aviation, nuclear, and chemical industries to meet a wide variety of needs.

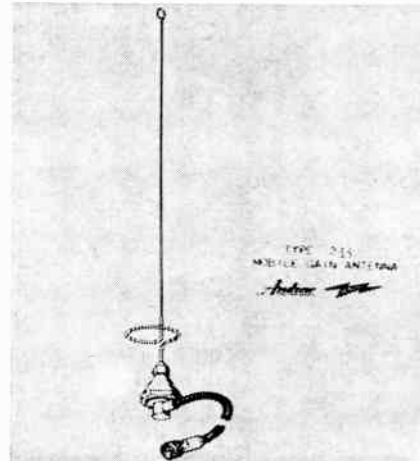
Mechanical properties include extreme strength and hardness combined with high resistance to abrasion and temperature (up to 1700°C.), as well as exceptional mechanical and thermal shock characteristics. R-95 ceramic parts can be metalized for subsequent soft or hard soldering to metals. Electrical properties are equally favorable, with a dielectric constant of 8.61 at 1000 m.c.

R-95 ceramic is recommended for either small or mass-production quantities in any application (electrical, mechanical, chemical or vacuum) requiring a precision ceramic of uniform body composition and consistent quality.

## ● Mobile Gain Antenna

### Item 1048

A new rooftop antenna for 450-470 MC range has been developed. This mobile antenna effectively multiplies mobile transmitter power by 1.5 without adding cost to the mobile communication unit or increasing battery drain.



The inductive-tuned  $\frac{3}{8}$ " wave radiator has 1.3 db measured gain. Use of RG-8/U feed cable (optional) gives an additional .5 db measured gain, making a total effective gain of 1.8 db (1.5 power gain) compared to conventional quarter-wave rooftop antenna with RG-58/U cable.

This new mobile antenna has a stainless steel radiator supported by a molded plastic insulator which mounts in a single  $\frac{7}{8}$ " hole. The antenna is supplied complete with coaxial cable and connectors.

## ● Telemeter Terminals

### Item 1049

The Model 1025 Telemeter Transmitter Terminal and the Model 1090 Telemeter Receiver Terminal have been designed to accurately telemeter mechanical or electrical variables which will actuate a potentiometer, slide wire, etc., or those which can be converted to a d.c. voltage or current. The transmitter converts d.c. millivolts to audio tones. The receiver converts audio tones to d.c. millivolts.

The transmitter and receiver may be connected by wire lines, radio, or microwave circuits. Multiplexing is accomplished by audio frequency shift channeling circuits which are provided as part of the terminals. The terminals are used for telemetering such quantities as temperature, speed, pressure, position, power, wind direction, humidity, volts, amperes, watts, vars, etc. Any quantity that can be measured in terms of a d.c. voltage or converted into a d.c. voltage or current by a suitable transducer may be telemetered. A current source and terminals are provided for direct connection to slide wires and potentiometers.

The Model 1025 Telemeter Transmitter Terminal first converts the d.c. voltages to a proportional 10-30 cycle frequency which in turn modulates a frequency shift carrier. This output carrier voltage is then applied to the wire line, radio or microwave link.

(Turn to page 38)



choose with  
confidence

use with  
satisfaction

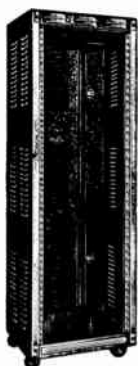
# BUD

**ELECTRONIC  
COMPONENTS  
and Sheet Metal  
PRODUCTS**

**Now  
AVAILABLE  
IMMEDIATELY  
from  
STOCK  
in  
CANADA**

Get acquainted with the new and improved products in the extensive Bud line of Electronic Components and Sheet Metal Products. There are over 1000 different types and sizes to meet the needs of business, industry and the amateur. Our large facilities, expert workmanship, 28 years of experience and manufacturing "know-how" assure quality products and the best value. Now Bud products are available from stock in Canada. A time and money saver for you. Illustrated below are a few of the many outstanding Bud products.

#### DE LUXE RELAY RACKS



An ideal housing for all types of electrical and electronic devices, widely used in business and industry as well as by amateur radio operators. Made of 16 gauge steel with recessed panel mounting supports. Top, sides and door are well louvered to provide adequate ventilation. Furnished in black or grey wrinkle or grey hammer-tone. Bottom construction has 4 added supports so that casters may be attached to the base for easy mobility. Available in six sizes with one door and 4 sizes with two doors. Shipped knock-down with all necessary hardware for easy assembly.

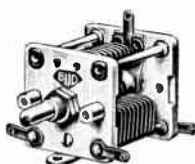


#### 75 WATT TRANSMITTING COIL



Highly efficient transmitting coil with polystyrene base that resists breaking or cracking. The Q of the coil is exceptionally high due to low power factor. Pins always remain perfectly aligned. Coils furnished with fixed or adjustable center links or fixed or adjustable end links. Can be used on bands from 6 to 160 meters or in circuits using Pentode tubes.

#### "CE" MIDGET CONDENSERS



Meet the most rigid requirements in design of efficient ultrahigh frequency electronic devices and precision laboratory equipment. Brass rotor and stator plate stacks assembled into permanent units by electro-soldering. Sleeves and ball bearings assure smooth rotation. Fully insulated. Available in single or dual section in many sizes and capacities.

#### CODE PRACTICE OSCILLATOR AND MONITOR CPO-128A



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## NEWS

(Continued from page 30)

### Winnipeg Section of IRE Hold Joint Meeting With EIC

On March 7th the Winnipeg Section of the Institute of Radio Engineers held a joint meeting with the Engineering Institute of Canada.

The guest speaker was Mr. Le Roy A. Griffith, director of Transistor Engineering, Transistor Division, Minneapolis-Honeywell Regulator Company of Minneapolis, Minn. The subject of Mr. Griffith's address was "Large Triode and Tetrode Germanium Power Transistor Characteristics and Applications".

### Astron Purchases Ceramic Capacitor Plant

Astron Corporation of East Newark, New Jersey, has purchased Skottie Electronic Corporation, Inc., of Peckville, Pennsylvania, manufacturer of ceramic capacitors. The announcement was made by Joseph Frank, president of Astron Corporation, who described this new addition as another step in his corporation's expansion program.

Astron is represented in Canada by Charles W. Pointon Limited, 6 Alcina Avenue, Toronto 10, Ontario.



● Recently announced staff changes at PSC Applied Research Ltd. include: (Above Center) Stein Sunde, production manager; (Left) Oswald S. Schmidt, assistant production manager; and (Right) James Speight, assistant to production manager. F. Manly Haines, who is a director of the company, has been named production director.

### Electronic Computer Course

George Glinski, P.Eng., president of Data Processing Associates Limited, Ottawa, is presently conducting a course on electronic analog computation for the staff of the Mechanical Division of the National Research Council in Ottawa.

F. W. Pruden of the Division has initiated this program and support has been given by J. H. Parkin, director.

Mr. Glinski is well known in the field of analog and digital data processing and has been lecturing on this subject at McGill University, Montreal and Carleton College in Ottawa for the past five years.

### Hackbusch Electronics Canadian Reps For Caledonia Products

R. A. Hackbusch, president of Hackbusch Electronics Limited, recently announced that his company will be the exclusive representatives in Canada of the Caledonia Electronics Transformer Corporation of Caledonia, N.Y.

Caledonia design and manufacture transformers and other electronic assemblies for communications.

All Caledonia products and services will be available to Canadian manufacturers and service organizations through Hackbusch Electronics Ltd.

(Turn to page 42)



## QUARTZ CRYSTALS

(Precision Lowdrift)

All Types and Frequencies

### ... careful does it

It's priceless to you — the extra care with which Snelgrove craftsmen create quartz crystals of supreme quality, for every application.

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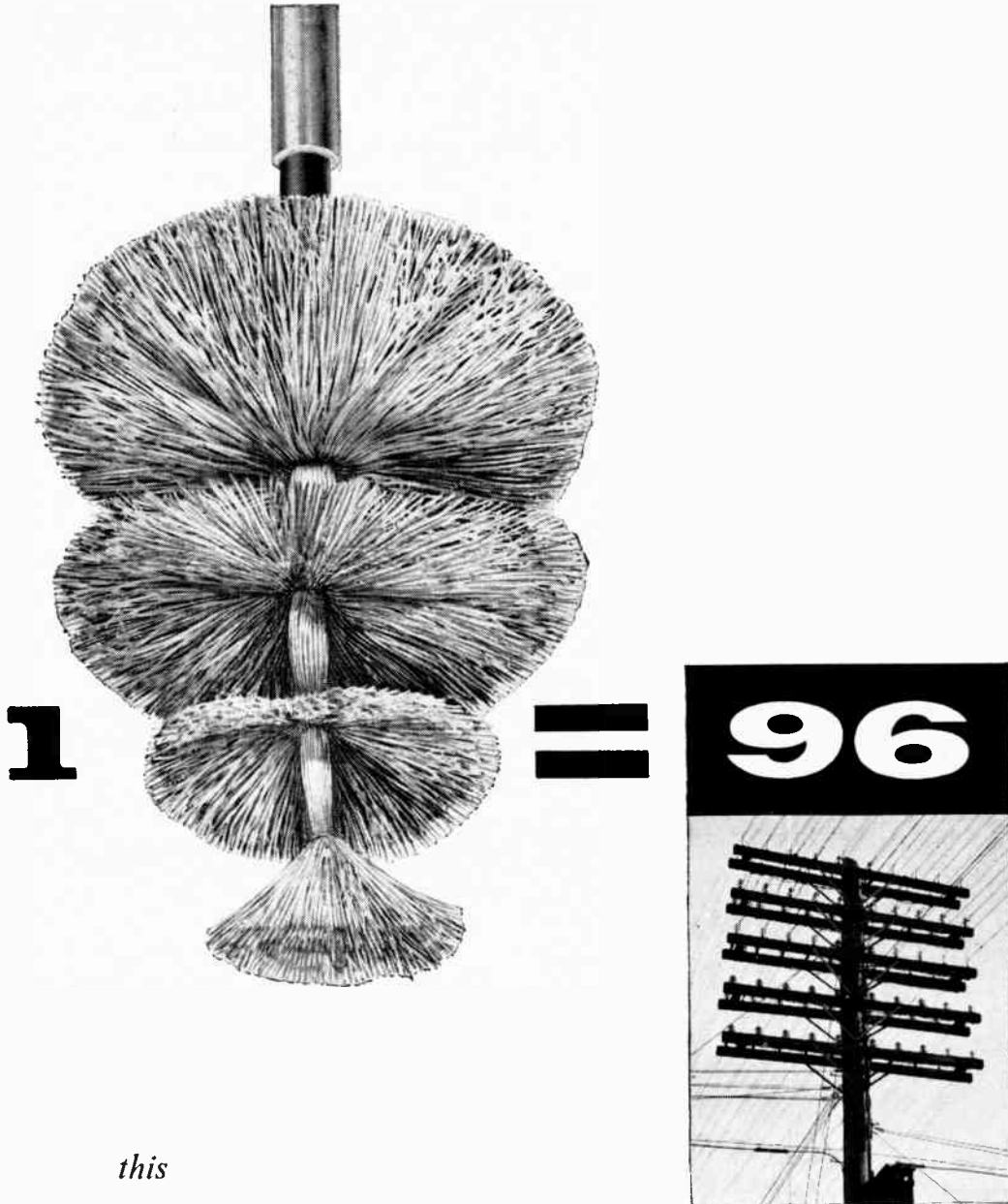
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For further data on advertised products use page 61.



*this  
one*

*Phillips telephone cable = 96 poles (loaded like this) . . .*

because the fanned-out telephone cable at the left contains 2424 paired wires—or a total of 4848 individual wires! It would take 96 fully loaded poles, as shown at the right, to carry all the wires contained in this one Phillips cable.

The cable, believed to be the largest made in Canada, was built to fit the requirements of a large Canadian telephone system.

From the first lead covered telephone cable made in Canada (by Phillips in 1890), right to the present day, Phillips are foremost in this field.

They can supply telephone cable for aerial, underground or submarine use . . . for a few stations in a small exchange or for the largest communications network.

Their finest recommendation is the fact that many Phillips telephone cables have given trouble-free service for decades and are still in use today.

*Phillips Electrical Company Limited, The Canadian Affiliate of the B.I.C.C. Group, Head Office — Brockville, Ontario. Phillips telephone wire and cables are also distributed throughout Canada by Automatic Electric Sales (Canada) Ltd. Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.*

5605

**WIRES AND CABLES**

This article describes a new development in portable communication equipment techniques.

This development has been carried out by Canadian engineers using private funds as a commercial venture, and has been brought to its present advanced stage in less than one year.

The basic design is capable of many variations to meet a variety of operating requirements and in view of its operational performance, it is felt that many uses will be found for it in such areas as Forestry Patrol, Surveying and Emergency Sea, Land and Air Operations.

Circuit units comprising the device are fully capable of being adopted for airborne use.

# Portable Communication Unit Using Transistor Circuits

By

D. W. HOLDSWORTH and S. KAGAN

RECENT advances in components, materials and circuit techniques have presented the design engineer with a unique opportunity to approach some old problems from a new viewpoint and thus achieve some radically new units of greatly increased utility. Such an advance is described in this article, the end result being an extremely small and rugged communication set with a number of novel features combined in such a way as to achieve extreme simplicity of operation and be capable of many varied designs embodying the basic features utilized in the unit.

At the commencement of this study, it was felt that a review of the basic philosophy of portable communication units was desirable and, in order to do this, a number of possible applications were considered. It was soon found that the requirements of most applications tended to be the same, namely:

(1) Simplicity of operation — the aim should be to achieve a unit which would approach the telephone in convenience, hence controls should be kept to a minimum.

(2) Light weight and small volume.

(3) Rugged—able to withstand rough handling and transportation such as all the usual military environmental requirements.

(4) Ability to withstand extreme temperatures and be capable of total immersion in water without damage.

(5) Maximum possible range of operation.

(6) To be independent of dry battery supply sources.

An extreme case in which all these requirements must be met is that of air rescue operations in which an airman may be forced down in a hostile environment, possibly injured, and with slowed down mental processes. Since the RCAF is keenly interested in this field, some of the first models of this set have been tailored to such a requirement. However, slight modifications are presently contemplated which will enable the unit to become generally useful in a number of applications.

A number of pre-production models have now been tested operating in the 3 mcs emergency band. These units have shown a reliable ground-to-ground range of 15 miles, and have been operated at ranges of up to 30 miles.

These units weigh approximately 7 lbs. with antenna and headset and measure 8" x 6½" x 3".

Further work is proceeding on both single and multi-channel units to operate in the 30 mcs and 50 mcs bands.

Details of the external appearance of the unit are shown in the accompanying photographs which also give some idea of size in relation to the operator. The unit is in two halves which are normally clipped together and operated as one unit. The case is of molded epoxy fiberglass and each half is completely hermetically sealed. The upper half contains the receiver and transmitter and the lower, the power supply which

is connected to the circuit by means of a short flexible cable.

To operate the unit, the headset is adjusted and the antenna erected. The base of the antenna consists of a wedge-shaped molding arranged to mate with a slide on the top of the case. The wedge is self-cleaning and cannot be rendered inoperative by mud or ice. Inserting the antenna automatically switches on the receiver which has extremely low current drain. The antenna is a center loaded whip which may be tuned by rotation of the outer case of the loading coil.

A transmit/receive switch is connected to the receiver and telex cable so that it may be held inside a glove or pocket. When using handset the transmit/receive switch is integral with the handle. To call out, therefore, it is only necessary to operate this switch. Antenna current may be read on a small sealed meter mounted near the antenna wedge.

In the initial conception of the unit, it was decided that maximum efficient use would be made of a single 6-volt power unit and several methods of powering the circuits are possible. The first is a silver cell storage battery of 2 ampere hours capacity combined with a hand-operated generator capable of recharging the battery. This combination gives unlimited operation and is ideal for emergency applications.

For field survey parties, etc., operating from a base camp, a higher capacity silver cell unit is available which can be recharged on a regular weekly schedule from a car battery or any other available source.

A further combination is a mercury cell power unit which must, of course, be replaced in the normal manner.

A feature of this unit is the very high transmitter power output of 3 watts which can be increased to 5 watts for special applications. This power, combined with the high sensitivity of the receiver is mainly responsible for the extreme range of the instrument.



● Compactness and ease of handling is shown in the above illustration of the portable communications unit.

● Light weight, small volume, rugged construction and simplicity of design are illustrated in the accompanying photograph of the portable communications unit.

In order to be free of moving mechanisms such as relays, a new approach was required for Antenna switching. The solution to this problem was found in the well-known principle of diode gating as used in computers. This afforded adequate switching of R.F. power from transmitter to antenna and from antenna to receiver as required. The total power drain required is 3 ma at 6 volts.

Two types of head sets are available, either the telephone type handset with an integral transmit button or a head harness type with a separate transmit switch on a cable. At the operating frequencies of 2 mc/s to 4 mc/s, portable antenna of reasonable efficiency is a major problem. A six foot center loaded whip was finally selected. Advanced techniques were used throughout, as shown most clearly in the loading coil which is only  $\frac{3}{4}$ -inch in diameter and 8 inches long. This reduction in size was accomplished by the use of a Litz wire coil and a ferrite tuning slug to achieve an adequate coil Q, rather than the conventional large air core, silver wire coil.

The equipment housing has received the same attention as the electronics. The newest materials and techniques were used throughout. Circuitry is mounted on printed boards, receiver, transmitter and other major sections are self-contained, plug-in units, permitting easy service access both to major section and individual components.

Extensive use is made of Epoxy-fiber-glass materials for all structural elements. New fabrication methods were investigated, resulting in relatively inexpensive parts of near phenomenal strength and chemical resistance over a wide range of environmental conditions.

The authors feel that the experience gained doing this development has been of inestimable value in enabling new circuit components and techniques to be engineered, and it is felt that as further work proceeds, a wide extension of these techniques will be called for.

In conclusion, we would like to acknowledge the important contributions made by Messrs. E. J. Harrison, P. Golench and other members of Crosley Industrial Electronics Division who participated in this program.

### Technical Aspects

The technical system design of a portable communication set can be split into certain major sections: Receiver, Transmitter, Power Supply, Handset, Antenna, Interconnections and Housing.

