

# ELECTRONICS *and* COMMUNICATIONS

DESIGN — MANUFACTURE — ENGINEERING — DISTRIBUTION — APPLICATION

Electronic Controls Permit  
Manufacture Of Ultra-Thin  
Precision Gaged Metal Strip . . . 24

Punch And Die Design  
Principles For Laminated  
Plastics . . . . . 26

New Inspection Technique  
Aids Electronic Industries . . . 28

Closed Circuit TV Makes  
Debut In Canadian  
Dental Education . . . . . 32

Organization And Control  
Of Electronic Components  
Aids Design Engineers . . . . . 34



Head table guests at the Canadian IRE Convention banquet are shown above. From left to right: Fred W. Radcliffe, General Manager, R.E.T.M.A. of Canada; Air Commodore Walter A. Orr, C.B.E., C.D., representing Department of National Defense, Ottawa; R. M. Brophy, Member of Defense Research Board and Member of the Advisory Committee; Ralph A. Hackbusch, President Canadian Radio Technical Planning Board and Member of the Advisory Committee; Hon. George C. Marler, M.P., LL.D., Minister of Transport; Major Charles L. Richardson, Q.C., Charter Canadian Member IRE and First Chairman Canadian Section; His Worship, Nathan R. Phillips, Q.C., Mayor of Toronto; Dr. J. T. Henderson, Regional Director Institute of Radio Engineers, IRE Presidential Nominee and Member of the Advisory Committee; A. V. Loughren, President of the Institute of Radio Engineers; and Clare A. Norris, General Chairman, Canadian IRE Convention Committee. Missing from the photograph are: Ian F. McRae, President, Canadian Industrial Preparedness Association and Member of the Advisory Committee; and T. J. Bell, Vice-President, Canadian Electrical Manufacturers Association.

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

Circulation Of This Issue  
Over 10,200 Copies



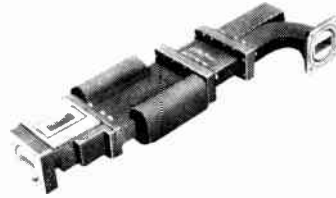
# N<sup>O</sup>W Canadian manufacturing facilities.

## A complete line of MICROWAVE components

for

## RADAR • GUIDED MISSILES • COMMUNICATIONS

Whether it is "Standard" plumbing or designing an entirely new waveguide system, Airtron's complete facilities can substantially reduce the time and expense between concept and reality. HERE ARE JUST A FEW EXAMPLES:



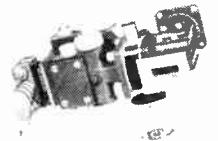
**FERRITE COMPONENTS** — Duplexers, waveguide switches, high and low power load isolators, variable absorption attenuators and other devices are the result of a continuous Ferrite development program. We manufacture our own Ferrite materials which are designed specifically for micro-wave applications. The facilities of our Cambridge division, which was established exclusively for the Research and Development of Ferrite devices are available to you.

**ROTARY JOINTS** — Waveguide or co-axial types covering the micro-wave spectrum may be obtained as standard units or can be supplied to meet your specifications.



**WAVEGUIDE SWITCHES**—Various S. P. D. T. units have been developed for such applications as switching from noise sources, signal generators or dummy loads. D. P. D. T. types have also been developed for reversing applications in dual channel systems.

**BALANCED MIXERS** — Low noise figures with broad bandwidth characteristics are accomplished by compact, precision-cast balanced mixer designs using the latest type crystals, with co-axial or waveguide crystal mounts for frequencies up to 40,000 MC. Mixer preamp. packages designed to meet your special requirements.



**ANTENNAS AND ASSOCIATED COMPONENTS** — Horn antennas and feeds of standard or special design can be supplied for such applications as fire control, counter-measure, guided missile, navigational or weather radar. Complete assemblies including rotary joints, flexible sections and associated waveguide assemblies can be supplied.

**FLEXIBLE WAVEGUIDE** — All sizes from L. to Ka band, including double ridge waveguide for commercial weather radar, are available in both convolute or S type construction. Beryllium copper tubing can be supplied for special requirements. These assemblies are rubber molded, vinyl dipped or unjacketed and can be preformed for your installation.



**OTHER AIRTRON PRODUCTS** — Twists, Magnetron Transistions — Double Ridge Waveguide components — R F and Pressure Contact Flanges and Gaskets—Quick Disconnects—Directional Couplers—Short Slot Hybrids—Dummy Loads — Flexible Coaxial Transmission Lines — Waveguide bending and Twisting to your specifications.

We have shown here just a few examples of our complete line of micro-wave components that have been designed and produced by AIRTRON. Write for further information. A 1955 catalog is available.

# Airtron CANADA LIMITED

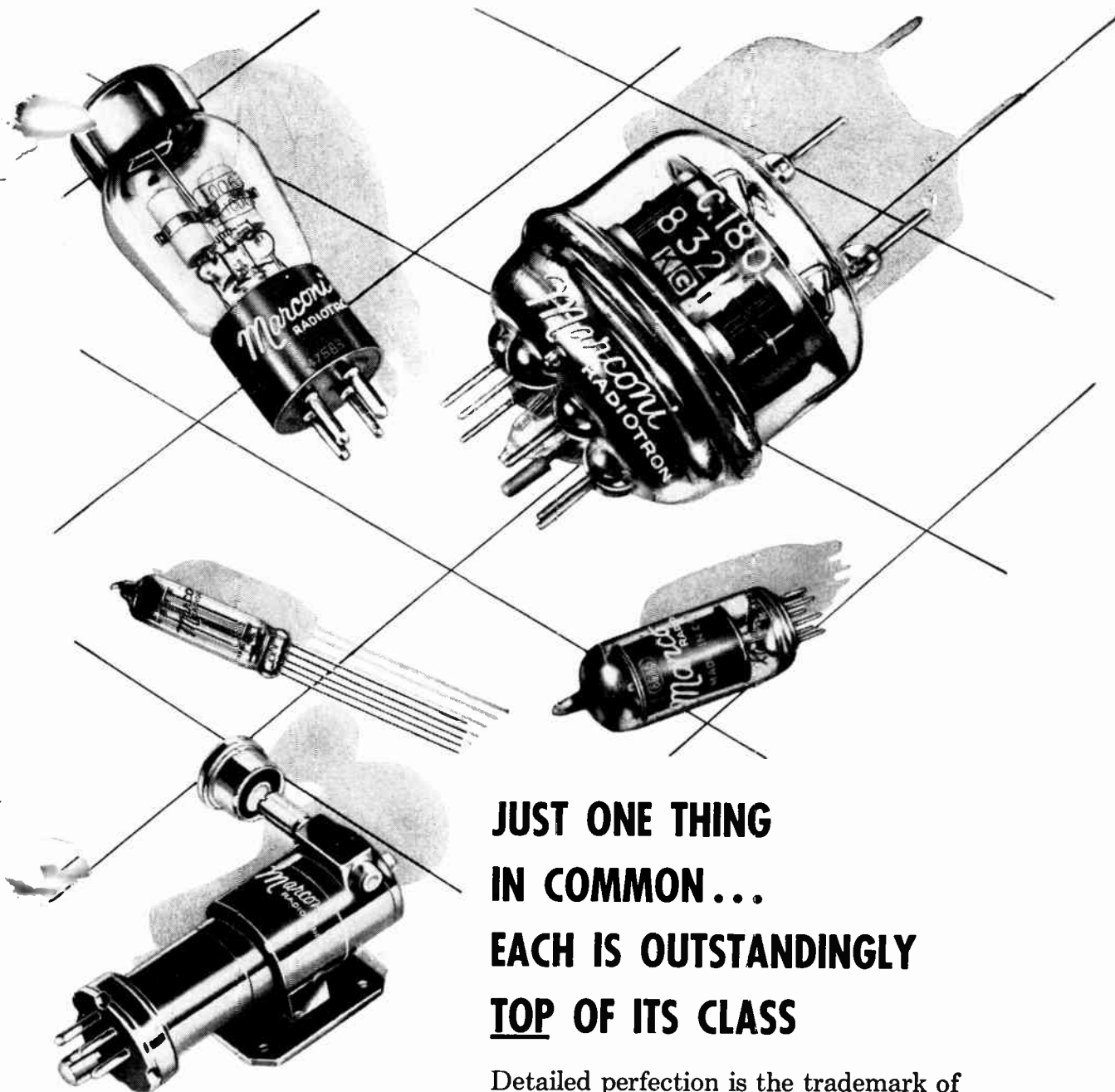
Sales & Engineering: 300 Campbell Ave., Toronto • Plant: Renfrew, Ont.

— Branch Offices —

5890 Monkland Ave.,  
Montreal

492 Somerset St. W.,  
Ottawa

Radiovision Sales Ltd.,  
325 10th Ave., West, Calgary, Alta.



**JUST ONE THING  
IN COMMON...  
EACH IS OUTSTANDINGLY  
TOP OF ITS CLASS**

Detailed perfection is the trademark of every unit . . . the evidence of critical inspection at every stage of production . . . the proof that maximum standards of every specification are observed.

Marconi quality and volume combined with customer-conscious service offers the most for complete satisfaction.



**MARCONI**  **RADIOTRONS**

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN **Marconi** COMPANY

830 BAYVIEW AVENUE • TORONTO, ONTARIO

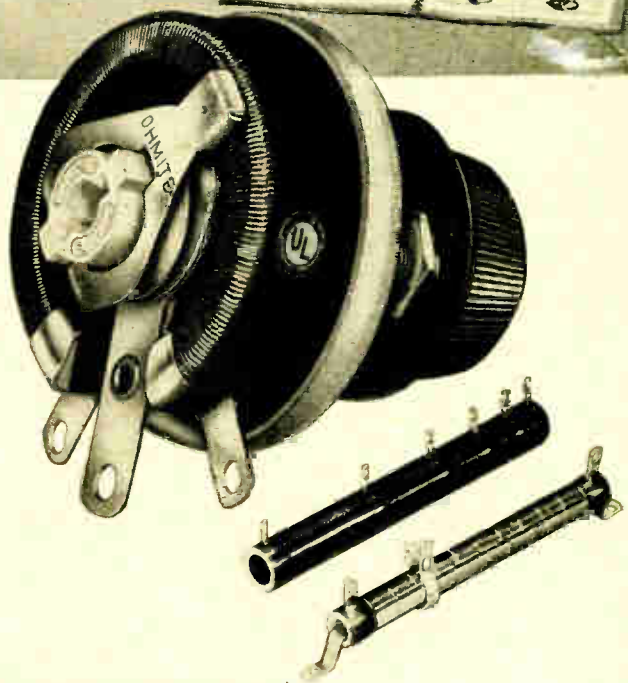
BRANCHES: Vancouver • Winnipeg • Montreal • Halifax • St. John's, Nfld.

let **OHMITE**  
 engineers  
**"TEAM UP"**  
 with your  
 engineers

IN SOLVING YOUR  
 RESISTANCE PROBLEMS



Save valuable engineering time . . . team up with Ohmite to solve your resistance problems. Ohmite engineers are resistance specialists . . . they can quickly analyze your requirements and recommend the correct rheostats and resistors to fit your application. Years of experience in building dependable resistance units . . . complete design, development and production facilities . . . plus a long record of helping others to economically solve their resistance problems . . . are your assurance that Ohmite can help you. We invite you to submit your resistance problems to us.



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

Be Right with - **OHMITE**

RHEOSTATS • RESISTORS • RELAYS • TAP SWITCHES • TANTALUM CAPACITORS

A. C. SIMMONDS & SONS  
 100 Merton St., Toronto 12

C. M. ROBINSON COMPANY  
 189 Market Ave., East, Winnipeg 2

# NEW PRODUCTS by COSSOR

## A NEW AID TO AIR TRAFFIC CONTROL AND AIR SAFETY COSSOR SECONDARY RADAR SURVEILLANCE SYSTEM

The system offers:

- ★ Reliable ranges up to 170 miles on all equipped aircraft irrespective of size.
- ★ Complete freedom from weather interference.
- ★ No ground clutter.
- ★ Positive and certain identification.
- ★ Complete side lobe suppression.
- ★ An invaluable emergency aid if other equipment fails.
- ★ Very low cost and power consumption.
- ★ No complexity; simple and easy maintenance.
- ★ An airborne transponder weighing under 30 pounds with only 11 tubes.
- ★ Complete ground equipment weighing only 250 pounds.

Four years extensive flight trials.

Increasing air traffic density and ever-increasing speeds show clearly the limitations of even the most modern primary radars. Ranges vary with aircraft size so that traffic control can not be certain that it is seeing all the traffic at even modest distances; ten mile a minute speeds limit tracking time to a very few minutes; positive identification is slow and difficult and overloads voice channels; solutions to weather interference and ground clutter are limited and costly.

Cossor this year celebrates its twentieth continuous year of radar development and now offers a complete, simple, rugged and low cost solution with its SECONDARY RADAR SURVEILLANCE SYSTEM. This comprises a small ground transmitter and receiver which interrogates and receives answers from a simple airborne transponder. The ground set can be used alone or in combination with any primary radar. The system gives great range, freedom from weather and ground clutter and automatically coded replies give positive identification.

## PRECISION DEFLECTION YOKES

COSSOR (Canada) are now supplying precision deflection yokes to many of the largest laboratories and defence project industries in the U.S.A. Yokes are available to customer's specification, in Nickel Iron, Ferrite, Class A, Class H insulation.

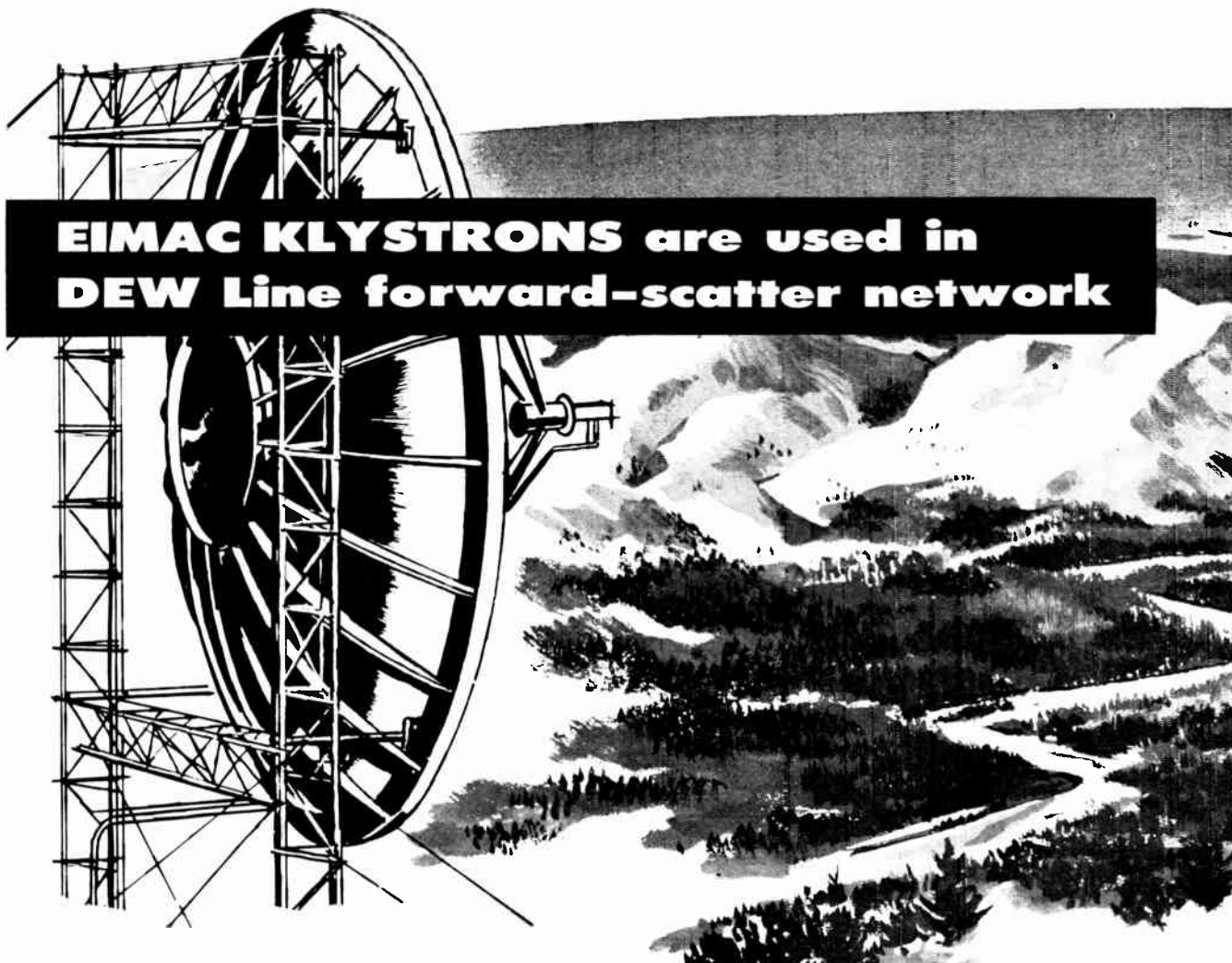
- |   |  |
|---|--|
| → Linearity - standard $\pm 1\%$ , custom build to $\pm .1\%$ . | → High Altitude Performance is limited only by flashover point of the terminals, which can be specified by customer.   |
| → Orthogonality $\pm 1/4^\circ$ .                               | → Temperature Range -  |
| → Half-axis colinearity $\pm 1/2^\circ$ .                       | Standard deflection yokes will operate as specified from $-10^\circ\text{C}$ . to $+60^\circ\text{C}$ . Class H insulated deflection yokes will operate from $-50^\circ\text{C}$ to $+160^\circ\text{C}$ . |
| → Mutual interaxis coupling .0025 or as specified by customer.  | → Humidity: The yoke is unaffected by humidity.  |
| → Differential capacity unbalance - 3.5 uuf max.                | → Meet JAN and MIL Specs.  |

## COSSOR (CANADA) LIMITED

301 Windsor Street  
OTTAWA  
160 Laurier W.  
5 - 4306

HALIFAX  
MONTREAL  
8230 Mayrand St., Decarie Boulevard  
RE. 3 - 6502

Phone 4 - 6497  
TORONTO  
648A Yonge St.  
WA. 4 - 1226



## EIMAC KLYSTRONS are used in DEW Line forward-scatter network

Collins Radio Company's pioneering of circuits and equipment has contributed greatly to the success of the revolutionary new art of forward-scatter communications. From the beginning of this program, Eimac tubes have provided the high power necessary to make scatter propagation practical. In Collins newest high power microwave transmitters for beyond-the-horizon communications in the Distant Early Warning network, only Eimac klystrons are used as final amplifier tubes.

*Third in a series of advertisements emphasizing the extensive application of Eimac amplifier klystrons and circuit components, negative grid tubes and rectifiers by leading manufacturers of forward-scatter UHF/microwave transmitters.*



Collins two and ten kilowatt forward-scatter transmitters utilize Eimac amplifier klystrons, negative grid tubes and rectifiers.



**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 109.



**FROM THE WORLD'S LARGEST PRODUCER**

# GYROS

by **Bendix**

## EXPERIENCE COUNTS!

If you require a rate, free, vertical, roll, attitude or special gyro, you should investigate what ECLIPSE-PIONEER can offer you. Since E-P is the world's largest producer of gyros, you can benefit from the wide range of models available, and from their experience.

In the event that a special type is required, consideration can be given to engineering and producing the gyro at ECLIPSE-PIONEER or, possibly at AVIATION ELECTRIC in Montreal.

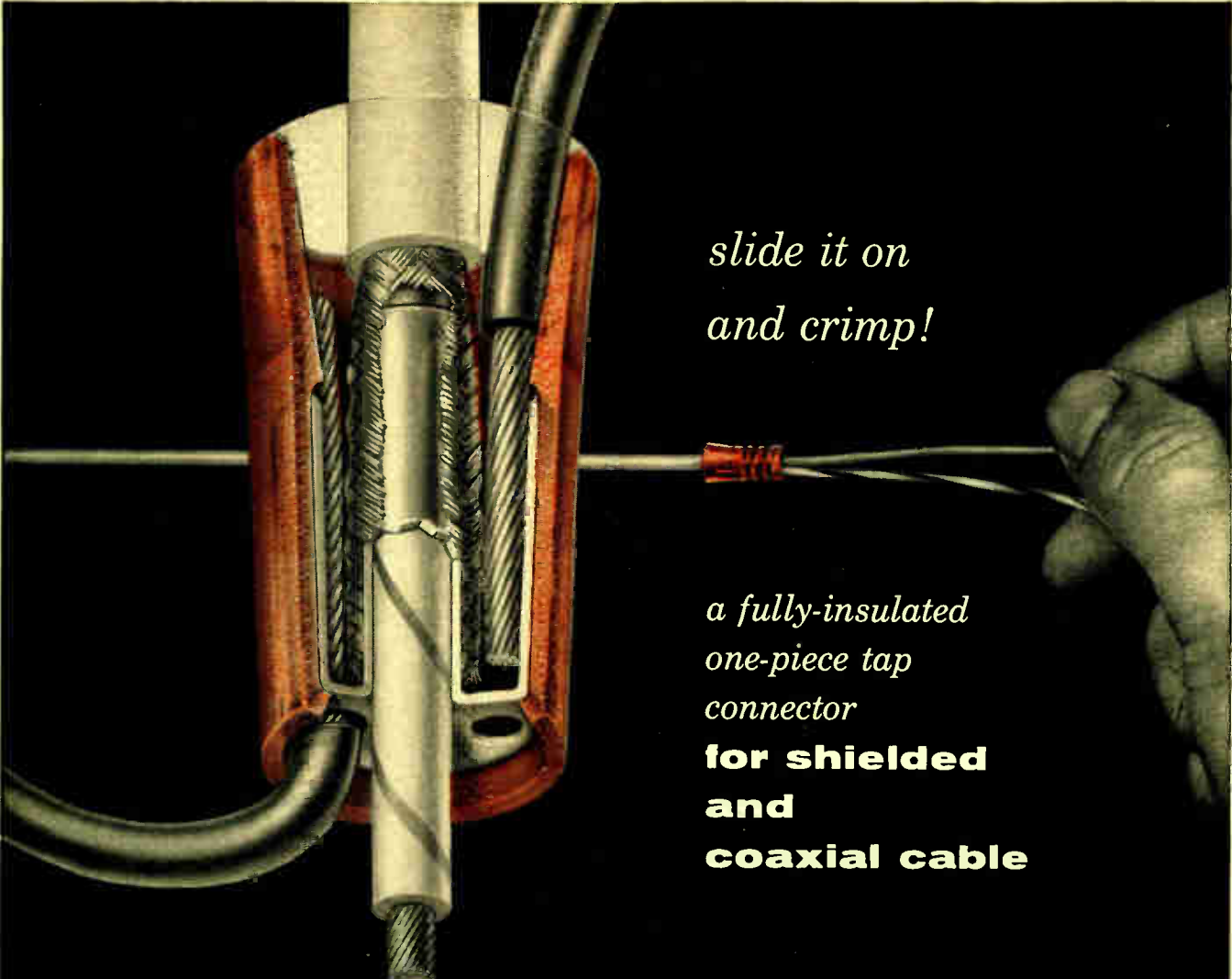
Your inquiries will receive prompt attention. Write or wire to-day to:

200 Laurentian Blvd., Montreal, Que.



**AVIATION ELECTRIC**  
LIMITED

HALIFAX • MONTREAL • TORONTO • CALGARY • VANCOUVER



*slide it on  
and crimp!*

*a fully-insulated  
one-piece tap  
connector*  
**for shielded  
and  
coaxial cable**

# UNI-RING

UNI-RING offers a tremendous saving in installation time over any previous method of tapping or terminating shielded or coaxial cable. As the inner ring slides under the shielded braid, the tap wire is held between the braid and the outer ring. Single or multiple taps, from either the front or back of the connector, can be accommodated . . . A single crimp, using the same basic HYTOOLS used for installing HYRINGS, completes the uniform, secure, and insulated assembly.

The protecting nylon insulation extends beyond both ends of the UNI-RING, eliminating metal-to-metal contact and preventing harmful wire-chafing in tight locations. The UNI-RING is color-coded to indicate conductor sizes.

UNI-RING's one-piece design insures electrical integrity, prevents heating, and eliminates noises caused by isolated metal parts.

5620

For samples and complete details, write:

**BURNDY**  
**CANADA LTD**

381 GREENWOOD AVE., TORONTO 8, ONT.

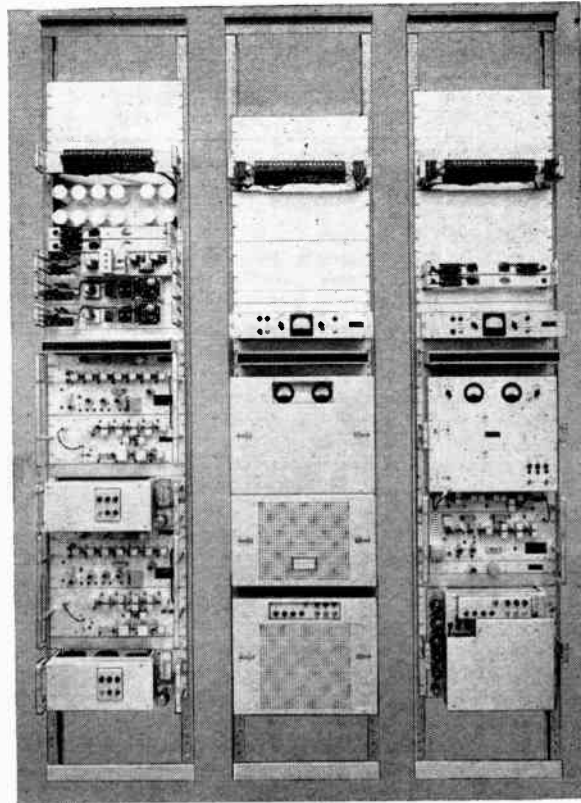
QUEBEC and MARITIMES: 1434 ST. CATHERINE ST. W., MONTREAL 8, QUE.

REPRESENTED IN:

Winnipeg by  
NORMAN L. HANEY & CO.  
Calgary and Vancouver by  
BUNSTON LTD.



*Lenkurt's new Type 72C Microwave system has a capacity of up to 360 voice channels in the 900-megacycle band. In this frequency range longer hops are possible—over any terrain, in any kind of weather.*



**LENKURT MICROWAVE**  
**designed**  
**engineered**  
**furnished**  
**and installed**  
**FOR TELEPHONE COMPANIES**

More and more telephone companies look to Automatic Electric for Lenkurt Radio Equipment, engineered specifically for telephone applications.

And now that Automatic Electric and Lenkurt offer "package plan" engineering, it's easier than ever for you to own, maintain, and use carrier and radio equipment. Our communications specialists provide complete "beginning-to-end" service, including *Specific Recommendations . . . Detailed Specifications . . . Complete Construction . . . Expert Installation . . . Staff Training . . . Follow-Up Counsel*. For more information, write or call Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver. 5647

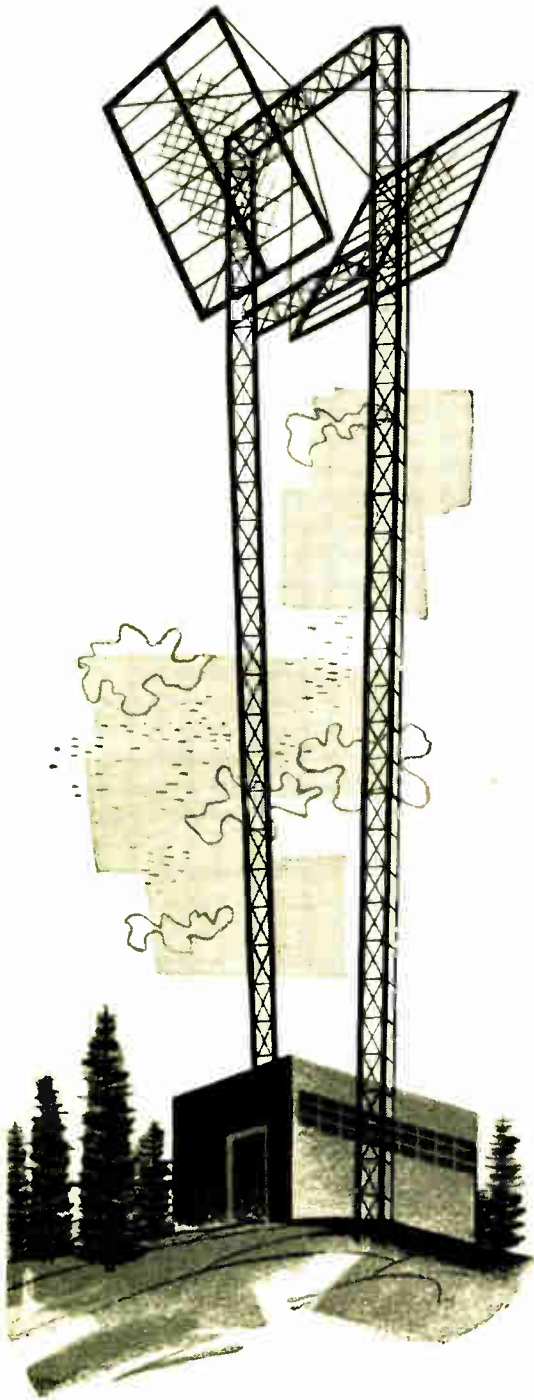
**AUTOMATIC**  **ELECTRIC**

ORIGINATORS OF THE DIAL TELEPHONE

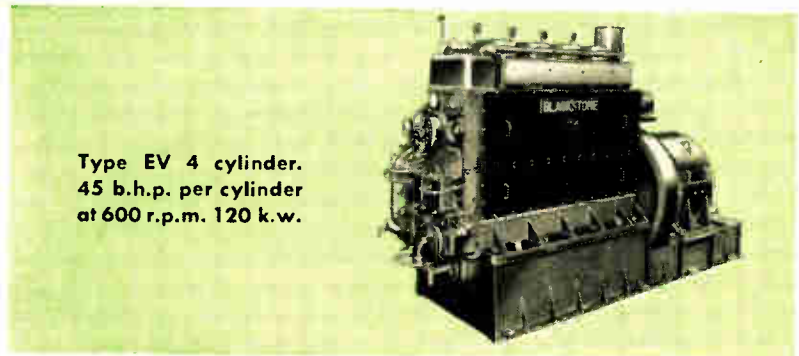


*You can depend on*

# BLACKSTONE DIESEL POWERED GENERATORS



For three generations, Blackstone Diesel Engines have been providing power for industry in all parts of the world. These proven diesel units are particularly suited to generating sets. Because of their great reliability, Blackstone engines are capable of running without continuous attendance and because of their accessibility they are extremely easy to service. Among their many and varied uses, they are also an ideal choice to power pumping units and gas line booster compressors. EV/EVS from 90 b.h.p. to 480 b.h.p. 600 r.p.m. ER/ERS from 112 b.h.p. to 576 b.h.p. 720 r.p.m. Parts and service for Blackstone engines are available throughout the world.



Type EV 4 cylinder.  
45 b.h.p. per cylinder  
at 600 r.p.m. 120 k.w.

## FEATURES

- Engine waste heat utilization without extra fuel costs
- Choice of four starting systems—compressed air, electric, "Air-master" automatic or "Motormaster" automatic controls
- Low fuel and oil consumption
- Manufactured to Lloyds specification
- Built-in water pumps and heat exchangers
- All working parts totally enclosed, pressure lubricated and easily accessible for routine maintenance

WRITE us for the name of your nearest distributor and for your free copies of Bulletins EVC and ERC, which describe, in detail, the EV/EVS and ER/ERS series of Blackstone Diesels.

# CANADIAN LISTER-BLACKSTONE LIMITED

1921 EGLINTON AVE. E., SCARBOROUGH, TORONTO 13, ONT.  
Vancouver Montreal

For further data on advertised products use page 109.



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

OCTOBER • 1956  
Vol. 4 No. 9

Printed, Engraved and Produced in its entirety by AGE PRESS  
A Division of AGE PUBLICATIONS LIMITED

# EDITORIAL CONTENTS

## FEATURES

Ultra-Thin Precision Gaged Metal Strip . . . . .	24
Punch And Die Design Principles For Laminated Plastics . . . . .	26
<i>By E. C. Graesser.</i>	
Inspection Technique Halves Instrument 'Bugs' . . . . .	28
Magnetic Tape And Automation . . . . .	30
Dental Surgery Televised First Time In Canada . . . . .	32
Control Section Aids Electronic Design . . . . .	34
Television And The Construction Industry . . . . .	36
Electronics In Practice . . . . .	38

## DEPARTMENTS

Editor's Page . . . . .	15
Editorial . . . . .	17
Business Briefs And Trends . . . . .	22
News . . . . .	42
New Products . . . . .	87
RETMA Report . . . . .	91

President NORMAN G. McHARDY  
 Editor THOMAS W. LAZENBY  
 Editorial Assistant D. K. TROWELL  
 Advertising Manager H. E. DALLYN  
 Production Manager NEVILL A. CAMPLING  
 Business Manager CLIFFORD A. SPARKS  
 Circulation Manager PAUL A. IRWIN  
 Art Editor WM. McREYNOLDS  
 Photo Editor GUIDO MILANESIO

**PUBLISHED BY AGE PUBLICATIONS LIMITED**  
 Founded By Norton W. Kingsland

Also Publishers of Restaurants and Institutions, Hotel and Tavern,  
 Heating, Plumbing & Air Conditioning AGE, Oil & Gas Heat.