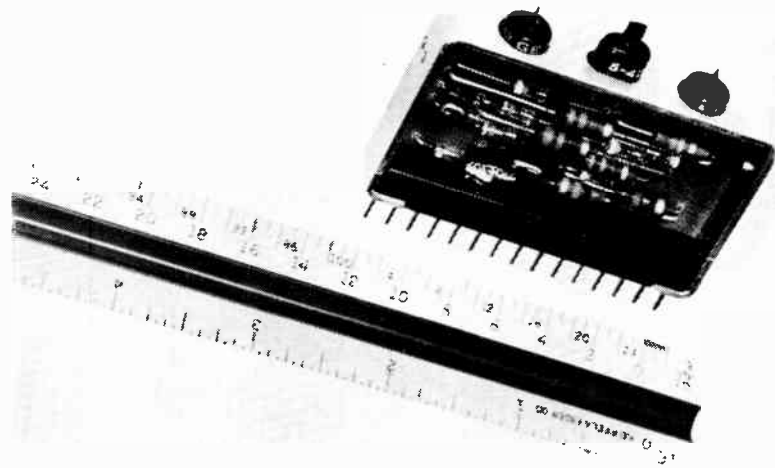
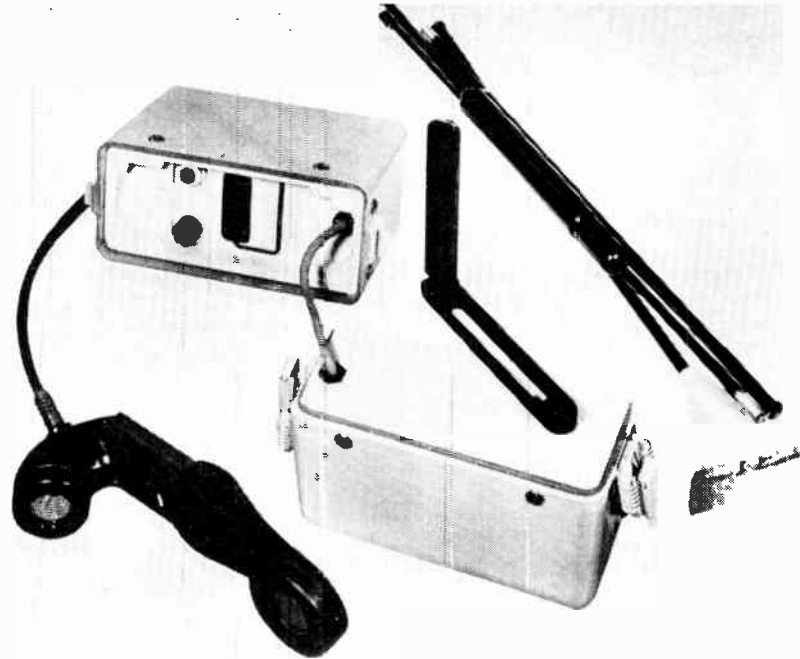
As this is a portable unit, it was felt that the power supply was the most critical feature. Heavy sectional batteries, of uncertain shelf life, poor performance under severe environmental conditions, and uneven sectional utilization, have in the past largely defeated the purpose of most equipment of this type. A fresh approach was decided upon which involved the use of a single secondary type sub-miniature battery of six volts and eighteen watt-hr. capacity. The inclusion of a hand driven generator to charge this battery in case of the lack of other charging facilities, has made the power supply as a unit, self-sufficient and independent of battery store, or other civilized amenities. The use of a single battery from which all necessary voltages are derived by high efficiency D.C. Transformation makes best use of the stored power available, by insuring that variations in duty cycle do not affect the efficiency. The result is a power supply capable of operating the receiver continuously for 500 hrs. At a duty cycle of 5 mins. transmit and 25 mins. receive every half hour, 10 continuous hours of operation are possible. This is provided by a battery weighing only 12 oz. and capable of withstanding fifty full charge-discharge cycles. The use of an alternate power supply which does not include the generator will increase these items by a factor of 3.

The requirements on the communication section were set as follows: Receiver Sensitivity to be 1.5 microvolts at a signal to noise ratio of 10 db. A.G.C. control up to 100,000 microvolts input. Audio response such that at least 85 per cent intelligibility results and an acoustic output of 80 db above the threshold of hearing or 80 phons. The power drain not to exceed 8 milliamps with no signal and 18 ma with signal. This dictated the use of transistor circuitry throughout. In the final receiver, seven transistors are used and all the

above requirements are met. The local oscillator is crystal controlled and only one trimmer need be adjusted to put the set on a new frequency. Total receiver weight is 2.5 oz.

The companion transmitter requirements were 3.5 watts minimum output into the antenna at an overall drain 1.8 amps from the battery and a modulation capability of 70 per cent minimum with an audio characteristic compatible with that of the receiver. In the final unit an output tube was used but modulation was achieved with transistor circuitry. Again all these requirements are met and total transmitter weight is 2.7 oz.

The use of transistors in both receiver and transmitter have provided a new degree of freedom to the designer. If properly utilized in circuitry logically arranged to suit transistors, many problems inherent in tube designs are avoided. An example of this is the second detector and audio output stages of the receiver. In their most logical configuration these provide the advantages of current drain proportional to signal strength and amplified A.G.C. as well as their primary functions of detection and audio power amplification. Processes of thought and engineering practices must be reoriented to utilize transistors. However, it is felt that this is a small price to pay when compared to the resultant gains.

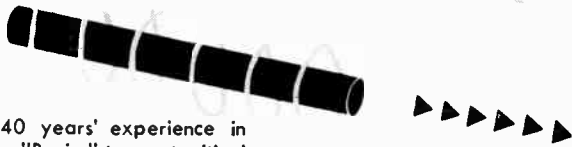


● This photograph of the portable communications unit shows component arrangement and illustrates the built in generator feature.

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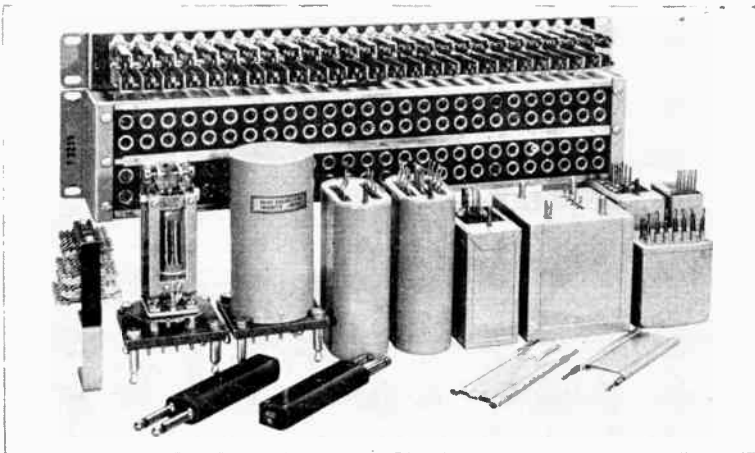
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## COMPONENTS FOR COMMUNICATION SYSTEMS



Radio Engineering Products produces a wide range of standard components for use in communication systems. In most cases these components can be delivered from stock.

**FILTERS:** Filters of advanced design are available for carrier telegraph, carrier telephone, and telemetering systems. These include channel filters, low-pass filters, and line filters.

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**REPEATING and RETARDATION COILS:** A large number of standard types are carried in stock. These include voice-frequency and carrier-frequency line coils, hybrid coils, and retard coils for telephone and telegraph applications.

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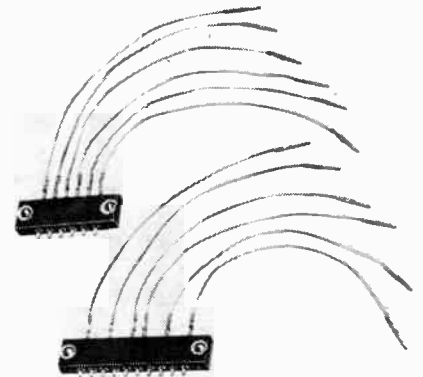
## NEW PRODUCTS

(Continued from page 32)

### ● *Miniature Terminal Strip*

*Item 1050*

A new subminiature terminal strip has been designed specifically for printed circuit computer applications. Available in 6 and 10 contacts, the new strip has the series designation "MB".



Two mounting holes on the body of the "MB" terminal strip permit stacking of the units in quantity and in a small area. One side of the strip accommodates taper tab (AMP Series 53) for solderless wiring. The second side is suitable for conventional wiring. Body material of the "MB" terminal strip is mineral-filled Melamine, Type MME per MIL-P-14D specs. Brass contacts are gold-plated over silver for low contact resistance and soldering ease.

### ● *"Twin-V" Mobile Radios*

*Item 1051*

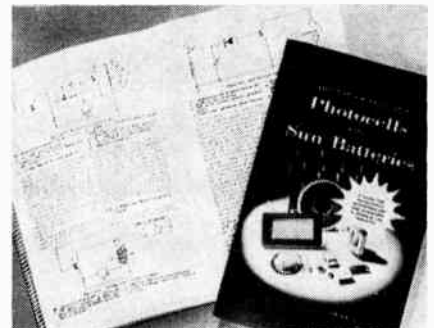
A new line of 6/12 volt mobile 2-way radios in the 25-54 m.c. and 144-174 m.c. bands, including new 6/12 volt dynamotor powered models, has been announced by a wellknown radio manufacturer. These new models, together with current 450-470 m.c. 6/12 volt models, provide a complete selection of 6/12 volt mobile radios. All mobile radio drawer units of the new series operate from 6 or 12 volt electrical systems without any type of modification.

The new line of equipment provides improved efficiency squelch circuit, simplification of conversion to split-channel operation, improved audio to increase intelligibility and further reduce ignition noise response.

### ● *Booklet On Sun Batteries*

*Item 1052*

A new technical booklet titled, "The Use of Selenium Photocells and Sun Batteries," has recently been published. Designed to be



of primary interest to engineers and amateur experimenters, this handbook contains 58 pages of technical information and over 35 illustrations, charts and diagrams which describe in detail applications and devices in which sun batteries and other photocell products are successfully employed.

For further data on advertised products use page 61.

## ● Mercury 198 Source And Microwave Exciter

Item 1053

Determination of wavelengths with accuracies to one part in one million can be obtained with the new model mercury <sup>198</sup> source and microwave exciter unit which are now available.

This apparatus, built for use in high dispersion interferometry, makes determination of wavelengths easier and provides a higher level of accuracy in analysis.

The mercury <sup>198</sup> source is a fused quartz electrodeless lamp, 6 mm. in diameter and 14 cm. long, utilizing about 0.4 m.g. of mercury <sup>198</sup> prepared by transmutation of gold in an atomic pile. Argon is used as a buffer to enhance mercury excitation.

The exciter is a portable unit, operating at a wavelength of 12.2 cm. in the 2400-2500 megacycle band, from a 60 cycle, 115 volt a.c. power source. Radio frequency energy is generated in a continuous-wave magnetron oscillator and carried in a flexible coaxial cable to the director which concentrates the external radiation on the lamp. The device has a maximum power output of 125 watts. Relative power output is indicated by meter on front panel.



High voltage direct current for the magnetron is provided by an a.c.-operated power supply which includes separate plate and filament transformers, two 816 rectifier tubes and a filter circuit. Input to the high voltage transformer is controlled by a time delay relay, timer and a Variac which controls the R.F. power output to the magnetron. Front panel preheat and power switches control filament application and plate power respectively, with adjacent lights to indicate switch positions. An a.c. blower supplies cooling air throughout the cabinet, which measures 15 x 10 x 11 inches.

## ● Cheaper And Smaller Transistors

Item 1054

One manufacturer has announced that it is now making transistors which are only .2" square and 1/8" thick. The president of this company states that the price of transistors has been reduced and that they now range from 75 cents to \$4.50. "Within two years," he said, "transistors may be below 50 cents."

His company also plans to further diversify its types of transistors and increase production from over 400,000 in 1954 to 2,000,000 units this year.

## ● Condensed Standard Specifications Catalog

Item 1055

A new 1956 illustrated catalog of condensed standard specifications on a wide range of power supplies, voltage regulators, voltage reference sources, frequency changers, etc. has just been released.

Included in the catalog are data on regulation accuracy, input and output voltages, ripple, recovery time, load range and other basic specifications. Also included is a list of local technical representatives and special service facilities.

Copies of the new condensed catalogs are available.

(Turn to page 47)

*New!*  
**IDEAL SURVEY METER  
FOR RADIATION SAFETY**



- Compact, convenient, accurate
- Operates on a single flashlight cell
- Weighs only 2 pounds
- Beta or gamma by twist of a knob
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- Accessories to multiply or divide both ranges by 10

## Curtiss-Wright RADIAMETER

The Curtiss-Wright Radiometer is a radiation survey meter designed especially for health physics and industrial hygiene applications. Using a unique inverted triode circuit, it performs functions usually requiring two instruments. The lower scale provides high sensitivity for decontamination monitoring. The high scale measures stronger radiation fields usually requiring an ionization chamber type instrument.

Where other radiation survey meters require several expensive and hard-to-find batteries, the Radiometer is powered by a single inexpensive flashlight cell. It is easy to handle and slips readily into a suit coat pocket.

Having the appearance of a light meter or camera, it attracts minimum attention from plant personnel during safety checks. The one-piece cast aluminum case is light in weight, but extremely rugged and waterproof. The Geiger tube or

battery may be changed in seconds and without tools. Controls are simple, even for non-technical personnel, and the meter is easy to read.

Accuracy is  $\pm 10\%$  of full scale on both scales for energies from 50 to 1,200 kev. The Radiometer is useful for monitoring energies as low as 15 kev. In the presence of radiation of high intensity, the instrument does not overload but continues to read off-scale. It can be zeroed even in a strong field. Its fast response permits monitoring x-ray installations turned on only momentarily. Battery life is long—approximately 140 hours.

Available accessories include a probe to multiply sensitivity by 10, a tube to divide sensitivity by 10, an alpha tube, a radium calibration source, a push-button on-off switch, and an attractive leather carrying case. Write for details.

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● The new phasemeter and plotter is lighter in weight and smaller and incorporates many new improvements over previous models of the manufacturer.

A NEW miniaturized dynamic phasemeter and plotter small and light enough to be installed in a pilot's compartment of an aircraft to give continuous flight position data is one of the latest navigational type of equipments to come off the production line of a large American manufacturer of electronic apparatus.

The new Raydist phasemeter, shown in upper left of illustration is the very heart of the precise positioning system, claimed to have many advantages over previous units. Tests show that with

good signals it has 3 times the accuracy of the former instruments, and even greater accuracy improvement with poor signals, because in the new model the accuracy is less affected by signal strength. It should be vastly superior under thunderstorm conditions. The new phasemeter unit reduces the number of tubes by 8 for a complete 2-dimensional unit. In the new dynamic phasemeter only 80 watts of electrical energy are required for its operation in comparison with 165 watts for a 2-dimensional old type unit. The new

Miniaturized Dynamic  
Phasemeter And Plotter  
For . . .

- Tracking
- Positioning
- Surveying
- Navigation

phasemeter is capable of following much more rapid changes in phase, and has much less lag than the previous units.

The phasemeter unit weighs only 8 pounds, less than ½ the weight of the previous models, and the space requirements are approximately 25 per cent of the former unit, and in addition to having greater accuracy, less space, less weight and less power requirements as mentioned above, the phasemeter has approximately 10 times the torque on the shaft and

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therefore is capable of driving counters, potentiometers, digitalizers, and devices for which the previous units were not practical, except in the microtorque range.

The new Plotter, shown at right in the illustration is a small automatic plotter designed primarily for aircraft applications, which allows the pilot of a ship or aircraft to continuously see his position plotted directly on a chart, a feature which is of great assistance to the pilot in evaluating the data obtained with Raydist. This is a big advancement over the previously delivered automatic plotting boards used with Raydist, which by their size and weight were necessarily confined to use aboard ships or at fixed ground locations.

For some years past now this precise means of determining position electronically, has found wide application in such fields as navigation, tracking, hydrographic surveying and positioning of ships and aircraft. Recently it has also been used in connection with petroleum crews for helicopter navigation in taking crews and equipment to the drilling rigs. These new equipment developments will greatly increase the suitability of Raydist for helicopter navigation and will have wide application for this use in general navigation.

The introduction of the new dynamic phasemeter and the Raydist plotter is the first in a series of new and improved Raydist equipments to be brought out by the manufacturers, pioneers in the field of continuous wave navigation, tracking, and surveying equipment, since a lengthy patent litigation which was recently settled in the favor of the company.

## 16 FOOT PICTURES

(Continued from page 24)

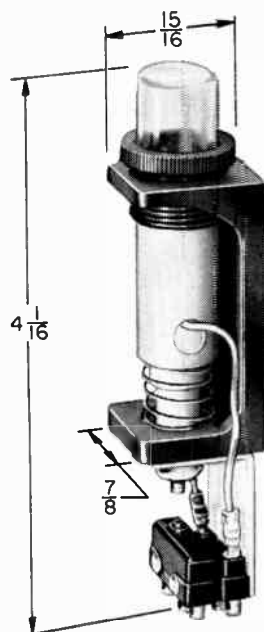
tions and medical discoveries to unlimited numbers of surgeons, internes, nurses and students located in local and remote auditoriums. This is of particular value in showing small, hard-to-see subjects such as in dental work.

The use of large screen projection television to bring an outstanding lecturer to several classroom groups will become an important tool in increasing the efficiency of teaching in universities and elementary schools and a relief of today's problem of teacher shortage. Compact or dangerous laboratory demonstrations can be shown in detail to a large group.

Another application anticipated will be in small and medium sized motion picture theatres for closed-circuit theatre events. Compactness and ease of temporary installation will make the system particularly suitable to theatres not permanently equipped for television projection. Under the very low ambient light conditions found in motion picture theatres, a picture size of 12 x 16 feet will probably be the most widely used.

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Subminiature Push Button Switches designed for panel mounting... provide almost simultaneous switching with a snap-acting mechanism that gives a positive feel. One of a complete line of panel mounting Push Button Switches designed for any application.

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# MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY LTD.



LEASIDE, TORONTO 17

## NEWS

(Continued from page 34)

**CAE Executive Appointments**

The appointment of W. M. Chamard as vice-president responsible for contracts and consumer product activities of CAE, and of R. C. Ludlow as secretary-treasurer, has been announced by K. R. Patrick, president and managing director of Canadian Aviation Electronics Limited.



W. M. Chamard



R. C. Ludlow

Mr. Chamard was formerly vice-president in charge of finance and is a member of CAE's executive committee. In his new capacity Mr. Chamard will be directly responsible for the marketing and manufacturing activities of the CAE Consumer Products Division.

Mr. Ludlow, who has held various positions with the RCA Victor Company including that of treasurer since 1947, will direct financial policy and planning for the CAE organization.

**March Meeting Of Toronto Section, IRE**

The speaker at the meeting of the Toronto Section of the Institute of Radio Engineers held on March 26th was H. Gruenberg of the Microwave Section of the National Research Council, Ottawa.

Mr. Gruenberg's subject was "The Use Of Ferrites In Microwave Components". He discussed load isolators, microwave switches, attenuators, modulators, phase-shifters, polarization changers, and other devices employing ferrites.

**L. Robert Clinton Purchasing Agent For National Vulcanized Fibre**

National Vulcanized Fibre Co., of Wilmington, Del., has announced the promotion of L. Robert Clinton to purchasing agent for the company. Mr. Clinton is a member of the Advisory Board of the Purchasing Agents Association of Wilmington.

National Vulcanized Fibre Co. has plants in Wilmington, Yorklyn and Newark, Del., Kennett Square, Pa., Chicago, Ill., Johnson City, N.Y., Toronto, Canada, and sales offices in all principal cities of the United States.

**Dr. Oskar Heil Joins Eimac Lab**

Dr. Oskar Heil has joined Eitel-McCullough, Inc., San Bruno, California, manufacturer of Eimac electron-power tubes. Dr. Heil has been named group leader of the Advanced Research Group recently formed in the research laboratory according to an announcement by Harold E. Sorg, vice-president and director of research for the firm.

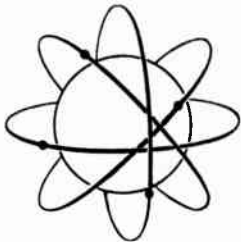
Dr. Heil, whose extensive and varied background in tube development has earned him international recognition, will direct research work at Eimac on new types of tubes and theoretical study of electron beams.

**Westpol Company Ltd. Establish Etobicoke Plant**

Announcement of the establishment of a new industry has been made by A. T. Janta, president of Westpol Company Limited, industrial engineers and manufacturers.

The firm's new plant, located at 80 Advance Road, Etobicoke, Toronto, will specialize in the field of light precision engineering including the manufacture of jigs, fixtures, gauges, dies, special purpose machines, precision components and mechanisms, pressings and fabrications, and mechanical test apparatus.

... products  
... experience  
... facilities



α Glendon  
announcement

We are proud to announce that the following manufacturers have entrusted us with their representation. Our experience, advice, and facilities are at your disposal to help you solve problems with the aid of these companies. In your own interests, we invite you to examine them and put them to the test of actual use.

**Danbury-Knudsen, Inc.**  
Co-axial switches, Wave guide components, Rack and panel connectors and mobile antennas.

**Industrial Products Co.**  
Co-axial cable assemblies, Connectors and RF components, Tip Jacks, etc. including many special and miniature types.

**The Fusite Corporation**  
Hermetically-sealed glass-to-metal feed through terminals, including high current assemblies for refrigeration purposes.

**Lundey Associates**  
Gasket type ceramic seals featuring inserts made from Teflon and Silicone rubber compounds.

**Frenchtown Porcelain Co.**  
Ceramic bodies with and without metallized coatings.

**Hamilton Hall Resistor Corporation**  
Cement coated, wire wound resistors.

**The GLENDON COMPANY LTD.**

44 WELLINGTON STREET EAST

TORONTO 1, CANADA

EM. 6-5673

For further data on advertised products use page 61.

## Canadian IRE Convention Program Has Federal Government Support

Technical papers to be read at the convention of the Canadian Institute of Radio Engineers in October will undoubtedly be of a high caliber, embracing many research findings of Canadians and others. The convention's technical program is under Dr. George Sinclair of the Department of Electrical Engineering of the University of Toronto.



DR. GEORGE SINCLAIR

The support of the Federal Government has been evidenced by the participation of four of its research and technical bodies and Canadian trade commissions abroad have readily cooperated in promoting this convention-exhibition. A letter from the Hon. C. D. Howe has complimented the I.R.E. on its enterprise in presenting this scientific assembly.

Already space for 166 displays has been sold in the Automotive Building, Exhibition Park, Toronto, where many of the world's leading manufacturers will exhibit the latest in radio, radar, television, control mechanisms, computers and the mysterious but important midget, the transistor.

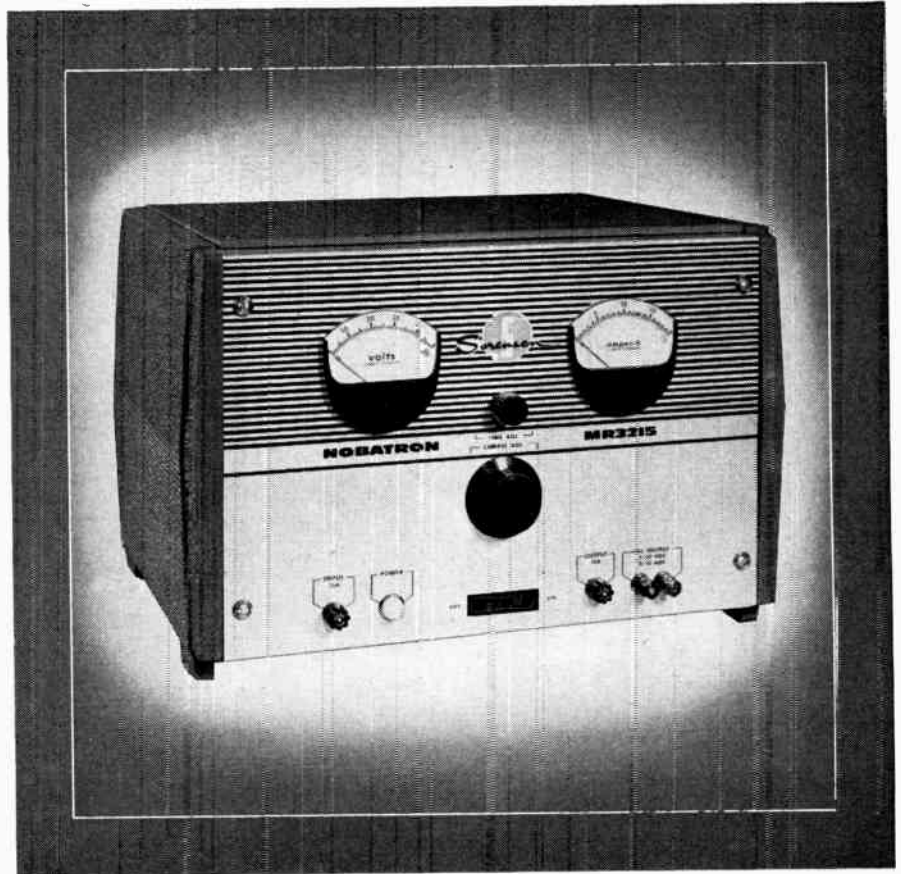
It is in keeping with Canada's consistent role for peace that the theme of the atomic exhibits will be "humanity's boon — not doom".

## Ladies' Night Scheduled For IRE, Toronto Section

The Toronto Section, Institute of Radio Engineers, will conclude the season's activities with a social evening on Monday, April 30th, to which members may bring the ladies. Dinner, followed by dancing, will be at the Boulevard Club, 175 Lakeshore Boulevard, Toronto.

M.C. for the evening will be B. de F. (Pat) Bayly and the guest speaker will be Bruce Smith of CJBC.

(Turn to page 48)



NEW PRODUCTS . . . BROADER ENGINEERING HORIZONS FROM SORENSEN

**MR3215 5-32VDC AT 0-15 AMPS**  
new, tubeless, magnetic amplifier

## WIDE RANGE REGULATED DC POWER SUPPLY

for versatile, trouble-free performance in countless design & test applications

Different outside . . . and inside! The latest design in magnetic amplifier regulation. A silicon diode is used as reference element and a transistor amplifier provides the control current for the magnetic amplifier. Wide range, continuously adjustable voltage at high current. Regulation  $\pm 0.5\%$  against line or load, ripple 1% RMS. Versatile, dependable, rugged, economical.

WRITE TODAY FOR DETAILED SPECIFICATIONS, PERFORMANCE DATA, AND QUOTATIONS.



SORENSEN & COMPANY, INC. • 375 FAIRFIELD AVENUE • STAMFORD, CONNECTICUT

# WHAT DO YOU WANT IN A TESTING METER



The  
MODEL  
8

## AvoMeter

GIVES YOU . . .

- Automatic cutout protection
- 20,000 ohms per volt movement
- 4 ac current ranges to 10 amps.
- 7 dc current ranges to 10 amps.
- 14 ac-dc voltage ranges to 2500 v.
- 3 resistance ranges zero to 20 megohms
- 4 easy-to-read scales
- polarity reversing button
- anti-parallax mirror
- external accessories for increased ranges.

ACCURATE • PORTABLE • LIGHTWEIGHT

For detailed bulletin write to Dept. E. 12

542A

**R.H.**  
**Nichols** LIMITED  
2781 DUFFERIN STREET • TORONTO

## HINTS FOR BETTER BROADCASTING

(Continued from page 26)

### Central Provincial Repair Shop Desirable

By *Mary C. Burgoyne, Managing Director*  
*CKTB St. Catharines, Ont.*

There are a few technical difficulties which we have come up against and which I am sure have been experienced by others throughout the industry.

The major drawback appears to be in the repair of radio broadcasting equipment. Speed is of the essence in the radio industry and when a certain piece of equipment needs repairing, the station is not always prepared to wait for a month or so until that equipment is returned. A second important factor is the cost of the repair job. In the case of microphones and pick-up heads, they must be returned to the manufacturers for repairs. The length of time required, the shipping expenses and the labor costs often make it more convenient and more economical to buy new equipment. We believe that a central repair depot for each province would be desirable where equipment could be repaired quicker and at a more reasonable cost.

### Short Life of Pick-up Heads

It has also been our experience that pick-up heads, even though afforded the most tender care, have an alarmingly short life. It is evident that some sort of improvement is needed to lengthen their usability.

### Standardization of Microphone Plugs

Another suggestion which we feel would improve the general efficiency of broadcasting would be the standardization of microphone plug throughout the industry. It is not uncommon for a station, when a new microphone arrives, to have to change their present microphone connector or employ an adaptor. Even a greater hardship is encountered when doing a remote or setting up equipment in another city and a microphone is borrowed from a neighbor station. Here it is a safe bet that the equipment will not match.

### Standard Loudness On Tapes

One factor which is a constant source of headaches to studio operators is the varying degrees of loudness on tapes received from national agencies. If a standard loudness was maintained by all agencies, as in the case of transcriptions which are excellent, the operator's job would be considerably easier.

### Provision For Three Turntable Inputs

By *Barry McR. Ogden, Chief Engineer*  
*CKCL Kingston, Ont.*

I can think of a suggestion that undoubtedly has occurred to other engineers as well as to myself. That is, why don't the manufacturers of audio consoles make provision for at least three turntable inputs in their basic design? The RCA BC-2B console is an example. It can be easily modified to provide a third turntable input but at the expense of either a microphone or network input.

### Improvised Improvements To Equipment

Firstly, on the turntable cue-program switches a relay circuit was installed to automatically lower the level of the air monitor speaker to facilitate proper cueing. This has practically eliminated "wowing-in" due to the operator failing to hear the low modulation when cueing.

A second taping studio was provided by utilizing a three channel presto recorder, building the amplifier section into a desk and rack mounting the power supply and mechanism. This arrangement permits one man operation and has proven invaluable for taping voice tracks and interviews without providing extra operators.

### Mobile Coverage Made Easier

We found it of advantage to be able to use our mobile transmitter in locations where the station vehicle which usually contains the mobile transmitter could not reach — such as on the ice or on the bank of a lake. Since the control-head and associated wiring is an integral part of the system and usually threaded through the car frame it is quite a chore as well as time-consuming to remove. To overcome this a

(Continued on page 54)

For further data on advertised products use page 61.

# THIS IS HELIAX<sup>®</sup>...

*The truly FLEXIBLE*

*Air dielectric cable*

This latest ANDREW cable, introduced just 18 months ago, has received phenomenal industry acceptance. This is easy to understand, when you consider that HELIAX offers electrical performance equal to that of the finest copper cables, yet is far lower in price and much easier to install.

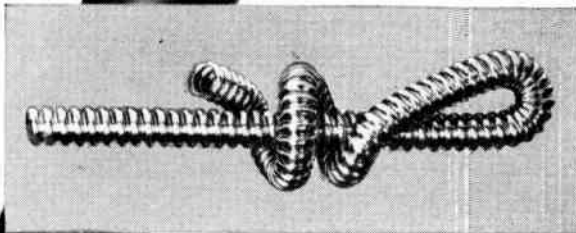
HELIAX has its own complete series of connectors, matching the superior electrical performance of the cable.

These fittings are pressurized and weatherproofed, and attach easily without special tools.

For a maximum of convenience in the field, HELIAX is normally supplied in complete assemblies, with end fittings factory attached. Available in  $\frac{7}{8}$ " and  $1\frac{5}{8}$ " sizes.

Continuous lengths to 3,000 feet.

*Write now for complete engineering data and a sample of this remarkable cable.*



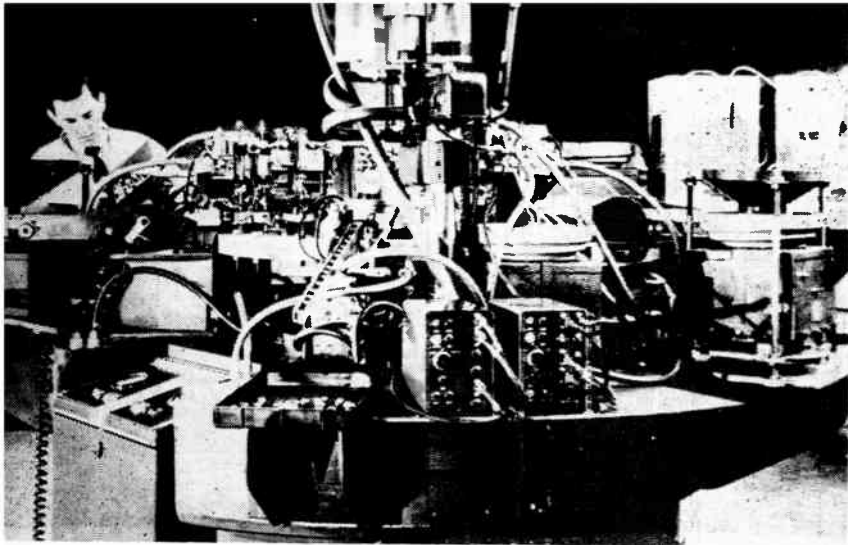
The secret of HELIAX lies in its corrugated outer conductor. As demonstrated at the left, this by itself can be bent on its own diameter without breaking, kinking or going out of round. These qualities give HELIAX its unusual flexibility, strength and ease of handling.

*Andrew*  
A N T E N N A

C O R P O R A T I O N L T D.  
606 BEECH ST., WHITBY, ONTARIO



ANTENNAS • ANTENNA SYSTEMS • TRANSMISSION LINES



# Automation With Flexibility

**FEEDS  
SORTS  
SIZES  
FORMS  
ORIENTS  
INSPECTS**

● The multi-purpose automatic assembly machine features a "feedback" system that checks the operation of all stations. If a part should fail to be inserted at one of the stations then the particular sub-assembly with the missing part is rejected at a later station.

A NEW multi-purpose automatic assembly machine is credited with the ability to turn out between 15,000 and 20,000 mercury batteries per 8-hour shift on a regular production basis. A unique feature of the machine is that by changing tools — a simple matter of a few hours — other products may be assembled on the same machine. Usually, assembly machines are built to do a specific job — without having product flexibility.

The new machine automatically performs all of the battery assembly operations that normally require a human operator. The machine feeds, sorts, sizes, forms, orients and inspects

five different battery parts. These parts include such varied forms and materials as metal cylinders and caps, felt absorbent, neoprene grommets, pressed metal and a liquid electrolyte which is also metered into the battery assembly. Mercury batteries are finding increasing usage in portable radios.

The unit also features a "feedback" system, a characteristic of all true automation systems: if a part should fail to be inserted at one of the stations, then the particular sub-assembly with the missing part is rejected at a later station but meanwhile no further parts are fed into it.

The complete machine weighs more

than 7,000 pounds. It carries the battery sub-assembly from one work station to another where parts are inserted or work is performed. Parts are fed from work nests located around the machine at the work stations. The machine can be positioned, i.e., "indexed", with an accuracy of  $\pm .002$ ". There is room around the six-foot diameter table for 16 tooling stations, although not all stations are tooled for the battery assembly operation. The machine can also be built on a straight-line principle, depending on the particular job at hand.

## FOR SALE Automatic Dial Type Telephones

Internal telephone system complete with dial and busy tones, ringer, battery, chargers, charge control and code call. Capacity 200 lines. Also desk sets, loud bells, switching keys and line protectors for a complete factory or village installation. Also available is a duplicate board fitted for 100 lines but otherwise complete. Battery on this board is 17 years old and equipment requires some repairs.

Apply: **The Canadian General Electric Co. Ltd.,**  
107 Park Street North,  
Peterborough, Ontario.

Attention: **Mr. O. W. Hurrle,**  
Supervisor - Salvage Unit.

Prominent Independent U.S. Manufacturer of Well Known  
Brand Name

TELEVISION • RADIO • HIGH FIDELITY

Seeks Experienced

**ESTABLISHED MANUFACTURER**

TO PRODUCE AND DISTRIBUTE OUR PRODUCTS IN CANADA

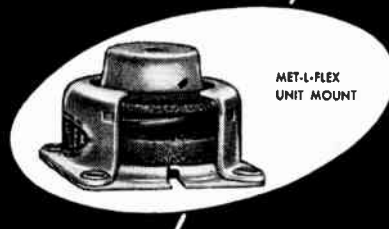
Write in confidence to  
BOX 500

Electronics & Communications - 31 Willcocks St., Toronto 5, Ont.

## VIBRATION ISOLATORS...

by **ROBINSON AVIATION** \*

... are designed for vibration isolation and shock protection of airborne equipment, instruments and controls.



MET-L-FLEX  
UNIT MOUNT

● MET-L-FLEX unit mount by Robinson is an all-metal resilient element made of stainless steel which is . . . rugged and compact . . . unaffected by oils, hydraulic fuels, temperature, altitude, vibration or moisture. High damping stability is maintained at all altitudes.

● MET-L-FLEX mounts are designed and built for the operating life of the equipment on which they are installed.

IN CANADA  
\* **AVIATION ELECTRIC**  
LIMITED

MONTREAL

VANCOUVER

For further data on advertised products use page 61.