MONTREAL, QUE., CANADA  
 Room 504, Dominion Square Building  
 1010 St. Catherine Street West  
 Tel. UNiversity 6-7897

TORONTO, ONT., CANADA  
 31 Willcocks Street  
 Tel. WALnut 2-3115

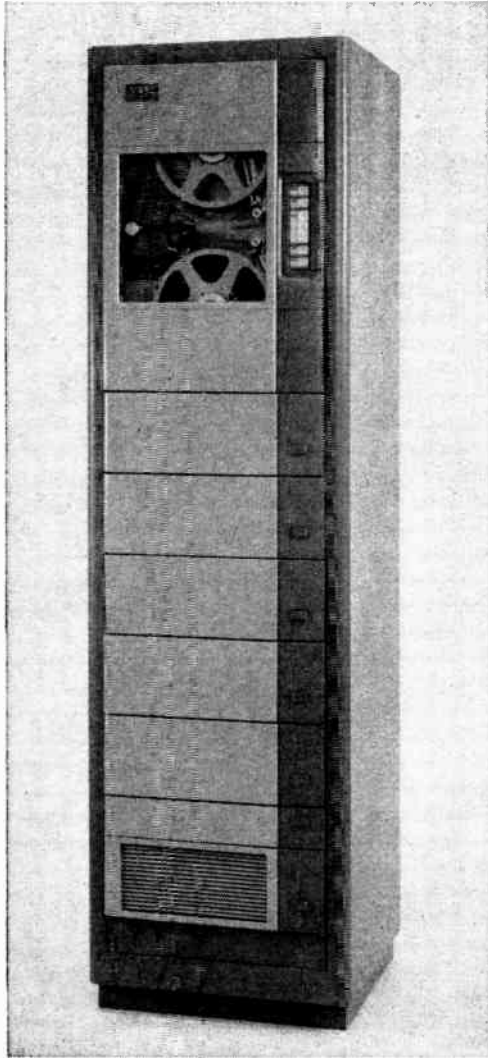
Member Canadian Circulation Audit Board, Inc.



Subscription Rates: Canada, U.S.A. and British Possessions \$ 5.00 per year  
 Foreign \$10.00 per year

Authorized as second class mail. Post Office Department, Ottawa.

# AMPEX PRESENTS THE *modular* FR-100



*a versatile  
new approach  
to the  
recording and reproduction  
of data  
on magnetic tape*

From the pioneer and leader in magnetic tape instrumentation comes an all-new series of equipment. Every component of the Ampex FR-100 is designed as an interchangeable module. This provides an unlimited versatility for recording and reproducing complex

combinations of data in the range from D.C. to 100,000 cycles. It reduces most line maintenance to a simple plug-in of spare components. And it forestalls future obsolescence by permitting adaptation to any conceivable changes in tape recording standards.

## FEATURES

- Plug-in interchangeable amplifiers permit quick selection of Direct, FM or PWM recording or reproduction on any track.
- New precision head assemblies provide greater timing accuracy between tracks and compatibility with all of the interchangeable amplifiers.
- Recording and reproduction characteristics permit interchange of tapes with Ampex 300 and 800 series machines.
- Models available with from one to 14 tracks.
- Tape transport handles the six standard tape speeds from 17 $\frac{1}{8}$  to 60 in/sec; other combinations on special order.
- A new Ampex standard of performance excels the widely accepted Ampex standards of the past.
- Construction throughout conforms with Mil spec. E-4158-A.

*For complete information write Dept. SS-2783*

Ampex International Division  
Home Office: 934 Charter Street  
Redwood City, California, U.S.A.



FIRST IN MAGNETIC TAPE INSTRUMENTATION

1537 The Queensway • Toronto 14, Ont.

For further data on advertised products use page 109.

# NOW!

# FOR THE FIRST TIME

## DIRECT WRITING CONVENIENCE WITH PHOTOGRAPHIC ADVANTAGES!

Introducing *Century* ELECTROGRAPH MODEL 420



**ELECTROPHOTOGRAPHIC  
RECORDING  
OSCILLOGRAPH**

*You Asked For This!*

### ONLY THE REVOLUTIONARY CENTURY ELECTROGRAPH OFFERS THESE FEATURES

- Permanent instantaneous oscillograms
- Eliminates need for messy liquid chemicals
- No darkroom required
- Automatic continuous dry processing
- View oscillogram while recording
- Utilizes sensitive light-beam galvanometers
- Up to 24 traces on eight inch paper
- Traces can overlap
- Precision timing lines
- Low power consumption

Century's engineers are the first to accomplish the long dreamed-for wedding of photographic recording and completely automatic dry processing to eliminate the need for costly darkroom facilities and liquid developing, rinsing and fixing.

The greatest advancement in the technique of multi-channel oscillograph recording in over 20 years, the CENTURY ELECTROGRAPH is essentially a direct-writing recording oscillograph utilizing the

RADICALLY new technique of Electrophotography combined with light-beam galvanometers.

NOW investigate CENTURY ELECTROGRAPH—the most modern approach to simplified oscillographic recording — when planning your instrumentation program whether for research, engineering, test, quality control, process control, or any other analog recording requirement.

**COSTS NO MORE THAN OLD-FASHIONED METHODS**



## Century Electronics & Instruments, Inc.

1333 NO. UTICA, TULSA, OKLAHOMA

For further information, call on our nearest representative:

EXPORT OFFICE: 149 BROADWAY, NEW YORK CITY — TEL.: BARCLAY 7-0562

PHILA.-WASH. AREA  
4447 N. BODINE ST.  
PHILADELPHIA 40, PA.  
TEL.: MICHIGAN 4-1822

N.Y.-NEW ENGLAND AREA  
29-46 NORTHERN BLVD.  
LONG ISLAND CITY 1, N. Y.  
TEL.: STILLWELL 4-7120

MIDWEST AREA  
363 W. FIRST ST.  
DAYTON 2, OHIO  
TEL.: FULTON 9292

TEXAS-N. M. AREA  
5526 DYER ST.  
DALLAS, TEXAS  
TEL.: EMERSON 6716

ARIZONA AREA  
3686 BAKER PL.  
TUCSON, ARIZONA  
TEL.: 7-1501

SO. CALIF. AREA  
40 SO. LOS ROBLES  
PASADENA 1, CAL.  
TEL.: RYAN 1-9663

NO. CALIFORNIA  
2015 EL CAMINO REAL  
REDWOOD CITY  
TEL.: EMERSON 6-8214



**STANDARDIZE WITH CANNON**



**NEW XLR**  
*...an important addition  
to the XL Series*

Standardize with Cannon Audio Connectors . . . designed to meet all audio equipment disconnect needs. Simplify circuitry and cabling. Get quiet, continuous operation with the standard connectors of the industry - *Cannon Plugs*.

You'll find exactly the type you need in 14 extensive series expressly designed for radio, sound, TV and related fields . . . in cord, rack or panel chassis, audio and low-level, portable, hermetic sealed, miniature and subminiature, and power-supply types. Standard equipment with leading manufacturers of electronic equipment. The old reliable "Latchlock" feature on Cannon microphone connectors . . . standard on top-ranking microphones.

Complete Audio Connector Bulletin is yours for the asking . . . D Series in separate bulletin coded D-4.



**P series**



**X series**



*for  
simplified  
**AUDIO**  
circuitry!*



**BRS series**



**UA series**



**D series**



**U series**



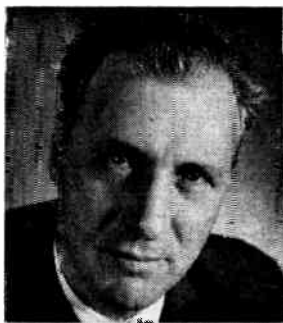
**K series**

# CANNON PLUGS



**CANNON ELECTRIC CANADA LIMITED**, 160 Bartley Drive, Toronto 16, Ontario.  
Montreal Office: Montreal Airport Dorval, P.Q.  
Factories also in Los Angeles, East Haven, London, Melbourne.  
Licencees in Paris, Tokyo.

5801



*The*

## EDITOR'S PAGE

The National Engineering Manpower Conference, held at St. Andrews-by-the-Sea early last month, was comprised of some 110 of Canada's leaders in industry, education, government, professional societies and organized labor, and had as its objective the analysis of the critical problem Canada faces in respect to the shortage of manpower in science and engineering and related problems in the general field of higher education.

As an essential part of its discussion the conference considered the broad picture of education from elementary schools through university and the effects of higher education on Canadian economic and industrial development, our ability to defend ourselves and our competitive position in world markets with special emphasis on development of engineering, scientific and technical skills.

The main basic material for the conference was contained in an extensive brief which was submitted to the delegates some two weeks previous to the conference. The brief urged that "Canada is in serious jeopardy of losing her position as a competitive and progressive industrial power unless we educate our scientific and technical manpower in a more effective manner."

Releases issued on the conference make it obvious that there are many men of vision and responsibility in varied fields of Canadian endeavor who are justifiably concerned over the problems Canada will have to overcome in the matter of building additional schools and universities and the training of additional teachers to man them if Canada is to produce sufficient engineers and scientists to meet our future requirements.

While it is presumed that capable authorities at the conference discussed the significant relationship between our industrial structure and economy and our projected future need for engineers and scientists, we cannot help wondering whether the concentration of thought on the part of these authorities on what will be required twenty and twenty-five years hence might not have blinded them to present-day facts that are doing little to encourage the development and growth of that sphere of activity without which it is doubtful if Canada will ever become a significant industrial power, and without which our future requirements for scientists at least, may be appreciably cut. What we have in mind specifically is industrial research in Canada which, because of our close economic tie-in with the United States and our close business affiliations with American concerns, makes Canadian initiated research a highly unattractive proposition in so far as a money-making activity is concerned.

It is only logical to assume that Canadian industry will continue to grow as a producer of goods, but it is wishful thinking, we believe, to imagine that Canada will ever become a significant self-supporting industrial power on the limited basis of research contributions provided by a few large, wealthy organizations and the scientific findings of government laboratories and universities. What is needed, we believe, to assure Canada a future stature in the world of science and technology is a more widespread engagement in research, a more widespread engagement in research by firms to which the required outlay of money for the establishment of laboratory facilities and the payment of scientific personnel constitutes a definite financial gamble. How, then, are such firms to be encouraged to engage in research work?

It is certainly not reasonable to expect government development contracts to carry any such load indefinitely and it is just as unreasonable to expect business management to embark on any such operation without assurance of reasonable financial return.

Stimulus could, however, be lent to such activity by more realistic tax concessions to firms desirous of establishing research programs. At the present time something of the order of ten per cent of the cost of research work being conducted by a firm is permitted to be deducted from taxable income. This, we suggest, is certainly no great inducement. Providing the value of a proposed research program, which could, if necessary, be examined and approved by an appropriate government agency for purposes of tax concessions be found justified, then, in so far as the future benefits to be derived from research are concerned, it would surely pay federal authorities, from the standpoint of national development, to be vastly more generous in the matter of tax concessions, even to the point, in the case of approved research programs, of allowing firms tax concessions in direct proportion to the amount of money spent on them.

Without research there is little point in training personnel of research caliber. Universities may just as well concentrate solely on the training of engineers to man a manufacturing but "researchless" Canadian industry and forget about the physicist and the mathematician et al. On the other hand, of course, we can continue to produce scientific personnel, gather them into highly specialized teams, engage them on highly important research programs productive of significant results, then watch them turn and flee holus bolus to the United States, taking with them developed prototypes of equipment which, if retained in Canada, could place this country on a highly competitive basis as a producer of intricate scientific equipment.

That such a condition should obtain is a sad reflection on our awareness of what is required if we are to expect Canada ever to become a significant industrial power. Such a condition, nevertheless, has recently obtained in the Toronto area where a recently-established young and vigorous research facility has closed its doors due to an unreasonable drain on company finances with the result that we have lost a premium team of researchers to the United States whose findings in the field of computation have been taken over by an American concern.

On the basis of the foregoing instance — and it is not an isolated one — we repeat our doubt as to whether those learned men gathered at the recent National Engineering Manpower Conference may not have lost sight of present-day conditions which, if not remedied, will adversely affect our future status twenty years hence as a self-supporting industrial power.

If, twenty years hence, which would appear to be the period of time in our industrial development about which the Conference concerned itself, we are to be anything other than a nation of scientific and technological copy-cats then it is essential that we now lay the foundation of a solid basis of fundamental industrial research which can absorb our future scientists. To train scientists without providing any better means for their employment than we possess at the present time would be tantamount to breeding thoroughbreds for mounting on a merry-go-round.

# How to end LOW LEVEL RECEPTION PROBLEMS

Weak incoming signals, noisy locations and low hearing ability all result in poor telephone reception. Research at AUTOMATIC ELECTRIC has developed special-purpose equipment to overcome reception difficulties.

These developments include a *transistorized* telephone that "speaks up" for the hard of hearing, a *transistorized* operator's headset that compensates for weak signals, and many others listed below.



### Transistorized Type 80 Monophone

Provides "normal" reception for people who are hard of hearing—even if they are unable to use a standard telephone!

Compact, single transistor amplifier about the size of a pencil eraser is installed in telephone housing. It boosts incoming speech up to 16 times. Volume is controlled by a small knob that is out of sight behind the telephone cradle.



### Transistorized Operator's Headset

Amplifies up to 16 times. Enables operator to hear very weak signals. Transistor amplifier is only 2½" x 1¾". It is housed in the plug to keep the headset light in weight. Draws all the current it needs to operate from the circuit. Connects through the plug. Volume control enables operator to adjust gain to comfortable hearing level.

### OTHER AUTOMATIC ELECTRIC SPECIAL PURPOSE EQUIPMENT

- ROANWELL 'CONFIDENCER' for noisy locations
- TYPE 25 HANDSET for moderately noisy locations
- TYPE 27A HANDSET for the hard of hearing
- TYPE 27B HANDSET for extremely noisy locations
- TYPE 38 ANTI-NOISE HANDSET with special noise-excluding mouthpiece and earpiece

5601

For complete information  
write today for Circular 1823



**AUTOMATIC ELECTRIC**  
(CANADA) LIMITED

Distributor in Canada

**AUTOMATIC ELECTRIC SALES (CANADA) LIMITED**

Head Office: 185 Bortley Drive, Toronto 16

MONTREAL • OTTAWA • BROCKVILLE • HAMILTON • WINNIPEG • REGINA • EDMONTON • VANCOUVER

For further data on advertised products use page 109.

World Radio History



## Merlins Of The Modern Age

*"What do these fellows do?" the visitor enquired.*

*He looked to where they stood in their booths or wandered down the broad aisles of the IRE Exhibition. They were the young men of Canada's youngest industry. And this is the answer to the visitor's question.*

*They are the Merlins of the modern age and work their own magic. They are initiates into the mysteries of Nature's powers, subduing the might of the elements to their own purposes.*

*They chart the oceans of space and fashion the instruments of far voyages. They push back the margins of the known and breach the boundaries of the hitherto possible. They confine the illimitable in a cabinet, and traverse it with the flick of a finger. For theirs is the speed of light exceeded, the power of the thunderstorm multiplied.*

★ *They challenge the tyranny of time itself, reducing days to an instant and months to a brief pause. They are explorers of the infinite, pioneers in insubstantial realms of thought and theory, of daring hypothesis and exact mathematical formulae.*

★ *They are navigators on unseen waves of light and sound, detectors and recorders of earth-shaking powers, observers of the measureless rhythms of star and plant. They plumb the twin abysses of time and space; and probe, with delicate antennae, the atomic substructures of the physical universe. They are pathfinders to a new world, plotting tremendous revolution in the quiet of their laboratories.*

★ *Such are these young Canadians, and such the industry of electronics and communications. Theirs is the embryonic world of automation, of the stratosphere and supersonic flight; of far-ranging radar and interplanetary travel; of nuclear reactors and radio astronomy; of scientific triumphs that speak of wonders yet to come. It is they who plan to lift from the shoulders of men and women, the burden of labor, bequeathing ease and plenty and leisure.*

★ *Today, they and the industry they serve confront the world with new conceptions of man's mortal existence. Theirs is the confidence and courage of youth, and their heritage is the sum total of human knowledge. They are flinging wide the gates of mankind's future, opening to view vistas of progress that are infinite in their diversity and extent, beyond the power of the imagination to conceive. In a myriad of ways they propose to change the ways and customs of men, to transform the earth into a neighborhood, to make of the world a community freed forever from the weights and fetters by which it has been burdened and bound since time itself began.*

*This then is the electronics industry, and these the young men who, at their very portals of the future, challenge Nature to yield up its deepest secrets the service of man and the betterment of the world.*

— George Dymond



# PROGRESS

## Points

## An

## Electronic\*

## Finger

The relay tower is a sign of our progress in communications just as the transmission tower opened the country with electric power over the past 50 years.

Central Bridge already successful in building steel ship bottoms, tanks, bridges and structural work of all kinds, leads again with fabrication and erection of these new electronic fingers in the sky; the television and micro-wave relay tower.

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

*\*Central Bridge Towers  
 were recently made for:  
 Bell Telephone Company of Canada  
 Dept. of National Defense  
 Canadian Broadcasting Corporation  
 Eastern Telephone and Telegraph  
 New Brunswick Telephone Company*

## **B**USINESS END OF A LONG LINE OF WIRES

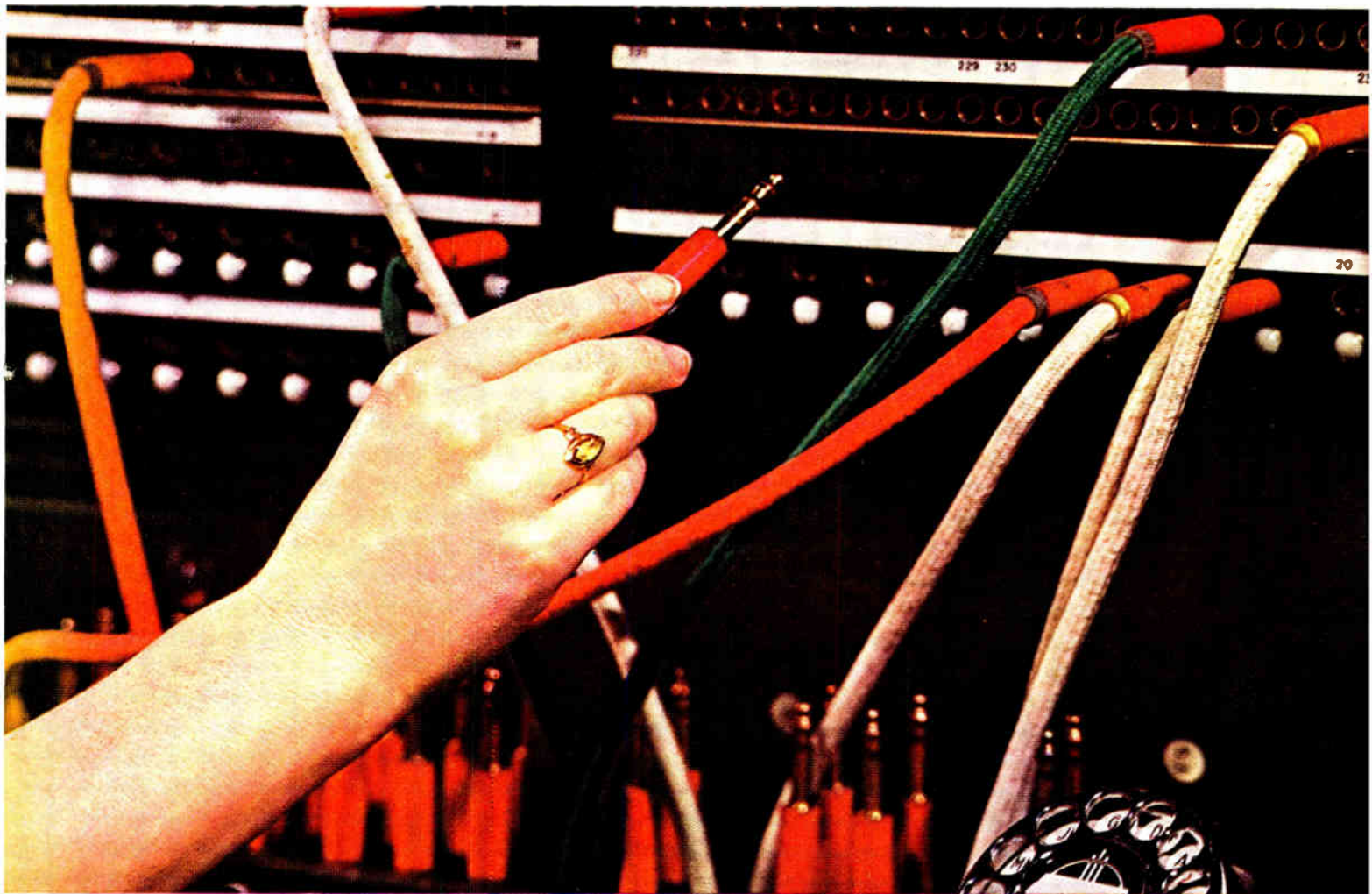
Back of this telephone jack, lies the complicated wiring of a modern switchboard, and all the connecting cables of a telephone system. Well over a hundred different wires are used to link one subscriber's phone with another. And every wire is individually designed to fill a specific need. Each one has been specially developed to meet the exacting requirements of the communications industry and the functioning of the whole system depends on these wires. That is why Phillips take such great care in their manufacture. That is why every wire must be tested before it leaves the Phillips factory. It is this insistence on reliability that has made

Phillips products a by-word throughout the communications industry. When you specify Phillips wires, you can be sure of both performance and quality.

*Phillips Electrical Company Limited, The Canadian Affiliate of the British Insulated Callender's Cables Group. Head Office—Brockville, Ontario. Branch Offices—Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Regina, Edmonton, Vancouver. Phillips Telephone Wires & Cables are also distributed throughout Canada by Automatic Electric Sales (Canada) Ltd.*

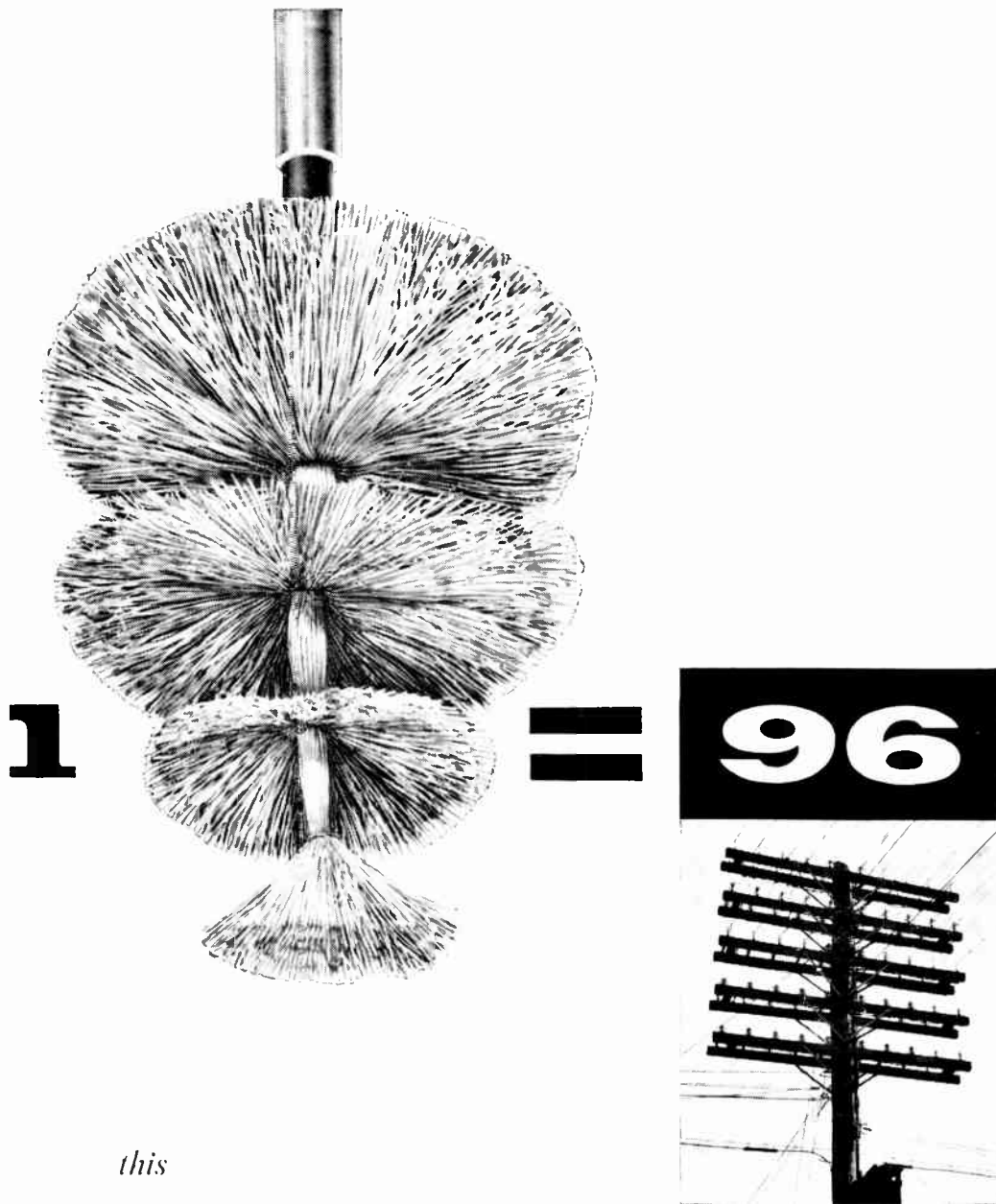
5629

SEE BACK OF THIS PAGE



**Phillips**

**WIRES & CABLES**



*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.

This cable, one of 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.

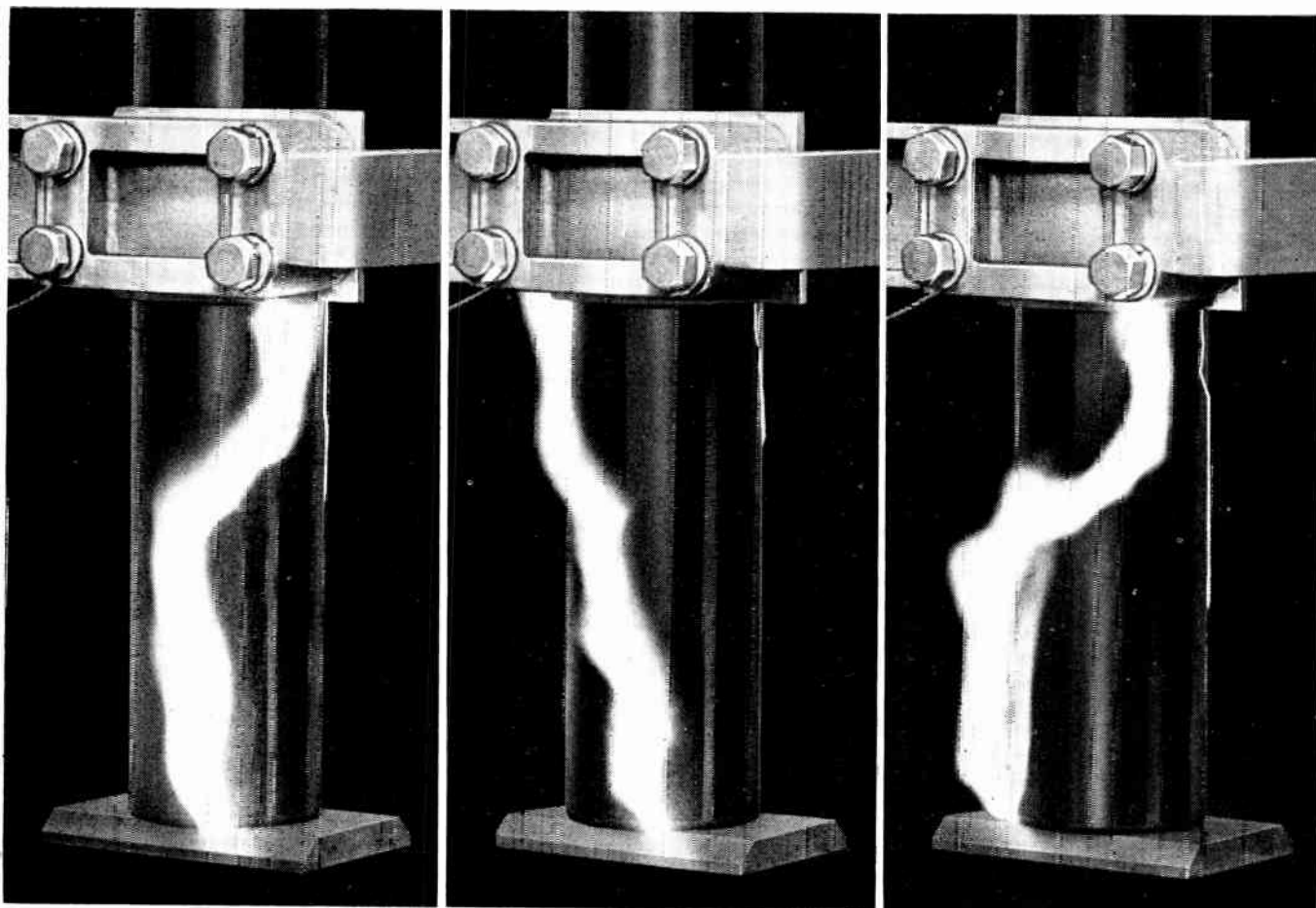
Their finest recommendation is the fact that many Phillips telephone cables have given trouble-free service for decades and are still in use today.

*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

**hillips**

**WIRES AND CABLES**



Unusual air dielectric test is only one of the host of rigorous tests continually carried out by National to give industry better insulating materials.

# THE LATEST NEWS ON ELECTRICAL INSULATION

Three new PHENOLITE® electrical laminates by NATIONAL feature superior dimensional stability, exceptional flame retardance, unusually low cold flow.

Just when designers need them most, from National's Research Laboratory come tested answers to three of the electrical industry's stubbornest insulation problems.

**Moisture resistant and dimensionally stable** PHENOLITE epoxy resin and glass base laminate G-10-865 meets MIL-P-18177 Specification for critical electrical and electronic applications.

**Flame retardant** PHENOLITE Y-2500, used for arc chutes, tap changer switches, switchgear insulating barriers and supporting members, refuses to burn—has excellent arc resistance.

**Low cold flow** is the outstanding property of PHENOLITE E-2040 for radio and TV parts. Other features are low moisture absorption, good dielectric strength, and ease of hot punching and shearing.

If you have an electrical insulating problem—bring it to National. Our staff of Applications Engineers will help you find the right answer in one of the many grades of versatile PHENOLITE. If you want more details of these three new PHENOLITE grades, write for technical bulletins. Address Department O-10.



**NATIONAL** FIBRE COMPANY OF CANADA, LTD.

ATLANTIC & HANNA AVENUES, TORONTO • 1411 CRESCENT STREET, MONTREAL

VULCANIZED FIBRE • PHENOLITE LAMINATED PLASTIC • PEERLESS INSULATION • KENNETT MATERIALS HANDLING RECEPTACLES • VULCOT WASTERASKETS • LESTER SHIRE TEXTILE BOBBINS • VULCOT PRODUCTS FOR THE NDMF

# business briefs & trends

★ The recent United States steel strike has delayed the construction of microwave towers in the Province of Alberta by about three months according to reports from Alberta Government Telephone officials. It is expected that the opening of the system which is scheduled for mid-summer 1957 will not be delayed however.

★ According to the following statistics automation increases employment. On January 1st, 1924 when the first dial telephones were introduced by the Bell Telephone Company the company had 12,740 employees; 4,178 men and 8,562 women. Now, with 85 per cent of the Bell's system operating on dial, the company employs 37,300 workers: 14,400 men and 22,900 women. Telephone operators who regarded the advent of the dial telephone as their nemesis were wrong. On January 1924 there were 7,750 operators employed by the Bell Telephone and today there are 13,500.

★ The Vancouver Sun is the first newspaper in Western Canada to operate its own private fleet of radio equipped cars. The two way radio system connects a fleet of twelve cars with the editorial offices of the newspaper.

★ A Decca storm warning radar system has been installed at the Malton Airport for the Meteorological Division of the Department of Transport. The system valued at \$25,000 will increase the efficiency of weathercasting in the Toronto area within a radius of 200 miles.

★ According to Dr. Paul Rankin, expert in verbal communication, the average American spends 70 per cent of his waking day in the four main types of communication. Nine per cent of that time is spent in writing, 16 per cent reading, 30 per cent talking and 45 per cent listening.

★ The task of producing a printer capable of keeping up with the speed of data processing machines has led RCA to develop a printer that can decode about 4000 electric impulses a minute, transform them into a photographic record and imprint them on business forms.

★ The United States cruiser Northampton has been fitted with the most powerful shipboard radar afloat. A magnetron capable of producing over 10 million watts at peak output and developed by the Westinghouse Electronic Tube Division forms the heart of the giant radar set which permits the ship to search out planes 400 miles distant.

★ The National Broadcasting Company's plans for color television call for a five-time increase in the company's evening schedule for this fall. Company officials anticipate that on some nights there will be as much as three straight hours of color programs and at least one major color broadcast every night of the week.

★ Tests on the Winnipeg to Toronto section of the Trans-Canada microwave system have been underway for several weeks prior to the official opening of the section which was scheduled for October 1st. March 1st has been tentatively set as the date for this section of the system to carry microwave service to Brandon, Manitoba.

★ Eight generators with a power output capable of supplying the power requirements for a town the size of Nelson, B.C. is required to supply the power needs of the electronic equipment fitted on Canada's new aircraft carrier H.M.C.S. Bonaventure.

★ An experimental model of a transistorized intercom system has been developed by the Webster Electric Company using printed circuitry. Plans for the manufacture of the unit on a production basis are being made by the company.

★ Australia's first television station located in Sydney began test operations in August and touched off a boom in the sale of television receivers. The Sydney station commenced regular programming on September 15th.

★ Indicative of Great Britain's awareness of the importance of scientists in our present day industrial economy is the following statement by Sir Anthony Eden: "Our scientists are doing brilliant work. If we are to make full use of what we are learning, we shall need more scientists, engineers and technicians. I am determined that this shortage shall be made good."

★ An example of the growing electrical power requirements for aircraft is indicated by the increase in DC generator capacity on commercial airliners from one 25 ampere 14 volt generator to four 400 ampere 28 volt generators. Direct current systems around 120 volts have been used but brush problems and current interruptions at higher altitudes have not been satisfactorily solved. Efforts are now being concentrated on the development of AC systems.

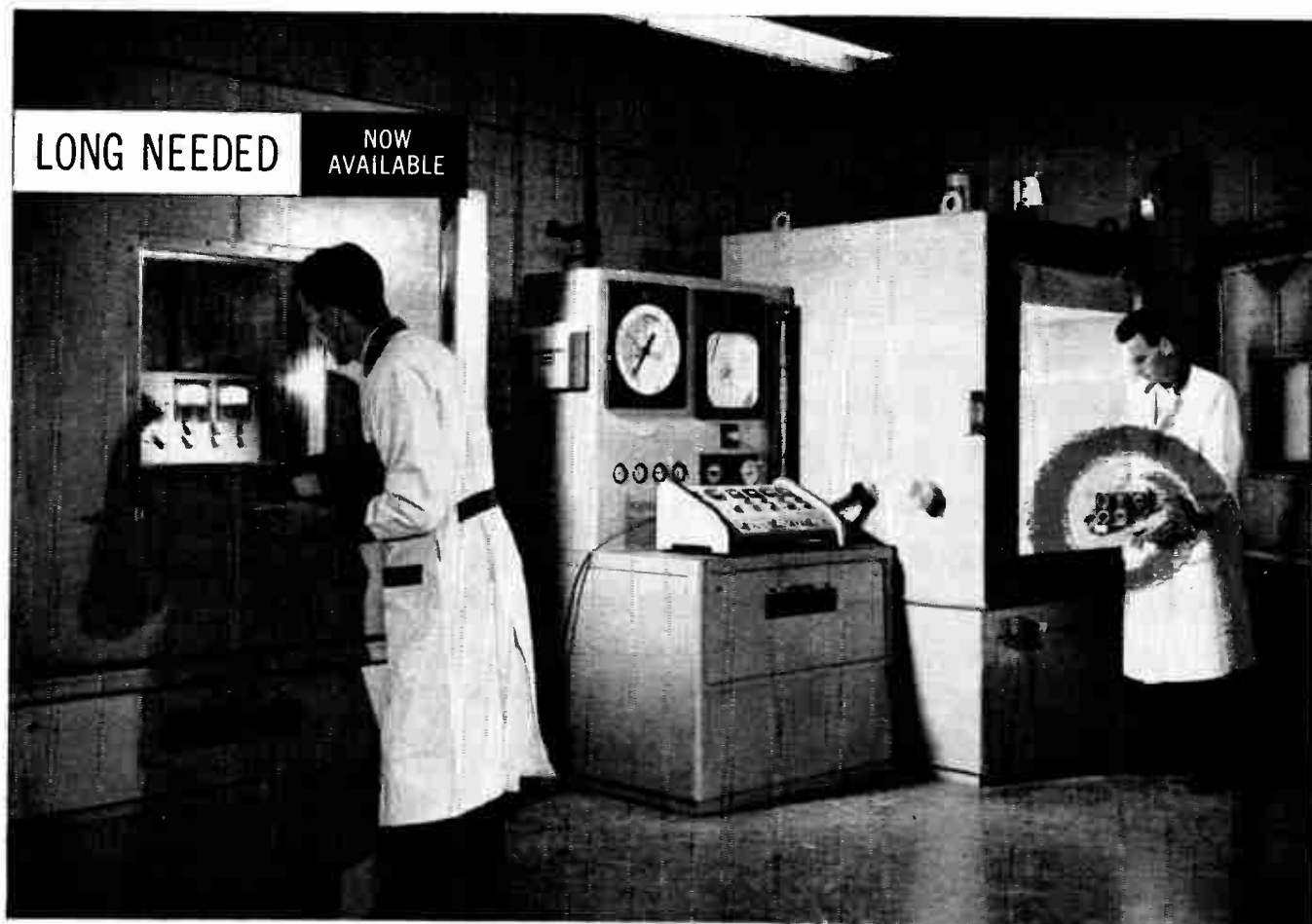
★ The era of push-button electronic shopping is expected to be ushered in early in 1957. A mock-up of the first electronic grocery store in the world was displayed recently in New York at the independent grocers alliance conference.

★ The London Life Insurance Company of London, Ontario is planning either the purchase or rental of a one and three quarter million dollar computing machine capable of processing the company's million and a quarter policies each day if necessary. The machine will require twenty or thirty people for its operation in addition to several electronic engineers whose sole job will be to keep the equipment in running order.

★ American transistor manufacturers sold over five million entertainment and commercial type transistors in the first six months of 1956 raising the sales volume of this component nearly 400 per cent over the sales volume for the same period in 1955. In June 1,130,756 transistors with a dollar value of \$3,645,293 passed over the counters.

★ Researchers at the Brookhaven National Laboratory have come up with what may be an answer to the old problem of what to do with radio active waste material from nuclear-fueled power plants. The suggested method is to concentrate the waste into solid form in order that it may not become fused or blend in with surrounding water or earth in which it may be immersed or buried.

(Turn to page 40)



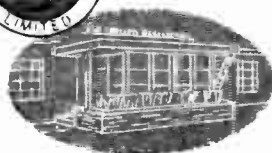
Preparing to test a Company produced rocket-firing intervalometer at  $-65^{\circ}\text{F}$ . at 60,000 feet altitude

## 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



### PSC APPLIED RESEARCH LTD.

1500 O'CONNOR DRIVE  
PLYMOUTH 5-3371

TORONTO 16, ONTARIO, CANADA

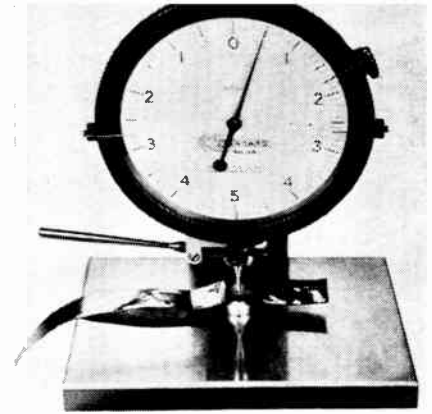
Specially designed Sendzimir mills regulated by elaborate electronic and hydraulic controls permits the manufacture of . . . . .

## Ultra-Thin Precision Gaged Metal Strip

WITH the aid of electronically controlled hydraulic devices it is now possible to produce ultra-thin metal strip in widths up to four inches and in thicknesses from .010 inch down to .00012 inch and with guaranteed uniform thickness tolerances of .00005 inches. The new technique for rolling this strip insures a high degree of uniformity in thickness free from camber across the width of the strip.

The Allied Products Division of the Hamilton Watch Company which is using this new production method is producing cold rolled, ultra-thin precision gage strip in a wide range of metals from the very hard high-temperature resistant alloys down to the very soft light metals.

This strip is produced in a "miniature integrated steel mill" a facility staffed and equipped to melt almost



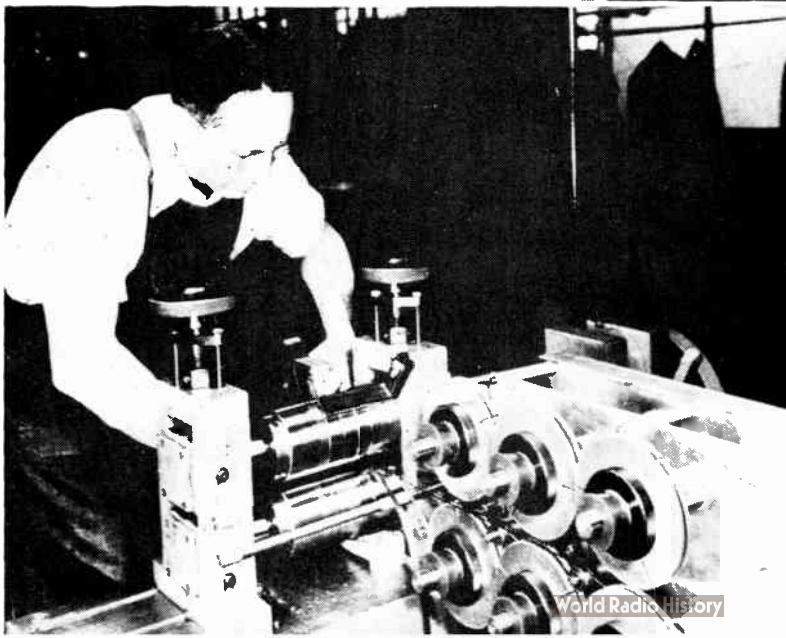
● Thickness of ultra-thin precision gaged metal strip being measured on dial gage which reads ten-thousandths of an inch.

any alloy, or to produce almost any desired metal processing.

Indicative of the high degree of accuracy achieved in this new process is the further operation of slitting this ultra-thin strip to smaller widths with closer tolerances than are commercially available (i.e., in ribbons as narrow as .04 inch, with widths held to a tolerance of  $\pm .001$ -inch). This slitting is done on special machines which not only permit slitting in such narrow widths to such close tolerances, but which also insure clean-cut edges that are free of ripple.

This ultra-thin precision gage metal strip has already been produced to meet special needs in the automatic control, electronics, and atomic energy fields. This strip is especially applicable:

- (1) Where exact thickness and precise metallurgical properties of thin metal discs (diaphragms) are required to insure accurate calibration and freedom from hysteresis in instruments or control devices. (Ex. — air-operated valve positioners, air relays, etc.)
- (2) In high speed production processes using thin metal strip raw materials, where the strip's close-tolerance dimensions and as-specified metallurgical properties insure easy stamping and a low percentage of rejects. (Ex. — light-gage metal springs; laminated shims; feeler gages, etc.)
- (3) In manufacture of tape-wound magnetic cores or sheaths, where precise thickness and metallurgical properties of the tape are required to produce desired electrical or magnetic performance characteristics. (Ex. — computer memory cores; magnetic delay lines; distributed-constant electrical components.)



● Upper left: Rolling extra-thin, precision gage metal strip on specially designed Sendzimir mills. Lower left: Slitting equipment shown can slit extra-thin metal strip in ribbons as narrow as .040".



## WARD LEONARD COMES TO CANADA

All the experience, manufacturing techniques, engineering and research facilities of the WARD LEONARD ELECTRIC COMPANY of Mount Vernon, New York are now an integral part of WARD LEONARD OF CANADA LIMITED a wholly owned subsidiary of the parent American company.

WARD LEONARD OF CANADA are now engaged in the manufacture of Ward Leonard Electric Control Devices as well as Esco Rotary Switches. We shall continue to handle the sales and distribution of Statter Oil and Air Circuit Breakers, Kenco Pumps, Esco Electro Switches, Barkelew Switches and Esterline Angus Recording Instruments.

WARD LEONARD OF CANADA LTD. are the sole Canadian representatives for Saft . . . the world leaders in the Nickel Cadmium field.

This advent into the Canadian industrial scene brings with it the pledge to maintain the integrity and fine reputation that our parent Company enjoys in the U.S.A.



### WARD LEONARD OF CANADA LTD.

1070 Birchmount Road,  
Box 70, O'Connor Postal Station,  
Toronto 16, Ontario.  
Telephone PL. 7-4131.

Precision punched parts from laminated plastics are finding increasing applications in the electrical and electronic industries, such as in printed circuitry, electric motors, electronic controls, and numerous components of radio or television sets. In the manufacture of such parts, punching is generally done with standard power-driven presses. Certain basic principles of punch and die design, however, should be carefully followed to insure optimum production rates and required precision in the punching operation. . . . .

# Punch And Die Design Principles for Laminated Plastics

by

E. C. GRAESSER

Chief Engineer of Quality Control and Application Engineering  
National Vulcanized Fibre Company, Wilmington, Del.

**I**N THIS article, basic factors to be considered are reviewed and discussed briefly as a guide to tool and die designers. Approximate dimensional correction factors for proper die design are given and their use is explained by means of a specific example with illustration.

Basic factors to be considered in punching of laminates include:

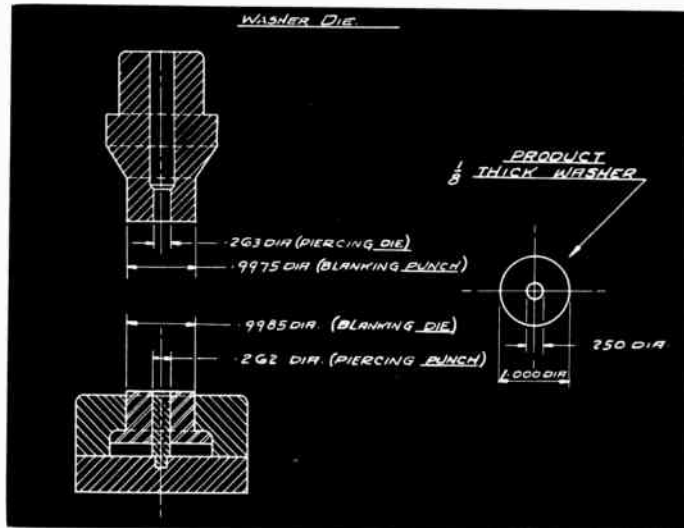
- (a) thickness of the stock
- (b) grade of the material
- (c) size and proportions of the finished piece
- (d) quantities to be produced
- (e) whether grade used is best punched by cold or hot punching methods
- (f) dimensional tolerances required.

**Thickness of Stock:** Some laminated Phenolite punching grades can be punched cold in thicknesses up to  $\frac{3}{32}$  inch. Harder grades require heating in thickness from  $\frac{3}{32}$  inch and up.

**Grade of Material:** Phenolite laminated plastics are available in more than 40 different grades — each with a different set of electrical and mechanical properties. The group, in general, is composed of various combinations of fibrous materials — such as paper, cotton fabric, nylon, asbestos, or glass fabric — impregnated with phenolic, melamine, or silicone thermosetting resins. The tool and die designer, therefore, must know the grade of material to be punched, so that he can design the die accordingly.

**Size and Proportions:** The factor of size and proportions of the piece being manufactured influences the basic punch and die design. In good punching practice the edges of the piece should not be closer to the edge of the strip than twice the thickness of the sheet. The hole should not be smaller in diameter than the thickness of the sheet, and the distance between holes (or between holes and the edge of the piece) should not be less than the thickness of the sheet.

(Turn to page 28)



● Diagram showing tool and die dimensions calculated to punch a 1.000-inch diameter washer with 0.250-inch hole.

**Table I APPROXIMATE DIMENSIONAL CORRECTION FACTORS FOR PROPER DIE DESIGN**

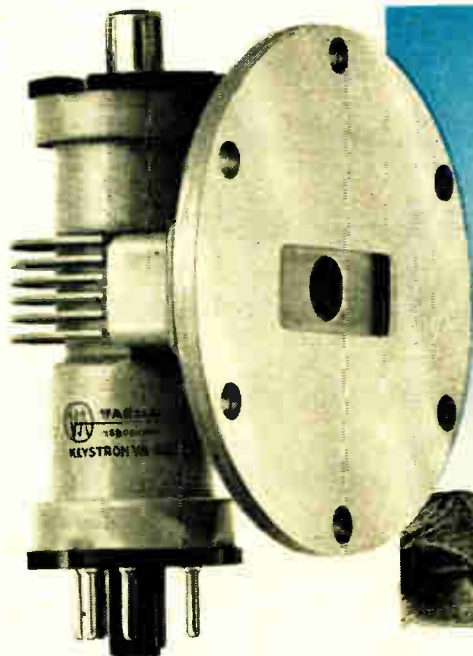
(For paper and cotton fabric base grades of Phenolite)

Material Thickness, Inch	Blanking Die Size Smaller Inch		Piercing Punch Size Larger, Inch	
	Cold Punched	Hot Punched	Cold Punched	Hot Punched
$\frac{1}{32}$	0.002	0.000	0.002	0.003
$\frac{1}{16}$	0.004	0.0015	0.004	0.007
$\frac{3}{32}$	0.004	0.0015	0.0065	0.010
$\frac{1}{8}$	0.004	0.0015	0.009	0.012
$\frac{3}{16}$	0.004	0.0015	0.015	0.016

- Notes:**
- To obtain best results, clearances between punch and dies should be kept to a minimum (0.001 inch maximum) and the die kept sharp.
  - For hot punching at approximately 225°F, a factor of about 0.002 inch should be allowed for each inch of length. This factor, which compensates for thermal expansion, should be used in calculating both center to center distances between punched holes and over-all length.

# NOW... the accepted standard

## of the Relay Industry!



## Varian's high performance relay klystron

It's the VA-220, another outstanding example of Varian design leadership... research and product engineering that brings you optimum reliability plus performance characteristics unsurpassed by any other relay klystron.

UNSURPASSED  
FOR EVERY  
RELAY APPLICATION

Microwave relay system designers and equipment buyers have long known that Varian relay klystrons are unmatched for frequency stability, power to override noise, reliability and long life. The VA-220 gives you performance that even exceeds the high standards set by Varian X-26 klystrons... at half the cost.

In the 6000 - 8000 megacycle band, VA-220 klystrons will consistently outperform all others. Here are six reasons why this sensational new klystron is your best buy for all relay applications:

THESE ADVANTAGES  
MEAN TOP PERFORMANCE

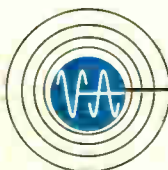
- **Greater Power**—VA-220 high power klystrons are conservatively rated. They will deliver more than rated power without failure.
- **Greater Frequency Stability**—VA-220 klystrons have negligible frequency drift.
- **Greater Uniformity**—Varian mass production techniques assure uniformity—every klystron is as reliable as a nut and bolt.
- **Longer Life**—VA-220 klystrons can be operated at full power for thousands of hours.
- **Less Distortion, Less Noise**—FM distortion and inherent noise are negligible—60 db below a 1-megacycle deviation.
- **Lower Cost**—VA-220 klystrons cost far less than any other relay klystron with comparable performance characteristics.

TYPE	FREQUENCY RANGE	RESONATOR VOLTAGE	POWER OUTPUT	BANDWIDTH	MODULATION SENSITIVITY
VA-220*	5925 - 7425 mc	750 v	1.2 watts	35 mc	375 kc/v
*VA-220 B, C, D, E and F each cover a frequency range of approximately 300 mc					

FOR COMPLETE SPECIFICATIONS

... and technical data on the VA-220 and other Varian klystrons, write to the Varian Application Engineering Department today.

THE  
MARK OF  
LEADERSHIP



**VARIAN associates**

OF CANADA, LTD. • GEORGETOWN, ONTARIO

KLYSTRONS, TRAVELING WAVE TUBES, BACKWARD WAVE OSCILLATORS, LINEAR ACCELERATORS, MICROWAVE SYSTEM COMPONENTS, R. F. SPECTROMETERS, MAGNETS, MAGNETOMETERS, STALOS, POWER AMPLIFIERS, GRAPHIC RECORDERS, RESEARCH AND DEVELOPMENT SERVICES

ELECTRONICS & COMMUNICATIONS, OCTOBER, 1956

For further data on advertised products use page 109.

Despite the skills and cautionary measures employed in present-day manufacturing processes stringent demands of customer requirements for peak quality have led manufacturers to establish tighter inspection techniques in their plants. . . .

## Inspection Technique Halves Instrument 'Bugs'

**T**O INSURE quality that is built, not inspected, into its instruments, a leading American manufacturer of electronic equipment has launched a Statistical Quality Control program at one of its manufacturing plants. The method is new in electronic manufacturing and combined with the company's regular production-flow inspection techniques it is claimed to have cut by 50 per cent the possibility of defects in finished instruments.

Statistical Quality Control independently covers the plant's seven regular inspection points in the manufacturing process. Quality levels are plotted on special charts to provide a continuous picture of conditions at every stage.

If the number of defects jump in a particular operation, it shows up immediately and can be investigated. A marked decrease in defects at any stage also is checked to see if regular inspection procedures have failed.

In addition, chart statistics can be compared with quality levels at other companies and military organizations, to indicate where production methods might be improved.

Both statistical quality controllers and regular inspectors check out products at seven stages beginning with inspection of parts received from

outside suppliers.

Fabricated and machined parts are in-process controlled, beginning when the first part of a set-up comes off the machine. At regular intervals during the production run, new samples are tested so that if a defective part is found, production can be stopped for corrections.

Assembly inspection follows a similar pattern, with mid-run inspections of sub-assemblies and visual examination of each completed instrument before it is turned over for the final four testing stages.

Electrical inspection includes 40-hour "cycle" aging (with power turned off and on at automatic intervals to bring out any defective or weak components in the finished products) and final calibration and adjustment to conform to specifications.

Next the instruments are turned over to the final visual inspectors who scrutinize it for foreign particles, mechanical damage, etc. before installation in cabinets.

Once housed, each instrument is subjected to ten more aging hours and a final electrical testing against specifications. Final stage is the "finish up" station, for cleaning, general appearance, etc.

## Die Design

*Continued from page 26*

**Quantity of Run:** Construction of the die depends upon the quantity of parts being produced. For example, a less expensive, thinner die might well be designed for a "one shot" run of, say, 5,000 parts, whereas, a heavier die would logically be designed for continuous production of large quantities of the part. Cross-section of the die must be made strong enough to insure economical die life.

### *Cold vs. Hot Punching*

Some grades of Phenolite can be satisfactorily punched cold and there are growing fields of application for these — particularly for copper clad printed circuits. Here, automatic operation requires close registration of punched mounting holes for component inserters, and punching at room temperatures assures precise dimensions of holes and hole spacing.

Especially in the automation of processes involving larger boards for printed circuits (as may be used in computers, for example) precise spacing of punched holes is imperative. Until recently, certain electrical grades of laminated plastic could only be hot punched, but heating of the laminate made it difficult to hold dimensional tolerances. Expansion of the heated sheet along its length may differ from expansion across its width and varies with the material involved. A cold punching laminate now available to the trade is a practical solution to this problem.

In certain cases electrical or mechanical requirements dictate the use of hot punching laminates. The degree of heat used for punching depends entirely upon the thickness and grade of the material. Two hundred degrees F. is often enough temperature, but in some cases, up to 275° F. is required. Heat can be applied to either the material or the dies. Methods of heating include steam plates, electric plates, infra-red lamps, or ovens. When the desired temperature is reached, the material is punched immediately.

### *Determining Punch and Die Dimensions*

All laminated plastics expand when heated. When punching is done at elevated temperatures, the blanks shrink as they cool to room temperature. This would seem to indicate that the blank would be smaller than the die, but this is not true because all Phenolite yields when punched.

● Aged and aging instruments undergo rigid checking and testing techniques. Each instrument is aged 40 hours before being calibrated, adjusted etc. according to specifications.



Yielding causes the blank to *increase* in size, and by an amount more than it shrinks due to thermal expansion. Thus, the blanking die for hot punching is *smaller* by the amount shown in Table I.

In the case of cold punching, the only effect is that of yielding. The die size is even smaller than with hot punching, because there is no thermal contraction.

Similarly, due to the effects of shrinkage and yielding, the piercing punch must be sized larger as indicated in Table I. In summary, varying with thickness in stock and method of punching (hot or cold), blanking dies are smaller and piercing punches are larger. The values given in Table I are sufficiently accurate to produce parts with tolerances of  $\pm 0.003$  inch for paper and cotton fabric base grades of Phenolite.

To indicate the usefulness of Table I, blanking die and piercing punch sizes will be determined for a 1.000-inch OD washer with a 0.250-inch hole. The material thickness is  $\frac{1}{8}$  inch and hot punching will be employed. Details of the design are indicated in the sketch, Fig. 3.

- (a) Blanking Die and Punch  
Diameters  
1.000 diam  
-0.0015 (factor from Table I)  
0.9985 diam (blanking die)  
-0.0010 (maximum die clearance)  
0.9975 diam (blanking punch)
- (b) Piercing Die and Punch  
Diameters  
0.250 ID  
+0.012 (factor from Table I)  
0.262 diam (piercing punch)  
+0.001 (maximum die clearance)  
0.263 diam (piercing die)

Sufficient experience has been gained to prove beyond a doubt that plastics provide certain advantages when used properly. Either hot or cold punching operations for laminated plastics produce precision parts if all basic factors are considered.

The Editor,  
Electronics and Communications.

I note in the Business Briefs and Trends column of the August, 1956, issue of ELECTRONICS AND COMMUNICATIONS a forecast attributed to me "that professional musicians will be wiped out by electronic imitators".

Such a forecast requires qualification, and I do not and did not predict that audiences would cease ultimately to demand 'live' music, the essence of which is a professional musician. In the case of reproduced music, I did say that it is *possible* that the composer's score will be fed into an electronic machine and reproduced directly without the intermediate interpretation of a professional musician. Indeed, it is now possible to do this, but I question if the practice will become general.

(Signed) B. G. BALLARD  
National Research Council

## TAKE A LOOK!

You'll Find The Successful  
Business Man Reading The  
Publication In His Field. . .

Electronics & Communications is  
THE Canadian Publication in  
Your Field.

The Crest of  
Good Living  
comes to  
New York



The  
*New Yorker*

JOSEPH MASSAGLIA, Jr.,  
President  
CHARLES W. COLE,  
General Manager

34th Street at  
Eighth Avenue



<p>HOTEL <i>Miramar</i> and Bungalows SANTA MONICA, CALIF. WILLIAM W. DONNELLY, Manager</p>	<p>HOTEL <i>Raleigh</i> WASHINGTON, D. C. JOHN F. SCHLOTTERBECK, Manager</p>
<p>HOTEL <i>Sainte Claire</i> SAN JOSE, CALIF. STEEN WEINOLD, Manager</p>	<p>HOTEL <i>Bond</i> HARTFORD, CONN. GRIFFITH R. DAVIES, Manager</p>
<p>HOTEL <i>Wilton</i> LONG BEACH, CALIF. ALVIN C. MOEHLER, Manager</p>	<p>HOTEL <i>Sinton</i> CINCINNATI, O. JOHN SCHEIBLY, Manager</p>
<p>HOTEL <i>El Rancho</i> GALLUP, N. M. MARTIN L. HANKS, Manager</p>	<p>HOTEL <i>Sherwyn</i> PITTSBURGH, PA. MURREL F. VAUGHN, Manager</p>
<p>HOTEL <i>Franciscan</i> ALBUQUERQUE, N. M. FOY D. SENN, Manager</p>	<p>HOTEL <i>Park Lane</i> DENVER, COL. MILTON J. FRAMPTON, Manager</p>

and in HAWAII . . . WAIKIKI *Biltmore* HOTEL  
RICHARD D. SCHOFIELD, Manager HONOLULU

CHICAGO MIDWEST HEADQUARTERS DE 7-6344  
BOOKING OFFICE 200 E. Walton.

World-Famed Hotels Teletype Service Television

Magnetic tape's never-failing memory, more precise and more reliable than that of any human being, may well hold the key to the automatic factory. Just as magnetic tape can reproduce sound, it can also reproduce instructions to machines and the time is not too distant when the design instructions for a piece of machinery may be transmitted across oceans and continents and fed into any one of a variety of machine tools enabling it to produce a precision machined component from blueprints thousands of miles away. . . .

# Magnetic Tape And Automation

More accurate than human operators.

**R**EFERRED to variously as cybernetics, automatic control and control engineering, the science of automation and robot machines promises to be today's industrial revolution.

Take a chemical plant. A man might look at the day's expected production figures from the sales office. He then makes the required equipment adjustments, recording them on magnetic tape. Out in the plant, an automatic valve moves a fraction of an inch. At the end of the day, the exact amount of chemicals has been produced to coincide with the sales department's needs.

Impossible? Today, yes. But so was the automatic thermostat in the living room just fifty years ago.

Three things have brought industry closer than ever before to the automatic factory.

These include:

- (1) Development of servo mechanisms, the answer to many machine control problems.
- (2) Building of electronic computers capable of providing "brains" and instructions for automatic machines.
- (3) New assembly line methods, new factories and new syn-

thetic materials lending themselves to automatic production.

Even today, the modern oil refinery is close to being an automatic operation. With only an average of seven men, a refinery can turn out some 300 barrels of oil a day. Into one end go the distillates of crude oil, through the catalytic cracker, and out the other end as the finished product.

In the metalworking industry, however, and others where the routine is less well established and less uniform, the problems are many times greater. Here is where magnetic tape may provide the answer.

An example is General Electric's "Record-Playback" control method using a tape recorded "program" to run metalworking machines. The equipment follows instructions on magnetic tape.

These are first put on the tape by linking the recorder to the particular machine and recording its motions, settings and operations as they are done once, manually.

Once the series of steps are on tape, the machine will repeat faithfully the entire operation with no variation . . . something no human operator can do.

Conventional machine tools are not always best suited for automatic control and sometimes the tool itself must be rebuilt or redesigned to serve best in an automatic operation.

One of magnetic tape's advantages as an ideal memory for controlling machines and processes is the fact that it is compact and easily stored. Another is that it always is the same and errors are not introduced into the work. Tapes can be easily duplicated, so many tapes operating many machines can be used. Changes in the design of the particular work piece can be made by cutting the magnetic tape and splicing in new sections, as well as erasing old sections.

As General Electric points out, because the magnetic tape is a complete record of each movement at every instant of the program, or operation, smooth, stepless contours are reproduced with relatively simple equipment.

A one-hour or a half-hour program may be produced from a standard 10½-inch diameter tape one-inch wide. A 14-inch diameter reel will direct a one-hour operation. For still longer programs larger reels or several smaller reels can be used. Even a sound channel for oral instructions for the machine intended can be incorporated in the system.

In addition to recording the pattern on tape by actually having an operator machine the part while the tape is initially recorded, there are other methods of programming which are possible. One of them is tracing. A tracer head may be mounted in place of the tool and a sample part or template used in place of the workpiece. The tape then records the machine motions and switching operations as directed by the tracer control and operator.

Another method, still in the development stage, is the system whereby a control follows the lines of a drawing, directly recording the motions on tape without setting-up the machine.

One of the applications for the General Electric unit has been automatically machining aluminum into thin contoured sheets to provide a tough, yet perfectly formed, skin for jet aircraft.

Automation is by no means limited to the machine tool field. The animated display in the corner store with a voice on magnetic tape is one example. Recently developed automatic elevator announcers . . . tape recorders which tell you to hurry up if you don't get off fast enough . . . are another. One firm manufactures a conveyor belt system which is completely programmed and controlled by magnetic tape.

In addition to providing loads of fun, magnetic tape has found its place in today's remarkable age of atoms and automation.

ask about Amp's **C**reative **A**pproach  
TO BETTER WIRING

More  
Confidence ...  
Less  
Expense  
with

**A-M-P**

## Taper Technique

A-MP Taper Pins, Taper Bloks, Taper Tips, Taper Tabs and Taper Tab Receptacles offer great freedom of circuit design and insure maximum electrical stability.

They cut material cost . . . cut labor cost . . . and reduce assembly time. Taper Technique is benefiting manufacturers of business machines, aircraft, guided missiles and electronic equipment.

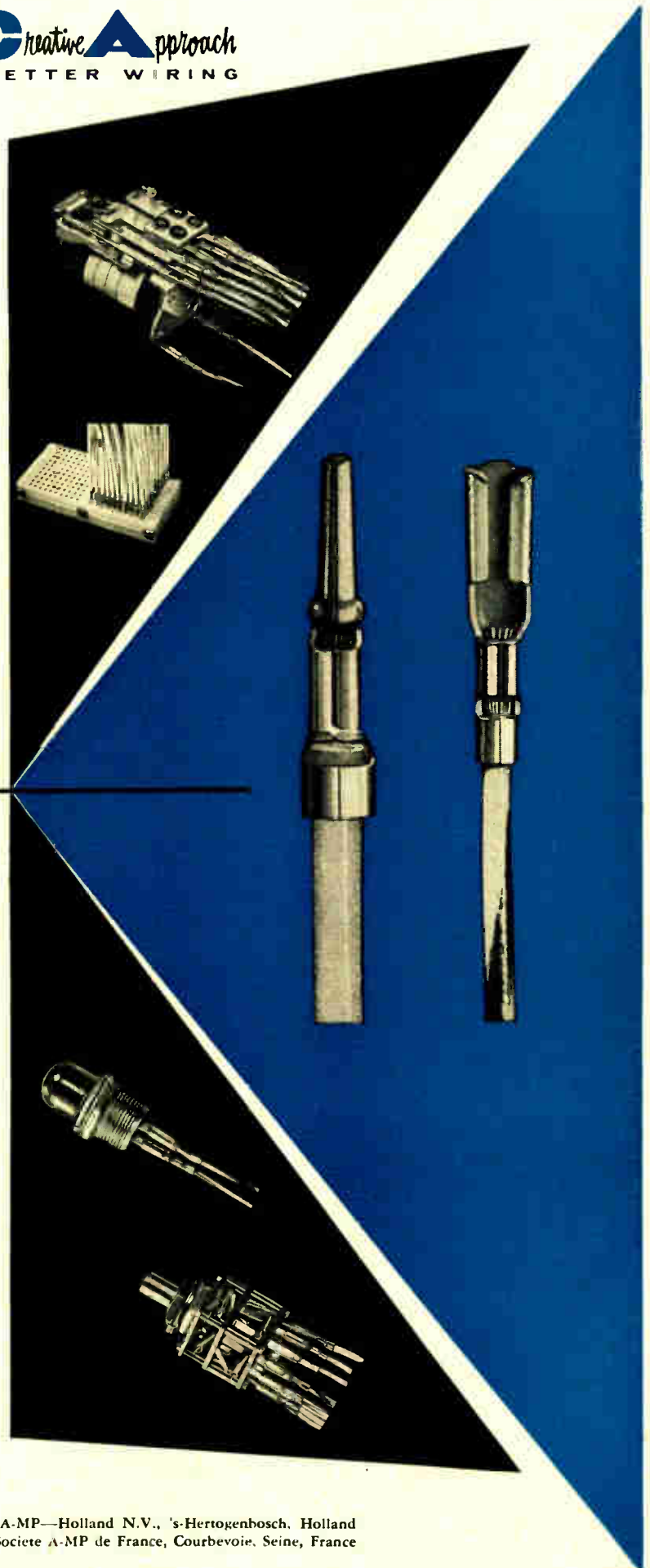
You, too, can benefit by the A-MP Taper Technique. Consult your local A-MP salesman or write to Harrisburg.