**NEW PRODUCTS**

(Continued from page 39)

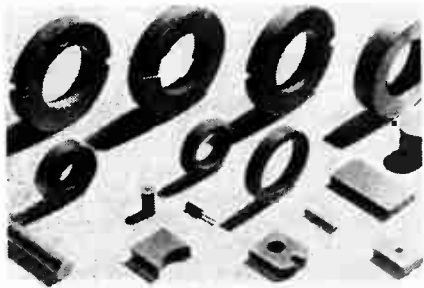
● **New Ceramic Magnets**  
Item 1056

A low cost, ceramic permanent magnet material has been developed which combines adequate energy product with high coercive force, low residual induction, virtually 100 per cent electrical resistivity and exceptional resistance to demagnetization.

Known as Ceramagnet permanent magnets, the new units retain their energy even when used without "keepers" or under other closed-circuit conditions, and in the presence of strong opposing fields. As an example, Ceramagnet cannot be demagnetized by another magnet of a force up to 2,000 gauss.

Ceramagnet magnets are practically non-conductors. Electrical resistivity is  $6 \times 10^{10}$  ohms-cm. cube, making them ideally suited for high-frequency and high-voltage circuits. They can be placed in the direct path of electro-magnetic energy to rotate the polarization plane, to focus cathode ray tube beams or for similar purposes.

Their magnetism will be unaffected by their surroundings. They themselves will exert little or no proximity on nearby circuitry.



Another feature that may offer interesting possibilities is the fact that Ceramagnet temperature characteristics are linear, including retrace, to 400°C.

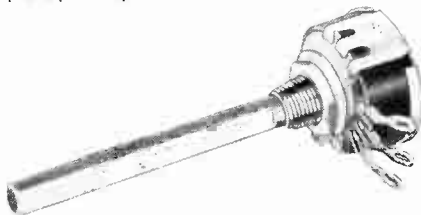
Made of non-critical, inexpensive barium and iron oxides, the new permanent magnets are classified among the hard magnetic materials. They cost materially less than metallic magnets. Also they weigh less — only 4.85 g.m.s./c.m.<sup>3</sup>.

Although the Ceramagnet energy product ( $0.915 \times 10^6$  gauss-oersteds at 600 gauss working point) is less than that of conventional metallic permanent magnets, their full energy is available under practically any condition.

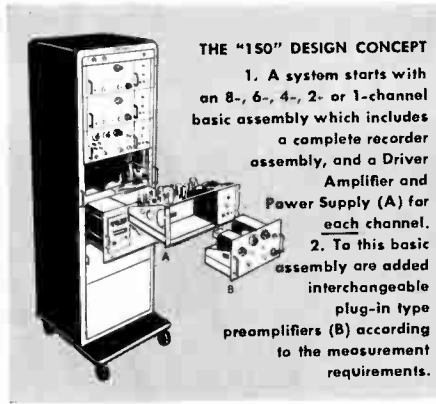
Units are available in practically any size or shape. They are machinable by wet grinding and may be machined after magnetizing. Although they can be magnetized in any direction, highest energy product is obtained by magnetizing across thinner sections.

● **3 Watt Variable Composition Resistor**  
Item 1057

A new type "VS" variable resistor will shortly be available. It is ruggedly built and surpasses JAN-R-94 specifications in every respect. It withstands the 200 hour salt spray test without corrosion, can be safely used at 150°C. (302°F.), and is completely dustproof.



(Turn to page 50)



**THE "150" DESIGN CONCEPT**

1. A system starts with an 8-, 6-, 4-, 2- or 1-channel basic assembly which includes a complete recorder assembly, and a Driver Amplifier and Power Supply (A) for each channel.
2. To this basic assembly are added interchangeable plug-in type preamplifiers (B) according to the measurement requirements.

**HERE'S REAL** DEMONSTRATED AT BOOTHS 455 AND 457 ELECTRONICS AVENUE H.E. SHOW  
**RECORDING VERSATILITY**

A Sanborn "150 Series" System can be set up to record any of these inputs in any of the channels.

**AC or DC Signals,**



AC-DC Preamp

balanced or single-ended, with sensitivity of 1 mv to 2 v cm (AC), 1 mv to 2 v mm (DC).

**Low Level Signals,**



STABILIZED DC Preamp

with extreme stability, high gain, and greater bandwidth than with 150-1500 Low Level Preamplifier.

**Magnitude and Direction of Physical Variables,**



CARRIER Preamp

with variable resistance, differential transformer or variable reluctance transducers.

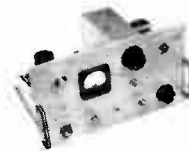
**Average Value of AC Watts in a Circuit,**



AC WATTMETER Preamp

in ranges from 25 volts x 40 ma to 250 volts x 2 amps. (with internal multipliers and shunts which can handle up to 4 amps).

**AC Voltage Components**



SERVO MONITOR Preamp

in phase or 180° out of phase with a reference voltage (e.g., servo error signal).

**Higher Level Signals**



INPUT COUPLING NETWORK

where maximum sensitivity of 1 v cm, and input impedance of about 200,000 ohms are adequate.

**DC Signals**



DC COUPLING Preamp

(push-pull, single-ended or difference between two). Basic sensitivity 50 mv cm to 50 v cm.

**RMS Values of AC Voltages, Currents,**



VOLT/AMMETER Preamp

from 25-250 volts, 50 ma — 1 amp.

**Voltage Levels Recorded Logarithmically**



LOG-AUDIO Preamp

Audio signals (20 cycles to 20 KC) or DC voltages recorded in logarithmic fashion on 50 decibel chart.

**Symmetric or Asymmetric Waveform Inputs,**



FREQUENCY DEVIATION Preamp

in 350-450 cycles (2 cycles mm) and 375-425 cycles (1 cycle mm) ranges.

**Extremely Low Voltages and Currents,**



LOW LEVEL Preamp

at sensitivities of 100 μv and 1 μa per cm. (with external shunt of 100 ohms), by means of DC chopper circuit.

BASIC "150" design features include: inkless recording in true rectangular coordinates, improved overall linearity, numerous paper travel speeds, and a choice of mobile-cabinet or portable-case packaging in 2-, 4-, 6-, and 8-channel systems.

Sanborn Representatives will be glad to help you select the equipment best suited to your needs. Complete catalog available.

**SANBORN COMPANY, Cambridge 39, Mass.**

## NEWS

(Continued from page 43)

### Canadian Electrical Supply Announces Retirement Plan

Michael I. Rosenthal, president of Canadian Electrical Supply Company Limited, has announced the establishment of a pension plan for employees of the company.

The plan has been worked out in conjunction with Centre d'Assurances, Montreal, and calls for employees to contribute 4 per cent of their salary, which will be matched by company contributions to the plan.

### CDC Engineers Offer Special Service

Earl F. Johnson, head of the Semiconductor Applications Department of Computing Devices of Canada, has announced that a highly trained staff of engineers and scientists are now prepared to devote special attention to firms requiring solutions to problems concerning transistors and diodes.

Specialists working on this phase of activity at Computing Devices of Canada are: E. F. Johnson, Robert G. Burton, Geoffrey M. Kerrigan and Laurence W. Phillips. These men have had extensive experience in varied types of electronic engineering.

### Four New Directors Elected To RETMA Board

Four new directors were recently elected to the Board of the Radio-Electronics-Television Manufacturers Association of Canada to fill the vacancies left by four directors who have resigned.

The new directors are:

H. C. Darroch of Crosley Radio and Television Division, Moffats Limited; W. F. Wansbrough of Canadian General Electric Company Limited; S. D. Brownlee of Canadian Admiral Corporation Limited; R. J. M. Allan of Addison Industries Limited.

The four directors who have resigned are:

I. Leslie, who has relinquished his position with Crosley Radio and Television Division, Moffats Limited; H. Smith, who is not now connected with the radio and television division of the Canadian General Electric Company Limited; V. Barreca, who has taken up a position at Canadian Admiral's United States plant; and H. Lightbown, who has retired from Addison Industries Limited.

This brings the number of directors on the Board to a total of 31, 12 of whom are elected by the Receiver Division, six by the Parts and Accessory Division, and six by the Electronics Division; there are six Honorary directors and a director of engineering.

One of the newly-elected directors, Stuart D. Brownlee, was recently elected chairman of the RETMA Color Television and UHF Committee of the Receiver Division.

### Magnetics, Inc. Elect Top Executives

Arthur O. Black has been elected president and William D. Dickey, executive vice-president of Magnetics, Inc., of Butler, Pennsylvania, by action of the company's board of directors.



A. O. Black



W. D. Dickey

Mr. Black, one of the founders of the firm, has acted successively as director of sales and executive vice-president of the organization.

Mr. Dickey, who will also fill the role of general manager, brings to his post extensive experience in corporate management and administration. He joined Magnetics, Inc. in 1955 as treasurer.

(Turn to page 51)

# OUTPUT POWER METER



OVER A WIDE  
RANGE OF  
FREQUENCY 20 c/s to 35,000 c/s

- Power Range: 20  $\mu$ W to 10 watts in 5 ranges
- Input impedances from 0.625 ohms to 20,000 ohms
- Balanced Input Facility
- Accuracy: 2½% of full scale deflection
- Small and light: 11" x 7½" x 7" — 8 lbs.

The Marconi Output Power Meter performs accurately over an exceptionally wide range of power, impedance and frequency. A patented resistance network forms an impedance pad to select the significant figures of the input impedance value. An English Electric wound-strip core of anisotropic magnetic alloy provides decade multiplication of impedance.

For full details, write Marconi Instruments Department.

## Marconi



CANADIAN MARCONI

COMPANY — MONTREAL 16, QUEBEC

Canada's Largest Electronic Specialists



LONG NEEDED

NOW  
AVAILABLE

Preparing to test a Company produced rocket-firing intervalometer at  $-65^{\circ}\text{F}$ . at 60,000 feet altitude

## A commercial environmental test lab in Canada!

One of Canada's first privately owned and commercially available environmental test laboratories is ready now—at your service. It is designed to test components and systems to military and commercial specifications. Here are two of the many test chambers. The left chamber tests at temperatures from  $-35^{\circ}\text{F}$ . to  $300^{\circ}\text{F}$ ., and at humidities from 20% to 98%. The right chamber provides temperatures from  $-100^{\circ}\text{F}$ . to  $300^{\circ}\text{F}$ ., at altitudes from sea level to 100,000 feet. If you have a qualification testing problem write for information on this new service to Canadian industry. Quotations are available on request.

Qualification testing for your products and research problems to current MIL Specs.:

- low temperature
- high temperature
- altitude
- humidity
- shock
- vibration
- salt spray
- sand and dust
- radio interference
- explosion
- fungus
- wind-tunnel



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1500 O'CONNOR DRIVE  
PLYMOUTH 5-3371

TORONTO 16, ONTARIO, CANADA

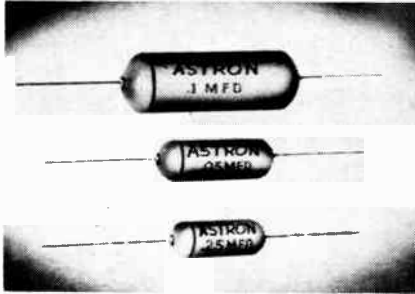
## NEW PRODUCTS

(Continued from page 47)

### ● Molded Plastic Metallized Paper Tubular

Item 1058

A manufacturer of capacitors and r.f. noise suppression filters, has announced that the Comet, first molded plastic metallized paper tubular, is now available in production quantities.



This new development, combines economy in commercial and military production with all the important operating characteristics and physical advantages of a metallized paper capacitor and the absolute protection of a molded plastic shell.

The Comet features: tough metallized paper capacitor section for miniature size, self-healing characteristics, light weight, and dependable operation; impervious immersion-proof, heat resistant, moisture safe, plastic shell; bonded end seal eliminates environmental effects; solid thermosetting impregnant for reliable operation over temperature range of  $-65^{\circ}\text{C}.$  to  $+125^{\circ}\text{C}.$  . . . vacuum impregnation guarantees uniformity of units; firmly implanted leads won't pull or melt out . . . makes soldering in tight places easy! Every unit is individually tested and guaranteed.

### ● Single-Turn Precision Potentiometer

Item 1059

A simplified method of phasing multi-section potentiometers is incorporated in the new Vari-Phase Precision Potentiometers.

These potentiometers permit external independent phasing of each sectional cup without affecting the phase relationships of others in the group. Furthermore, the phasing may be accomplished after mounting in equipment, in order to correct or cancel out any mechanical or electrical errors that may have developed during or after assembly. The phasing is accomplished by loosening a clamping nut, moving the terminal board in the desired direction, then retightening. Vari-Phase Potentiometers have no clamping rings to hold cups, and therefore a reduction in overall diameter is realized.

Vari-Phase Potentiometers are available in five different sizes to meet the many functional requirements:  $\frac{7}{8}$ "",  $1\frac{1}{16}$ "",  $1\frac{5}{8}$ "", 2" and 3" diameters. Mounting conforms to Aircraft Industries Associated Standards, but other types of mounting are also available.

### ● Leak Detector

Item 1060

The first non-destructive, atomic energy leak detection system known as Radiflo, for testing hermetically sealed parts and containers, has been announced.

The Radiflo System provides a nominal sensitivity of 1 c.c. per 500 years, is ideally suited to the automation industry and custom testing among manufacturers, users, laboratories, etc., requiring products sealed to the highest standards of quality. Typical applications consist of hermetically sealed relays, evacuated metal bellows, special vacuum tubes, sealed switches, pressure and temperature controls, bourdon tubes, etc. The system may be used in any leak detection problem whether for positive or negative sealed pressures, and on a semi or fully automatic basis.

The Radiflo System is economically adapted to mass production because large numbers of parts can be radiated or immersed and cleaned simultaneously. Thus, over 50,000 parts may be tested per month, on a single shift basis.

### ● Hydrogen Thyatron

Item 1061

A new hydrogen thyatron, the PL-165 is now on the market. The new tube has ratings intermediate between those of the 4C35 and the well-known PL-5C22, but is no larger than the 4C35. The new PL-165 is



especially designed for applications where space is limited to that occupied by the 4C35, but where the capabilities of the 4C35 are exceeded. Maximum ratings of the PL-165 are: Peak plate voltage, 12 k.v.; peak plate current 325 amperes. Maximum dimensions are: height overall, 6.25 inches; seated height, 5.63 inches; diameter, 2.56 inches.

(Turn to page 52)

## FIFTY YEARS' EXPERIENCE AT YOUR SERVICE

# HAVE YOU RELAY PROBLEMS?



Have you relay design problems — problems of size and space, climate and environment? We are relay specialists of long experience. Whatever your relay problem, we can provide the solution—with 50 years' specialized relay building and the most advanced sources of information to help you.

Bring your relay problems to us. There's no obligation and we guarantee your satisfaction.

Hermetically Sealed

Plug-In or Solder Terminal Type

Can Sizes to Accepted Standards

## JOHN HERRING AND COMPANY LTD.

3468 Dundas Street West  
TORONTO - ONTARIO

Relays Made in Canada to Meet Military Specifications

For further data on advertised products use page 61.

**NEWS**

(Continued from page 48)

**Third Annual Canadian Room**

The third annual Canadian Room held in the Hotel Commodore March 18th to 23rd again played host to the many Canadians attending the IRE Annual Convention and Exhibition in New York City. Despite the worst snow storm to hit New York since 1946 several hundred Canadians managed to make their way to New York for the world's largest exhibition of electronic equipment. Close to three hundred Canadians and a number of American businessmen attended the Canadian Room. Included among the contingent of Canadians who visited the Canadian headquarters were management and engineering personnel representing the Canadian electronics and communications industries together with government officials from the three Canadian armed services, Department of Defense Production, National Research Council, Canadian Arsenal Limited, Inspection Board of Canada, Atomic Energy of Canada and the Department of Transport.

The Canadian Room is held annually during the Institute of Radio Engineers National Convention and Show to provide a meeting place for Canadian visitors to the show and their American business associates. Members of the operating committee for the 1956 Canadian Room were: Gerald Morello, Quality Hermetics Limited; Bill Deacon, Adams Engineering; Clare Fraser, PSC Applied Research Limited; Ed Lomas, E. G. Lomas Company; T. W. Lazenby, Electronics and Communications; Ray Peirce, Sperry Gyroscope Company of Canada; Seymour Janikun, Atlas Radio Corp., Limited; Ken Davis, J. R. Longstaffe Co., Limited; John Root, R-O-R Associates Limited and Bud Dallyn, Electronics and Communications.

**W. Stanley Kendall Joins Computing Devices of Canada**

Newly appointed contracts manager for Computing Devices of Canada Limited is W. Stanley Kendall, formerly director of sales for Collins Radio in Canada.



W. S. Kendall

Mr. Kendall will be responsible for making the services and facilities of Computing Devices of Canada known to prospective customers for specialized electronic equipment in government and industry. He will work from the head office of the company at Bells Corners, near Ottawa.

(Turn to page 57)

**New, low cost, versatile**

**INDUSTRIAL COUNTER**



Measures frequency, speed, rpm, rps, random events

Measures weight, pressure, temperature, acceleration\*

Direct numerical readings, range 1 cps to 120 KC

Accurate, compact, rugged, easy for anyone to use

**-hp- 521A Industrial Counter—\$475.00**

Newest of the high quality, precision Hewlett-Packard counters is Model 521A, a low cost, multi-purpose instrument specifically designed for industrial use. Model 521A makes possible all the measurements listed above, plus many more. It reads directly in cycles per second, rpm, or rps; has connections for photocell and external standard. Uses power circuit for time base or has plug-in crystal time base (extra) for precision accuracy. Accessory power supplies of —150 v dc, + 300 v dc, and 6.3 v ac. Most broadly useful low cost electronic counter ever made. \$475.00. (with crystal time base, \$575.00).

\*With transducers

**OTHER PRECISION -hp- ELECTRONIC COUNTERS**

Instrument	Primary Uses	Frequency Range	Price
-hp- 521A Industrial Electronic Counter	Measure frequency, speed, time interval	1 cps to 120 KC	\$ 475.00
-hp- 522B Electronic Counter	Frequency, period, time interval measurements	10 cps to 100 KC	915.00 Δ
-hp- 524B Frequency Counter	Frequency, period measurements	.01 cps to 10 MC	2,150.00 ■
-hp- 525A Frequency Converter	Extends 524B's range to 100 MC	10 cps to 100 MC	250.00
-hp- 525B Frequency Converter	Extends 524B's range from 100 to 220 MC	100 MC to 220 MC	250.00
-hp- 526A Video Amplifier	Increases 524B's sensitivity to 10 millivolts	10 cps to 10 MC	150.00
-hp- 526B Time Interval Unit	Measures interval 1 μsec to 100 days	1 μsec to 107 sec	175.00

**-hp- TRANSDUCERS for RPM/RPS MEASURING**

Instrument	Primary Uses	Frequency Range	Price
-hp- 506A Optical Tachometer Pickup	rps and rpm measurement	300 to 300,000 rpm	\$ 100.00
-hp- 508A/B Tachometer Generator	Shaft speed measurement	15 to 40,000 rpm	100.00

Δ Rack mounted instrument available for \$15.00 less. ■ Rack mounted instrument available for \$25.00 less.