**A-M-P**

©A-MP 1956

Aircraft-Marine Products of Canada, Ltd.  
1764 Avenue Road  
Toronto 12, Ontario, Canada

Aircraft-Marine Products, Inc., Harrisburg, Pa., U.S.A. • A-MP—Holland N.V., 's-Hertogenbosch, Holland  
Aircraft-Marine Products (G.B.) Ltd., London, England • Societe A-MP de France, Courbevoie, Seine, France



# Dental Surgery Televised First Time In Canada

**M**ORE than 150 members of the medical and dental professions gathered in the amphitheatre of the Montreal General Hospital recently and watched dental surgery being performed on television for the first time in Canada.

Under the auspices of the McGill University Faculty of Dentistry and the Montreal Endodontia Society, Dr. Louis I. Grossman, internationally famous dental surgeon from the University of Pennsylvania, conducted a one-day refresher course in endodontics and root surgery.

The event was made possible by RCA Victor Company Ltd., which supplied the equipment. It featured a closed circuit linking the tiered, fan-shaped auditorium with the operating room two floors below.

A coaxial cable feeding into six 21-inch TV sets connected Dr. Grossman with his audience, and viewers were able to ask questions by means of a microphone in the amphitheatre. According to the sponsors, this brought to the audience greater detail than has ever before been possible.

Two cameras and a control monitor were set up in the operating room. One of the cameras, fitted with a Zoomar lens, focussed on the operation, and the other on X-rays of the patient.

The Zoomar was a key factor in demonstrating to the group of dentists and doctors TV's effectiveness as an educational medium.

Widely used in commercial television, this lens brings close-up pictures of backfield action during a football game, or of a baseball player fielding a long fly ball. In dentistry, it can fill the entire TV screen with a picture of a tooth, bringing to the

● *Upper right:* A new teaching tool was recently unveiled at the Montreal General Hospital, as dental surgery was performed on television for the first time in Canada. Dr. Louis I. Grossman, *right*, is shown operating at the General, as one camera focusses on the patient and a second on X-rays.

● *Lower right:* Six 21-inch TV sets were set up in the amphitheatre to carry the picture.

The growing significance of closed circuit television for use in medical and dental education has been amply demonstrated for the first time in Canada, bringing to the audience greater detail than has ever before been possible. . . .

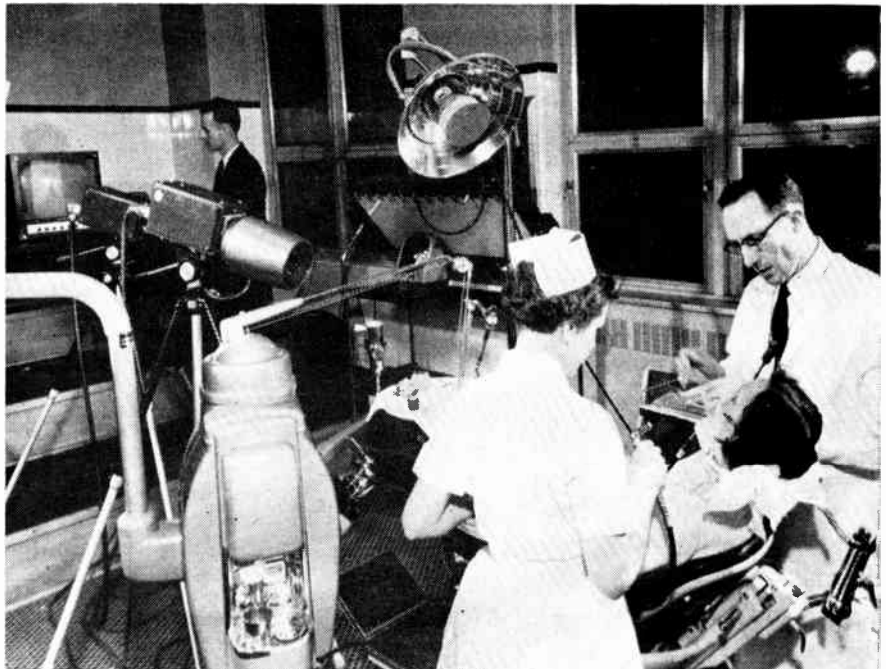
audience detail which even the surgeon himself lacks.

F. R. Deakins, president of RCA Victor, said the showing reflected a growing trend toward use of TV for other than commercial purposes.

"Many hospitals and medical schools are looking into the possibilities of using television as a teaching aid, in consultation and diagnosis, and

in medical research," he stated. "We think it has a very bright future, perhaps even more so in color than in black and white because color gives greater realism."

Dr. Grossman was guest clinician in two televised operations at the General on May 14th, one in the morning and one in the afternoon. Both had to do with root therapy.







# Reduce Operator Fatigue

for increased, day-long  
efficiency

Install these comfort-  
able chairs with  
the "personalized" fit

*Telephone operator chairs specially built  
by Harter to Automatic Electric specifica-  
tions. They reduce fatigue—increase  
working efficiency!*

Improved features of these chairs ensure comfort and improved working efficiency for all operators on all types of switchboards. Seat height is easily changed by the operator. And a simple screw-spindle adjustment and two convenient hand-wheels provide vertical and horizontal backrest adjustments to suit the individual.

Fully molded foam rubber seat gives permanent comfort and the padded backrest provides firm, day-long support. Seat and back are upholstered in "Tolex" vinyl-coated fabric. This material is tough and water-proof, yet resilient and flexible. It never gets tacky.

Standard upholstery colour is brown. Green and maroon can be supplied if desired. Metal parts on the standard chairs are enamelled, mahogany in colour, except the foot ring, which is chrome-plated. Castors are ball-bearing type with replaceable 2-inch soft rubber treads. The standard chairs are equipped with swivel glides.

Chairs may be equipped with saddle type cane seats on special order.



CAT. NO. CS-3311



CAT. NO. CS-13307

For further information write or phone:  
Exclusive Canadian Distributor

## **AUTOMATIC ELECTRIC**

**SALES (CANADA) LIMITED**

Head Office: 185 Bartley Drive, Toronto 16  
MONTREAL • OTTAWA • BROCKVILLE • HAMILTON  
WINNIPEG • REGINA • EDMONTON • VANCOUVER

5556

The increasing complexity and number of electronics components with which manufacturers now have to deal has led to the necessity of providing some means of control and standardization with the result that many companies have established special divisions to assist their engineering departments in the selection of suitable components and sub-assemblies. At Canadian Westinghouse, savings of from \$6,000 to \$13,000 have been noted on specific projects as the result of the company's recently established Materials and Standards Section. . . .

## Control Section Aids Electronic Design

**I**NCREASED sales, growing staff and facilities are the obvious indications of company expansion that rate the headlines. However, expansion of services within a growing organization are the signs that reveal something is being done to keep quality and control in step with growth.

Just such a move took place at Canadian Westinghouse recently when increased demand for specific engineering services within the Electronics Division caused the formation of a new section known as the "Materials and Standards Section". In a sense, the two major services — "Standardization" and "Technical Information" — under the control of the new section are designed to ease the growing pains of this fast-expanding division of Westinghouse.

The standardization phase of the section is responsible for reducing to a practical level, the almost endless variety of parts, materials and processes that in the absence of some such control will inevitably come into use in the design and manufacture of

electronic equipment. It is therefore the function of the Materials and Standards Section to provide all engineers and layout draftsmen with a Standards Book, from which their initial selection of component parts,

materials and processes must be made.

The many complicated details involved in the procedure for ascertaining if a particular item should be considered as a "standard" is initially conducted by the section. If after thorough investigation and evaluation covering cost, applications, availability and performance, a new standard seems feasible, the relevant details of the item are drafted into a proposal and submitted for final approval to a committee comprised of engineering and manufacturing representatives of all departments in the Electronics Division. It will be appreciated that when the committee level is reached most of the technical problems have already been solved by the section and consequently the committee's activity is essentially an approving one.

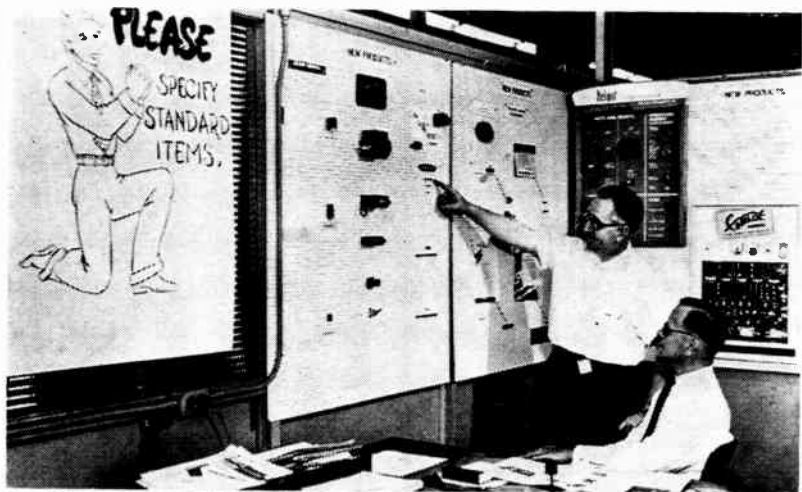
The standardization investigations are conducted on a very practical level that cannot possibly be described as an "ivory-tower" approach. Every component under consideration is discussed with the people involved and sometimes the trail leads right to the girl assembling the part on the production line.

At the moment, a material control program is underway to consider stocking certain standard items under a statistically evaluated minimum-maximum inventory control in the production storeroom. This will help eliminate special purchase orders to prevent job end shortages due to shrinkage and breakage. It will reduce paper work and costs in the purchasing department previously brought

(Turn to page 38)

● *Upper right:* The display of new equipment is an important feature of the Materials and Standards Section. Engineers and draftsmen come into the office and discuss requirements.

● *Lower right:* Engineer using filing cabinets is checking on component listings and information. Information on all products is filed in the cabinets and can be sent through the mail on request of engineers or draftsmen.



# RIGHT ARM of industrial research

Sanborn's galvanometer writing arms record valuable data to help solve the countless measurement problems of research, design, and production testing.

**S**INGLE to 8-channel inkless and permanent recording in true rectangular coordinates of 0-100 cps phenomena — ranging from telemetered aircraft data to atomic reactor characteristics — is the vital and growing role of Sanborn oscillographic recording systems in industry. The Sanborn file of users indicates that such recordings are aiding in the dynamic analysis of jet engine starters, machine tools, agricultural machinery and oil drilling equipment; performance of pilotless target aircraft, modern submarines and tracking radar systems; and the production testing of servo components, valve positioners and precision potentiometers. Sanborn systems designed especially for recording analog computer output extend applications further — in simulated flight set-ups, solution of complex problems with six or eight variables, etc.

The advantages of making Sanborn equipment the "right arm" of your recording problems include extreme *flexibility*, by means of a dozen different interchangeable, plug-in "150 Series" preamplifiers which quickly and economically adapt a basic system to changing requirements; choice of 1-, 2-, 4-, 6- or 8-channel systems, in vertical mobile cabinets or "portably packaged"; numerous chart speeds, many individual channel controls, and high over-all system linearity.

To see how oscillographic recording the Sanborn way can become the "Right Arm" of your analysis work, write for detailed information or contact your Sanborn Representative. Sixteen-page "150 System" catalog on request.

## SANBORN COMPANY

Industrial Division, Cambridge 39, Mass.



8-, 6- CHANNEL



4-CHANNEL



2-CHANNEL



1-CHANNEL



2-, 4-, 6-, 8-CHANNEL  
ANALOG COMPUTER SYSTEMS



Engineers in charge of construction of the two massive dams at Barnhart Island and the Long Sault Rapids site of the huge St. Lawrence River Power Project maintain a constant vigil of progress through the medium of television.

# The Construction Industry

FOR the first time in dam construction history, television is being used to supervise work taking place over an area of many miles. Television plays this key role at two massive dams under construction by the Power Authority of the State of New York and the Hydro-Electric Power Commission of Ontario at Massena, New York, on the St. Lawrence River. General Precision Laboratory cameras scan the 3230' Barnhart Island Power Plant Dam and the 2350' Long Sault

Dam and Raytheon KTR television microwave relays transmit the television signals more than three miles to the Resident Engineer's office.

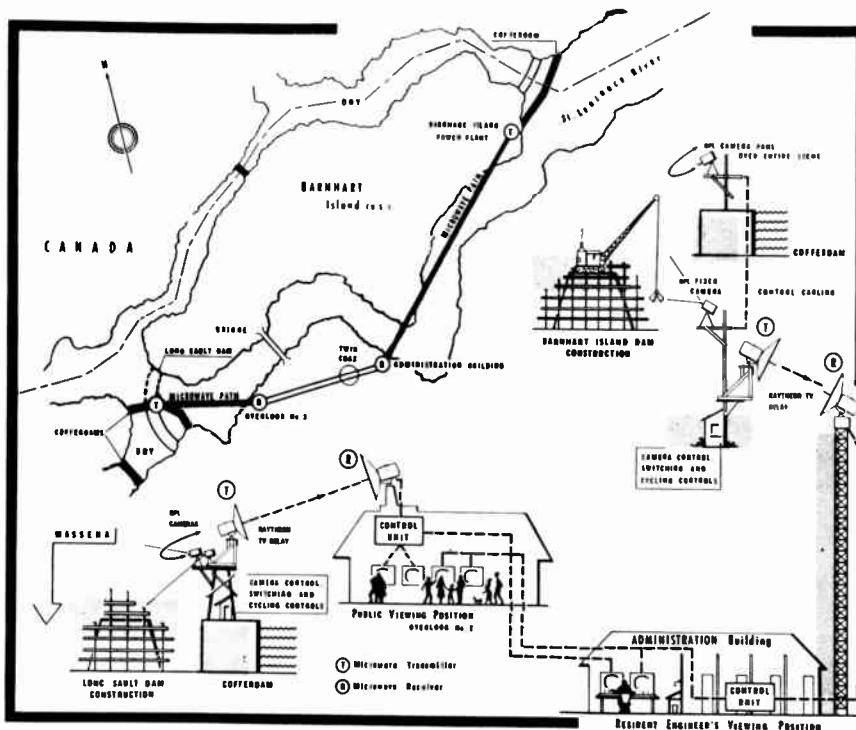
The television system set-up is as follows: At both dams two vidicon camera chains are used. The Barnhart installation has one fixed and one scanning camera, while Long Sault has two fixed cameras viewing two different angles. The fixed unit looks across the entire dam site. The other camera, equipped with a telephoto

lens and a remote pan and tilt unit, slowly scans a 120° arc. The fixed cameras are on for 30 seconds and alternate with the scanning cameras which have a one minute cycle. All four cameras are housed in weather-proof enclosures. Video signals from the camera chains are transmitted by microwave relays to the administration building where the project is continuously in view over two monitors. The Long Sault link operates at 6750-6775 mc with a path length of 0.52 miles and the Barnhart Island system at 6850-6875 mc; 2.94 miles. Four foot dishes are used on transmitters and receivers. The resident engineer is in contact with the work sites by two-way radio and can route supplies, equipment and manpower as needed.

Because this \$600,000,000 power project is so extensive, the size of two dams and the distance between them so great, only television makes possible a continuous and convenient survey of the entire development. A few minutes of observation of the television receivers is equal to several hours travel to construction sites. Savings in time and cost resulting from the use of television are considerable.

Raytheon microwave links are used rather than co-axial cable for transmitting the television signals for a variety of reasons. The path of the signals must cross water at several points and cable would either have to be buried or hung on poles. This is unsatisfactory because of the possibility of accidental damage while maneuvering large construction equipment. The microwave system is less costly and is not affected by crossing water or the movement of heavy machinery. If necessary, the location of the Raytheon units may be readily altered.

The television installation was set up by Raytheon Manufacturing Company, Waltham, Massachusetts; General Precision Laboratory, Inc., Pleasantville, New York and the Power Authority of the State of New York.



● For the first time in dam construction history, television is used to supervise construction work on a project covering several miles. The unique TV installation is at the massive dams being built by the Power Authority of the State of New York as part of the St. Lawrence Seaway development. At both the 2350' Long Sault and 3230' Barnhart Island dams, two cameras are in operation. At each dam, one camera is stationary and looks across the entire site; the other, equipped with a telephoto lens, scans a 120° arc. The fixed and moving cameras are automatically switched. Television signals are transmitted by microwave relays to the resident engineer's office where a few minutes' observation of the TV monitors is equal to several hours' travel to the work sites. In addition to the television sets watched by the resident engineers, the televised construction activities are screened for public viewing at an overlook.

# Stock Delivery!



**NEED ONE CARTON?**



**...OR FIFTY?**

... you can always count on quick delivery of

## *magnet wire*

from

# CANADA WIRE

Whatever amount of magnet wire you need... a single spool, a carton, or fifty, Canada Wire is equipped to give you quick service always and emergency service when you need it. You save the space and expense of carrying large stocks... you have one convenient source of supply for all types and sizes. ... you are always sure of highest quality, from Canada's largest manufacturer of wire and cable products.



### MAIL COUPON FOR CATALOGUE

EC10

Sales Promotion Department,  
Canada Wire and Cable Company Limited,  
Postal Station "R",  
Toronto 17, Ontario.

Please send me your Magnet Wire catalogue M52.



Name.....

Company.....

Address.....

City..... Prov.....

56-18

## CANADA WIRE & CABLE COMPANY



Factories: Toronto, Montreal, Fort Garry, Vancouver  
Sales Offices from Coast to Coast

# Electronics In Practice

TWO recent applications of ultrasonic testing are claimed to have been the first in their respective countries.

One application concerned ultrasonic testing on the Toronto General Hospital extension. The Toronto General is undergoing a twenty million dollar building expansion which will almost double its present facilities. About 2,900 tons of steelwork have been required for the new extension and all this steel was completely shop and field welded.

After several months of experimentation with various types of non-destructive weld tests consulting engineers specified that ultrasonic testing be used. The experiments were carried out in co-operation with the consulting engineers and fabricators of welded structures in the Toronto area.

The application of ultrasonic testing to the welded joints on the hospital addition is believed to be the first of its kind in this country. A lightweight portable supersonic flaw detector was selected as being the

most suited for working on open steel-work high above ground level. It is easily carried by one man and operates on power generated by a small unit on the ground.

With training the operator can distinguish porosity, slag inclusions, and cracks, and determine the extent of such discontinuities in the weld metal. The quality of the butt welds between beams and columns is of primary concern, calling for the use of an advanced method of non-destructive testing.

The second application using the same instrument is part of the regular routine inspection in the manufacture of Hot Dip Galvanised metal window frames.

The completed steel frames are dipped into a hot spelter bath to effect final galvanising.

The spelter baths are approximately 5' x 10' and 9' deep, built of 2" mild steel with a brick flue surround. The furnace is oil fired.

Over a period the hot spelter affects the bath plate. Consequently the liquid is pumped out of one bath into an-

other and the empty bath is examined with particular regard to the thickness of the bath plate. Before the introduction of the Flaw Detector to this type of testing, the complete brick-work of the bath was dismantled and the thickness of the bath plate examined and tested physically. Thin spots thus detected were welded over and the bath rebuilt, a lengthy operation.

Nowadays the use of ultrasonic flaw detectors reduces the measuring procedure to about a day or a day and a half.

At regular intervals the bath is taken out of service, emptied and cooled. The lining is marked off by vertical chalk marks into sections. The engineer then takes the flaw detector into the tank and tests the thickness of the bath plate at various points within the marked out sections.

The results are entered on a chart and the complete results are plotted and compared with previous figures.

Sectors showing reduced thickness are given closer examination with the flaw detector. Thin places are then welded up to the required thickness and the tank is again ready for use. It has been out of commission for only a few days, no dismantling has been required, and the minimum of labor used.

## Design Control (Continued from page 34)

about by frequent small quantity orders and effect a cost reduction through quantity discounts on large orders, and the avoidance of "minimum order" penalties. The "in-stock" availability of the same parts for development, prototype and production units will also mean substantial saving.

### *Important Economics*

Already savings from \$6,000 to \$13,000 have been noted on specific projects. As an example, bulk stocking of hook-up wire will affect a per-annum saving of \$6,000 at the specifications and stock order level. This was made possible by the study of the new section.

The intent of the new section is not to impose limitations upon the engineer's or draftsmen's freedom of selection. It was formed to cut valuable engineering time that was being spent investigating, locating and approving "bread and butter" components, materials and processes. In the past, it was not uncommon for two engineers in different departments to be investigating the same part and talking to the same salesman. Now all salesmen are initially channeled through the Materials and Standards

Section and engineers within the division working on similar problems are brought into contact with each other when necessary.

An engineer wanting details on a part, checks an index card system in his department that lists both part and manufacturer by number. He makes his request to the Materials and Standards Section by phone giving the index number he wants. The material, which is generally catalog and technical data, is taken from the section file, and pertinent information from laboratory reports are added to it, although the actual lab reports are never sent out in the circulating file.

These various reports, which sometimes include an engineer's personal findings, are the hard core center around which the "Technical Information" aspect of the new section is built. This section is responsible for the dissemination of technical data on new components, equipment and processes throughout the entire division. It is done through the medium of a monthly bulletin entitled "Product News", or by special internal mailings to a supplied list.

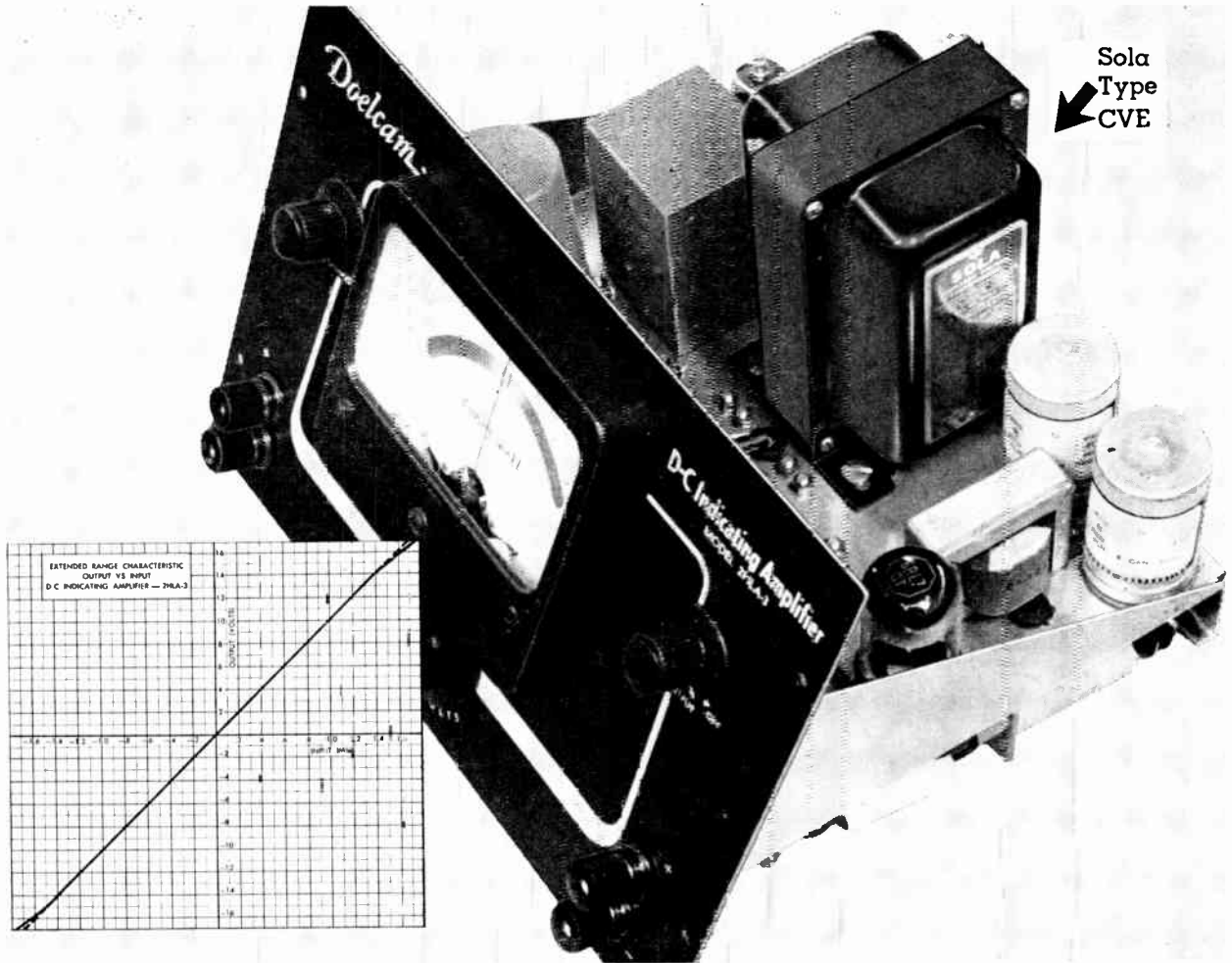
This group has started a wallboard

display of all the latest electronic parts offered by various suppliers. Engineers from all departments in the Electronics Division are encouraged to come in and stroll around to keep up to date on the newest products and equipments. Items mentioned in "Product News" are tied in with the bulletin in one of the display boards.

This aspect of the new section is heartily endorsed by suppliers who are anxious to send samples for study and display. The various manufacturers now know their parts are being noticed and well used and appreciate the "one-call only" feature now being presented.

Also available through this "Technical Information" group to both manufacturing and engineering departments are the sources of special components, substitution for specific applications and the establishment of component and materials evaluation programs when necessary for standardization activities.

The number of engineers and draftsmen who are already making use of the service and facilities of the new section, indicate the unique new venture is successful at Westinghouse.



Sola Type CVE

Above is the 2HLA-3 Indicating Amplifier, a product of the Doelcam Division of Minneapolis-Honeywell. Housing is removed to show chassis-mounted Sola Type CVE Regulated Power Supply Transformer. Inset is an extended-range characteristic showing linear amplifier output.

## Sola-Regulated DC Amplifier Provides Reliable Measurement of $2 \times 10^{-15}$ W Signals

The Doelcam 2HLA-3 DC Indicating Amplifier has introduced a standard of performance heretofore unattainable in the field of amplification and measurement of low level dc signals. This precision instrument measures signals as small as  $2 \times 10^{-15}$  watt. High gain, excellent linearity, and negligible drift of the 2HLA-3 are unaffected by variations in line voltage or tube characteristics.

Contributing to this reliable and stable performance of the Doelcam amplifier is its chassis-mounted Sola Type CVE Regulated Power Supply Transformer. The Sola CVE static-magnetic stabilizer provides a single, compact source of plate and filament supply voltages regulated within  $\pm 3\%$ , with input voltage variations of 100-130 volts. All windings are on the same core, pro-

viding a moderately-priced unit to replace both voltage-regulating circuit, or component, as well as conventional power transformer.

These Sola transformers are available in three standard models ( $\pm 3\%$  regulation); or in special designs with regulation of one winding as close as  $\pm 1\%$ . They have no moving parts or tubes, and are completely automatic, instantaneous, and continuous in operation. In addition, they provide self-protection against short circuit, and require no maintenance.

Your area representative will be happy to provide you with information on the specific benefits of a Sola Type CVE Regulated Power Supply Transformer as a component in your product.

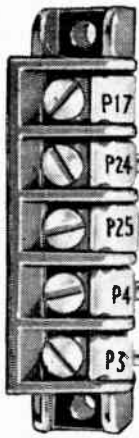
**SOLA** Constant Voltage TRANSFORMERS



Write for Bulletin 32J-CV-170D  
**SOLA ELECTRIC CO.**  
 4633 W. 16th St.  
 Chicago 50, Ill.

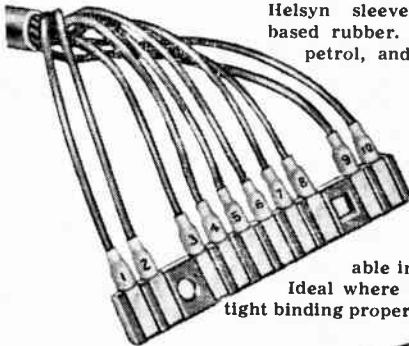
CONSTANT VOLTAGE TRANSFORMERS • FLUORESCENT LIGHTING BALLASTS • MERCURY VAPOR LIGHTING TRANSFORMERS  
 SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Blshop 2-1414 • NEW YORK 35: 103 E. 125th St., Trafalgar 6-6464  
 PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4988 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • CLEVELAND 15:  
 1836 Euclid Ave., Prospect T-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • LOS ANGELES 23: 3138 E. Olympic Blvd., ANgelus  
 9-9431 • SOLA ELECTRIC (CANADA) LTD., TORONTO 17, ONTARIO: 102 Laird Drive, Mayfair 4554 • Representatives in Other Principal Cities

mark it forever...  
with **Hellermann**



**P.V.C. Cable Markers. Bind and mark in one simple operation.**

Lengths in multiples of  $\frac{1}{8}$ ". Temperature range — 65 to +100°C. Blank Sleeves can be supplied with marking ink HJ150A for prototype marking. Printed in Canada — special attention to limited quantities.



Helsyn sleeves are neoprene based rubber. Resistant to oil, petrol, and effects of light. Temperature range adequate from Tropical to Arctic and high humidity conditions. The material is non silver staining. Lengths available in multiples of  $\frac{1}{8}$ ". Ideal where high insulation & tight binding properties are required.



Special quality elastic sleeves bind all cable ends faster and easier than ever before. Hellermann Cable Sleeves are easily and quickly applied... under tension by means of this special three pronged tool. One sleeve or a million.

USE *Hellermann* BINDING  
AND MARKING SYSTEMS!

Canadian Factory Sales

**ASTRAL ELECTRIC COMPANY**

LIMITED

44 DANFORTH ROAD, TORONTO, ONT.

**BUSINESS BRIEFS**

(Continued from page 22)

★ According to Lloyd W. Boothe, Toronto district manager, RCA Victor Company Limited, there is an immediate sales potential for television sets in 900,000 Canadian homes which are wired for electricity and located within good range of TV stations. As of July 1st it was estimated that there were 2,100,000 TV sets in homes across Canada out of a total of 3,800,000 households Mr. Boothe pointed out, describing as a myth reports that the TV saturation point had been reached.

\* \* \*

★ Philco of Philadelphia have developed a new manufacturing technique for the mass production of high speed and UHF transistors. As a result of this new technique the company now has in the engineering development stage a micro-alloy transistor and a surface barrier diffused transistor.

\* \* \*

★ Radio hams and build-it-yourself enthusiasts constitute a highly lucrative market for the transistor and the General Electric's Semiconductor Products Department in the United States have been giving this field some attention of late with the production of a high-frequency transistor which it is reported will sell for well under the two dollar mark. As early as last November the Raytheon Manufacturing Company produced a transistor for this market that sold for 99 cents.

\* \* \*

★ The Graduate School of Insurance Administration in Greenwich, Conn., has established seminars for the training of life insurance executives in the theory and application of electronic data processing equipment. According to J. Owen Stalson, director of the school, special seminars for the training of executives in other industries such as railroads, power companies and other users of electronic data processing equipment may be set up if the present course for insurance executives proves successful.

\* \* \*

★ Redifon of England, manufacturer of transmitters, were the successful bidders for the supply of transmitters to be used in conjunction with the new "meteor trail" communications system recently developed by the Defense Research Board of Canada and known by the code name "Janet". Redifon, it is reported, obtained the contract for the supply of the transmitters on the basis of quick delivery and a substantially lower cost than other bidders. Within six months of receiving the order the Redifon transmitters were in operation in Canada.

\* \* \*

★ Britain intends building at least sixteen nuclear power stations which will be generating about 2,000 MW (two million kilowatts) of electricity by 1965. The long-term plan envisages enough atomic reactors to generate 10 to 15 thousand megawatts by 1975 — saving the equivalent of at least forty million tons of coal each year.

\* \* \*

★ Three types of consumer service contracts for RCA Victor compatible color television receivers were announced on June 11 by E. C. Cahill, president of the RCA Service Company, Inc. A \$39.95 contract providing for complete installation and unlimited maintenance and service for 90 days. A \$69.95 contract providing for installation and unlimited maintenance and service for 90 days, plus service thereafter at \$7.50 per call regardless of whether the set can be serviced at its location or must be removed for repairs—and provision of all tubes and parts for a full year. A \$99.50 contract providing one-year coverage with unlimited service and parts.

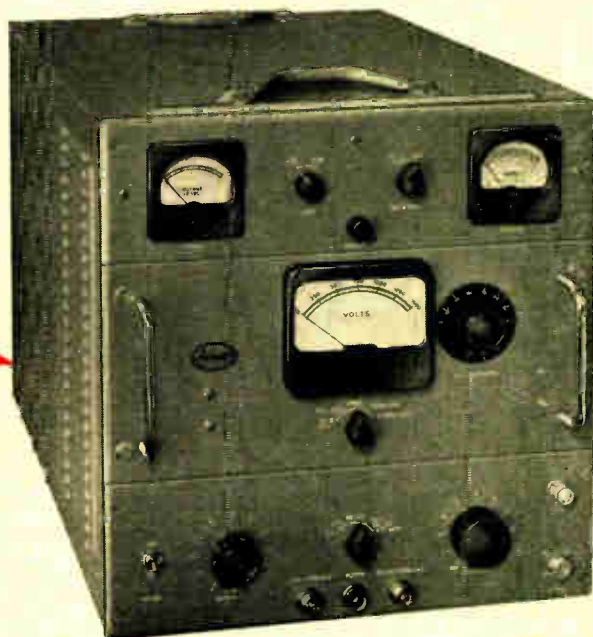


# NEW!

## MICROWAVE SWEEP GENERATOR

### 1,000 to 15,000 mc

- 7 Bands...
- Interchangeable Units...
- Stable Backward Wave Oscillators...