**FOR COMPLETE DETAILS ON ANY -hp- EQUIPMENT, SEE YOUR -hp- FIELD ENGINEER, OR WRITE DIRECT**

**HEWLETT-PACKARD COMPANY**

3346G Page Mill Rd. • Palo Alto, Calif.  
Cable: "HEWPACK"

Represented in Canada by

**ATLAS RADIO CORPORATION, LTD.**  
50 Wingold Avenue, Toronto 10, Ontario



**Electronic Measuring Instruments**  
Quality, value, complete coverage

For further data on advertised products use page 61.



**I'm DALOHM...  
miniature but mighty!**

You can depend on  
the expanded line of



**TYPE RS**  
**MINIATURE POWER RESISTORS**  
**NEW smaller sizes—ADDITIONAL wattage range**

For all applications where the equipment must survive the most severe environmental, shock, and vibration conditions.

Smallest in size; completely welded from terminal to terminal; silicone sealed, offering high dielectric strength, maximum heat dissipation, and maximum resistance to abrasion; impervious to moisture, salt ions, and gases.

RS-2A, 2 watts; RS-2B, 2 watts; RS-2, 2 watts;  
RS-5, 5 watts; RS-7, 7 watts; RS-10, 10 watts.

- Temperature coefficient 0.0002/Deg. C
- Ranges from 0.05 ohm to 55,000 ohms, depending on type
- Tolerances 0.05%, 0.1%, 0.25%, 0.5%, 1%, 3%, 5%

Conform to applicable JAN and MIL Specifications

Write for Bulletin R-23A

**DALE PRODUCTS, INC.**  
Phone 2139  
1322 28th Ave., Columbus, Nebraska, U.S.A.



Export Dept :  
Pan-Mar Corp.  
1270 Broadway  
New York 1, N.Y.  
In Canada:  
Charles W. Pointon, Ltd.  
6 Alcina Ave., Toronto

# KESTER



**FASTER ACTING**

**EASIER TO USE**

**LONGER LASTING**

**THE BEST**

Absolutely non-corrosive and non-conductive, KESTER "RESIN-FIVE" CORE SOLDER contains an activated type of resin that gives you that fast, positive action on all your jobs . . . including the most difficult.

**KESTER SOLDER COMPANY  
OF CANADA, LTD.**  
Dept. U - Brantford, Canada

# SOLDER

## NEW PRODUCTS

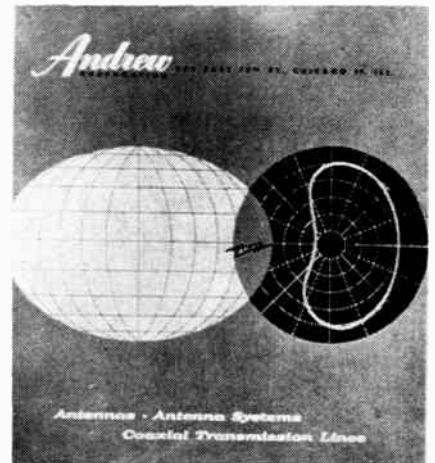
(Continued from page 50)

### ● *Engineering Considerations Of Carrier Telephone System* Item 1062

A 67-page booklet of engineering considerations on Type 45A Carrier Telephone Systems has recently been published and is now available to the telephone industry. The booklet describes transmission characteristics, system layout, line equipment, incidental cables, equipment considerations and auxiliary buildings. It contains many graphs and diagrams illustrating the various sections of the book, all of which will be of paramount interest to the telephone engineer.

### ● *New Antenna Products Catalog* Item 1063

One of the well-known designers and manufacturers of antennas, antenna systems and transmission line, has produced one of the most comprehensive catalogs, devoted to this segment of broadcasting and communications, that has come to our attention.



This 100 page catalog contains the product description and engineering data of over 500 of their products. Twenty pages are devoted to system engineering data and related information that engineers specializing in this field of electronics will find informative. The catalog is available upon request.

### ● *New Tandem Transistor* Item 1064

Now available for the first time is a newly developed MT-1 tandem transistor which increases the utility and versatility of semi-conductor devices. Two d.c.-coupled transistor elements are housed in a single case and form a simple two-stage cascade. The tandem transistor combines extremely high current and power gain with a high ratio of input-to-output resistances. In addition it is a variable-B (Beta) transistor equivalent to a variable-u (Mu) pentode.

### ● *Ruggedized Panel Instrument* Item 1065

A new, ruggedized 1½" panel instrument has been designed for applications in aircraft, portable or other electronic equipment subject to shock, vibration or temperature extremes.

Model 131 instrument is available in a wide variety of scales, ranges and specifications. Standard features include a positive watertight sealing arrangement, high flux density Alnico No. 5 magnet, and a ruggedized version of the DeJur miniaturized external pivot D'Arsonval movement for maximum accuracy and stability.

(Turn to page 65)

For further data on advertised products use page 61.

# complete money-saving service

You can save enormously on time, materials and labour, with rural distribution wire and supplies from Automatic Electric. The wire is insulated, colour coded and formed like cable. It is put up fast and economically. All that's needed is a single bracket at each pole for proper attachment. Here is a typical installation:

*for all your rural distribution wire and supplies*

**PROTECTED TERMINAL** Can be supplied for either cable or station protection. Weather-tight and designed for either pole or crossarm mounting. Available for 6, 11 and 16 pair wire.

**DISTRIBUTION WIRE** The economical solution for expanding rural and suburban telephone facilities. 19 gauge solid copper conductors are polyethylene insulated and P.V.C. jacketed. The conductors are twisted together in pairs around an insulated messenger. 6 pair wire illustrated, 11 and 16 pair also available.

**TYPE "B" BRACKET** attaches the messenger directly to the pole as shown. If there were no terminal box, the wire would lie on the bracket—protected from rubbing by a plastic guard. A type "C" bracket is available for crossarm mounting.

**WIRE VISE** Jaws of steel hold the support wire in a never relaxing grip. The fastest and neatest way of dead ending wire and cable.

**WIRELINK** for splicing the messenger. Uses the same principle as the wire vise. Simply insert the wires in the ends until a click is heard. The wirelink will then never let go.

**UNPROTECTED TERMINAL** for pole or crossarm mounting. Weatherproof, durable, reliable and very inexpensive. Available for 6, 11 and 16 pair wire.



These are just a few of the money-saving items Automatic Electric offer to thrifty-minded telephone companies. For helpful information and better service on your own particular requirements contact your nearest Automatic Electric office. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton and Vancouver. Head Office: 185 Bartley Drive, Toronto 16, Ontario.

**AUTOMATIC ELECTRIC**

SALES (CANADA) LIMITED

5623

# New **FREED** VARIABLE TEST VOLTAGE MEGOHMMETER NO. 1620



**A NEW COMPANION  
TO THE INDUSTRY  
ACCEPTED 1020-B  
MEGHOMMETER**

The Freed Type 1620 Megohmmeter is a versatile insulation resistance measurement instrument with a continuously variable DC test potential from 50 to 1000 volts. Components such as transformers, condensers, motors, printed circuits, cables and insulation material can be tested at their rated voltage and above, for safety factor.

- Resistance — 0.1 megohms to 4,000,000 megohms.
- Voltage — variable, 50 - 1000 volts.
- Accurate — plus or minus 5% on all ranges.
- Simple — for use by unskilled operators.
- Safe — high voltage relay controlled.

SEND FOR COMPLETE TRANSFORMER AND INSTRUMENT CATALOGS  
**FREED TRANSFORMER CO. INC.**  
1716 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N.Y.

## ENGINEERS ...

SPECIFY *Hoyt* FOR —

- ✓ Accuracy
- ✓ Appearance
- ✓ Economy

You get big advantages — optimum performance at minimum cost — when you specify HOYT Instruments incorporating more than 50 years' manufacturing experience. HOYT offers you a complete Line of Panel and Portable Meters in a variety of sizes, ranges and cases . . . Milliammeters, Microammeters, Millivoltmeters, Ammeters, Voltmeters and others — Moving-Coil, Repulsion and Rectifier Types — all designed for today's needs.

Take advantage of HOYT'S lower cost! Write today for complete information and prices on the Meters you need.



**POLYSTYRENE CASES  
ANTI-STATIC TREATED**



**BAKELITE CASES  
ROUND & SQUARE**



**METAL CASES  
FLUSH & SURFACE**

*Hoyt*

**ELECTRICAL INSTRUMENTS**

Sales Div.: **BURTON-ROGERS CO.**  
42 Carleton St., Cambridge 42, Mass., U.S.A.

## HINTS FOR BETTER BROADCASTING

(Continued from page 44)

simple control head providing squelch control and a monitor speaker were made up with interchangeable plugs, which allows the transmitter proper to be removed from the vehicle and set up within a few minutes and just as quickly installed again. A simple whip antennae was used with a suction cup mount or mast that can be jammed into the ice.

### Alternating Key Switches

By *B. H. Bedford, President  
CHVC Niagara Falls, Ont.*

An idea that we employ is scarcely revolutionary, but several visiting station men did not have it themselves and felt they could employ it.

On our control console, each key switch that brings in a microphone, turntable, or nemo input has an opposite position that throws the same piece of equipment into the audition mixing system. This is normal, I believe. But in our case the same key switch actuates another set of relays that throws all studio and control room loudspeakers over from the normal program system on to the audition system. The same is accomplished by the extension switch in the announce room. This means that pre-program business and instructions from studio to control room are made much simpler than with a separate talk-back system.

Carrying this further, the loudspeaker feed is also fed out on all nemo inputs up to the moment the nemo input is put on the air. From this the man on remote gets his cue, or an engineer testing lines in advance just needs to carry headphones, and the line company can easily check any line we have patched up. It also means that by flicking his mike on audition the control room man talks to a remote operator at will. The only time this does not work is on remotes over forty miles, where the carrier company inserts a one-way repeater. On all short remotes we avoid the expense of an order wire.

Generally this arrangement necessitates relays since direct switching would require many key contacts and difficulty might arise through high level and low level circuits in proximity.

*Standardized Electronic Hardware*

**IMMEDIATE  
DELIVERIES**



**Complete  
Stock in  
Canada**

COMPLETE REPRESENTATIVE STOCK of world's largest selection of standardized electronic hardware manufactured by USECO now warehoused in Canada. Supported by factory inventory of 21-million pieces. Also prompt service on etched circuits and standard and special terminal boards. Write your distributor or to our Canadian representative, Lake Engineering Co., 36 Upton Road, Scarborough, Ontario.

**U. S. ENGINEERING CO., INC.**

*A Division of Litton Industries, Inc.*

521 COMMERCIAL STREET • GLENDALE 3, CALIFORNIA



# cae

THE LARGEST CANADIAN-OWNED ELECTRONICS COMPANY

Bringing Canada's future  
a little closer  
a little faster

through electronic design  
and development

... taking an idea and transforming it into reality. This is the motivating force challenging CAE's designers and engineers.

CAE has assembled teams of imaginative and skilled people ... physicists, engineers, draughtsmen, technicians ... all capable of carrying out electronic engineering through design, development, manufacture, installation and maintenance ... teams active in such diverse fields as: nucleonics ... avionics ... automation.

Scientists and engineers planning a future in the dynamic era which lies ahead will find CAE a vitally 'live' organization where ideas are welcomed...and inspired! A place where vivid imaginations, driving ambitions and special abilities help to bring Canada's future a little closer ... a little faster.

Charles Beaudry  
member of CAE's Design and  
Development Staff, is pictured  
here working on an original  
development project.

A LEADER IN ELECTRONICS  
FOR GOVERNMENT,  
HOME AND INDUSTRY

# cae

CANADIAN AVIATION ELECTRONICS LTD.

Montreal • Ottawa • Toronto • Winnipeg • Vancouver



Employing Nuclear Energy A Revolutionary  
New Battery Now Makes Possible Those  
Talked About Portable Television Sets With  
The Use Of A Recently Developed . . . . .

# Atomic Battery

**B**ATTERY-RUN portable television sets and other gadgets of the future are now possible with the use of a 17,000-volt, single cell atomic battery which is smaller than 1½-volt flashlight battery.

This battery, called the ATBEE, converts nuclear energy directly into electricity through a special, solid dielectric and is applicable, for example, to electronic photo flash units, in combination with an electrostatic generator.

According to the manufacturers, the ATBEE makes an ideal power source for dosimeter chargers, timing circuits, trickle chargers, Geiger Counters, elec-

trostatic generators, scintillation counters and ionization counters.

This remarkable energy source delivers 17,000 volts per cell (measured by a Dept. of Defense Agency) with a maximum current of one millimicroampere. It measures one inch in diameter, 1¾ inches in height and weighs 5 ounces. Its usefulness as a power source can be seen from its 25-year half-life, high voltage, and linear charging rate, plus the wide temperature range over which it operates effectively. Because no chemical reaction takes place, the nuclear battery can be used in temperatures ranging from - 65°C. to + 65°C.

Currently, limited quantities of two versions of the unit are available. Designated as Models F-10 and F-50, they consist of three basic parts, a 2 or a 10 mc strontium-90 source of beta particles, an electrode which collects these beta particles, and a solid insulator which allows penetration of the high speed beta particles but prohibits any reverse flow of low energy particles.

The equivalent electrical circuit of the source is a parallel arrangement of three elements — a constant current source  $I_b$ , an internal resistance  $R_i$  of the insulator induced  $\beta$  radiation and the geometrical capacitance  $C$ . Straight-forward circuit theory can be used to calculate the effect of any external circuit on these characteristics.

Insulation proved the critical feature in developing the source. Because physical and electrical properties of insulators are degraded by nuclear radiation, the manufacturer was forced to develop his own method of treating a plastic dielectric so that it would provide high volume resistivity under radiation and would not lose any appreciable tensile strength.

The manufacturer selected strontium-90 as the beta particle source because of its abundance in the fission process and its availability in large quantities, but other isotopes can be used when a different battery life is desired.

the greatest number of  
**IN-STOCK WIRE ITEMS** for  
the **ELECTRONICS INDUSTRY**

**NOW!**  
**IN-STOCK**  
in  
**CANADA**  
at

**ALPHA  
ARACON  
RADIO**

29 Adelaide St. W.  
Toronto 1, Ont.

Write for  
**FREE catalog**



First in Quality Wire for over 34 years

**ALPHA WIRE CORPORATION**  
430 BROADWAY, NEW YORK 13, N. Y.

**YOUR NO. 1 SOURCE OF SUPPLY  
AND AUTHORITY ON**

**SILVER**  
for **ELECTRONICS**

**FINE SILVER (Wire, Strip and Foil)**

**SILVER ANODES FOR PLATING**  
(Slabs, Balls and Grain)

**SILVER POWDERS**

**SILVER BRAZING ALLOYS**

**SILVER SOLDERS FOR ELECTRONIC USE**

**SOLDER-FLUSHED SILVER ALLOYS**

**SPECIAL SILVER ALLOYS TO  
YOUR REQUIREMENTS**

Precious Metals Since 1867



**HANDY & HARMAN OF CANADA LIMITED**  
141 JOHN STREET, TORONTO 28, ONT.  
MONTREAL SALES OFFICE—620 CATHCART STREET

DEALERS IN ALL PRINCIPAL CITIES

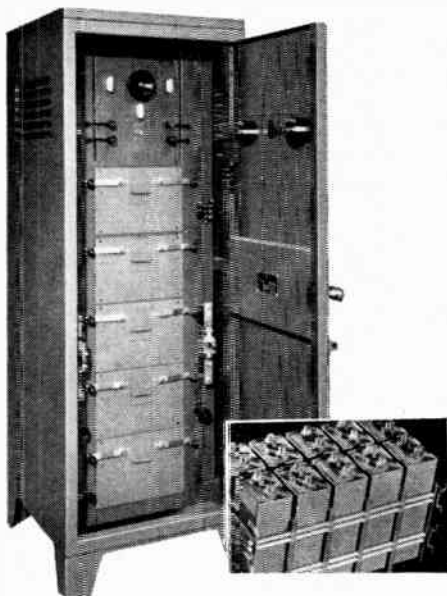
For further data on advertised products use page 61.



## FOR CLOSING OR TRIPPING CIRCUIT BREAKERS

On all operations requiring  
*high sustained currents or pulses.*

✓ **NO BATTERY ROOM NEEDED**



**CANADIAN INDUSTRY  
IS SWITCHING TO SAFT  
D-C STAND-BY POWER UNITS**  
with

# VOLTABLOC

*the only hermetically sealed, sintered plate,  
secondary cell available in the world today.*

✓ **NO MAINTENANCE**

- No corrosion
- No gassing . . . leakproof
- Mechanical and Electrical ruggedness
- Dependable performance at extreme temperatures

SAFT Stand-by Power Units are now being specified for Public Utilities, Industrial and Commercial use.

Send to-day for complete information on your specific application.



## NEWS

(Continued from page 51)

### Promotions Announced By Fiberglas

The appointment of Charles W. Ness as advertising and promotion manager of Fiberglas Canada Limited has been announced by T. J. Bell, executive vice-president of the company.



C. W. Ness



K. D. Hutchinson

Mr. Ness graduated from the University of Toronto as a metallurgical engineer in 1939. In 1946 he joined the sales department of Fiberglas Canada Limited and since 1950 has been manager of the textile products division.

Kenneth D. Hutchinson, manager of Eastern Canada sales, has been moved from the Montreal office to succeed Mr. Ness as manager of the textile products division.

Mr. Hutchinson has been with the Fiberglas Company since 1945, when he joined the Oshawa office staff. Six months later he was transferred to the Montreal sales branch and has been there ever since with the exception of the year 1949 when he was in the Toronto sales office.

### Appointment At Decca Radar (Canada) Limited

E. E. Jenkins has recently been appointed manager of the Systems Division of Decca Radar (Canada) Limited. Since coming to Canada in 1951, Mr. Jenkins has been associated with the Northern Electric Company, Belleville, on the manufacture of the FPS-3 Search Radar. In 1953 he was on loan to Air Material Command in Ottawa to advise on the maintenance of ground radar equipment, and subsequently joined the Civil Service there.

### Measurements Corp. Acquires Linear Equipment Labs, Inc.

The acquisition of Linear Equipment Laboratories, Inc. has recently been announced by Measurements Corporation of Boonton, New Jersey. The company has been located in Copiague, Long Island, New York but will move to the new location at Boonton, New Jersey.

(Turn to page 59)

## TUBELESS AUDIO COMPENSATION

*only 14 db!  
insertion loss!*

**The Model 4201 Program Equalizer** has been developed to provide utmost versatility for the compensation of sound recording and broadcast channels. High and low frequencies may be boosted or attenuated while the program is in progress with negligible effect on volume levels. It may be switched in or out instantaneously to permit compensation at predetermined portions of the program. This feature is especially useful in tape dubbing work.



Model 4201, Program Equalizer

#### FEATURES:

Equalization and attenuation in accurately calibrated 2 db. steps at 40, 100, 3000, 4000 and 10,000 cycles.  
Insertion Loss: Fixed at 14 db. with switch "in" or "out."  
Impedance: 500/600 ohms.  
Low Hum Pickup: May be used in moderately low-level channels.

send for Bulletin E for complete data  
Net Price **\$195.00**  
F. O. B. North Hollywood

Model 4201 Program Equalizer is also available for the custom builder in kit form with complete wiring instructions. Send for Bulletin TB-4.

*Representatives in  
Principal Cities*

## HYCOR

Division of  
International Resistance Company  
12970 Bradley Avenue,  
Sylmar 9, Calif.



The key to high quality reception for Dubuque TV viewers is provided by Jerrold's high-gain, low-distortion signal amplifying equipment. "Right down the line" — at the an-

tenna site, at the distribution hubs, and at the pole line feeders (above) — these amplifiers depend on built-in and accessory Sola Constant Voltage Transformers.

## From Head End to Pole Line Feeders, Sola Constant Voltage Transformers Regulate Dubuque Jerrold TV System

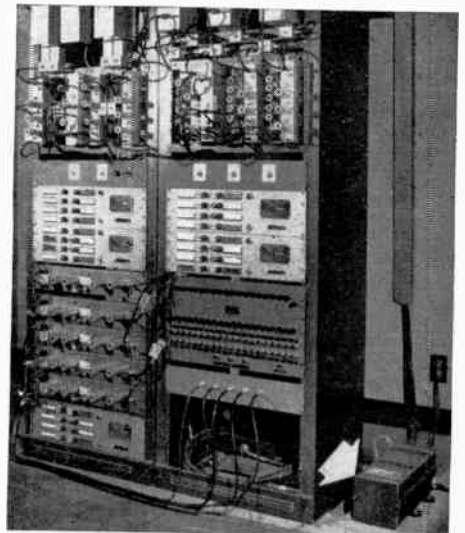
The Jerrold community television system from Dubuque, Iowa, is an excellent example of system-wide use of *regulated* supply voltage to insure top performance and low maintenance costs.

To provide Dubuque viewers with the highest quality picture possible, the system uses high-gain receiving antennas, mounted on a 420' tower. Jerrold high-gain amplifiers then forward signals through 12 miles of coaxial cable, branching into an amplified distribution network of 130 miles of coaxial cable embracing the whole of the city.

Peak performance of amplifiers and other electronic system components requires maximum stabilization of supply voltages throughout the system. For this reason Sola Constant Voltage Transformers are an integral part of line amplifier power supplies, and are used as accessories with other equipment.

Sola standard static-magnetic regulators provide automatic, instantaneous output voltage unaffected by changes in input voltage. Their regulation is within  $\pm 1\%$  regardless of primary voltage swings of 30%. They have no moving parts, no tubes, require no manual adjustments and are self-protecting against short circuit.

If you require a maintenance-free source of stabilized voltage, Sola Constant Voltage Transformers may be your answer. Call a Sales engineer, or write for Circular 32D-CV-170D.



Stabilized voltage for Dubuque Jerrold system head end equipment, such as pre-amplifiers and converters shown here, is provided by the stock 500va Sola Constant Voltage Transformer (arrow) installed as an accessory.

# SOLA *Constant Voltage* TRANSFORMERS

CONSTANT VOLTAGE TRANSFORMERS for Regulation of Electronic and Electrical Equipment • LIGHTING TRANSFORMERS for All Types of Fluorescent and Mercury Vapor Lamps. • SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Blshop 2-1414 • NEW YORK 35: 103 E. 125th St., Tralfalgar 6-6464 • PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4988 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • CLEVELAND 15: 1836 Euclid Ave., Prospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • LOS ANGELES 23: 3138 E. Olympic Blvd., Angelus 9-9431 • TORONTO 17, ONTARIO: 102 Laird Drive, Mayfair 4554 • Representatives in Other Principal Cities

For further data on advertised products use page 61.

## NEWS

(Continued from page 57)



● Fred W. Radcliffe, the newly appointed general manager of the Radio-Electronics-Television Manufacturers Association of Canada.

### A. R. Williams Agents For Sealomatic Equipment

Recently announced is the appointment of The A. R. Williams Machinery Company Limited, sales division of Standard-Modern Tool Company Limited, as representatives for Sealomatic Electronic Heat Sealing equipment for the whole of Canada with the exception of the Province of Quebec.

The A. R. Williams Machinery Company Limited is located at 373 Front Street East, Toronto 2, Canada.

### ARL Production Appointments Announced

The re-organization of PSC Applied Research's Production Division in line with the Toronto company's expansion plans is announced by Mr. J. M. Bridgman, managing director.

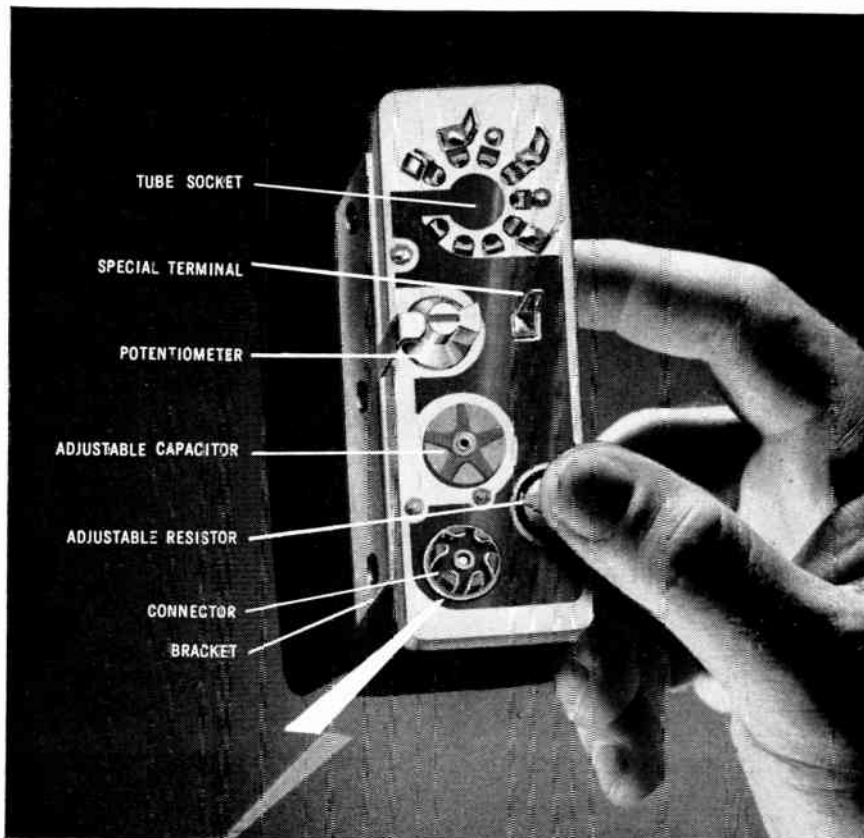
F. Manly Haines, a director of the company and former production manager becomes production director. James Speight, formerly in research and technical supervision and administration of the Ontario Hydro Electric Power Commission's plant at Strachan Avenue in Toronto, has



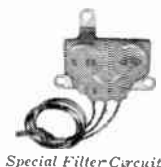
F. M. Haines

been appointed assistant to Mr. Haines. Stein Sunde has been appointed production manager. Oswald A. Schmidt becomes assistant production manager, precision instrumentation, mechanical and Roy Adams, assistant production manager, electric and electronic instrumentation.

(Turn to page 60)



## Look what YOU can have in Centralab Packaged Electronic Circuits



Take a look at the many features that can be built in CRL's versatile Packaged Electronic Circuits. Pictured are some special assemblies that illustrate the use of . . .

- Ⓜ Fixed and adjustable resistors.
- Ⓜ Fixed and adjustable capacitors.
- Ⓜ Inductance.
- Ⓜ Specialized switches.
- Ⓜ Wiring.
- Ⓜ Built-in tube sockets.
- Ⓜ Mounting brackets.
- Ⓜ Miscellaneous hardware.

Only Centralab P.E.C.\* can accomplish such a variety. Over 160 standard P.E.C.\* designs are available for your immediate use. For special requirements, call on Centralab engineers — but *early* in the planning stage, before you've "frozen" your design.

Remember this is not a laboratory curiosity. Over 55,000,000 are in use today.

Write for technical bulletin 42-227.

**Centralab Canada Ltd.**

804 Mt. Pleasant Rd., Dept. 70Y  
Toronto 12, Ontario

\*Trademark

**A DIVISION OF GLOBE-UNION INC.**

964D East Keefe Avenue • Milwaukee 1, Wisconsin  
In Canada: 804 Mt. Pleasant Road, Toronto, Ontario



## NEWS

(Continued from page 59)

## IRE Toronto Section Considers Directional Broadcasting

On Monday, April 9th, the Toronto Section of the Institute of Radio Engineers met to hear a brief account of directional broadcasting in Canada. The speaker was E. W. Farmer, M.Eng., P.Eng., M.E.I.C., a Senior Member of the IRE and Supervisor of the Communications Systems Engineering Group of the Canadian Marconi Company, Montreal.

During his talk, Mr. Farmer

developed an antenna pattern and demonstrated the design of the coupling equipment required to get the power into the antenna and realize the desired pattern.

## New Modern Plant For Hycor

Hycor Division of International Resistance Company recently announced the opening of its new, larger plant in Southern California's San Fernando Valley.

According to the firm's management, the major purposes of the expansion are greater production economy, faster delivery and better all-round service.

## David F. Knudsen Becomes Public Relations Manager For CDC

Computing Devices of Canada Limited has appointed a full time Public Relations Manager. He is David F.



D. F. Knudsen

Knudsen, for the past five years Editor of Electrical News and Engineering.

Computing Devices of Canada was the first all Canadian company to enter the specialized field of electronic computation. It is now

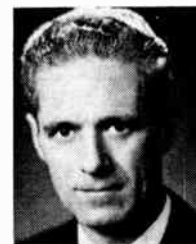
active in research, development and manufacture of electronic devices for government and industry. Mr. Knudsen will be located at the head office of the company at Bells Corners, near Ottawa.

## Appointments Made By Canadian Westinghouse

Three appointments in the Canadian Westinghouse Company's television-radio division have been announced by W. A. Dewar, recently named marketing manager. They are: L. O. Johansson, who has been named television production manager, marketing department; Sesto Sinibaldi, appointed radio product manager; and C. F. Moor, who has been named as manufacturer's representative for Ontario.

## Canadian Marconi Provide Chairmen For Workshop Seminar

A workshop seminar was held in the Royal York Hotel, Toronto, from April 23rd to April 25th by the American Management Association.



Geo. E. Rochford



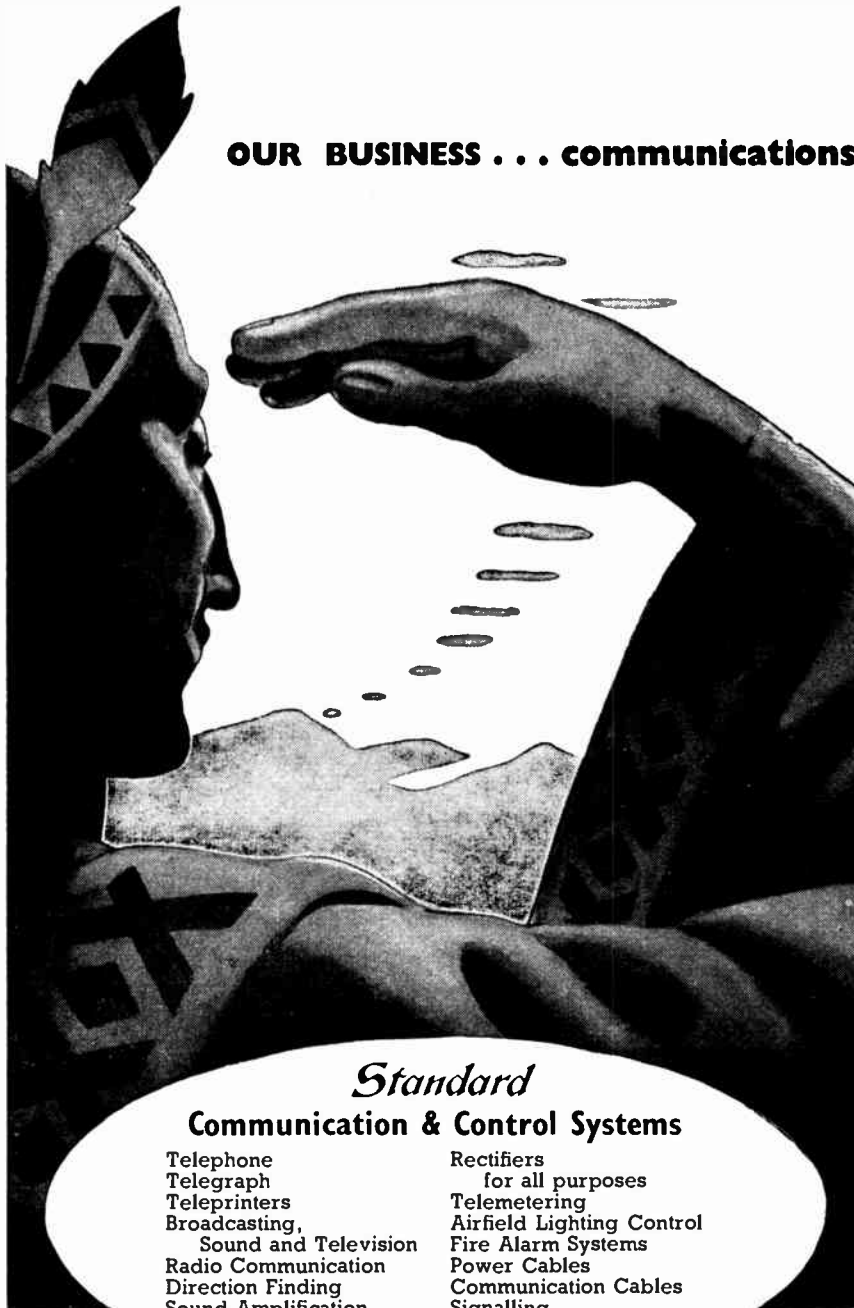
J. A. Howlett

George E. Rochford, production manager of Canadian Marconi Company's Commercial Products Division, Montreal, served as chairman for the seminar on Production Planning and Control.

Jack A. Howlett, personnel development officer of the Canadian Marconi Company acted as chairman of the discussion-type meeting which dealt with executive selection.

(Turn to page 63)

## OUR BUSINESS . . . communications



## Standard

## Communication &amp; Control Systems

Telephone	Rectifiers
Telegraph	for all purposes
Teletypewriters	Telemetering
Broadcasting,	Airfield Lighting Control
Sound and Television	Fire Alarm Systems
Radio Communication	Power Cables
Direction Finding	Communication Cables
Sound Amplification	Signalling,
Remote Control	Office and Factory

## Standard Telephones &amp; Cables

Mfg. Co. (Canada) Ltd.

9600 ST. LAWRENCE BLVD., MONTREAL

# INDEX TO ADVERTISERS

Page number is on the right  
Key number for use with  
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Key No.	Page
1 Ahearn & Soper Co. Ltd. The	66
2 Alpha Wire Corp.	57
3 Ampex Corp.	21
4 Amphenol Canada Ltd.	2
5 Andrew Corp.	45
6 Arga Div.	28
7 Automatic Electric Sales (Canada) Ltd.	4
8 Automatic Electric Sales (Canada) Ltd.	13
9 Automatic Electric Sales (Canada) Ltd.	53
10 Automatic Electric Sales (Canada) Ltd.	70
11 Aviation Electric Ltd.	46
12 Aviation Electric Ltd.	65
13 Bell Telephone Co. of Canada Ltd., The	63
14 Bohne Industries Ltd.	44
15 Bud Radio, Inc.	33
16 Burton-Rogers Co.	54
17 Canadian Aviation Electronics Ltd.	55
18 Canadian Electrical Supply Co. Ltd.	40
19 Canadian General Electric Co. Ltd.	
20 Canadian I.R.E. Convention	31
21 Canadian Marconi Co.	3
22 Canadian Marconi Co.	48
23 Canadian Stackpole Ltd.	72
24 Canadian Westinghouse Co. Ltd.	6
25 Canadian Westinghouse Co. Co. Ltd.	14
26 Cannon Electric (Canada) Ltd.	27
27 Centralab Div.	59
28 Central Bridge Co. Ltd.	20
29 Collins Radio Co.	18
30 Computing Devices of Canada Ltd.	19
31 Cossor (Canada) Ltd.	5

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**INDEX — Continued**

Key No.	Page
32 Crosley Radio & Television	71
33 Curtiss-Wright Corp.	39
34 Curtiss-Wright Corp.	61
35 Dale Products, Inc.	52
36 Electro Sonic Supply Co. Ltd.	40
37 Ericsson Telephone Sales of Canada Ltd.	38
38 Fraser Ltd., D. M.	56
39 Freed Transformer Co., Inc.	54
40 Glendon Co. Ltd., The	42
41 Handy & Harman of Canada Ltd.	57
42 Helipot Corp.	25
43 Herring Co. Ltd., John	50
44 Hewlett-Packard Co.	51
45 Hycor Co., Inc.	56
46 Kester Solder Co.	52
47 Minneapolis-Honeywell Regulator Co. Ltd.	41
48 Minnesota Mining & Mfg. of Canada Ltd.	68
49 McCurdy Radio Industries Ltd.	17
50 Nichols Ltd., R. H.	44
51 Ohmite Mfg. Co.	67
52 P.S.C. Applied Research Ltd.	49
53 Phillips Electrical Co. Ltd.	9
54 Product Services, Inc.	??
55 Radio Engineering Products Ltd.	38
56 Rogers Majestic Electronics Ltd.	7
57 Rogers Majestic Electronics Ltd.	69
58 Sanborn Co.	47
59 Snelgrove Co. Ltd., C. R.	34
60 Sola Electric Co.	58
61 Sorensen & Co., Inc.	43
62 Standard Telephone & Cables Mfg. Co. (Canada) Ltd.	60
63 U.S. Engineering Co.	54
64 Ungar Electric Tool Co. of Canada	64
65 Varian Associates	10

**NEWS**

(Continued from page 60)

**J. H. Baldwin Heads Design Group At Minneapolis-Honeywell**

Formation of a new design and development engineering group in the Aero Division of Minneapolis-Honeywell Regulator Co. Ltd. which will work in the fields of automatic control and instrumentation, has been announced by Carl A. Anderson, manager of the Aero Division.