- Sweeps full frequency range of unit
- Rapid sweep or fixed frequency operation
  - Direct reading frequency dial
  - Power monitor and attenuator
- High power output, from 10 mw to one watt
- Pulse rise time less than 0.15 microsecond (external modulation)
  - Provision for amplitude modulation from external source
    - Internal 1000 cps and 456 kc square wave modulation
- No moving parts, assuring long equipment life and reliable operation

Polarad Model ESG Microwave Sweep Generator makes possible rapid, dynamic testing of broadband and narrowband microwave systems and components. Its operation is completely electronic, eliminating the need for point-by-point measurement. An integral variable r-f attenuator is provided with each microwave oscillator unit, and the r-f power output level is continuously monitored. This versatile instrument may be used for fixed frequency measurements. Frequency is read directly on face of meter.

*Model ESG can be used with the Polarad Rapid Scan Ratio-Scope for direct and instantaneous measurement of reflection or transmission coefficients.*

#### TEST:

receivers, amplifiers, preselectors, jammers, intercept equipment, beacons, antennas, T/R tubes, crystal mounts, fixed and tunable filters, as well as complete radar and microwave systems.

#### SPECIFICATIONS

Basic Unit: Model E-B

MODEL	FREQUENCY RANGE	POWER OUTPUT
Model E-L1	1000 to 2,000 mc	80 to 1000 mw
Model E-L2	1600 to 3,200 mc	80 to 1000 mw
Model E-S1	2000 to 4,000 mc	80 to 800 mw
Model E-C1	3600 to 7,200 mc	25 to 400 mw
Model E-C2	4800 to 9,600 mc	20 to 150 mw
Model E-X1	6500 to 11,000 mc	20 to 100 mw
Model E-X2	7500 to 15,000 mc	15 to 40 mw

Sweep Width: Continuously adjustable to full frequency range of Microwave Oscillator Unit in use.

Sweep Rate: 60 cps

Internal Modulation Rate, during Sweep Operation:

(a) 1000 cps square wave. (b) 456 kc square wave.

Modulation capabilities, during non-swept Operation:

(a) 1000 cps square wave. (b) 456 kc square wave. (c) External modulation.

Output when modulated with external pulse:

(a) Pulse rise time less than 0.15 microsecond. (b) Minimum pulse width less than 0.3 Microsecond.

AVAILABLE ON EQUIPMENT LEASE PLAN

Immediate maintenance available by field service specialists

**POLARAD**

PROVEN RELIABILITY

**ELECTRONICS CORPORATION**

43-20 34th Street • Long Island City 1, New York

REPRESENTATIVES IN CANADA: Measurements Engineering Limited, Arnprior, Ontario

# New Honeywell High Gain Weld-Seal TRANSISTORS



New rugged terminals permit easy soldering of connections without harming the transistor.

New welded case — hermetically sealed for superior ruggedness and durability.



**TYPES H5, H6, H7, AVAILABLE NOW!**

**They're welded**—so you can build new ruggedness and durability into your equipment! And the new line of Honeywell transistors gives you superior electrical performance and high, uniform power gain over a wide range of collector current values. You get long life, outstanding stability and performance. Take advantage of these new and improved transistors *now*. Mail coupon for full information today!

**A COMPLETE LINE OF POWER TRANSISTORS TO MEET YOUR SPECIFIC NEEDS.**

	H5	H6	H7
Input Resistance	24-48 ohms	27-54 ohms	30-60 ohms
Power Conductance	17.5-35 mhos	35-71 mhos	71-141 mhos
Current Gain, Median	30	40	60

(for collector current of 2 amps.)

# Honeywell



Power Transistors

HONEYWELL REGULATOR COMPANY LTD.  
DEPT. EC-TC-10, LEASIDE, TORONTO 17.

Please send data sheet TR-14 on Honeywell Weld-Seal Power Transistor

NAME .....

FIRM NAME .....

ADDRESS .....

CITY ..... PROVINCE .....

# NEWS

## Marconi Appoints A. G. Racicot As Purchasing Agent

The appointment of Mr. A. G. Racicot as purchasing agent for commercial products division of Canadian Marconi Company, has been announced by C. P. McNamara, manager of the division. Although he will be directly attached to commercial products division, Mr. Racicot will supervise purchasing for the entire company, with the exception of the broadcast and television receiver division, and the electronic tubes and components division.



A. G. RACICOT

Mr. Racicot joined Canadian Marconi Company's accounting department sixteen years ago. He was subsequently transferred to the production end of the company's operations where he received a number of promotions leading to his present appointment.

## Faster Service Provided For Airtron Customers In Canada

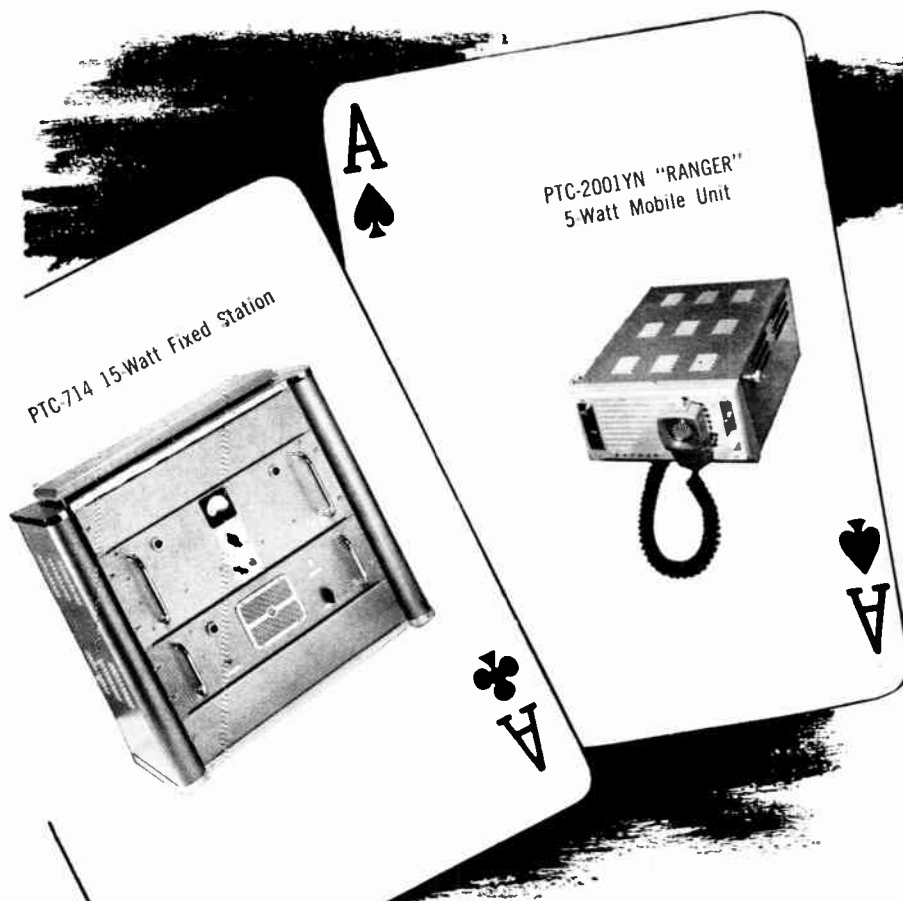
The formation of Airtron Canada Limited, a new manufacturing and sales organization, has just been announced by David Ingalls, president of Airtron, Inc., Linden, N.J.

With the new company, faster and more personalized service is now made possible for all Canadian manufacturers having use for the wide range of Airtron electronic components and aircraft accessories. W. J. Muller is in charge of production at the company's modern plant located in Renfrew, Ontario. The sales operation is handled from Airtron Canada's main office in Toronto under E. D. Smith.

The new Canadian organization is part of an aggressive expansion program currently under way at Airtron, Inc. Another recent development was the opening of a new microwave center at Cambridge, Massachusetts, devoted primarily to the research, design and production of ferrite materials and ferrite components.

Canadian manufacturers requiring information or preliminary assistance on the design, development or production of electronic components for microwave and radar systems, should write directly to Airtron Canada Limited, 300 Campbell Ave., Toronto, Ont.

(Continued on page 44)



# THE WINNING PAIR

**PTC-714  
PTC 2001YN  
AM Radiotelephones**

## **NEW** PYE 15-Watt Fixed Station and "RANGER" 5-Watt Mobile Unit

New economy—new efficiency. These are the keynotes in the new Pye PTC-714 15-watt Fixed Station and "Ranger" PTC-2001YN mobile unit. The result of 3 years intensive engineering, these new models are the first in a complete new line to be introduced by PYE. Just check these features:

**PYE 15-Watt Fixed Station incorporates:**

**NEW** simple circuitry with fewer tubes.  
**NEW** highly efficient noise limiting.  
**NEW** sensitive relay squelch.  
**NEW** unparalleled intelligibility.  
**NEW** transmitter modulation limiting.  
**NEW** RF output — over 15 watts at 160 mc.

**"RANGER" 5-Watt Mobile Unit incorporates:**

**NEW** low battery drain with simple circuitry: either 6 or 12 volt operation.  
**NEW** compactness — lightness — underdash mounting.  
**NEW** double conversion crystal-controlled receiver.  
**NEW** drawer type servicing.  
**NEW** transmitter stand-by switch.  
**NEW** RF output — over 5 watts at 160 mc., over 6 watts at 40 mc. 6 watts of Public Address Power available.

The new Pye PTC-714 Fixed Station and the Pye "RANGER" Mobile Unit is the only AM 2-way radio communication system specifically designed to meet the standards laid down by the R.E.T.M.A. and granted type approval by the D.O.T. under specifications 108 and 109. Future split channel operation is also provided for. For complete details on how the new PYE Fixed Station and "RANGER" Mobile Unit can save you money in low initial and maintenance costs, simply write us; we will be glad to forward you complete specifications.

*Watch for more outstanding developments by Pye!*

Manufacturers and engineers of H.F., V.H.F., U.H.F. radio systems, suppliers of telephone apparatus of all kinds; manufacturer and supplier of scientific instruments, industrial and commercial television cameras, marine radio-telephones, fish finders and depth sounders.



193 E. HASTINGS ST., VANCOUVER  
1191 UNIVERSITY ST., MONTREAL

HEAD OFFICE AND PLANT:  
82 NORTHLINE RD., TORONTO 16

78 BANK ST., OTTAWA  
3 DUKE ST., HALIFAX

# I E R C . . .

electron tube shields

## IMPROVE MISSILE RELIABILITY

... help them get  
where they're going!



Patents Pending — Cross licensed with North American Aviation, Inc.

I E R C offers the only shields commercially available that will meet or exceed MIL-S-9372 for temperature resistance, vibration control, compatibility with all tube diameter tolerances and have approval as Heat-dissipation shields for providing lowest bulb operating temperatures through proper design and function.

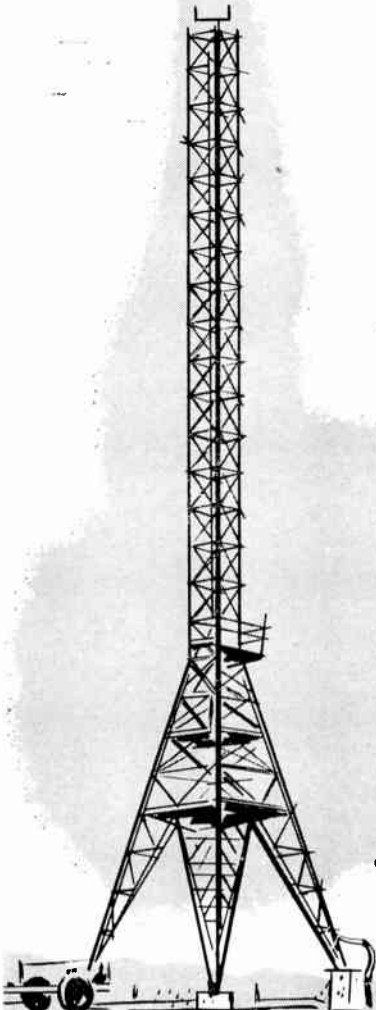
Improve your equipment reliability—specify I E R C "B" type shields to end premature tube failures caused by heat and vibration effects.



I E R C SUBMINIATURE TUBE CLAMPING SHIELDS are the most widely preferred maximum-cooling miniature shields in use on all sizes and types of subminiature tubes. Special-purpose types can be developed for your individual requirements. Write for Technical Bulletin 1203-556 showing present models for plate, bracket, channel, top and right angle mounting.

Write for complete information TODAY!

**International**  
electronic research corporation  
145 West Magnolia Boulevard, Burbank, Calif.



REPRESENTED IN CANADA BY: R-O-R Associates Limited, 290 Lawrence Ave., West Toronto 12, Canada

### NEWS

(Continued from page 44)

#### Federal Wire & Cable Appoints B.C. Rep

Newly appointed B. C. representative for Federal Wire and Cable is William Hayter, who has been associated with the electrical trade in British Columbia for the last nineteen years. From 1952, Mr. Hayter was B.C. manager for Triangle Conduit and Cable (Canada) Limited. He left there in 1955 to start his own agency.



WILLIAM HAYTER

Mr. Hayter, who is an associate member of the Electrical Inspector's Association of British Columbia, will continue to represent Federal Pacific Electric Products in British Columbia, as at present.

#### R.E.T.S. Continue To Expand Operations In Canada

Mr. David Fingard, President of Radio Electronic Television Schools of Canada, Ltd., announced recently that Dr. P. B. Rynard, Graduate of the Faculty of Medicine, Queen's University, Kingston, Ontario, class of 1926, has been appointed Chairman of the Board of the new Associate Division of R.E.T.S., Northern Ontario R.E.T.S.

Dr. Rynard is a prominent general surgeon and a public figure in the political field.

John P. Rynard is President of the Northern Ontario Schools, and his educational background was acquired both at Queen's University and at the University of Toronto. Mr. Rynard has been associated with R.E.T.S. since its inception into Canada.

Mr. K. C. Curtis, president of a manufacturing concern, is Secretary-Treasurer of the Northern Ontario Schools.

The first School of Northern R.E.T.S. will be opening in Sudbury in the near future.

Negotiations are already under way for the establishment of an R.E.T.S. School in the Maritimes, which it is expected will be opening in Halifax around the first of the year.

Mr. Fingard, President, R.E.T.S. of Canada Limited, has also announced that at the forthcoming graduation ceremonies to be held in the Mount Royal Hotel, Montreal, the guest speaker will be either the Hon. Paul Martin, Minister of Health and Welfare; or the Hon. George Marler, Minister of Transport.

(Continued on page 48)

# URGENT NEED

*by Canadian Industry for Trained Technicians*

# ANSWERED

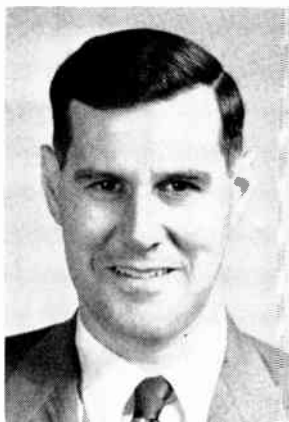
*by Radio Electronic Television Schools of Canada Limited*

R.E.T.S. is reputed to be one of America's finest and largest training school systems.

R.E.T.S. graduates are employed by most leading industries in many parts of U.S. and Canada.

R.E.T.S. provide a course of fifty weeks' duration; one night a week, with home studies; that permits you to earn your livelihood while you are learning.

R.E.T.S. have a teaching staff comprised of top-ranking professional electrical engineers, sub-engineers, and technicians with a great many years of experience. Such a combination has proved tremendously successful.



**GEORGE CHERNISH**  
B.Sc., P.Eng.

One of America's foremost coloured television experts, Mr. George Chernish, is currently responsible for all phases of colour TV research and development of the Television Division of Paramount Pictures Corporation in California. Mr. Chernish joined the teaching faculty on September 1st to assist in launching the new course. Mr. Chernish will later be going to the United States where R.E.T.S. plans to open a chain of schools.



**LESLIE L. HILL**  
D.Eng., Ph.D. (Eng.)

Dr. Leslie L. Hill will direct the coloured television course. Dr. Hill has had extensive experience in electronics, including studies on Image Tubes and their application for coloured television. His career has been on an almost world-wide scale, taking him to Italy, Gibraltar, Egypt, the U.S. and Canada.



**DAVID FORDE**  
B.Sc., P.Eng.

Mr. David Forde, who is Director of Education for the schools, will supervise the new course, assisted by Dr. Leslie L. Hill. Mr. Forde is a graduate of R.E.T.S. and the University of Toronto.

The colour television course registered by the Department of Education — consists of 12 lessons and will be directed by Dr. L. L. Hill, Mr. George Chernish, B.Sc., P.Eng., Prof. R. Anthes. For further information enquire:

**RADIO ELECTRONIC TELEVISION SCHOOLS OF CANADA LIMITED**

HEAD OFFICE: 261 SPADINA AVE., TORONTO, ONT.

Phone EM. 6-9618

SCHOOLS FROM COAST TO COAST

## Hon. George Marler Addresses IRE Gathering

**T**HE Hon. George C. Marler, Minister of the Department of Transport, speaking to more than 750 people in attendance at the banquet on the opening night of the three-day convention and symposium of the Institute of Radio Engineers, said that all forms of transportation have become increasingly dependent on the science of electronics in the last decade.

Mr. Marler said that his department has a major problem on its hands in providing space in the radio spectrum for many new and essential services, and he appealed to Canada's radio engineers to aid in the solution of this problem and in developing a more efficient use of the radio spectrum. The number of licensed public and private radio stations has risen from slightly over one thousand in 1929 to 43,000 — "all to be accommodated on the one radio frequency spectrum."

Private radio systems have been used for a number of years by taxis and for police and fire unit control. It is now proposed, said Mr. Marler, to increase the use of radio in the operation of vehicles used for long haul transport, such as buses and trucks. "Communications," he said, "is the comrade in arms of transportation."

The Department of Transport is also working closely with major airports to install surveillance radar which will enable those in charge of air control to "see" the aircraft as far away as 150 miles and to a height of 60,000 feet.



● Snapped by *Electronics and Communications* candid camera are the above head table speakers who addressed the banquet gathering of the IRE Convention in Toronto, October 1-3. They are: Hon. George C. Marler, His Worship Nathan R. Phillips, Ian F. McRae, Dr. J. T. Henderson, Major Charles L. Richardson, Q.C.; Clare A. Norris, A. V. Loughren, and R. M. Brophy.

### W. C. Ward Appointed To Collins Radio Post

Collins Radio Company of Canada Ltd. announces the appointment of Walter C. Ward as Resident Manager, Ottawa office.

Mr. Ward came to Collins from Measurements Engineering Ltd. with whom he has been associated since 1945 as Vice-President and Treasurer. Prior to this, he was with S. F. Bowser Company Ltd. and Research Enterprises Ltd.

Mr. Ward is a graduate of the University of Toronto in Electrical Engineering.

### General Instrument — F. W. Sickles Takes Over Farley Of Hamilton

It is announced that T. S. Farley Ltd., of Hamilton, Ontario, manufacturer of radio frequency coils, has been taken over by General Instrument — F. W. Sickles Co. of Canada Ltd., a subsidiary of General Instrument Corporation.

The enlarged operation is claimed to make General Instrument the largest manufacturer of television, radio and electronic components in Canada.

### George Glinski Lectures On Electronic Data Processing For McGill

The continuance and expansion by McGill University, Department of University Extension, of electronic digital and analog computer courses is announced for this year.

George Glinski, Dipl. Eng., P. Eng., of Ottawa, well known lecturer and authority on electronic computation and data processing has already begun the sixth year of lectures on this subject at Carleton College, Ottawa.

## RETMA-IRE Golf Tournament Draws Record Attendance

Nearly one hundred golfers took part in the Annual RETMA-IRE Golf Tournament at the Cuten Fields Golf Club at Guelph on September 18th. Double that number visited the club that day and attended the dinner which followed the outdoor activities.

Head table guests included F. J. Heath, chairman of the IRE Toronto Section, A. L. Fromanger, chairman of the IRE Hamilton Section, R. C. Hackbusch, RETMA director of engineering, A. L. Stopps, chairman of RETMA's components division and a vice-president of RETMA, J. D. Campbell, president of RETMA, D. Knapp, chairman of the 1956 RETMA-IRE golf tournament committee, R. J. Halfnight, golf tournament committee member, J. R. Longstaffe, a RETMA director, and C. A. Norris, chairman of the 1956 Canadian IRE Convention.

## Canadian Electromagnetometer To Australasia

Canadian Canso GKI, which has been responsible for discovering many rich mineral deposits across Canada, left Toronto September 24th on the long flight across the world to Australia to introduce Canadian-designed mineral detection equipment there.

A veritable flying laboratory, it is the first aircraft to be fitted with an electromagnetometer, magnetometer and scintillation counter. It was sent by Aeromagnetic Surveys Limited, of Toronto, the world's leading and largest aerial prospectors, to a sister company, Adastra Hunting Geophysics Pty. Ltd. of Sydney, New South Wales, to pioneer aerial geophysics in Australasia.

## Air Vice-Marshal Plant Appointed To Executive Post With Collins Radio

Air Vice-Marshal John L. Plant, commanding officer of the RCAF Air Material Command, has been appointed executive vice-president of Collins Radio Company of Canada, Ltd., the company announced recently.

Air Vice-Marshal Plant, an RCAF veteran of 28 years, entered his new position with the organization upon retirement from military service. He has held a variety of flying, training and administrative posts and, during 1951, was posted to NATO as Assistant Chief of Staff for Personnel and Logistics, Allied Air Forces Central Europe. Two years later he was appointed Chief of Staff and was promoted to the acting rank of Air Marshal. Returning to Canada in 1954, he reverted to the rank of Air Vice-Marshal and was named Air Member for Technical Services.

## Gabriel Lapointe To Assist President Of CAE

The appointment of Gabriel Lapointe as assistant to the president and manager of the legal and patent department has been announced by K. R. Patrick, president and managing director of Canadian Aviation Electronics.

Mr. Lapointe brings to his new post a thorough background of legal and business training. He is a law graduate of Laval University, a member of the Quebec bar and also holds a Master's degree in business administration from Harvard University.

CAE has developed a number of proprietary items in the field of automation, electronics and nucleonics. The new department under Mr. Lapointe's direction will be largely concerned with the protection of these Canadian proprietary items in the home and international markets.

● Snapped at the IRE Convention are: *Top:* J. S. Pounder, Morley C. Patterson, Al Jones and George Armitage, Rogers Electronic Tubes Ltd.; *Second:* J. McCail, Bob Bogart, J. R. Longstaffe, and N. J. Rolfe; *Bottom:* Leon Simard, H. Lawrence, Postmaster, Toronto, Grant Smedmor, IRE Convention Manager, and L. E. C. Young, England.



● Presentation of prizes R.E.T.M.A. 1956 Golf Tournament. *Top:* Clare Norris presenting IRE Trophy to Alex Barclay; *Second:* Weston-Wrigley Team Trophy presented to J. Rees and B. Courtenay by Arthur Vincent; *Third:* Presentation of R.E.T.M.A. Low Gross Trophy to R. E. Schak by J. D. Campbell; *Bottom:* Diamond State Fibre Trophy presented to Fred Shepherd by B. Lyons.

# Canada's First IRE Convention Outstanding Success

**A**TTEENDANCE at the recent IRE convention and engineering symposium held in Toronto from October 1st to October 3rd was indicative of the lively spirit of the industry in Canada and the keen interest of the public in this field of endeavor. Total attendance at the convention was 10,038 of which it is estimated that 7,818 were actively engaged in some capacity in the electronics industry. Public attendance at the event totalled 2,220.

Electronic research and experimentation, involving more than one billion dollars, took tangible form in the vast display of more than 134 leading international manufacturers which attracted scientists, bankers, government officials and business men, some of whom traveled from as far afield as the United States, Great Britain and Israel.

A program of more than 130 technical papers, the presentation of which ran concurrently with the exhibition, attracted engineers from every branch of manufacturing which embraces the electronics sciences, and attendance at the reading of the papers filled the lecture rooms to capacity during the course of the three-day convention.

Business-wise, the success of the exposition may be summed up in the attitude of exhibitors, many of whom have already requested confirmation of larger space reservations for future shows and similar requests from manufacturing concerns who were not represented at this year's show.

While the majority of exhibits at this year's show were those of Canadian manufacturers, interest shown by American visitors to the show with particular reference to the overall management of the event, the spaciousness of the show building and the availability of restaurants, parking and transportation facilities, indicated that many American firms may apply for exhibition space in future shows.

Among the branches of industry represented at the show were electronic components, antennas, audio equipment, broadcast transmission systems, aeronautical and navigational electronics, tubes, transistors, computers, medical and industrial electronics, telemetry and remote con-

trol, mobile communications, ultrasonics, instruments and laboratory apparatus, packaging and education. Government exhibits at the show included those of the Armed Forces, Atomic Energy of Canada Limited, National Research Council, Defense Research Board and the Post Office Department.

● Among the research and educational exhibits at the Canadian IRE Convention and Exposition shown below are: *Top: University of Toronto; Second: Defense Research Board; Third: Radio Electronic Television Schools of Canada Limited; Bottom: Atomic Energy of Canada.*



● Typical of the many groups attending the IRE Convention are those at the left. Among those pictured are George Glinksi, Doug. Peacock, Mr. and Mrs. Palin, Mr. and Mrs. Clare Norris, Mr. and Mrs. R. C. Poulter, W. H. Furneaux, Capt. J. G. Beckner, Paul Corbell, Squadron-Leader T. J. B. Robinson, R.C.A.F., Commodore H. G. Rogers, R.C.N., Squadron-Leader E. W. Smith, R.C.A.F., Mrs. J. Auer, T. D. K. Rooney, E. C. Clayton, Air Vice-Marshal John L. Plant.



*We  
Were  
There...*

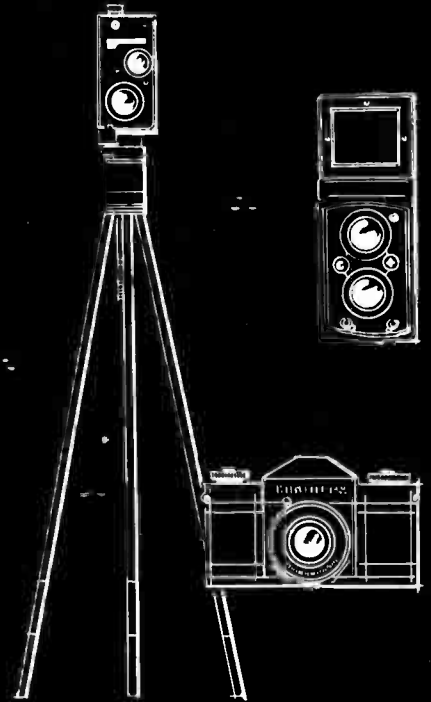


The First Canadian  
**IRE**  
Engineering Symposium  
and Exposition

•  
OCTOBER 1-2-3, 1956  
•

AUTOMOTIVE BUILDING, C.N.E.

Toronto - Ontario - Canada





## We Were There

There is a vital significance in being part of the origin of something that brings a keen and lasting satisfaction. To have played some part for instance, in an event destined to grow in stature and importance as a measure of the industrial progress of one's country is indeed an occasion well worth remembering.

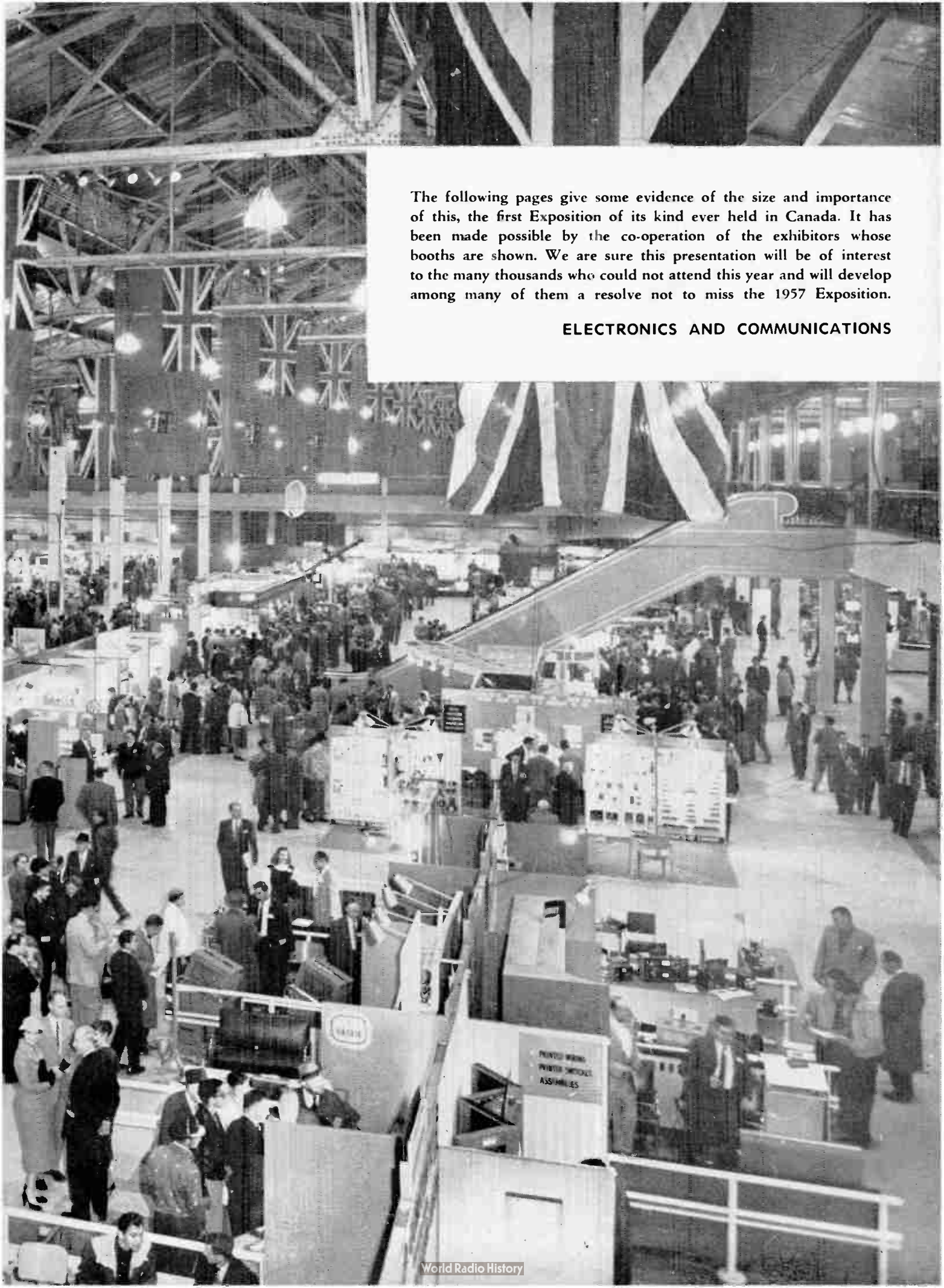
Such has been the position of exhibitors at the first Canadian IRE Convention and Exposition, an event which has made known far afield the manufacturing achievements and engineering skills of the Canadian electronics industry.

To have been part of this first Convention and Exposition marks any organization as a leader and a pioneer in the Canadian electronics industry, an industry which we well know is destined to bring about an industrial revolution that will benefit mankind to an extent greater than ever before realized.

As active participants in the electronics industry, they are a vital link in the moulding of that greater future which lies ahead and which will be brought to fruition largely through the faith and foresight of those who formed part of Canada's first IRE Convention and Exposition.

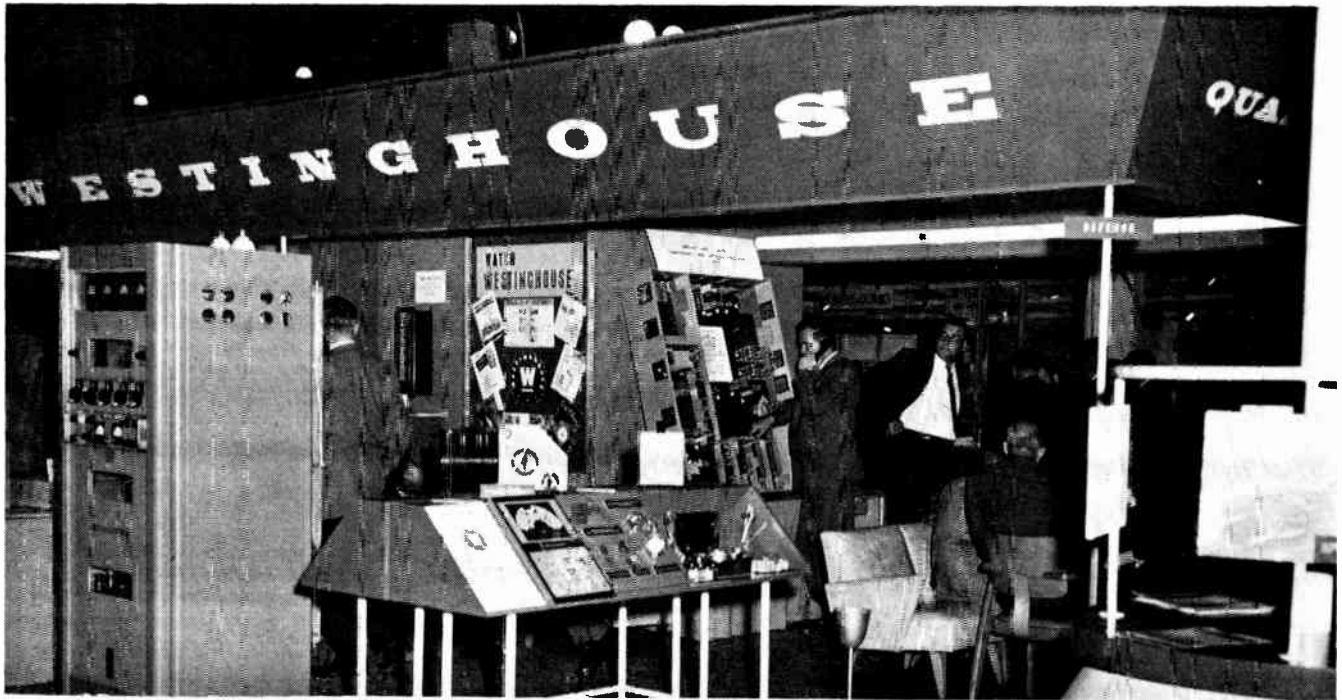
This is the recording of this pioneer event — the recording of those whose names who were there as founders; the recording of those names which, as the years pass, will be recalled as having been among those to launch the Canadian electronics industry off on this early event of international significance to the scientific world.