The new group will be headed by John H. Baldwin, a native of British Columbia, who has been a supervisor in the Aeronautical Research Department of the Honeywell organization in the United States. Mr. Baldwin's experience includes that of project engineer on the U.S. Navy's Automatic Carrier Approach and Landing System developed by Minneapolis-Honeywell and the development of reliability analysis systems.



J. H. Baldwin

**J. E. Cuninghame Transferred From CGE To Syracuse, N.Y.**

John E. Cuninghame, formerly with the Electronic Equipment and Tube Department of Canadian General Electric Company Ltd., has recently been transferred to the Microwave and Communications Department of the General Electric Company at Electronics Park, Syracuse, N.Y.



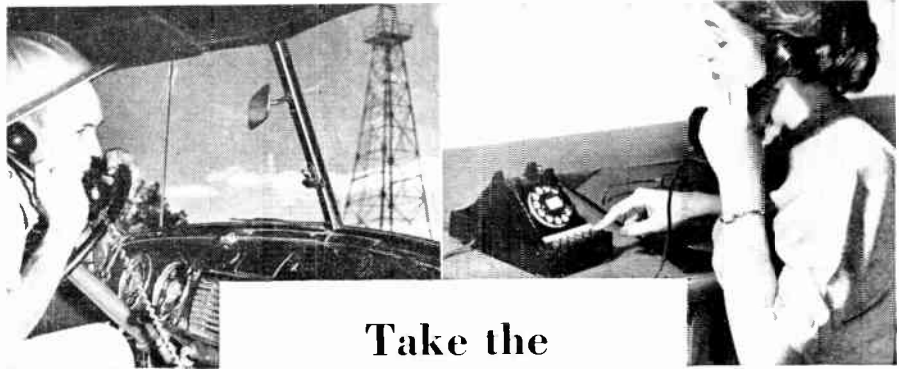
J. E. Cuninghame

The new position involves the development of specialized electronic equipment of a classified nature for use by the United States Armed Forces and industrial users.

Mr. Cuninghame originally studied electronic engineering in the United States in 1937. During the war he was a radar officer in the Royal Air Force and was one of the first 20 Canadians to be commissioned by the Air Force for secret radar work. Included among Mr. Cuninghame's special assignments were the building in Iceland of what was for many years the most northerly radar station in the world three months before Pearl Harbour, and the installation on the Western Front of the first "GH" radar stations to be used by Bomber Command.

(Turn to page 64)

**BELL TELEPHONE'S SPECIALIZED COMMUNICATIONS SERVICES**



**Mobile Telephone** — Service speeds work, keeps costly equipment busy.

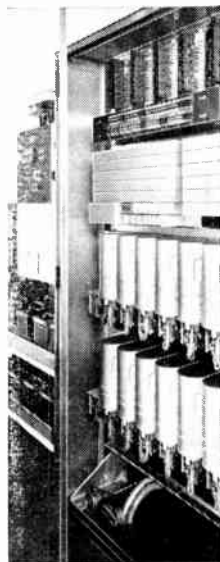
**Push Button Telephones**—incoming calls—outgoing calls—inter office calls *all* on one telephone.

Take the  
**HIDDEN COSTS**  
out of your  
**BUSINESS COMMUNICATIONS**

*Your first cost isn't your last cost* when you provide your own communications system. Many of the continuing costs are buried deep in idle equipment, taxes, depreciation and loss of interest on capital.

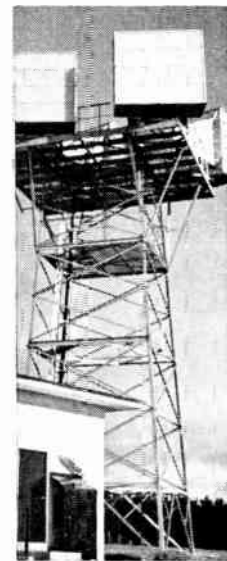
With BELL Communications, *you pay only for service*—service tailored to your specific operations TODAY but flexible to changes needed TOMORROW. With new techniques and new equipment constantly being developed by BELL to improve your service—*obsolescence becomes our problem not yours.*

Why not let us analyse *your* problem? Just telephone us and we'll be glad to call on you. There's no charge!



**PBX (Private Branch Exchange)**—a dial switchboard system which is faster and more efficient.

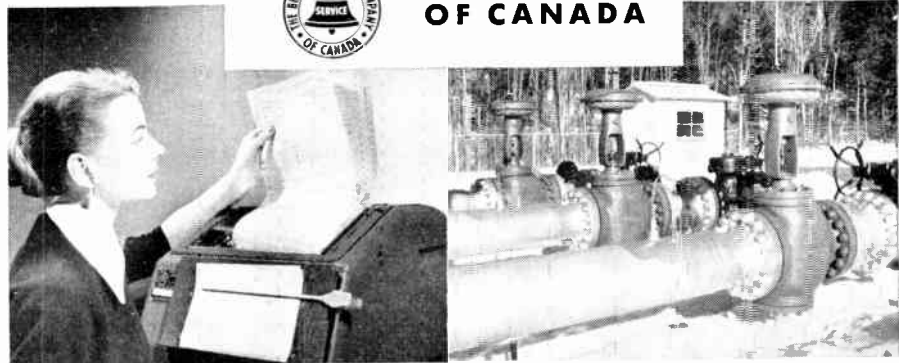
**Bell Teletype**—flexibility makes it readily and economically adaptable to any business—large or small.



**Microwave Radio Relay System** for Long Distance and TV programs.

**Channels for Telemetry and Supervisory Control**—as used by the Oil, Gas and Power Industries.

**THE BELL TELEPHONE COMPANY OF CANADA**



**Whatever your communication needs be sure to consult the BELL**

# NOW... Noise Free A.C. Power!



## NEW CURTISS-WRIGHT DISTORTION ELIMINATING VOLTAGE REGULATOR

- Reduces typical power line distortion to less than 0.3%
- Furnishes 1.4 KVA of distortion-free power
- Electronically regulates 115 V output to  $\pm 1\%$
- Recovery time less than 1/50 cycle
- Provides additional 4 KVA of  $\pm 1\%$  electromechanically regulated power
- Electromechanical time constant only 0.6 seconds
- Electromechanical regulator, unlike usual magnetic voltage stabilizer, introduces no distortion or phase shift

Here at last is the ideal solution to the disturbing problem of harmonics and low frequency noise appearing in 115 V., 60 cps power sources. In one compact package, every laboratory can now obtain *both*

- 1) distortion-free, regulated power when needed, and simultaneously
- 2) a large supply of electromechanically regulated power for applications where normal line distortion is tolerable.

In addition to its general laboratory utility, this instrument is ideally suited for preventing instability and inaccuracy in a.c. computer system nulling operations. Many other applications. 230 V. model also available. Immediate delivery. \$1,689 f.o.b. Carlstadt, N. J. Write for details.

Component & Instrument Department

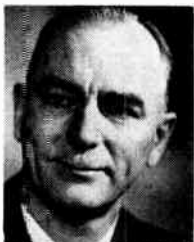


## NEWS

(Continued from page 63)

### J. F. Hooper To Manage Mid-West Region For Rogers Majestic Electronics

S. G. Paterson, president and general manager, Rogers Majestic Electronics Limited, announces the appointment of John F. Hooper as manager, mid-west region, covering the provinces of Manitoba, Saskatchewan and north western Ontario to the head of the lakes.



J. F. Hooper

manufactured by the company.

In his new capacity, Mr. Hooper will be responsible for the sale and service of Motorola VHF 2-way radio, power line carrier, microwave, supervisory control equipment and other communications products

### New CESCO Division For Industrial Sales

M. I. Rosenthal, president of Canadian Electrical Supply Co., Ltd., has announced the setting up of a "Government and Industrial Division" to handle inquiries and expedite orders.

The manager of the new division will be Mr. J. Pascal, who has had 27 years of experience in the radio and electronic fields and during the last 12 years has held various positions in the company.

### Arthur H. Gregory Receives New Appointment At Northern Electric

Arthur H. Gregory has been appointed manager of the semi-conductor products department of the Northern Electric Company's Communications Equipment Division in Montreal.

Mr. Gregory, who is a graduate of the University of Manitoba with a B.Sc. (Electrical Engineering) degree, joined Northern Electric in Montreal in 1941, and was on the staff of the company's Pacific district between 1945 and 1954. He has had experience in both the electronics and telephone equipment engineering fields, having served as a specialist in broadcast systems, electronics and communications equipment sales.



A. H. Gregory

**Ungar**  
SUPER HI-HEAT  
Soldering  
Pencil  
and  
Tips

NO. 4033  
NO. 4035  
NO. 4039  
NO. 4036

Ungar pencil soldering irons and interchangeable tips for every soldering job! Featherlight, less than 5 inches long, the Ungar iron has been designed to speed soldering production and reach hard to get at soldering points. Cool and comfortable, the new heat deflector head reflects heat AWAY from the handle.

The 400 Super HI-HEAT series tips are engineered especially for production line soldering and extra heavy duty service. A searing 850° to 1000° of actual tip temperature is at your command, yet only 47½ watts! Special processing eliminates maintenance chores. Change from one tip to another in less than 5 seconds!

**Ungar**  
ELECTRIC TOOL CO.  
OF CANADA  
44 DANFORTH ROAD  
TORONTO 13, CANADA



## NEW PRODUCTS

(Continued from page 52)

### • New Headset Design

Item 1066

A new concept in headset design has been produced by a nationally known manufacturer of headsets, hearing aids and electronic components.

The new headset, called "Duo-dyne," was developed from data supplied by a recently conducted U.S. Army research project which revealed that a few milliseconds in time delay in reception in one ear contributed to better understanding of speech.



The headset creates the audio effect of actual presence at the source of the sound — voice or music. The "live" effect is produced by inducing a 5 millisecond time delay in transmitting sound to one ear piece.

One dynamic driver is located in a Tenite housing with the PL-55 plug and is separated from the second driver in the tone arm junction by 5 feet of plastic tubing. Each driver feeds a separate ear — one driver emphasizes highs, the other, lows.

Weighing only 2 ounces, this under-the-chin style headset has a frequency response of from 100 to 8,000 c.p.s., and an impedance of 15 ohms. Comfortable listening level is attained with a 1 milliwatt power input. Tone arms are made of anodized aluminum, and plastic ear plugs are removable for easy cleaning.

### • Frequency And Period Counter

Item 1067

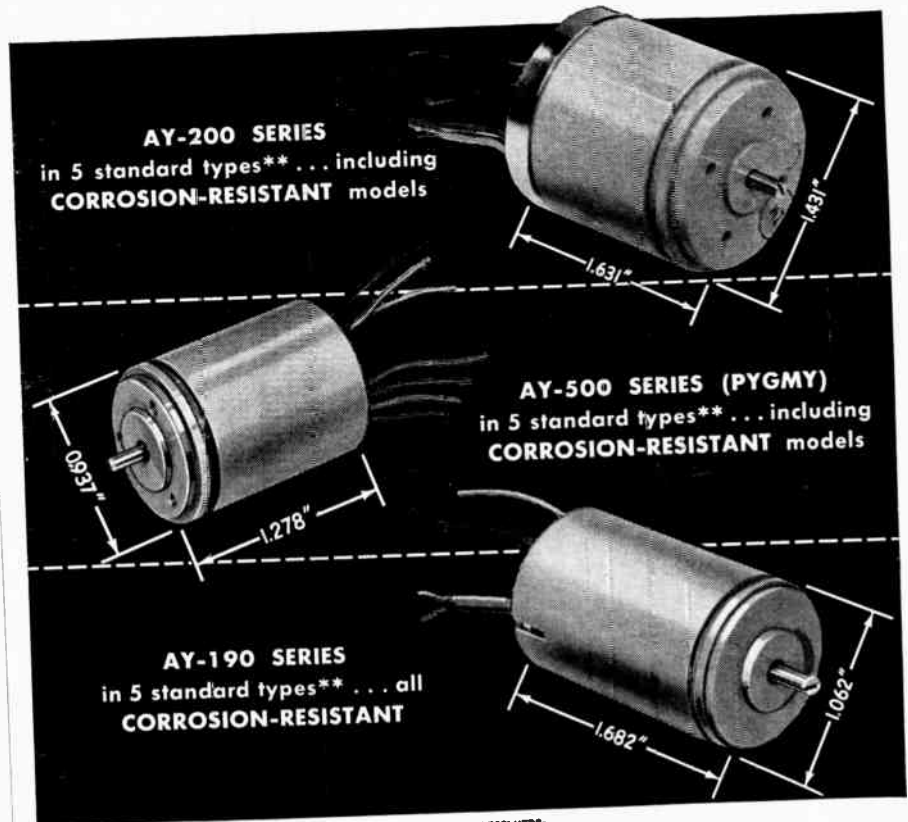
The Model 201A Frequency and Period Counter is a streamlined, compact and easily portable instrument used for precise frequency and period measurements, production line testing, telemetering, calibration, etc., with direct digital read-out. Among the important exclusive features are the inclusion of a crystal oven to provide an accuracy of .0001 per cent, plus .1 sec., 1 sec., 10 sec. and 1 cycle time bases at no extra cost.

Specifications for Frequency Measurement include: Input Sensitivity — 0.05 volts r.m.s.: 10-100,000 c.p.s. and 0.07 volts r.m.s.: 1-10 c.p.s.; Frequency Range — 1-100,000 c.p.s. Under Period Measurement, specifications show: Period Range — 10 microsecond to 1 second (automatic) and 1 second to no limit (visual); Accuracy —  $\pm 10$  microseconds  $\pm$  stability; Gate time — 1 cycle of unknown frequency (10 cycles optional). Exceptionally important among the General Features: Stability — Short Term: 1 part in 1,000,000; Long Term: 5 parts per million per week. Power requirements are 117 volts  $\pm$  10 per cent, 50-60 cycles (50-400 cycles optional), 175 watts.

The new Model 201A weighs only 28 lbs. and offers easy portability. Complete catalog information is available on request.

# PRICE IS RIGHT! DELIVERY IS RIGHT!

## ECLIPSE-PIONEER AUTOSYN\* SYNCHROS



\*\*TRANSMITTERS, RECEIVERS, CONTROL TRANSFORMERS, DIFFERENTIALS AND RESOLVERS

### And there's a Bendix autosyn to meet every need!

Eclipse-Pioneer's experience, facilities, and production techniques make possible the following important advantages:—

- Significant price reductions
- Delivery of standard types from stock
- A complete range of standard and special types

Whatever your synchro requirements, it

will benefit you to request further information from AVIATION ELECTRIC, 200 Laurentian Boulevard, Montreal.

OTHER STANDARD AND SPECIAL ECLIPSE-PIONEER AUTOSYN SYNCHROS INCLUDE models 1, 11, 15, 18, 23 and 2R as well as high temperature, high frequency, linear, and other types for special needs.

\*REGISTERED TRADE-MARK BENDIX AVIATION CORPORATION

# AVIATION ELECTRIC

LIMITED

MONTREAL

VANCOUVER

SALES • SERVICE • OVERHAUL • MANUFACTURE OF AIRCRAFT INSTRUMENTS & ACCESSORIES

For further data on advertised products use page 61.

# EIMAC Klystrons bring new power to another frequency range...



Eimac X563E, 5900-6400mc, and amplifier circuit assembly.

Eimac X563 amplifier klystrons make 50 watt CW power output commercially available at 5400-7400mc. A bonus feature of the X563 is its adaptability to present C-Band systems. Existing milliwatt equipment is sufficient to drive a conservatively rated X563 to power gains of 10,000 times and efficiencies of 20-25%.

Single adjustment tuning knobs make each of the X563's four integral cavities as easy to

## TYPICAL OPERATING CONDITIONS PER TUBE X563 KLYSTRONS

D-C Beam Voltage . . . . .	2750v	Power Output . . . . .	60w
D-C Beam Current . . . . .	110ma	Efficiency . . . . .	20%
D-C Focusing Voltage . . . . .	-50v	Driving Power . . . . .	5mW

tune as a standard AM broadcast receiver.

The Eimac X563 is also available with magnetic circuit components, output waveguide fitting and collector and cathode sockets comprising a suitcase-size amplifier assembly weighing only 20 pounds.



Eimac offers the most extensive selection of high power amplifier klystrons for pulse CW and AM applications. For information and a copy of "Klystrons Facts #3" contact our Technical Service Dept.



## EITEL-McCULLOUGH, INC.

SAN BRUNO

CALIFORNIA

The World's Largest Manufacturer of Transmitting Tubes

REPRESENTED  
IN CANADA BY

## THE AHEARN AND SOPER COMPANY LIMITED

P.O. Box 715

Ottawa, Ontario



For further data on advertised products use page 61.

# OHMITE<sup>®</sup> RHEOSTATS

## HAVE Smoother Windings!

### 5 REASONS WHY—

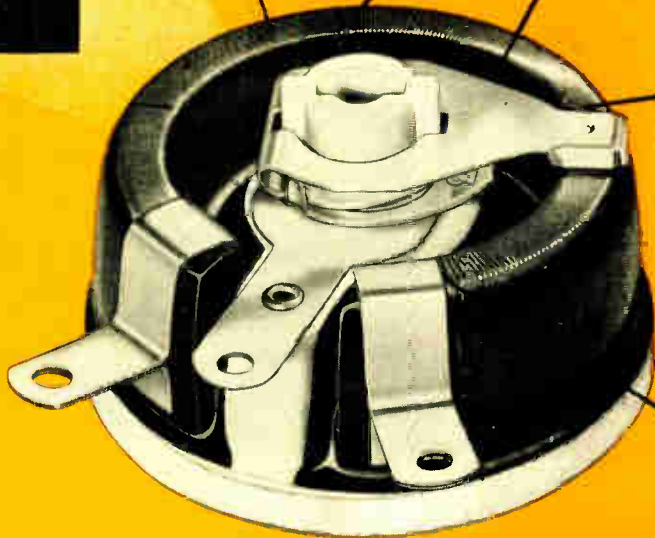
1. **PRECISION GROUND CORE** . . . Cores for fine wire, high resistance units are ground to give a smooth, flat contour for the contact brush.
2. **SMOOTH JUNCTIONS** where wire sizes change between sections of tapered windings . . . less differential between wire sizes.
3. **PERMANENTLY LOCKED WINDINGS** . . . Core and windings are bonded together with vitreous enamel to prevent shifting of wire.
4. **UNIFORM WIRE SPACING** . . . Ohmite has developed special winding machines to insure uniform spacing and eliminate crossover of adjacent turns on fine wire units.
5. **FLUSH TERMINALS** . . . Terminals are flush with windings . . . brush glides smoothly from windings to terminal.