In short, this is the record of those who were there!



The following pages give some evidence of the size and importance of this, the first Exposition of its kind ever held in Canada. It has been made possible by the co-operation of the exhibitors whose booths are shown. We are sure this presentation will be of interest to the many thousands who could not attend this year and will develop among many of them a resolve not to miss the 1957 Exposition.

## ELECTRONICS AND COMMUNICATIONS



Canadian Westinghouse Company Limited, Canada's Leading Defense and Commercial Manufacturers, offering a Complete Line of Point-to-Point, Mobile, Microwave, Power Line Carrier, Radio Navigation Communications and Industrial Electronics such as Induction Heating, Closed Circuit Television, Welding Controls, Machine Tool Control, Photo-electric Devices and many others. This, plus the services of Canada's Most Complete Environmental and Appraisal Laboratory and a Complete P.A.C.E. Computing Facility.

## **Canadian Westinghouse Company Limited**

Electronics Division

HAMILTON, ONTARIO



Cannon Plugs known around the world are manufactured in Canada for the Finest Equipment Produced by the Aircraft, Geophysical, Radio, Sound, Electronic, Motion Picture, Petroleum, Electrical and Television Industries.

## **Cannon Electric Canada Limited**

160 Bartley Drive, Toronto 16, Ontario



Latest world advances in receiving, broadcast and special purpose tubes, and components were displayed and demonstrated in ROGERS attractive green and gold booth.

## Rogers Electronic Tube and Component Division

11-19 Brentcliffe Road, Leaside, Ontario



Rogers Majestic Electronics Limited attractive booth featured Motorola 2-way radio equipment, microwave, carrier and supervision and control equipment, industrial radio pagers, Dage industrial television, Crosby communications equipment, Philips scientific apparatus and measuring equipment, and Kleinschmidt teleprinters.

## Rogers Majestic Electronics Limited

Vanderhoof Avenue, Leaside, Ontario



Design • Engineering • Application • Manufacturing • Quality and Service

Twenty-five years' experience in manufacturing Electronic Components for the Canadian Electronics Industry. Resistors, Controls, AN and RF Connectors, Cable and Cable Assemblies, Speakers, Transformers, Coils, Relays, Radio and TV Components, waveguide Plumbing and Accessories, Switches, Knobs, Precision Tubing, etc.

*"Products of Canada"*

## **J. R. Longstaffe Co. Ltd. & Associates**

300 Campbell Avenue

Toronto 9, Canada



Leaders in the Supply and Manufacture of  
Servo System Components, Aviation and Mobile Radio Instruments,  
Electrical Connectors and Special Purpose Tubes for Industry and Defense.

## **Aviation Electric Limited**

Halifax

Montreal

Toronto

Calgary

Vancouver



Radio and Television Components — Potentiometers — Vibrators — Electrolytic Capacitors — Switches —  
 I.F. Transformers — R.F. Coils — Variable Capacitors — Drives and Discs — Loudspeakers  
 Powdered Metallurgy  
 Communication Equipment — Connectors — Terminal Fuse Blocks  
 Aircraft Equipment — Electronic and Mechanical Products

## The Plessey Company of Canada Limited

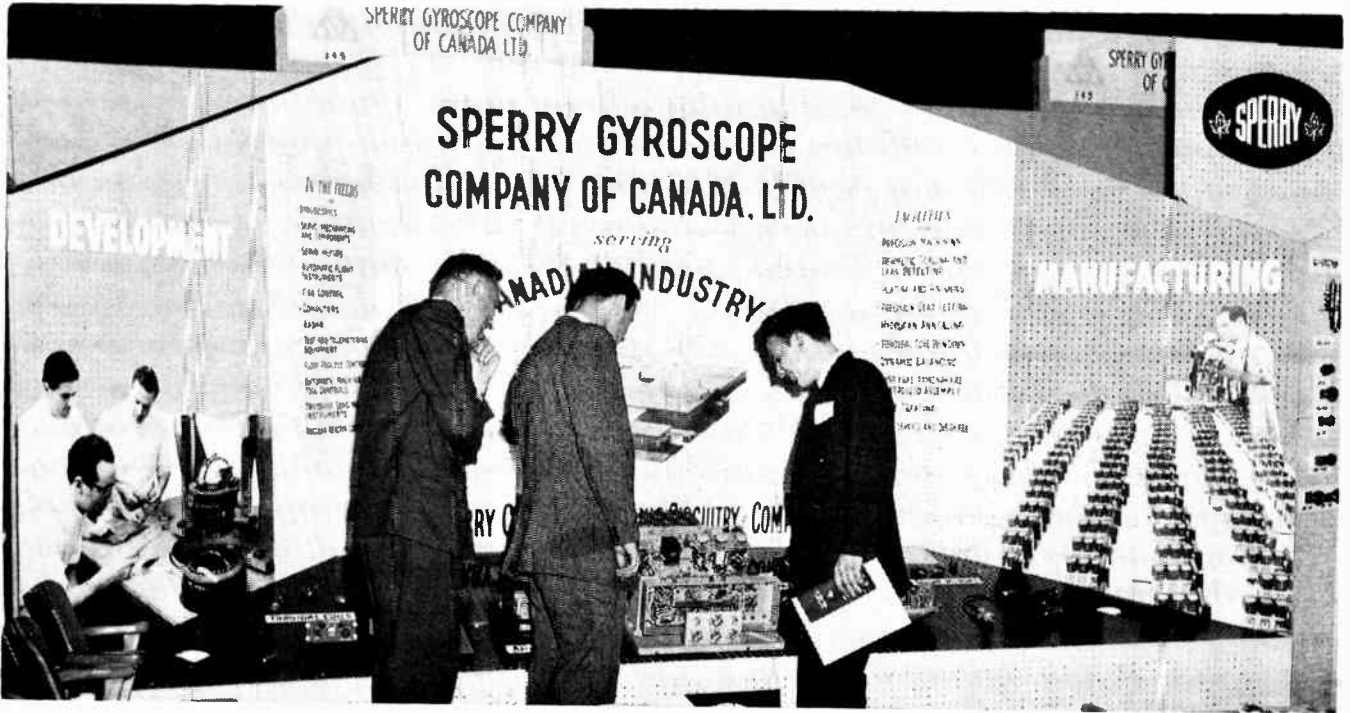
243 Dunbar Ave., Montreal, Que.



A Canadian Company supplying a wide variety of electronic and nucleonic equipment throughout North America. Developmental effort available. Also suppliers of no-break and automatically controlled diesel generating plants.

## Mechron Engineering Products Ltd.

Ottawa — Canada



Aircraft and Marine, Navigational and Control Instruments, Servo Motors and Mechanisms, Fire Control Systems, Specialists in the Development and Manufacturing of Precision Control Equipment.

## Sperry Gyroscope Company of Canada Ltd.

P.O. Box 710, Montreal, Quebec



(From right to left) D. Fingard (President), L. L. Hill, Ph.D. (Eng.) (Consultant & Co-Author Color Television Course). R. Desaulniers, Gen. Mgr. Eastern Branches, Ex-Chairman I.R.E., Montreal, Prof. R. Anthes, Faculty Hamilton, who presented a paper on Color Television at I.R.E. and will direct color course in Hamilton, D. Forde, B.Sc., P.Eng. Director of Education, Toronto.

## Radio Electronic Television Schools of Canada Limited

261 Spadina Avenue, Toronto, Ontario





Above is depicted the booth of the Instrumentation Division of Atlas Radio Corporation Ltd., representatives of leading U.S. manufacturers in the Instrumentation field.

Prominently displayed are Hewlett-Packard instruments, and in addition, the following distinguished Instrumentation lines:— Borg, Edin, Electro, Gertseh, Kay Lab, Sierra, and Tel-Instrument

Instrument Division

## Atlas Radio Corporation Limited

50 Wingold Avenue, Toronto 10, Ontario



Sales and Service representatives for United States and Foreign manufacturers of transducers, ground airborne telemetering equipments, digital and electronic test instruments, power supplies and components.

## Electromechanical Products

Markham Road — Agincourt, Ontario



A Canadian Company now having served the Canadian Electronic's industry for twenty-five years.

Manufacturing resistors, suppressors, ceramic dielectric capacitors, button mica and trimming capacitors. Electro-Mechanical Assemblies.

## Erie Resistor of Canada Limited

Trenton, Ontario



Manufacturers of R.F. Interference Suppression Filters, Pulse-forming Networks, Complete Pulse Packages, including the Pulse Transformer, Chokes and Pulse-forming Networks, Lumped Constant and Distributed Constant Delay Lines, Specialty Capacitors, Feed-Thru, (FIL-CAPS) Capacitors.

## Filtron Company Inc.

Flushing, Long Island, New York



An Associate Company of The International Telephone and Telegraph Corporation and engaged in the Engineering and Manufacture of Communications Equipment with Special Reference to the Requirements of Aeronavigation.

## Standard Telephones & Cables Mfg. Co. (Canada) Ltd.

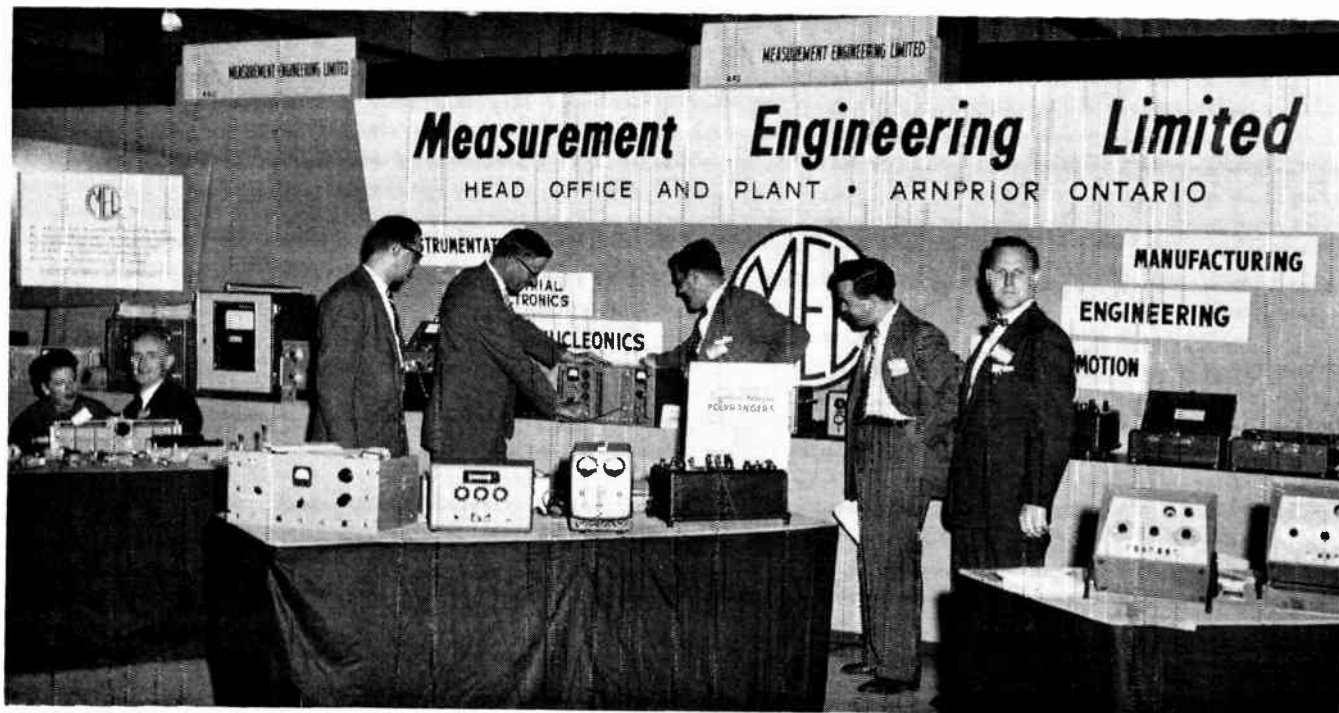
9600 St. Lawrence Blvd., Montreal



Canadian Manufacturers of Hermetic Seal Terminals for the Electronics Industry. Manufacturers of Glass-to-Metal Seals including: Crystal Bases, Transistor Enclosures, Multi-terminal Headers, Feed-Thrus, Stand-offs and Special Headers.

## Quality Hermetics Ltd.

45 Hollinger Road, East York, Toronto, Ontario



An Organization rendering a complete service as Consultants, Design Engineers, Production and Sales Specialists in Electronics, Communications, Nucleonics, Instrumentation and Control.

## **Measurement Engineering Limited**

Arnprior, Ont.



Manufacturers of Antennas and Transmission Lines for Broadcast, Communications, Point-to-Point, Mobile, Microwave and Scatter Applications.

## **Andrew Antenna Corporation Ltd.**

606 Beech St., Whitby, Ontario



Creative Leaders in Communications, Specialists in Airborne Communications & Navigation Equipment.  
Microwave, Scatter, and other Point-to-Point Communications.

## Collins Radio Company Of Canada Ltd.

11 Bermondsey Road, Toronto 16, Ontario



A Canadian company active in the fields of simulation, automation, computers, data processing and data reduction, semiconductors, instrumentation, weapons system design and analysis, and electronic development.

## Computing Devices Of Canada Limited

P.O. Box 508, Ottawa, Ontario



Supervisory Control and Telemetry using scanning, binary code, digital computers, and tape recorders.

Process equipment and annunciators  
Widney-Dorlec Cabinet Systems and Telescopic  
Mountings. Branson miniature relays. Microtran transformers.

## General Communications

980 O'Connor Drive, Toronto 13, Ontario



A complete antennae service, including design, manufacture and installation.

Trylon products include antennae, antenna systems. Towers for all communication purposes and broadcasting. Sleet and snow proof vertical radiators. Ice indicators, de-icing control equipment, antenna switches and transmission lines.

## Wind Turbine Company

51 McCormack Street, Toronto, Ontario



#### Electronic Engineering Representatives For

Ballantine, Electronic Voltmeters  
 Bruel & Kjaer, Sound & Vibration Instruments  
 Electro-Pulse, Pulse Generators and Counters  
 Huggenberger, Strain Gauges  
 Kelk, A.C. Voltage Regulators

Moseley X-Y Recorders and Plotters  
 Sanborn, High Speed Graphic Recorders  
 Vectron, Microwave Spectrum Analyzers  
 Bomac, TR Tubes, Klystrons, Magnetrons  
 Eastern Air Devices, Motors and Blowers

Helipot, Potentiometers  
 I.E.R.C., Heat Reducing Tube Shields  
 Mepeco, Precision Resistors  
 Microdot, Miniature Cables & Connectors

### R-O-R Associates Ltd.

290 Lawrence Ave. West, Toronto 12, Ontario



Electronics and Communications — a popular spot for delegates with tired feet — featured its coming Directory and Buyers' Guide issue — published in December — Tom Lazenby, Editor, sports his committee badge with pride — "Bud" Dallyn, Advertising Manager, explains a point or two to Miss Lee Denault, Measurement Engineering Limited.

### Electronics and Communications

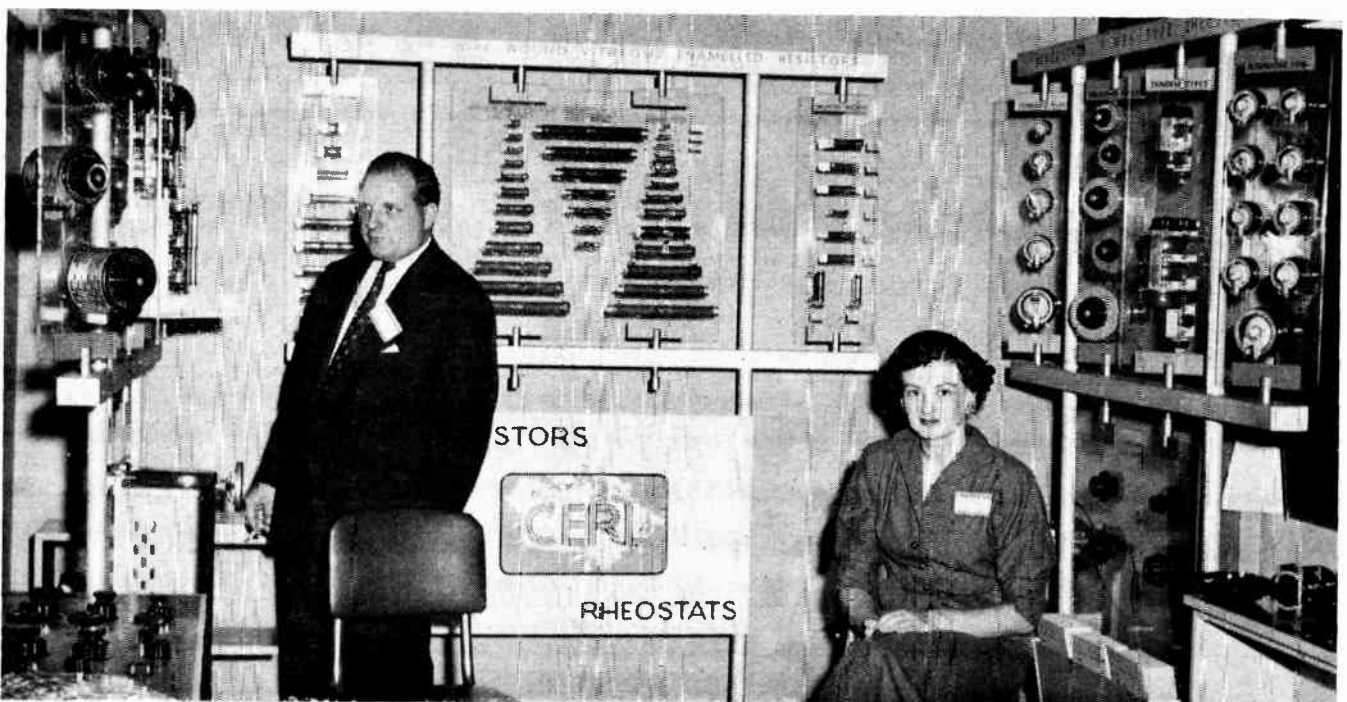
31-35 Willcocks Street, Toronto 5, Ontario



A Canadian company engaged in the manufacture of Filters, Toroids, Test Equipment. Representing prominent manufacturers for the following: Oscilloscopes, Signal Generators, Q Meters, Cathode Ray Tubes, Microwave Equipment, Digital Voltmeters.

## Bayly Engineering Limited

First Street, Ajax, Ont.



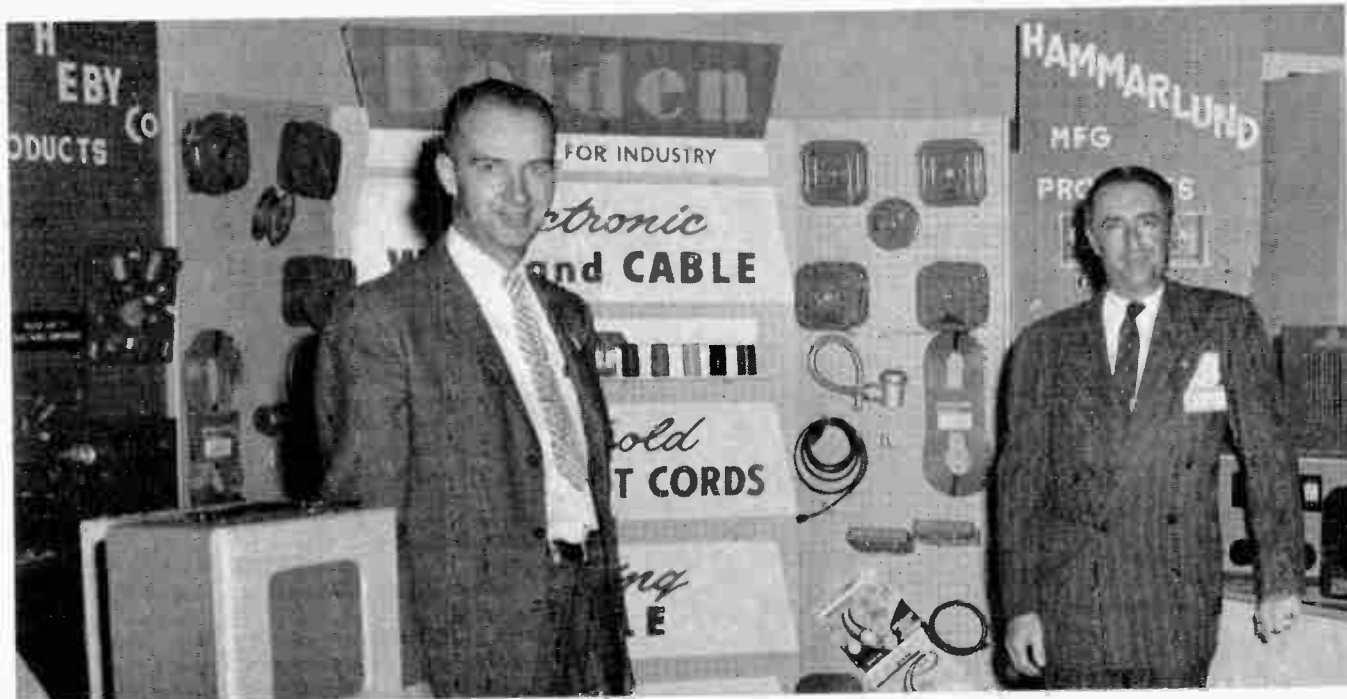
Manufacturers of Vitreous Enamel Coated Power Type Resistors. Power Type Rheostats. "Regavolt" Regulating Transformers. Molded Knobs (including Collet fitting type). Handwheels and Dials.

Manufacturers and Sole Licensees for BERCO Products in Canada.

## Canadian Electric Resistors Limited

Curity Avenue, Toronto 16, Ontario





Belden Manufacturing Company, Electronic Wires and Cables. Hammarlund Manufacturing Company, Receivers and Capacitors.

Hugh H. Eby Radio and TV Electronic Components. Masco Sound Equipment.

## White Radio Limited

Hamilton, Ontario



A Canadian company with a background of over fifty years in the Communications Field — Now specializing in the applications of Electronics to Communications and Product Development.

## Hackbusch Electronics Ltd.

Toronto, Ontario



Varian Associates of Canada Limited offer complete services for micro wave tube and system component development and manufacture to the Canadian Electronic industry.

The Company also manufactures graphic recorders and markets precision DC instrumentation.

## **Varian Associates of Canada Ltd.**

Georgetown, Ontario



At CAE electronics, avionics, nucleonics and automation are more than new words, they are tried and tested tools of today toward a limitless tomorrow. CAE has the talents, the tools and an easy confidence based solidly on sound engineering, imaginative designing, and quick adaptability in the varied fields of production.

## **Canadian Aviation Electronics Limited**

Montreal, Ottawa, Toronto, Winnipeg, Vancouver



Philco — Famous name in the field of electronic training materials. Producers of semi-conductor devices, closed circuit television, television studio equipment, microwave system and the new “audi page”.

## **Philco Corporation of Canada Ltd.**

Don Mills, Ontario



Known from coast to coast for Television Tuners, Loudspeakers, Wirewound Resistors, Variable Tuning Capacitors, Trimmer Capacitors, Precision Gears and Gear Train Assemblies, Servo-loop Systems, Microwave Components.

## **Marsland Engineering Limited**

Kitchener, Ontario



TV Audio Consoles, Silicon Diodes, Speech Input Equipment, Magnaphones, Carrier Equipment, TV and Audio Rack, Transistors, Electro-Matic Cycle Computer, Wire Spring Relays, Hi-Fi Amplifiers, Trans-Canada Radio Relay.

## Northern Electric Company

1600 Notre Dame Street West, Montreal, Quebec



Magnetic Drum Storage — Digital Data Handling Systems Engineering — Electronic and Instrument Production Facilities — Control Systems — Nuclear Reactor Simulators — Computer Control of Machine Tools — Packaged Logical Elements and Custom Printed Circuit Design Production — Special Purpose Radio Equipment.

## Ferranti Electric Limited

Industry Street, Toronto 15, Ontario



Exhibit featured many phases of electronic equipment and components supplied by Canadian General Electric. Highlighted were facilities and services—consulting, engineering and manufacturing for military and commercial applications.

Progress Is Our Most Important Product

## Canadian General Electric Company Limited

Electronic Equipment & Tube Department

830 Lansdowne Avenue, Toronto, Ontario



We specialize in relays manufactured in Canada and we represent only prime suppliers of other products. Miniature versions of standard electronic components our speciality. Miniature bearings, transformers, capacitors, Relays, tubing and resistors.

## John Herring and Company Limited

3468 Dundas Street West, Toronto, Ontario



A complete display of Stark Electronic Instruments Limited. Hickock Electrical Instrument Co. — Beta Electric Corporation — W. Gary Wright — Filtors Incorporated — featuring test instruments and meters of Stark and Hickock Manufacture. High Voltage Power Supplies by Beta — Quartz Crystals by W. Gary Wright and hermetically sealed relays by Filtors. The products shown are represented by

## **M J S Electronic Sales Limited**

Stark Building, Ajax, Ontario



Established for 37 years as a sales organization operating throughout Canada, representing leading Manufacturers of Quality Electronic Components.

## **A. C. Simmonds & Sons Ltd.,**

100 Merton Street, Toronto 7, Canada



The first public appearance of this firm, the only self contained vacuum process selenium rectifier manufacturer in Canada. Already well known for their vibratory materials handling and automation devices, they can now supply rectifiers from 15Ma to several thousand amperes for the television, radio, general electronics and industrial applications.

## Syntron (Canada) Limited

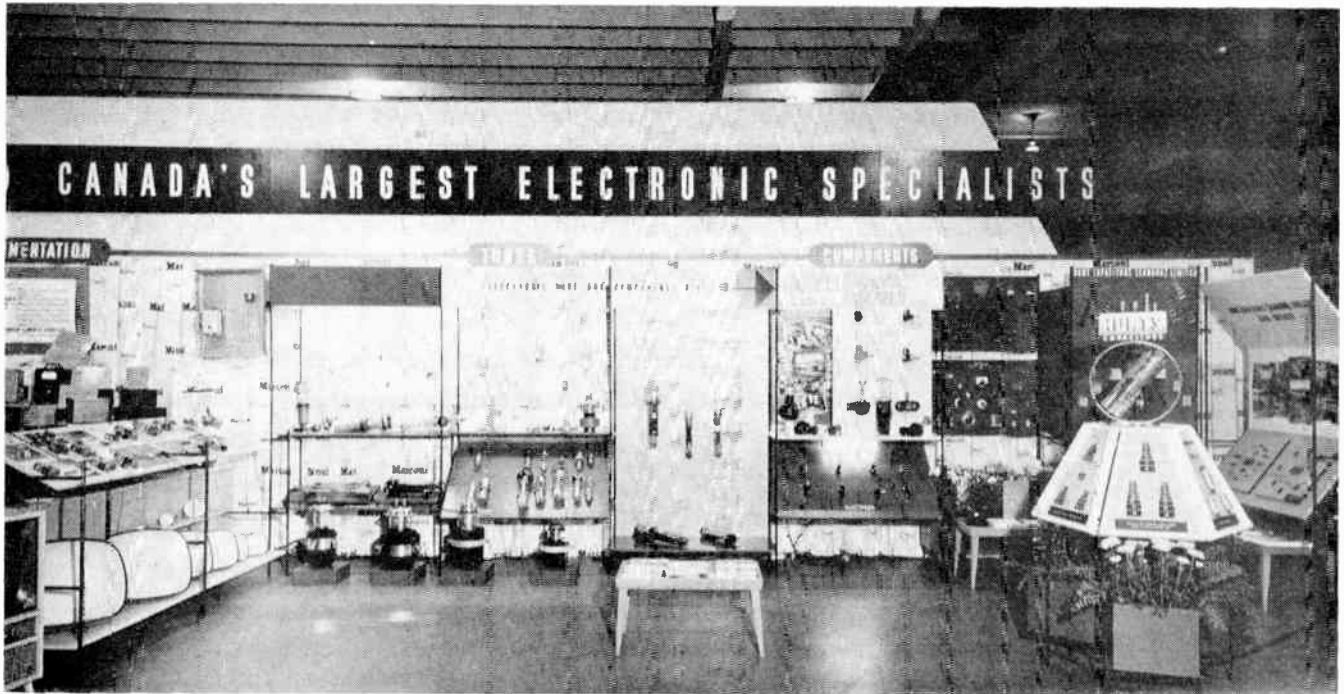
12 Main St. East, Stoney Creek, Ontario



Canada Wire and Cable Company Limited booth exhibiting CW Telcon, coaxial, radio lead-in wires and all types of communication cables. Exhibiting for the first time was Telecable & Wires Ltd., whose new plant at Fort Garry, Manitoba will manufacture a complete line of telephone wires. Plant will be officially opened October 29.

## Canada Wire & Cable Co. Ltd.

Postal Station "R" Toronto 17



With emphasis on complete range and coverage an extensive selection of Marconi tubes and Hunt capacitors of both Canadian and English origin were shown, along with Clarostat and National industrial components.

## Canadian Marconi Company

Electronic Tube and Component Division

830 Bayview Avenue, Toronto, Ontario



A full range of Radio Relay systems and of land, sea and air communications and navigational equipment designed and manufactured in Canada is featured by this major Electronics Company, which is noted also for its extensive lines of instruments and its special installation and maintenance services.

## Canadian Marconi Company

2442 Trenton Avenue, Montreal 16, Quebec



# Past Achievement

## Promises Future Success

☆ *The photographic record of the Canadian IRE Exposition contained in the preceding pages represents only part of the many manufacturers of electronic equipment who exhibited in the Canadian IRE Convention and Exposition, the most comprehensive technical program in Canada's history.*

☆ *The outstanding success of the Convention and Exposition is now a matter of record and those who took part in the event have shown evidence of their pride in the manufacturing and engineering ability of Canada. It is also an indication of the many exhibitors' desire and enthusiasm to back to the limit the opportunity which the IRE Convention and Exposition affords to place Canada on a ranking par with other industrial nations of the world.*

☆ *It is not by accident that the Canadian IRE Convention and Exposition took place but by faith and forward thinking of those in the industry who painstakingly planned this event. Its success is now a matter of past achievement, an achievement that attracted over 10,000 visitors; an achievement that has led exhibitors already to seek enlarged exhibit space for next year's Convention and Exposition; an achievement that marked a milestone in Canada's industrial development and an event that no company in the Canadian electronics industry can afford to be missing from when it is held again on October 16th, 17th, and 18th next year.*

## NEWS

(Continued from page 52)

## Toronto Section, IRE, Opens 1956/1957 Season

The Toronto Section of the Institute of Radio Engineers opens its 1956-1957 season on October 22nd at the University of Toronto, Electrical Building, Room E21.

The guest speaker will be C. E. Torsch of the Rola Company Inc., Cleveland, Ohio. Mr. Torsch's paper will cover the current production design of a highly efficient TV receiver using 110° deflection system and consuming less power than was necessary to operate earlier 50° sweep systems. This system uses the same 17 KV anode and 250V supplies.

Slides and samples of circuitry and components involved in the system will be shown. These components are believed to constitute the first commercially available complete deflection system for a 110° parabolic-flare picture tube.

## Westinghouse Booklet Lists New Industrial Films

Available for distribution to organized groups, 16 sound films — many in color — have been listed in a special folder now released by the industrial apparatus division of the Canadian Westinghouse Company.

Mostly technical in nature, the listed films cover a wide range of subjects from the Bikini atom bomb tests to the subject of maintenance and jet engines. They are of interest to all types of organizations rural and urban.

The booklet will be available through any Westinghouse district office. Complete descriptions of films and ordering instructions are included. The film booklet is designated No. BH-7156.

● Canada's Transport Minister, Hon. George C. Marler, uses gold-plated telephone in conversation with U.K.'s Postmaster General, Rt. Hon. Dr. Charles Hill and U.S.'s American Telephone and Telegraph Co.'s president, C. F. Craig, as part of the opening ceremonies of the new trans-Atlantic telephone cable. Listening in are D. F. Bowie, center, President of Canadian Overseas Telecommunication Corporation, who was chairman of the Ottawa ceremony, and T. W. Eadie, President of Bell Telephone Co. of Canada.



● S. J. Sinclair, Manager of the Broadcast and Television Receiver Division of Canadian Marconi Company announces that L. M. Daley, left, has been appointed to the newly created position of Marketing Manager and will direct all merchandising, sales and advertising activities of the Division. T. P. Kelly, center, has been appointed Sales Manager, and C. D. Lockhart, right, Advertising Manager.

## Electronics Industry Moves Into Peterborough

A new industry will open up in Peterborough when Miltronics Ltd. moves its plant to that city from Weston.

While present operations are on a comparatively small scale, it is felt that the fast-growing field of electronics augurs success for the company.

## G-V Controls Inc. Appoints Canadian Sales Rep

Leonard Electric Ltd., 346 Bering Avenue, Toronto 18, Canada, has been appointed the Canadian sales representative of G-V Controls Inc., East Orange, New Jersey, U.S.A.

This appointment brings to the Canadian electrical, electronic, and aviation industries readily available qualified technical service in the application of G-V hermetically sealed thermostats, thermal relays and other equipment.

## Trans-Canada Cable Inaugurated At Ottawa

**S**PEAKING on behalf of Canada in opening the new trans-Atlantic phone cable service, Transport Minister George C. Marler said: "We in Canada are proud to have been associated in this great pioneer venture and we join wholeheartedly in the praise which has been given to those whose research made it possible, those who so skillfully engineered it and all who have co-operated in so many ways to win through to this success."

Other official participants in the three-way conversations were: Rt. Hon. Dr. Charles Hill, Postmaster General of the United Kingdom, who declared the cable open on behalf of the U.K.; Sir Gordon Radley, Director General of the British Post Office; C. F. Craig, President of the American Telephone and Telegraph Co. on behalf of the United States; D. F. Bowie, President of the Crown Company, Canadian Overseas Telecommunication Corporation, who was chairman of the Ottawa ceremony; and T. W. Eadie, President of Bell Telephone Co. of Canada and Chairman of the Trans-Canada Telephone System.

Highlights of the installation of the new trans-Atlantic service were the landing of the first section of the cable at the cable station at Clarendville, Nfld. in 1955; splicing of the return section of the cable at Clarendville last August; and extending the cable across Cabot Strait and overland to Montreal and Portland, Maine.

The single core of the new trans-Atlantic cable produces some 36 voice circuits of which all but one will be used for telephone purposes. The remaining channel will be split into 22 telegraph circuits each capable of working at 60 words a minute. Ample facilities are also provided for direct teleprinter connections between clients, still picture transmission and the carrying of broadcast programs. It is not capable, however, of carrying television.



## Cables Sealed Away For Posterity

**L**ENGTHS of the most up-to-date representative wires and cables made today, were sealed away as a record for future generations, behind the corner stone of the new buildings for the Phillips Electrical Co. Ltd. in Brockville, at an impressive ceremony last October 5th.

Mr. W. H. McFadzean, chairman of the board of British Insulated Callender's Cables Ltd., in laying the corner stone for the huge \$7½ million expansion to the plant, made some interesting comments.

"We are proud of these new buildings which have been very carefully designed to provide for maximum efficiency and at the same time permit of future expansion.

The growth and future of the Canadian electrical industry merits our greatest confidence. We see great things in the years ahead, and these buildings represent part of our contribution to meet the growing requirements as new fields are opened up.

The machinery and equipment which will go into these buildings are the most modern obtainable. They will place in the hands of our workmen the wherewithal by which they will be able to produce the highest quality wires and cables in sufficient quantity to keep pace with increasing needs of the expanding economy of Canada.

It is therefore, with a great deal of pleasure that we lay the corner stone for this new expansion."

With these words Mr. McFadzean smoothly laid the stone for work to proceed on the new structures. When the building program is completed the factory will stretch almost a quarter of a mile in length beside the Queen's highway in Brockville.

Mr. T. A. Lindsay, president of Phillips, placed the cable samples in the protected cache behind the corner stone, where they will be sealed away under the masonry.

With Mr. McFadzean and Mr. Lindsay on the platform were Mr. H. F. Akehurst of BICC, London, England, Mr. J. R. Phillips and Mr. A. Lauder, vice-presidents of the Canadian company, and Mr. F. W. Barnhouse, general sales manager.

## Muirhead Instruments Ltd. Technical Appointments

A. J. Muirhead, vice-president and general manager of Muirhead Instruments Ltd. of Stratford, Ontario, has recently announced two technical staff appointments. F. E. J. Lyons has been appointed mechanical superintendent and N. G. Arkell has been named electrical superintendent.



● Mr. W. H. McFadzean, Chairman of British Insulated Callender's Cables is shown tapping the corner stone in place, for the new buildings of the Phillips wire and cable company in Brockville. Mr. T. A. Lindsay, President of Phillips placed a cache of 11 modern cables in a crypt behind the stone, which were all suitably labelled for future generations to discover. *Left to right:* Mr. J. R. Phillips and Mr. A. Lauder, Vice-Presidents; Mr. H. F. Akehurst, Overseas Manager BICC; Mr. McFadzean, Mr. Lindsay, Mr. F. W. Barnhouse, General Sales Manager.

## Electronic Computer Service And Programming Course Inaugurated

Adalia Ltd. recently installed an ALWAC III-E electronic digital computer and auxiliary units in its Montreal head office at 1410 Stanley Street. This electronic data processing equipment enables the associated Adalia companies (in London, Montreal and New York) to provide a complete computing service to science, industry, finance and government. This is the first general purpose computer service to be established in Montreal, supported by nine specialized technicians, assisted by a staff of 20.

Sir Robert Alexander Watson-Watt, who heads the Adalia companies, is one of the most dynamic and colorful figures in the field of scientific research. Some 22 years ago he "unveiled" radar. Sir Robert's achievement was credited by the British Government as having been the biggest individual contribution to Allied victory in World War II.

Sir Robert and heads of his departments are now particularly interested in the practical application of electronic digital computers for commerce and industry.

Adalia recently inaugurated a unique computer demonstration and programming course for university professors, heads of government agencies and industrial departments. This course comprised ten lectures.

## W. H. Holroyd To Open European Bureau

W. H. Holroyd — until recently, Sales and Marketing Manager of Computing Devices of Canada Limited, and formerly with Canadian General Electric's Electronics Division for ten years — is unavoidably returning to England, for urgent family reasons.

After establishing residence, he will announce the opening of a Transatlantic Electronics Bureau. With the shortage of engineering, manufacturing and marketing personnel, a service will be provided to Canadian electronic companies, of personal interviews and complete reports on British and European engineers, to cover an area of personnel securement hitherto hit-or-miss or uneconomical.

Retaining his Canadian citizenship, Mr. Holroyd will reside in Yorkshire, and may be reached through the editorial offices of this magazine, pending the appearance of a professional card in the advertising columns.



● John D. Campbell, President of R.E.T.M.A. of Canada, chats with Dr. W. R. G. Baker, President of R.E.T.M.A. of the United States at the 12th Joint Canadian R.E.T.M.A./U.S. R.E.T.M.A. Symposium held at Hot Springs, Virginia.

## NEWS

(Continued from page 81)

## Ampex Makes New Appointments

Ralph E. Endersby, who formerly managed the Ampex Toronto office, has recently been appointed audio division export manager of the Ampex Corporation, according to Phillip L. Gundy, vice-president and manager of

the audio division. Mr. Endersby will be responsible for all sales of Ampex audio equipment outside the United States.

Mr. Endersby, in turn, has announced that Jim Detlor has been appointed as the



J. DETLOR

new Canadian division manager.

Mr. Detlor is well known in the electronics industry in Canada, both in Ottawa where he served as the Ottawa representative for the electronics division of Canadian General Electric, and in Toronto where he has been instrumentation equipment specialist for Ampex.

## New Edition Of Electro-technical Vocabulary Announced

Canadian Standards Association announces that the Second Edition of International Electrotechnical Vocabulary has been published by the International Electrotechnical Commission.

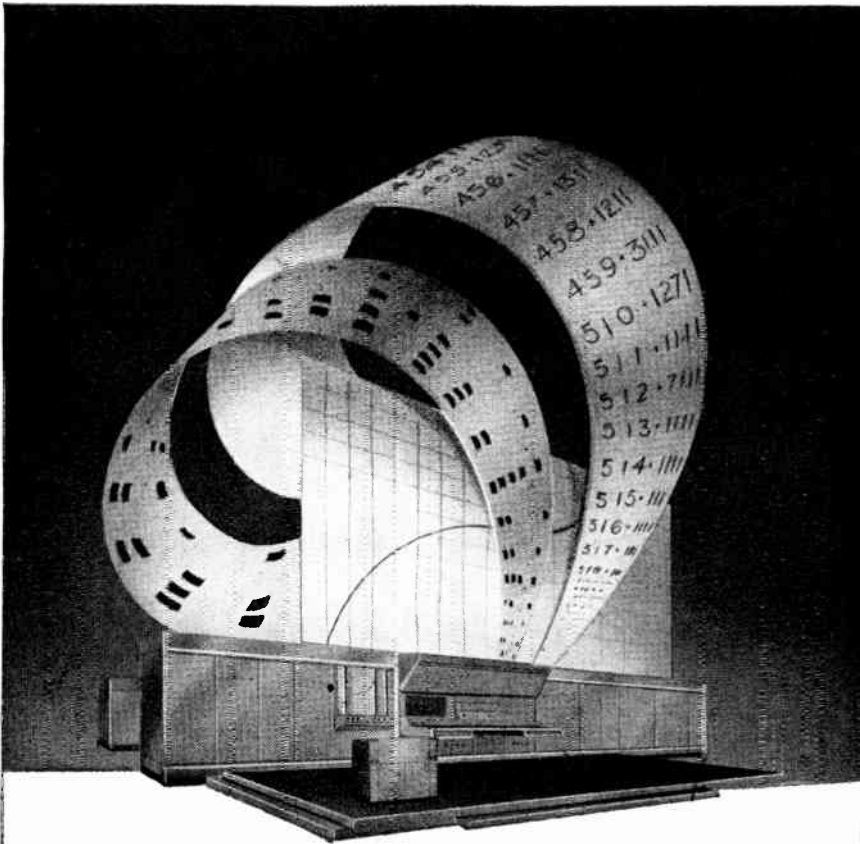
Published in 1956 by the Central Office of the I.E.C. under the patronage and with the financial assistance of the United Nations Educational, Scientific and Cultural Organization (UNESCO), it supersedes the first edition published in 1938. As in the first edition, the definitions are given in French and English, but the terms appear in German, Spanish, Italian, Dutch, Polish and Swedish.

## Keith Warne Appointed Minneapolis-Honeywell Advertising Manager

Keith Warne, formerly an account executive with F. H. Hayhurst Co. Ltd., has been appointed advertising manager for the Minneapolis-Honeywell Regulator Co. Ltd., W. H. Evans, president, has announced.

Mr. Warne is a native of Winnipeg and a graduate of the University of Manitoba. A former Winnipeg newspaperman, he also worked for several years in the travel and publicity division of the Manitoba Department of Industry and Commerce. He was associated at one time with RCA Victor in Montreal.

(Continued on page 84)



## To another problem barrier... ADIOS

Progressive engineering from PACE has passed another milestone toward the elimination of tedious, time-consuming manual programming operations. ADIOS (automatic digital input-output system) is the latest development from Electronic Associates, Inc. with characteristic optimum reliability, versatility and accuracy.

ADIOS facilitates the programming and read-out of PACE's precision analog computing equipment by making it completely automatic:

1. Adjust attenuators to 4-digit accuracy.
2. Adjust diode function generator potentiometers.
3. Read-out attenuator settings.
4. Read-out the output voltages of all operational components.
5. Read-out results of both static and dynamic problem check.

ADIOS is controlled either by keyboard or punched paper tape. Setting or read-out of components is entirely by selection as both sequences are controlled by auxiliary tape. Permanent record of operations is provided with an electric typewriter and a tape punch. The digital voltmeter part of the read-out system has a visual indicator so that all operations can be monitored by the operator.

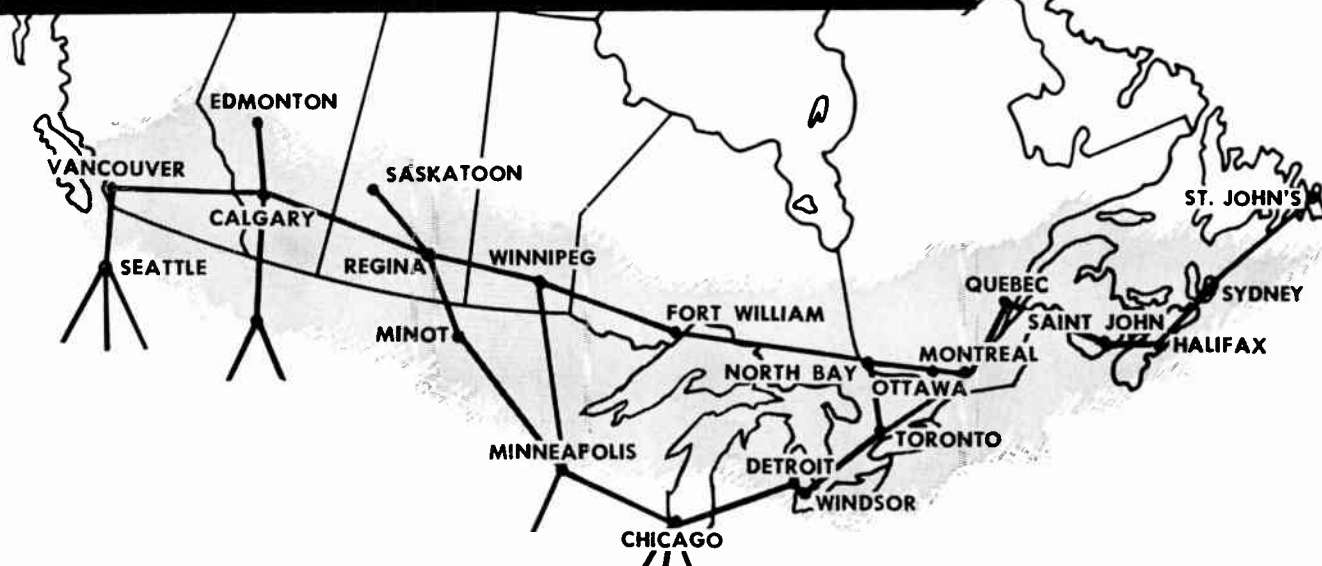
Your inquiries are invited for detailed information on ADIOS, PACE computing systems, time-rental at our Princeton Computation Center or a visit with our skilled Sales Engineering Staff. Write Department IA-9, Electronic Associates, Inc., Long Branch, New Jersey.



• • • SETS THE PACE  
PRECISION ANALOG COMPUTING EQUIPMENT  
LONG BRANCH, NEW JERSEY • TELEPHONE LONG BRANCH 6-1100

For further data on advertised products use page 109.

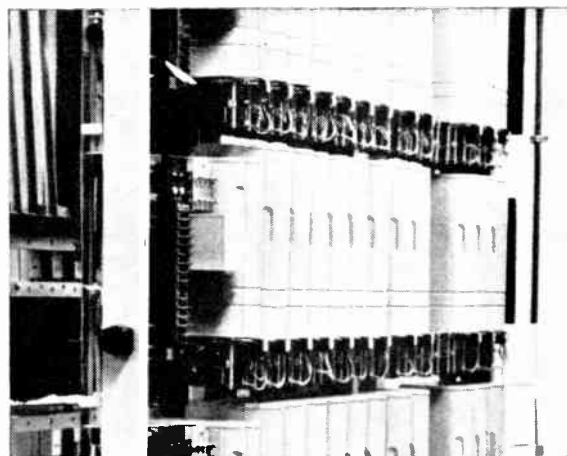
GET SET FOR NATIONWIDE TOLL DIALING **TOMORROW—**  
ENJOY TOP ECONOMY, TOP EFFICIENCY **TODAY—**



## GO STROWGER!

When nationwide toll dialing comes, you can tie right in with the 2-letter, 5-figure system if you're equipped with Strowger Type 11 M-A-X. Simply insert a digit absorbing first selector switch in place of the original, which may be reused as a second or third selector. Other features necessary for Nationwide Toll Dialing (Operator or Subscriber) which are not already an integral part of Strowger equipment, may easily be added at any future date.

Nationwide toll dialing is round the corner. But Strowger advantages are available right now. For initial or expanding installations—or if you are converting to automatic—Strowger is your best investment by far. Strowger Type 11 M-A-X grows with you and your community. For moderate growth, add a single switch—just jack it into place. For larger growth, add a shelf with pre-wired banks. And if your community's development is really spectacular, install an extra frame—with as many shelves as you need. There are no capacity limits to Strowger expansion, and no heavy installation costs. Your own men install each item, quickly and inexpensively.



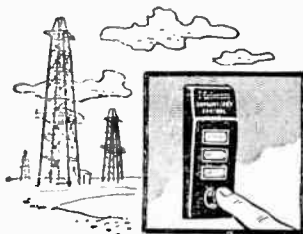
*Strowger banks, shelves and frames for Type 11 M-A-X are supplied complete and pre-wired, ready for installation by your own men.*

For full information on dependable, economical Strowger Type 11 M-A-X, call us or write us today. Or ask for a consultation. Our recommendations are free. Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

**AUTOMATIC  ELECTRIC**

ORIGINATORS OF THE DIAL TELEPHONE

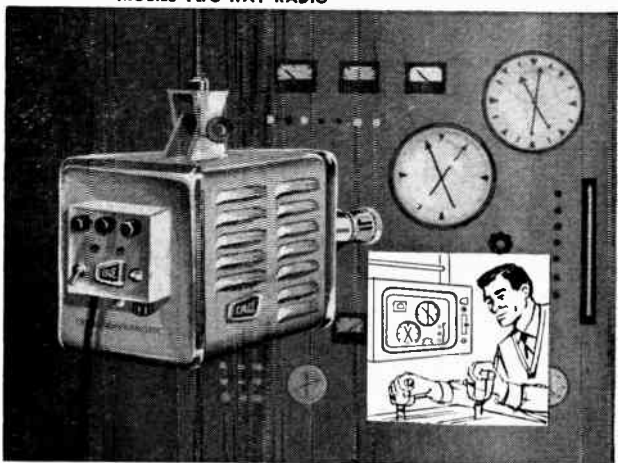
5634



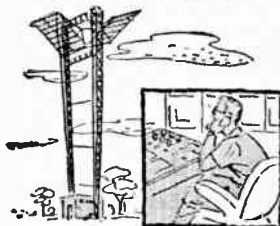
SUPERVISION AND CONTROL



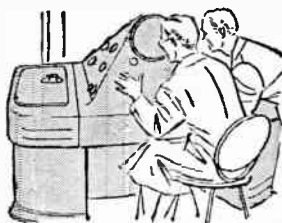
MOBILE TWO-WAY RADIO



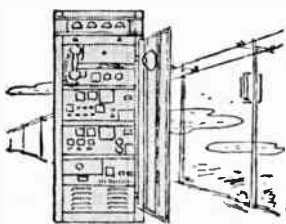
This ROGERS closed circuit television installation makes possible meter and gauge readings from a remote location. Television spotted throughout this plant saves energy, speeds up work, enables valuable supervisory people to be more places, do more things.



RADIO RELAY



SCIENTIFIC APPARATUS



POWER LINE CARRIER

Because Rogers Majestic Electronics provide such a wide variety of basic equipment and components our engineers can give you custom-made systems at production line prices. Whether you are investigating or investing in mobile two-way radio, closed circuit television, microwave, scientific apparatus or any other electronic equipment, consult Rogers first.

Unexcelled engineering skill, quality products, and efficient service stand back of the Rogers Majestic representative in your area. Let him show you how the various time-saving, profit-making communications tools and electronic control instruments can help you.

Write, phone or wire our nearest office for a consultation—there's no obligation.



*Specialists in Electronics*

# ROGERS MAJESTIC ELECTRONICS

LIMITED

HALIFAX • MONTREAL • OTTAWA • TORONTO • WINNIPEG • VANCOUVER

## NEWS

(Continued from page 82)

### Honeywell Aeronautical Division Receives New Appointments

The appointment of A. W. Babcock, R.I.A., as administrative assistant to Carl A. Anderson, manager of the Aeronautical Division, Minneapolis-Honeywell Regulator Co. Ltd., has been announced by the company.

Mr. Babcock will be responsible for contracts administration including financial and cost accounting functions for the division. He has been connected with the radio and electronics industry since 1935.



A. W. BABCOCK

A further announcement has been made by Mr. Anderson in the appointment of Charles Spence as chief field service engineer for the Aeronautical Division. His appointment as the division's first full time field service chief, Mr. Anderson said, will result in better liaison with the various military agencies and better integration of field activity.

### RCA Victor Company Appointments

The board of directors of RCA Victor Company, Ltd., has recently announced the appointment of Frank R. Deakins as chairman and of P. J. Casella as president and chief executive officer.

Mr. Deakins has served 41 years with RCA Victor and has been president of the Canadian company for the past 12 years.

Since joining the company in June, 1954, Mr. Casella has been successively general manager of distribution; vice-president, distribution; vice-president, consumer products, and a director.

### Alan R. Turner Becomes PSC's Western Projects Engineer

Alan R. Turner has been appointed Western Projects Engineer for the Photographic Survey Corporation Limited and its new engineering associate, Hunting Technical Services Limited, both of Toronto. The announcement, by W. H. Godfrey, general manager of both organizations, states that Mr. Turner will make his headquarters in Calgary.

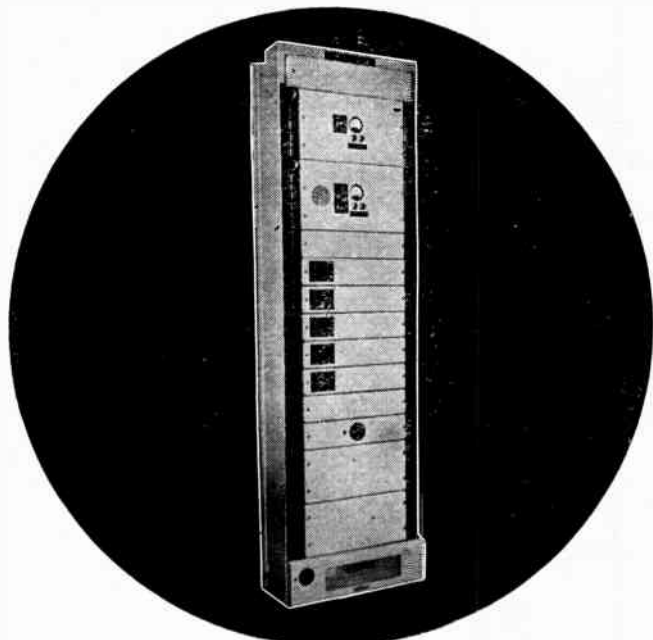
Mr. Turner comes to Calgary from Vancouver where he has been recently assistant to the manager of PCS's Western division there.

(Continued on page 86)

For further data on advertised products use page 109.

# G-E's 2 Easy Solutions

to short haul Point-to-Point Communications



Complete terminal of GEC VHF Radio Telephone equipment. Panels slide in easily . . . can be quickly removed for maintenance.

## PROGRESS LINE 2-WAY RADIO

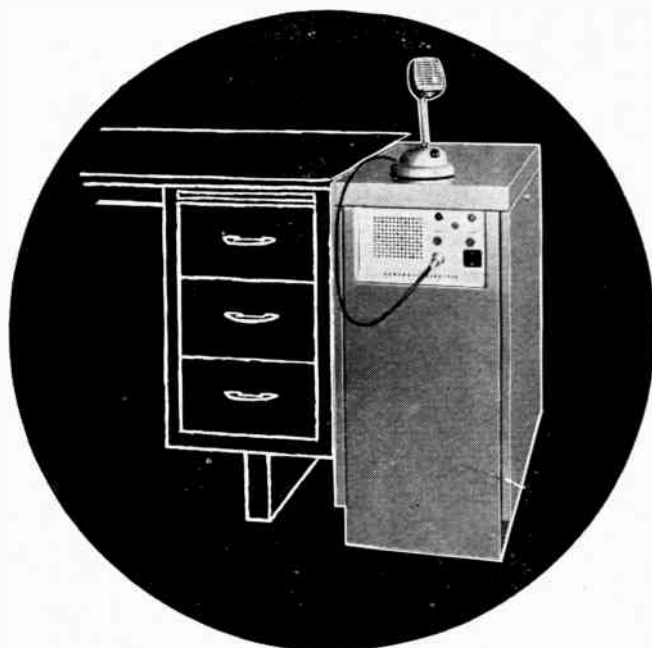
For single channel radio links, Progress Line base-station equipment provides inexpensive, easily transportable terminals. Individual 19" rack-mounted power supplies accommodate the plug-in VHF-FM Transmitter and Receiver units. These, plus a line termination panel occupy only 19 1/4" of rack space. Up to 42" extra rack space available in standard cabinets.

Broadband version will carry up to 3 channels.

Where line or cable systems are impractical or costly—where you want both dependable performance, and return on investment—G-E 2-Way Radio and G-E-C Multi-Circuit Junction equipment can increase service to customers, increase income and profits. In industrial applications, this equipment can be used to facilitate communication between work site and the local exchange . . . can be used over rough terrain where line costs are prohibitive. It can be used as a studio to transmitter broadcast link . . . or in linking summer

## SPO-5050 MULTI-CIRCUIT JUNCTION RADIO

Small and inexpensive, this VHF Radio-telephone is ideal for semi-permanent and fixed installations. Frequency-Division-Multiplex operation provides up to five circuits over the FM-VHF link. It is designed to operate within 156-184 mc/s and can be supplied in various bands from 71 to 328 mc s. Over fifty miles, cost of two terminal installations, antennas and feed lines is less than the cost of the copper alone in a single open-wire pair.



The GE Progress Line Desk-Mate Station. Radio communication in a deluxe cabinet in the handiest form possible.

resort areas. Military communications requirements and Remote Broadcast Programming can also be adapted economically and quickly, to this type of equipment.

When you require short haul Point-to-Point Communications facilities, it will pay you to investigate G-E 2-Way Radio and G-E-C Multi-Circuit Junction equipment. For further information write: Electronic Equipment Sales, Canadian General Electric Company Limited, 830 Lansdowne Avenue, Toronto, Ont.



## ELECTRONIC EQUIPMENT

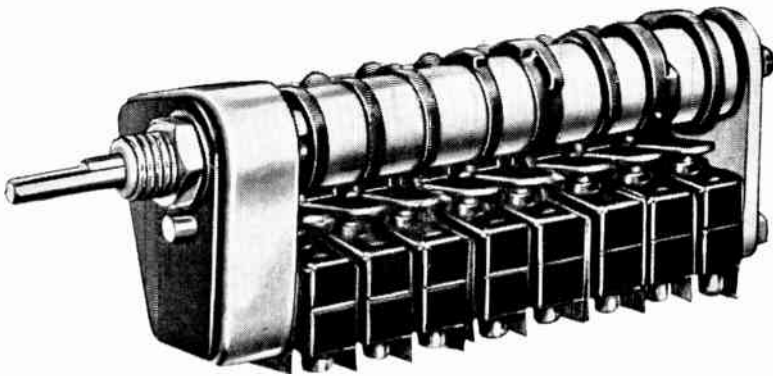
ELECTRONIC EQUIPMENT OFFICES LOCATED IN:

VANCOUVER • CALGARY • WINNIPEG • TORONTO • MONTREAL • HALIFAX

MR-756

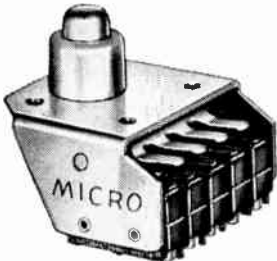
**CANADIAN GENERAL ELECTRIC COMPANY LIMITED**

# MICRO SWITCH PRECISION SWITCHES FOR MULTIPLE CIRCUIT CONTROL



**SUBMINIATURE ROTARY SELECTOR SWITCH**

MICRO SWITCH rotary selector switches provide a means of switching two to eight different circuits with one small compact assembly. The switch consists of two to eight single-pole, double-throw subminiature basic switching units operated by cams on a common shaft. The cams are pre-set to operate the basic switches at 45° detents. Cams can be set to your specifications at the factory, permitting any combination of the switching units to be actuated in any position.

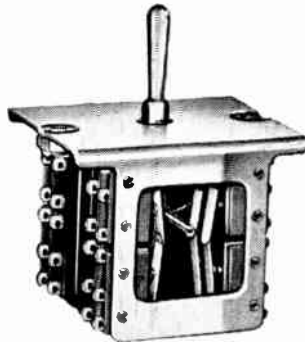


**MULTIPLE CIRCUIT PANEL MOUNTING  
PUSH BUTTON SWITCH**

Small, panel mounting manually operated push button switch containing two to fourteen basic switching units. Each unit may be wired either normally open or normally closed providing numerous combinations of "off" or "on" circuits in either depressed or released plunger positions.

**SUBMINIATURE TOGGLE ASSEMBLY**

An assembly of up to sixteen subminiature basic switches operated by a single bat handle. Eight switches can be operated with each direction of the toggle motion. This assembly makes an unusually efficient, compact, lightweight component . . . each of the subminiature switches are less than 3/4" long and weigh less than 1/15 ounce.



**2-POLE PANEL MOUNTING TOGGLE SWITCH**

Conforms to "AN" and "JAN" specifications and provides superior service and life characteristics through (1.) greater over surface creepage and clearance distances; (2.) sealed toggle lever; (3.) no return springs in momentary versions; (4.) solid silver contacts; and (5.) copper moving contact carrier to provide maximum conductivity.



**MICRO SWITCH  
A PRINCIPLE  
OF GOOD DESIGN**

MICRO SWITCH produces a complete line of extremely reliable snap-action precision switches for single and multiple circuit control. For complete information, write to Honeywell, Dept. EC-EC-10.



# MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, LTD.  
LEASIDE, TORONTO 17

## NEWS

(Continued from page 84)

### Kelly Named Chief Accountant For Logistics Research

Earl Kelly has been appointed chief accountant for Logistics Research, Inc., of Redondo Beach, Cal., manufacturer of ALWAC electronic digital computers and data processing systems.



**EARL KELLY**

Mr. Kelly's, appointment was announced by Hugh F. Tracey, assistant to the president of the Southern California firm.

Before Mr. Kelly joined Logistics, he had been assistant manager of the cost accounting division at Canadian Aviation Electronics.

### Crescent Industries Appoints Rep For Eastern Canada

A.T.R. Armstrong, Ltd., 700 Weston Road, Toronto 9, Ontario, was appointed the new manufacturer's representative for eastern Canada, it was recently announced by Paul F. Leopold, sales manager of the distributor division of Crescent Industries, Inc., Chicago.

Armstrong will represent Crescent's full line of hi-fidelity automatic phonographs and tape recorders in all provinces except Alberta, British Columbia, Saskatchewan and Manitoba.

### Canada's Oldest Battery Manufacturers Merge

The merging of the operations of Exide Batteries of Canada Limited and the Willard Storage Battery Company of Canada Limited was recently announced. The new company will be known as The Electric Storage Battery Company (Canada) Limited and will be comprised of three divisions: Exide Automotive, Exide Industrial and Willard Automotive.

While operating as completely separate entities, the two companies have, since their inception, been members of the same family group. The present move was designed primarily to integrate research, engineering and manufacturing in order that the requirements of a rapidly expanding Canadian economy may be anticipated and supplied.

A new plant on the Dixie Road, Toronto Township, will be completed early in 1957. Until this plant is ready, administration offices will remain in their present locations.

For further data on advertised products use page 109.



# 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 109. Just mark the products you are interested in on the coupon on Page 109 and the information will be in your hands within a few days.

## ● High-Precision Impedance Comparator

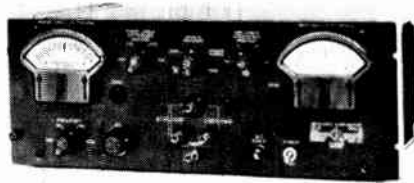
Item 1245

The rapid sorting of electrical components has been facilitated by the extensive use of the General Radio Company's impedance comparator type 1605-A which indicates directly the percent difference between two impedances without requiring a bridge balance. The 1605-A Impedance Comparator can be used to compare complex impedances of any phase angle. An added feature of the instrument is that it indicates not only the difference in magnitude between the two components being compared, but also indicates simultaneously the phase angle difference. These differences are indicated directly on panel meters. On the most determined to 0.01 per cent and 0.0001 radian, respectively.

The Type 1605-A Impedance Comparator is completely self-contained, including a calibrating voltage. The internal oscillator provides frequencies from 100 cycles to 100 kc in decade steps. Meter voltages are available externally to operate recorders, remote indicators, or selecting devices.

The range of impedances which can be compared is nominally from 2 ohms to 20 megohms. Four independent ranges are provided for the impedance-difference ( $\pm 0.3\%$ ,  $\pm 1\%$ ,  $\pm 3\%$ ,  $\pm 10\%$ ) and the phase-angle-difference ( $\pm 0.003$ ,  $\pm 0.01$ ,  $\pm 0.03$ ,  $\pm 0.1$  radian full scale). A versatile

instrument for both production and the laboratory, the comparator has many uses. In addition to the usual comparison of components other important uses are: measurement of drift of deposited-carbon resistors; inspection of silvered-mica sheets;



measurement of phase shift in various types of wire-wound resistors; inspection and adjustment of ganged capacitors and potentiometers; and checking balanced transformer windings.

## ● Secondary Radar

Item 1246

One of Cossor (Canada) Limited's outstanding contributions to the aircraft industry is Secondary Radar. It uses a transmission from a very simple low cost ground station on one frequency received by a small, lightweight airborne beacon which automatically transmits a reply back to the ground on a different frequency, providing

an Air Traffic Controller with the ranges and bearings of all Transponder equipped aircraft within radio line of site at ranges up to 150 nautical miles from the ground station, and at altitudes up to 50,000 feet.