See for yourself! Examine an Ohmite Rheostat first hand. Compare its smoother resistance windings. Turn the knob and note how easily and smoothly the contact brush glides over the rheostat windings.

There's less wear on the resistance wire and on the contact brush. The brush makes contact with all of the turns and the resistance varies smoothly and uniformly as the shaft is turned. Every Ohmite Rheostat is *individually tested* on ultrasensitive electronic instruments to assure perfect contact between the winding and the contact brush.

Standardize on Ohmite Rheostats for unsurpassed dependability, smoothness of operation, and long life.



### A COMPLETE LINE OF RHEOSTATS

from 25 to 1000 watts. Also available to meet MIL-R-22A requirements in *each* of the 26 type designations.

Write on company letterhead for Catalog and Engineering Manual No. 40.



# Be Right with OHMITE<sup>®</sup>

OHMITE MANUFACTURING COMPANY, 3689 Howard Street, Skokie, Illinois (Suburb of Chicago)

RHEOSTATS • RESISTORS • RELAYS • TAP SWITCHES

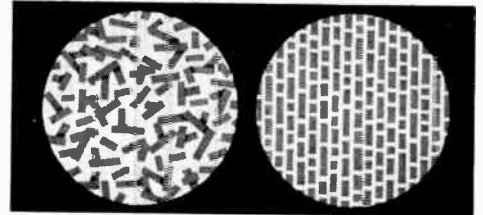
WorldRadioHistory



*Now...record the whole performance...*  
**without a break!**

Got a favorite concert or opera program you'd like to preserve on tape? Symphony or dramatic production? Now, *record it all* using new "Scotch" Brand Extra Play Magnetic Tape. With 50% more tape wound on each reel, Extra Play Tape gives you as much recording time as 1½ reels of standard tape, plus strength to spare. This means annoying interruptions for reel change are sharply reduced to offer more perfect recording results.

You'll notice a crisper tone and higher fidelity, too—the result of "Scotch" Brand's exclusive oxide dispersion process. By packing minute, fine-grain oxide particles into a neater, thinner pattern, "Scotch" Brand has been able to produce a super-sensitive, high-potency magnetic recording surface. Hear the difference yourself. Try new "Scotch" Brand Extra Play Tape on your own machine.



**Electron Photo Microscope Shows the Difference!**

At left, artist's conception of magnified view of old-fashioned oxide coating still used by most ordinary long play tapes. At right, "Scotch" Brand's new dispersion method lays fine-grain particles in an orderly pattern to give a super-sensitive recording surface that contains as much oxide as conventional tapes, yet is 50% thinner.

**NEW!**  
 REG. TRADE MARK  
**SCOTCH**  
 BRAND

*Extra Play Magnetic Tape 190*

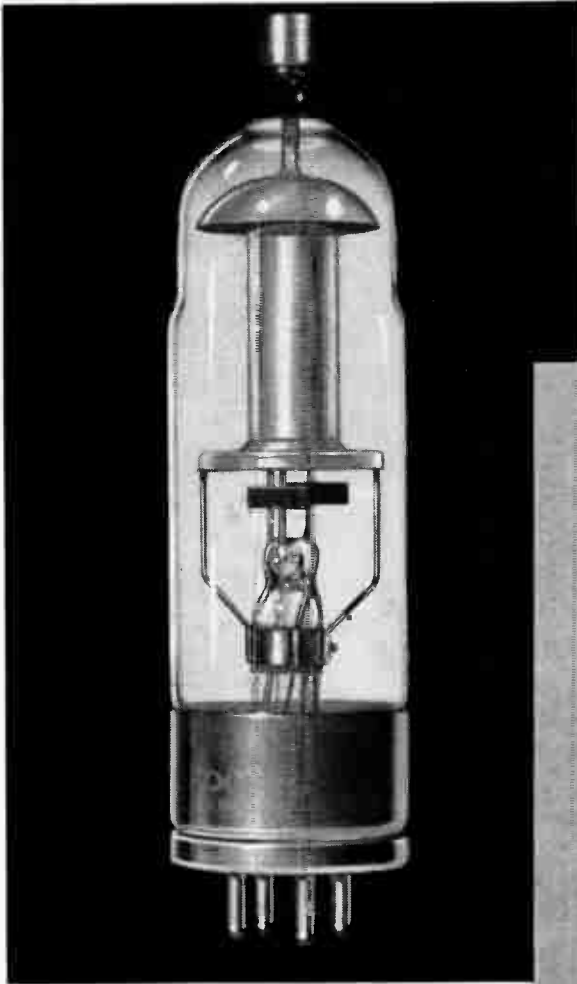


**MINNESOTA MINING & MANUFACTURING OF CANADA LIMITED • LONDON • CANADA**

Sales Offices: Halifax • Montreal • Toronto • Winnipeg • Saskatoon • Calgary • Vancouver  
 Resident Salesmen: Saint John • Quebec City • Ottawa • Hamilton • North Bay • Regina • Edmonton

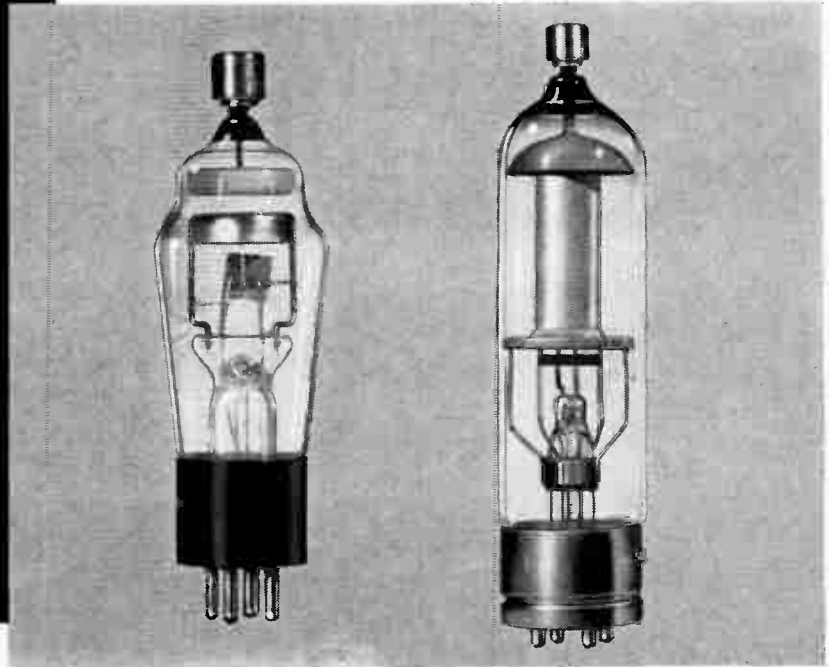


For further data on advertised products use page 61.



8008AX REPLACES 8008

**Here's freedom  
from programme  
interruptions...**



866AX REPLACES 866A

872AX REPLACES 872A

# RUGGED NEW ROGERS RECTIFIER TUBES

An exclusive feature, the new solderless plate termination, makes these new ROGERS rectifier tubes mechanically more rugged than any others in existence. As a result of a new technique, ROGERS bond metal and glass in a stronger, more reliable termination.

This new feature contributes to the long-life of ROGERS rectifier tubes—gives you greater freedom from programme interruptions and permits virtually unattended operation of radio transmitting equipment in this respect.

Developed by the combined resources of four great electronics specialists—ROGERS in Canada, MULLARD of England, AMPEREX of United States, and PHILIPS of Eindhoven, these new tubes are currently in operation in installations throughout the world.

#### MECHANICAL DATA:

- 4 point suspension giving greater mechanical rigidity.
- Heat radiating tags are fitted to reduce the temperature of the heater lead-out connections as it passes through the glass.

#### ELECTRICAL DATA:

- Special gettering techniques eliminating foreign gases thereby maintaining true mercury vapour characteristics over extended life.
- Because of above factor, a constant arc voltage drop is present. The inverse voltage expressed as a factor in relationship to the D.C. voltage output will depend on the circuit employed.

## ROGERS ELECTRONIC TUBE & COMPONENT DIVISION

11-19 Brentcliffe Road, Leaside, Toronto 17, Ontario

MONTREAL

TORONTO

WINNIPEG

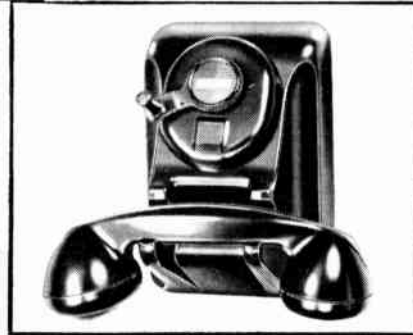
VANCOUVER

RECEIVING TUBES • PICTURE TUBES • TRANSMITTING TUBES • SEMI-CONDUCTOR PRODUCTS • SPECIAL PURPOSE TUBES  
A DIVISION OF CANADIAN RADIO MANUFACTURING CORPORATION LIMITED

ELECTRONICS & COMMUNICATIONS, APRIL, 1956

World Radio History

For further data on advertised products use page 61.

*Leich***900***Magneto Telephone***PROTECTS YOUR  
SERVICE INVESTMENT  
LONGER****VERSATILE,  
LOW COST****can be installed as a wall or desk  
telephone with no changes, no additions!****easily, quickly converted to common  
battery or dial service!**

Leich 900 Magneto Telephone used as a wall model.  
Notice the convenient position of the generator crank



A compact, smartly designed "universal telephone"!

As a magneto telephone, the Leich 900 gives excellent transmission and reception—even on long, heavily loaded rural lines.

The Leich 900 is easily converted to a common battery telephone by simply removing the Alnico generator and face plate, adding a dial blank and changing a few wires. If the magneto exchange is converted to dial, it's easy to add a dial. The telephone's case, base, induction coil, condenser, hookswitch, mounting plate, transmitter and receiver always remain the same.

Magneto, common battery or dial, the Leich 900 with its 45 degree angled hookswitch levers, always gives you a choice of either a table or wall mount telephone—without changing or adding any parts!

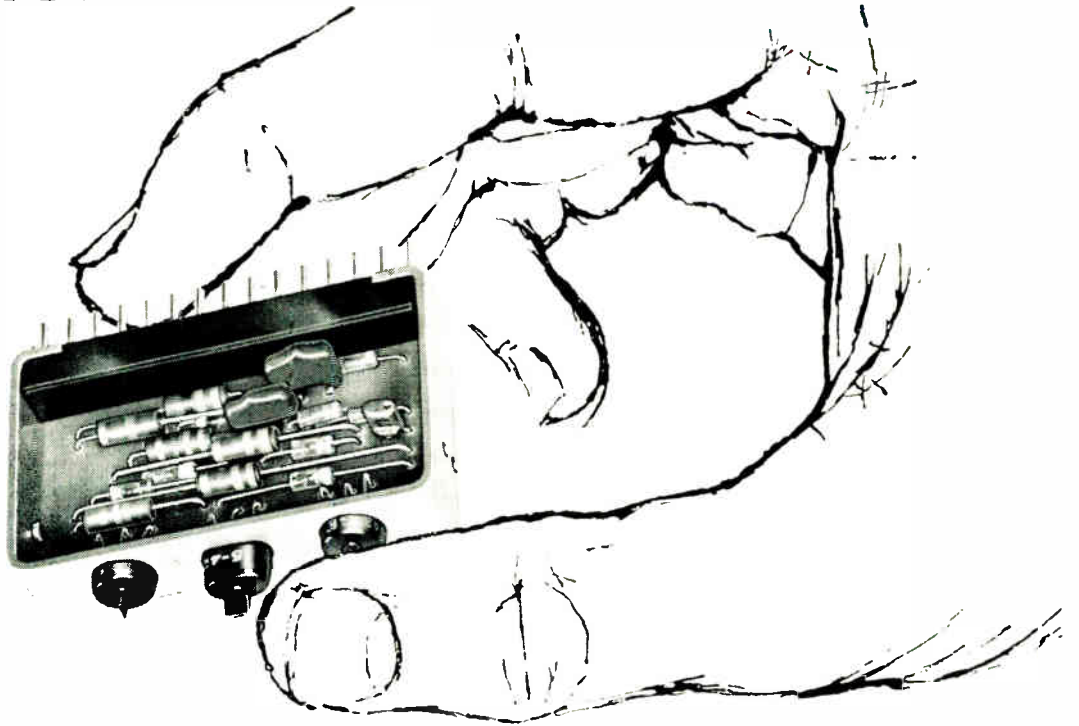
If the future indicates a change from rural to suburban telephone service, you will need to protect your investment. Install Leich 900 Magneto Telephones and prevent obsolescence. You'll be surprised at their low cost! Contact our nearest branch for descriptive literature. Head Office: Automatic Electric Sales (Canada) Ltd., 185 Bartley Drive, Toronto 16. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

5619

**AUTOMATIC ELECTRIC**  
SALES (CANADA) LIMITED

For further data on advertised products use page 61.

new from **CROSLEY**



ACTUAL SIZE

## **"PACKAGED"** **TRANSISTORIZED** **LOGICAL BUILDING BLOCKS**

### **7 TYPES AVAILABLE**

Write for full information on the application of these building blocks to your needs. Our Engineering System Department will be glad to assist you with your problems.

#### **Bistable Trigger Element—Type BT-1**

Combines bistable element with suitable triggering and gating circuit giving complete flexibility of operation as a scale of two circuit, flip flop or memory element.

#### **Bistable Storage Element—Type BS-1**

Simplified version of type BT-1 for use as switching and storage circuits where separate set and reset pulses are available. Possible applications include shift registers, word generators, etc.

#### **Gated Amplifier Element—Type GA-1**

A transistor pulse amplifier incorporating a coincidence gate for pulse regeneration or retiming.

#### **Complementor Amplifier Element—Type CA-1**

Unit provides output which is "ones complement" of input; i.e. changes ones to zeros and zeros to ones.

#### **Monostable Element—Type ME-1**

A one shot multivibrator—provides a single fixed width output pulse when triggered by a suitable input pulse.

#### **Multiple "And" Gate Package—Type AG-1**

A package containing a number of multiple input crystal diode coincidence gates with input and output impedance levels suitable for use with the other elements of the series.

#### **Multiple "Or" Gate Package—Type OR-1**

As for type AG-1, except operation is logical "or".

These exclusive new Crosley transistorized computer elements offer the digital system designer, logician or computer engineer new freedom in using logical elements in system construction. They may be used with the same flexibility of application as resistors and capacitors.

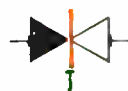
They are small, rugged, independent of environmental conditions, temperature stable from  $-50$  to  $+55$  C. No critical trigger impulse restrictions. Power consumption under  $\frac{1}{2}$  watt.

Units are designed for operation at pulse repetition rates as high as one megacycle and in general are able to supply clamped 10 volt output pulses into loads in excess of 25 ma. Maximum rise and decay times are below 0.15 microsecond.

WRITE FOR FURTHER INFORMATION

*Another basic Canadian design achievement from*

**CROSLEY DEFENCE AND ELECTRONICS DIVISION**  
**MOFFATS LIMITED**



AN *AVCO* COMPANY

Weston, Ontario, Canada.

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**TESTED 200%**

*plus!*

**Y**OU'VE probably noticed the steadily growing preference for Stackpole fixed composition resistors in critical military uses as well as in a high percentage of today's television, radio and industrial electronic equipment.

There are two main reasons: Outstandingly dependable products backed by equally dependable, personalized service.

Dependability is assured by the most modern manufacturing techniques *plus* constant testing. From preliminary sorting tests to the final 100% test and numerous quality control tests extending from raw materials through production, it is conservative to say that Stackpole resistors are tested well over 200%.

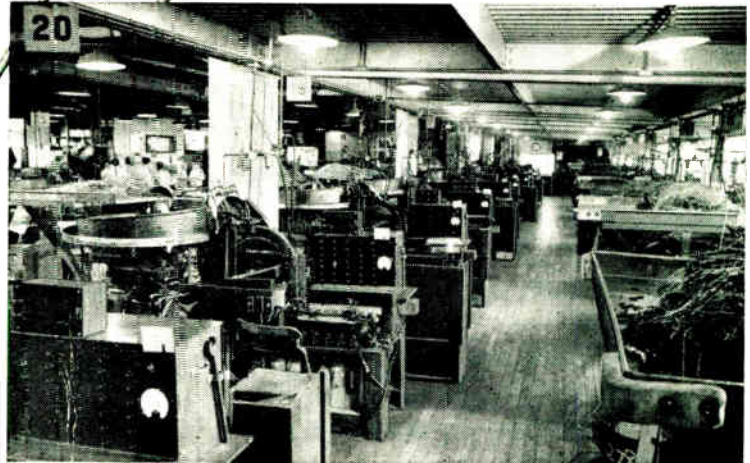
As for service in meeting resistor requirements accurately and when promised—this is a Stackpole factor that is just as carefully controlled and tested as the manufacturing processes themselves.

And it is our sincere aim to keep it that way.

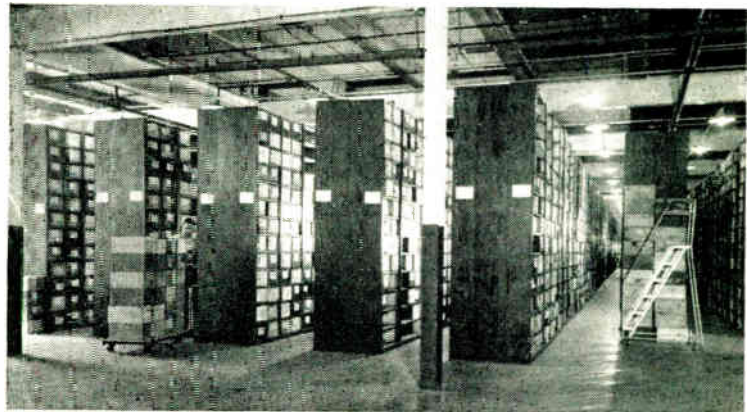
Electronic Components Division

**CANADIAN  
STACKPOLE LTD.**

550 Evans Ave., Etobicoke, Toronto 14, Ont.



**ELECTRICAL TESTING**— Each Stackpole fixed composition resistor gets a final test on automatic machines like these. Other tests before and during production bring the total test percentage to well over 200%.



**SERVICE IN THE MAKING**— A portion of the huge fixed composition resistor stock Stackpole strives to maintain to assure prompt deliveries.



# STACKPOLE FIXED COMPOSITION RESISTORS

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