It may be "associated" with a Primary Radar System in such a way that both the Primary and Secondary replies are presented on the same indicator. The Secondary Radar Equipment is relatively small, lightweight and cheap, and it is suitable for associating with many existing Primary Radars. Since only one-way transmission is involved between each Secondary Radar transmission and reception, a longer range performance is obtained on Secondary Radar than on Primary Radar, although the Secondary Radar Transmitter powers are much less than those of typical Primary Radars.

The reply from any particular aircraft may be modified at the aircraft in a way that enables the reply to be distinguished from that of another aircraft. Thus a means is provided to enable a ground controller to identify the reply from any aircraft with which the controller has radio telephone contact.

The Secondary Radar interrogation and response are made at different frequencies so that ground clutter and precipitation returns do not appear on the Secondary Radar display. Thus Secondary Radar often permits tracking to be made on aircraft in regions which are beyond the resolution of Primary Radar.

Another item of distinction is Cossor's high quality special Deflection Yokes which are currently being supplied to meet exacting specifications to research laboratories and production equipment throughout North America. Prototype coils can be produced for any writing speeds or tube type at short notice. Coils may be designed for single ended or push-pull Class A or AB1 operation and Class H insulation Yokes are now in production.

(Turn to page 89)

## MODEL 260 COMPARISON BRIDGE



### SPECIFICATIONS

#### ● RANGES:

Phase	Magnitude
0-0.15%	0-0.30%
0-1.5%	0-3.0%
0-15%	0-30%

0.01% per dial division on most sensitive range.

- IMPEDANCE: 20Ω — 3 meg., to 0.01% accuracy  
0.2Ω — 300 meg., to 1% accuracy
- ACCURACY:  $\pm 1/2$  dial division
- GENERATOR: 5 volts in series with 150 ohms to each arm.
- FREQUENCY: 0.1 to 10 kc available. 1 kc supplied as standard equipment.
- POWER SUPPLY: 115 volts, 60 CPS.

High Accuracy  
for PRECISION  
COMPARISONS


**esi**

**ELECTRO MEASUREMENTS, INC.**


7524 S.W. Macadam, Portland 1, Oregon

## STARK

Canada's first  
manufacturer of PANEL,  
PORTABLE and SWITCHBOARD  
METERS




**MODEL 605**




**MODEL 604**

Available in Standard Sealed or Ruggedized Styles.

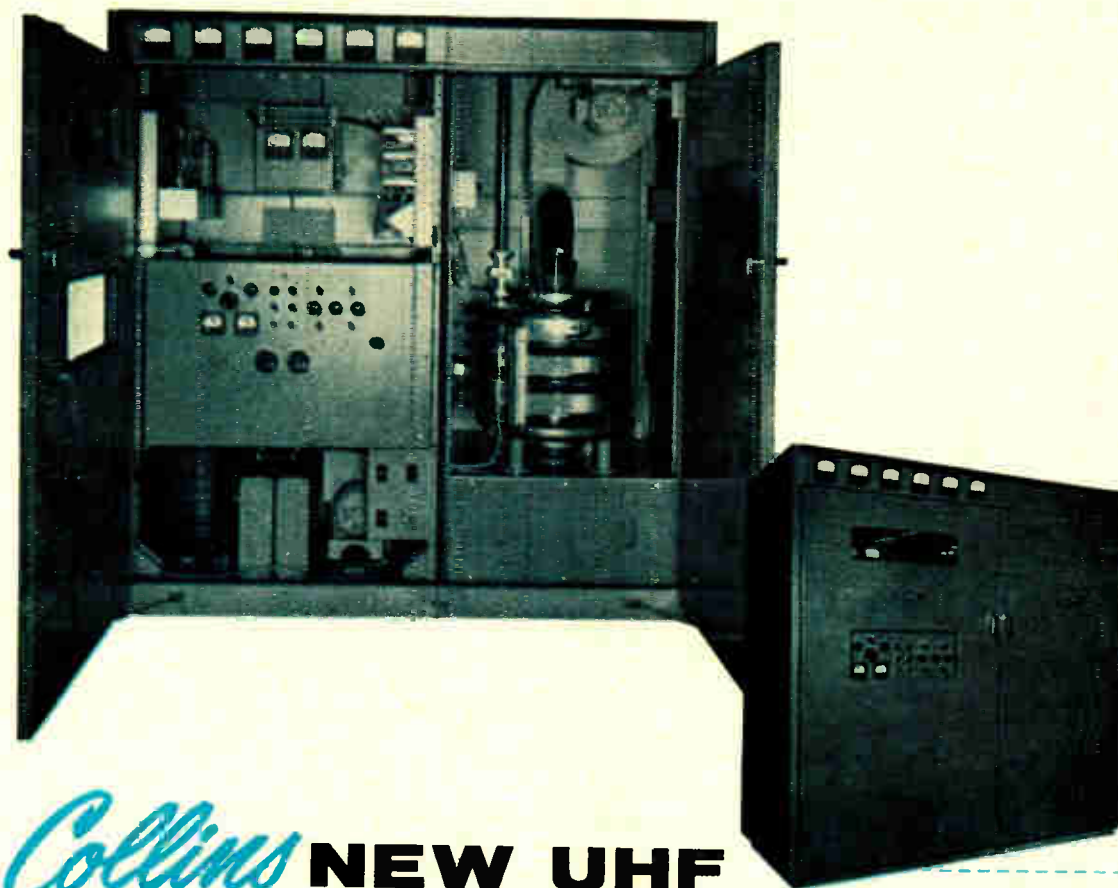


**MODEL 46-250**  
250 Degree



**MODEL 804**  
Standard Panel Type

**STARK ELECTRONIC INSTRUMENTS LTD.**  
Factories and Sales Office: Ajax, Ont.  
Foreign Division: 276 West 43rd Street  
New York 36, N.Y., U.S.A.



## *Collins* **NEW UHF** *Transhorizon Transmitter*

*Another outstanding  
development in  
Collins Transhorizon  
Program*

Collins one kilowatt transmitter, operating in the 700 to 1,000 megacycle frequency range offers high performance, reliability and simplicity of operation. Especially designed for use on tropospheric scatter propagation circuits, it has a two megacycle bandwidth with a gain of 30 db. The maximum RF driving power required is 5 watts.

An air-cooled klystron is used as the final amplifier. Control and protective circuitry are arranged for ease and simplicity of operation. Front panel controls and meters are provided for all critical

circuit functions. Klystron cavities are motor-tuned. A monitor provides direct reading indication of incident or reflected power on the 50 ohm coaxial output line. Operating frequency may be easily changed by retuning the three klystron cavities and re-adjusting the output coupling and magnet currents.

The transmitter is housed in two cabinets. Full length doors and hinged panels allow complete front access to all sub-units and components. Additionally, the RF Cabinet may be opened during operation for adjustment or inspection, without exposing personnel to high voltages. All connections are made at the tops of the cabinets, simplifying installation.

A ten kilowatt transmitter is also available for longer range UHF tropospheric scatter circuits.

### **SPECIFICATIONS**

**POWER OUTPUT:** 1 kw, CW nominal, 2 kw, maximum  
**FREQUENCY RANGE:** 700-1,000 mc  
**DRIVING POWER:** 5 watts maximum  
**FREQUENCY STABILITY:** .001% (when used with Collins 310L-1 Exciter-Modulator)  
**DISTORTION:** Noise and FM distortion 60 db below maximum deviation  
**SPURIOUS OUTPUT:** All spurious output frequencies at least 80 db below carrier level except low order harmonic at the output frequency. Second and third harmonics are a minimum of 50 db below carrier level.  
**COOLING:** Forced air  
**PRIMARY POWER:** 3Ø, 4 wire, 60 cps +3 -10 cps, 208 volts, ±10%  
 8 kw with a 2 kw RF output  
 6 kw with a 1 kw RF output  
**CABINET DIMENSIONS:** Power supply cabinet: 43½" w, 34" d, 78" h  
 Klystron cabinet: 33½" w, 34" d, 78" h  
**WEIGHT:** 2,600 pounds

*Collins* **CREATIVE LEADER IN COMMUNICATION**



**COLLINS RADIO COMPANY OF CANADA LTD.**

11 Bermondsey Road, Toronto 16, Ontario

For further data on advertised products use page 109.

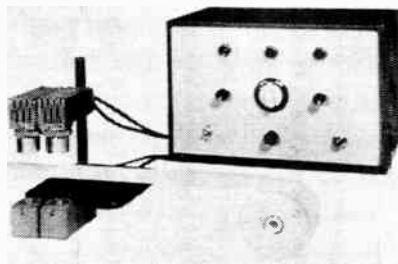
## NEW PRODUCTS

(Continued from page 87)

### ● Decitron Edge Register Detector

Item 1247

The Electronic Products Division of the Post Machinery Co., announces the availability of an easily adjusted and easily read Decitron Edge Register Detector. The Model ER-1 unit detects web edge position with extreme accuracy. Inward or outward displacement of the web from the desired path actuates the photoelectric control



relays to give a directional correction signal. Neutral space is easily adjusted to correspond to the dynamics of the correction mechanism.

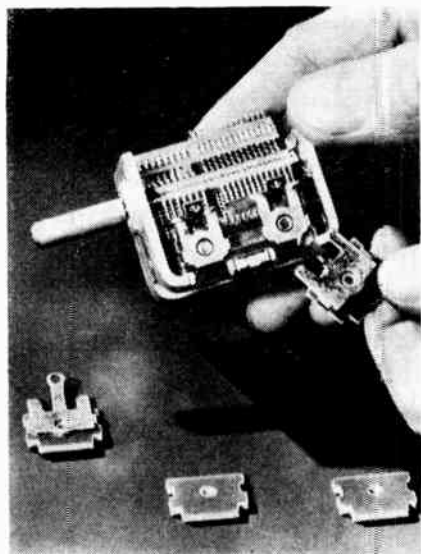
Specifications include a 10 amp contact rating to operate reversing motor or clutches; input current of 115V, 60 cycles; indicator lamps for visual indication of readout; weight—20 lbs.; either two FH-20 or two FH-22c photohead detectors.

### ● Phenolic Laminate

Item 1248

A new electrical grade laminate has been developed by National Vulcanized Fibre Co. for radio and TV applications where good electrical properties and extremely low cold flow are important.

Known as Phenolite E-2040, the new material is a paper-base sheet laminate bonded with a special phenolic resin. In addition to its cold flow properties, the new



grade features low moisture absorption, good dielectric strength (both perpendicular and parallel to the laminations), and ease of hot punching and shearing.

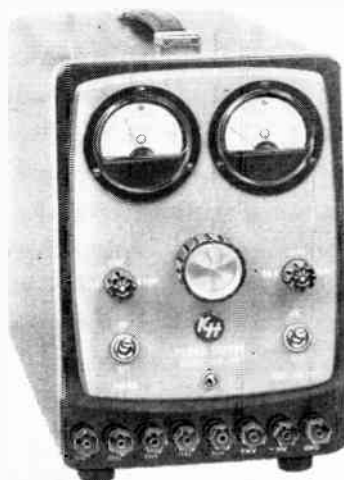
Grade E-2040 is available in sheets up to 39 in. by 47 in. and thicknesses of from .010 in. to 1/4 in. Color is natural; finish, dull.

Additional information on Phenolite E-2040 is available on request.

(Turn to page 90)

## REGULATED POWER SUPPLY

With 100 Microvolts Hum



Model UHR-225

In addition to the d-c output, there are two independent 6.3V a-c outputs, each rated at 5 amps. Price, \$275.00 f.o.b. factory.



For Further Details Write Dept. EC.

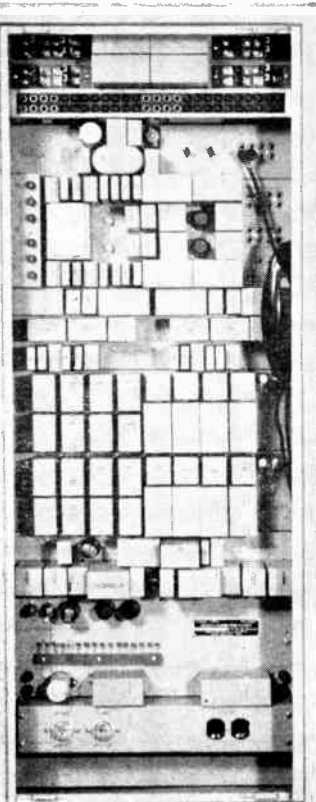
**Krohn-Hite Instrument Co.**

580 Massachusetts Avenue • Cambridge 39, Massachusetts

## TELEPHONE REPEATER TYPE TA-289/FCC

This is a packaged voice-frequency repeater adapted for use on almost any type of two-wire or four-wire line facility. The principal components are amplifiers, hybrid circuits and balancing networks. It also includes line protectors, monitoring telephone set, d-c telegraph composite sets, adjustable line equalizers, v-f signal converter type CV-339/FCC, and rectifier for a-c operation. It has a maximum net gain of 24 db on 2-wire circuits and of 30 db on 4-wire circuits, between nominal 600 ohm impedances.

Type TA-289/FCC Repeater, Telephone, manufactured for the U.S. Army Signal Corps. This is a recent redesign of the type OA-7/FC Repeater, Telephone, and is moisture- and fungus-proofed. It meets all applicable MIL specifications.



## RADIO ENGINEERING PRODUCTS

1080 UNIVERSITY STREET, MONTREAL 3, CANADA

Telephone: UNiversity 6-6887

Cable Address: Radenpro, Montreal

MANUFACTURERS OF CARRIER-TELEGRAPH, CARRIER-TELEPHONE AND BROAD-BAND RADIO SYSTEMS

# KESTER

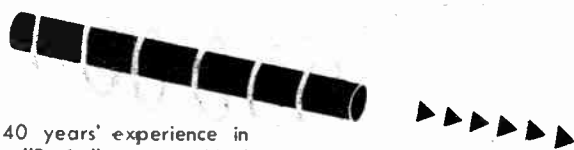
Absolutely non-corrosive and non-conductive, KESTER "RESIN-FIVE" CORE SOLDER contains an activated type of resin that gives you that fast, positive action on all your jobs . . . including the most difficult.

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

# SOLDER

## NORTH RELAYS STEP-SWITCHES

for **DEPENDABILITY**



More than 40 years' experience in manufacturing "Brains" to meet critical industrial or military specifications for:

- SWITCHING
- SUPERVISING & RECORDING
- COMMUNICATIONS
- REMOTE CONTROL
- MISSILE GUIDANCE
- OTHER AIRBORNE AUTOMATIC CONTROLS
- MANY OTHER "AUTOMATIONS"

Canadian Distributors for NORTH ELECTRIC CO.

# ERICSSON

TELEPHONE SALES OF CANADA LIMITED

Industrial Division

130 Bates Road, Montreal 8, P.Q. REgent 1-6428

For further data on advertised products use page 109.

## NEW PRODUCTS

(Continued from page 89)

### ● Heathkit Audio Vacuum Tube Voltmeter

Item 1249

This brand new AC vacuum tube voltmeter emphasises stability, broad frequency response, and sensitivity. It is designed especially for audio measurements, and low-level AC measurements in power supply filters, etc. Employs a cascode amplifier circuit with cathode-follower isolation between the input and the amplifier, and between the output stage and the preceding stages. An extremely stable circuit with high input impedance (megohm at 1000 CPS). Response of the AV-3 is essentially flat from 10 CPS to 200 kc, and is usable for tests even beyond these frequency limits. Increased damping in the meter circuit stabilizes the meter for low frequency tests. Nylon insulating bushings at the input terminals reduce leakage, and permit the use of the 5-way Heath binding post.



The extremely wide voltage range covered by the AV-3 makes it especially valuable not only in high-fidelity and service work, but also in experimental laboratories. AC (RMS) voltage ranges are 0-0.1, .03, .1, .3, 1, 3, 10, 30, 100, and 300 V. Decibel ranges cover - 52 DB to + 52 DB. An entirely new circuit as compared to the previous model. Employs 1 per cent precision multiplier resistors for maximum accuracy. Handles AC measurements from a low value of one millivolt to a maximum of 300 volts.

### ● 45-Volt Selenium Rectifiers

Item 1250

A new line of 45-volt selenium rectifiers in standard sizes from 11/16" to 2" square has been announced by the Federal Telephone and Radio Company, a division of International Telephone and Telegraph Corporation.

Seven types are already being manufactured and availability of additional types in larger sizes will be announced shortly.

The new rectifiers are made possible by advances in production techniques. The cells exhibit high stability and very low reverse or "leakage" current, making them ideal for use in magnetic amplifiers.

The rectifiers will permit significant savings in cost and space by reason of the fact that fewer cells will be needed to achieve a desired voltage rating. The rectifiers are being manufactured in both commercial and radio-TV types.

Complete details on the 45-volt rectifiers may be obtained on request.

(Turn to page 95)

# RETMA REPORT

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

By  
**BASIL JACKSON**



## **RETMA Presents Brief to Royal Commission on Broadcasting**

On September 17th the President of the Radio-Electronics-Television Manufacturers Association of Canada, John D. Campbell, presented the RETMA Brief to the Royal Commission on Broadcasting in Ottawa. The Brief advocated three main recommendations as follows:

1. The formation of an independent regulating body for broadcasting.
2. Action on the introduction of color television in Canada.
3. The financing of the Canadian Broadcasting Corporation on a basis other than that presently used.

It was recommended that an independent regulatory body be established to administer, on an equal basis, radio and television broadcasting for both the public broadcasting system and for privately-owned stations. Voluntary advisory committees should be formed to represent the electronics industry, private broadcasters the advertising industry, and others to enable the independent regulatory body to be well informed of the viewpoints of all those concerned with Canadian broadcasting.

The present policy of not issuing more than one television station licence for any city, or prescribed area, should be changed. Also, privately operated television stations should be permitted to become established in cities and other prescribed areas in which the Canadian Broadcasting Corporation already operates, or intends to operate, a television station.

On the question of introducing color television into Canada it was recommended, that, as a first step, the authorities responsible for controlling broadcasting should approve the making of the minor and relatively inexpensive modifications to the television transmitters of the public broadcasting system so that the present United States color programs now transmitted in Canada as black and white programs will be made available to Canadians in color. These would be transmitted by both the public broadcasting system and by the privately-operated stations. This would create a demand for color television receivers and manufacturers would then be able to design, develop and produce these sets for Canadian conditions until such time as the public broadcasting system and private broadcasters could produce their own color programs.

It was emphasized, to the Royal Commission, that this recommendation should be considered only as a first step. It was further recommended by RETMA that the licences issued to privately-operated stations should include the right to transmit in color so that short color films and live color programs could be transmitted as soon as stations could commence such operations.

With regard to proper financing of public broadcasting RETMA strongly recommended that the present unsatisfactory method of attempting adequately to finance the CBC by the 15 per cent excise tax on radio and television receivers be abolished. The CBC should be properly financed wholly from general revenue. It was suggested that such an appropriation of funds should be sufficiently large to enable the CBC at all time to develop freely technological advances, such as color television, without retarding the progress of the electronics industry and the broadcasting and telecasting services of Canada.

## **Three DDP Speakers Address RETMA**

On September 18th three Department of Defense Production speakers took part in a panel discussion organized by the Components Division of RETMA. The speakers, all from the Electronics Branch of DDP, were D. B. Mundy, Director of the Electronics Branch, J. F. Murphy, Contracts Officer in the electrical and components section, and G. C. Rowe, chief of production development. The discussion took the form of an information exchange session to promote the best relations between the Department of Defense Production and the components segment of the electronics industry.

(Continued overpage)

# RETMA REPORT

Mr. Mundy dealt briefly with the policies and procedures used by the Department of Defense Production in carrying out its procurement function.

"The basic assumption on which the procurement system rests" said Mr. Mundy, "is that the best guarantee of fair value for the public money lies in an open competitive market. Wherever possible, therefore, we employ fixed-price contracts based on competitive tenders normally, and the contract is given to the lowest tenderer - but not invariably. Ability to meet the specifications required is no less important than the price. In addition, delivery requirements, the record of a firm on previous contracts, and its financial position, must all be weighed against the attractiveness of its bid. Arbitrariness or impropriety must, of course, be avoided - but there must be room for sound judgment."

Mr. Murphy gave a brief account of the departmental policies and procedures in the case of purchases by the electronics branch in Ottawa.

"First and foremost", said Mr. Murphy, "it is to be recorded that in all cases, right down to individual item awards, the Canadian content factor, provided of course that the part offered is in conformity with specification, is a paramount consideration in the order award. To effect this, all Canadian firms tendering, including supply houses, must complete a certificate in all 'invitations to tender' advising the particular items offered which would be entirely manufactured in Canada, imported in semi-finished state with final assembly by the Canadian company, or entirely imported; in the case of the first two classifications, the estimated dollar percentage of foreign contents involved also must be stipulated".

Mr. Murphy said that a point which apparently had been of some concern to Canadian component manufacturers was that possibly orders were being placed on Canadian distributors for JAN and MIL (Joint Army-Navy, and Military) parts which were subsequently supplied without source inspection by a Canadian or a United States Armed Service Agency, or that inferior parts not conforming to specification were supplied. All cases which were reported by the industry as being possibly in this category, have been investigated by the Controller General of Inspection Services with the Service Source Inspection Authority in Canada or the United States, and this contention has been found to be without foundation. Various procedural steps were in effect to prevent this occurring. The speaker gave further information about tendering in Canada and assured the meeting that it is the definite policy of the Electronics Branch of the Department of Defense Production to place component business in Canada, wherever this was practical and economical.

Mr. Rowe reviewed the recent progress in component manufacture during the past year and mentioned that, with regard to standardization, it seemed to be that Canadian manufacturers were moving closer to the United States standards, having tended to move away from JCNAAF specifications and towards the adoption of MIL specifications.

He then enumerated some of the work now in progress on the research and development program on reliability. On resistors, fixed and variable, of the carbon composition type, an investigation was being made to determine the reasons for unreliability of these components. The DDP was developing a reliable variable resistor and a high dissipation fixed resistor for military use. With regard to capacitors, they were currently developing sub-miniature trimmers for military purposes and also miniature ganged capacitors suitable, it was hoped, for transistorized military equipment. In the field of electrolytics, they were studying methods of achieving high capacity in small volume over a very wide temperature range.

In conjunction with the Department of National Defense and the Defense Research Board, the DDP was studying the matter of improved switches, micro or other small motors, relays, and other components. In the vacuum tube field, the major line of endeavor was to achieve ruggedness, increased reliability, and long life under stringent conditions of military use, and to stimulate the development and production of micro-wave and other modern electronic equipment in Canada.

Mr. Rowe spoke on the question of the introduction of automation. He thought that it was very possible that new products would emerge from the automation process which would never have existed but for automation. He thought that the relationship between reliability and automation would always be close; whether automation was the essential for achieving reliability economically was not yet apparent.

# Electronic Development and Design

Some recent work of the CDC Special Projects Group includes . . .

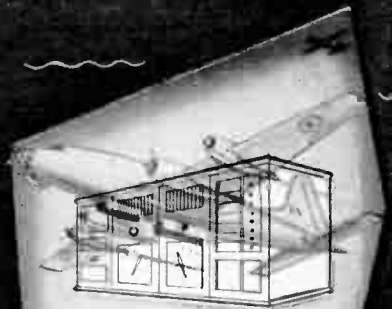
- ... **CATHODE RAY TEST TUBE STATION** — for the precision testing and evaluation of CRT's. Developed for CAMESA, to be used as a standard in Canada, and as a tool to investigate problems associated with CRT's.
- ... **RADAR SPECTRUM ANALYZER** — to measure the energy distribution of the frequency spectrum of transmitted radar pulses. Developed for the Bell Telephone Laboratories.
- ... **RADAR SIMULATOR** — to provide an artificial target for a radar installation. Developed for Bell Telephone Co.
- ... **VELOCITY MEASURING SYSTEM FOR PROJECTILES** — consisting of sixteen stations, each with light screens and photo-cell amplifiers with associated chronographs. Velocities are measured with an accuracy of 0.02%.

On short notice, the experienced engineers, design draftsmen and technicians of our Special Projects Group can design and produce prototypes (engineered for production) of any electronic machine. Bring your problems and projects for technical evaluation and proposal.

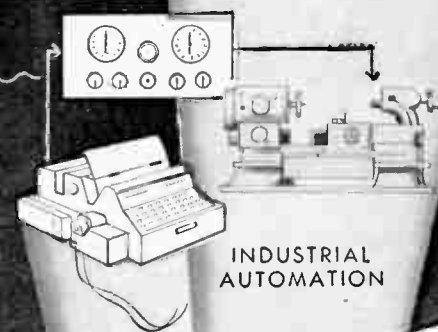
#### ENGINEERS --

You'll find major opportunities by joining our fast growing company. For full details contact the Personnel Manager, Box 508, Ottawa, Ont.

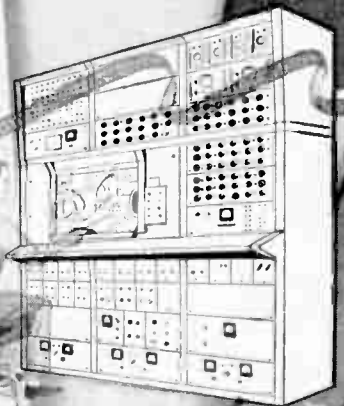
5618



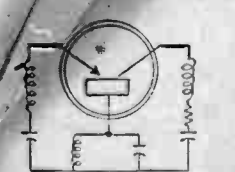
SIMULATION



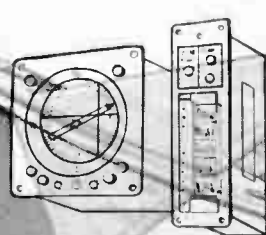
INDUSTRIAL  
AUTOMATION



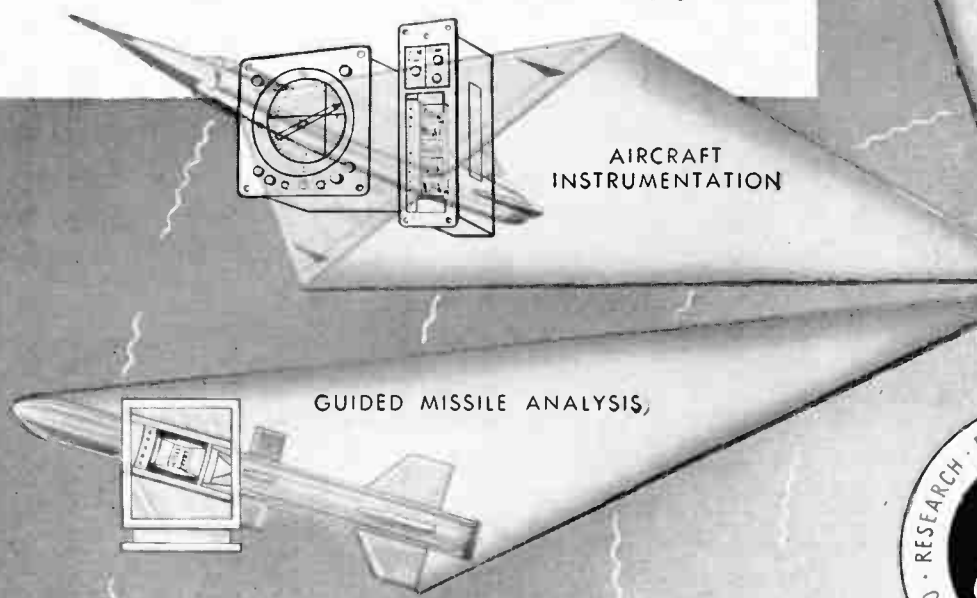
COMPUTERS



SEMICONDUCTOR  
APPLICATIONS



AIRCRAFT  
INSTRUMENTATION



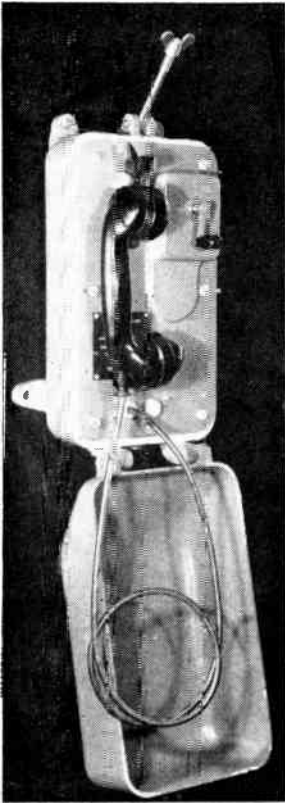
GUIDED MISSILE ANALYSIS



**COMPUTING DEVICES OF CANADA LIMITED**

P.O. BOX 508 • OTTAWA • CANADA

# MAGNETO TELEPHONE EQUIPMENT FOR *RURAL* AREAS

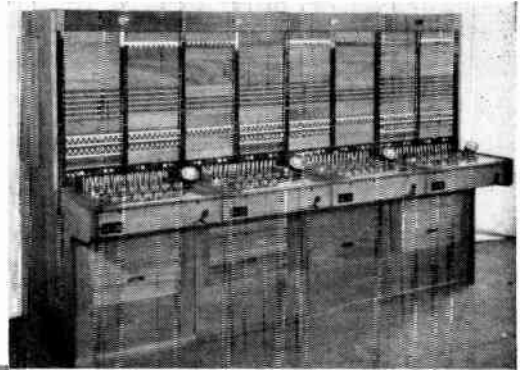


Weatherproof Hood Telephone (walling fixing) Dial, C.B., Magneto or Sound Power models available.

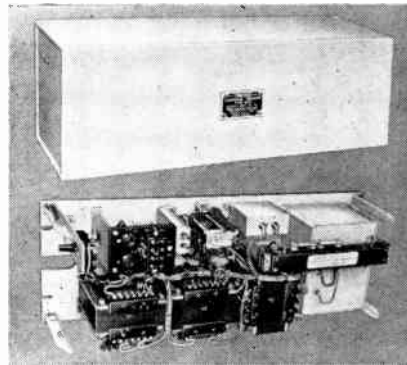
T.M.C. telephone equipment is in great demand in all countries of the Commonwealth. Production has yet to fully catch up with this ever increasing demand in Canada and elsewhere although thousands of units are to-day operating at high efficiency keeping open vital communications in all the rural areas of this country.

Users realize that over forty years' experience is embodied in to-day's T.M.C. telephone equipment which is designed, manufactured and tested to operate under the most arduous conditions.

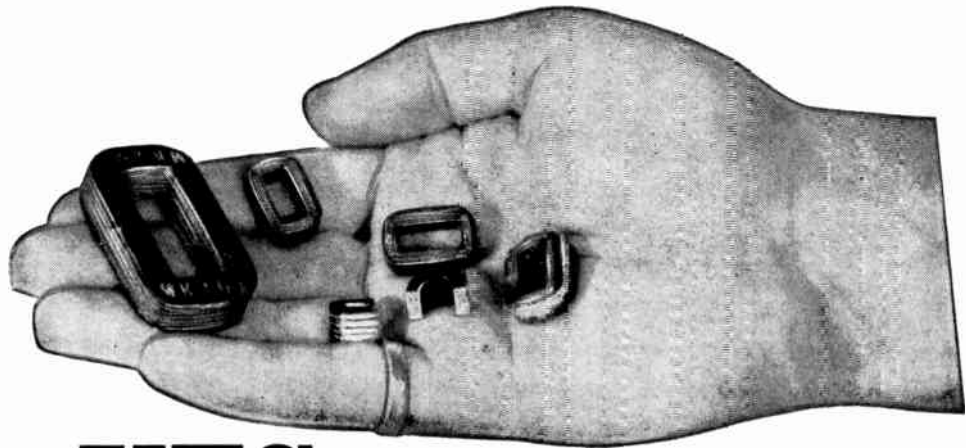
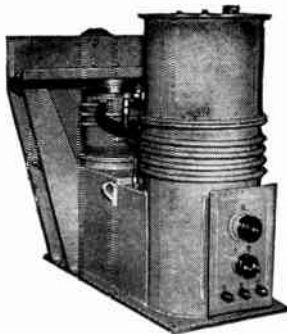
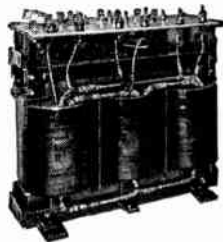
Call at our showrooms and see the full range of Magneto Wall and Desk Telephones, Cordless Switchboards, both C.B. and Magneto, etc. Prices by reason of large production are highly competitive.



Four Positioned C.B. Switchboard.



Syncycle — Synchronous Converter.



## YES...

No core too small—No transformer too large!

Illustrated above and reading counter-clockwise: HyperCores, Chokes, Power, Pulse, Filament, and Plate Transformers.

## MOLONEY ELECTRIC COMPANY OF CANADA LIMITED

Factory and Head Office: 213-219 Sterling Road, Toronto 3, Ont., Regional Offices: Montreal, Calgary

For further data on advertised products use page 109.



## NEW PRODUCTS

(Continued from page 90)

### ● Heathkit Voltage Calibrator Kit Model VC-3

Item 1251

This entirely new voltage calibrator produces near-perfect square wave signals of known amplitude. Precision 1 per cent attenuator resistors assure accurate output amplitude, and multivibrator circuit guarantees good, sharp square waves, as distinguished from clipped-sine waves. Output frequency is approximately 1000 CPS. Fixed outputs selected by panel switch are: .03,

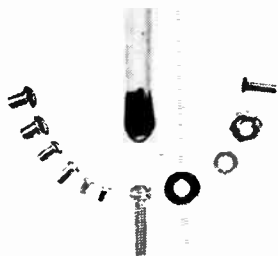


0.1, 0.3, 1.0, 3.0, 10, 30, and 100 volts peak-to-peak. Allows measurement of unknown signal amplitudes by comparing to known peak-to-peak output of VC-3 on an oscilloscope. Will also double as a square wave generator at 1000 cycles for determining gain, frequency response, or phase-shift characteristics of audio amplifiers. Equally valuable in the laboratory or in radio and TV service shops.

### ● Miniature Precision Hardware For The Electronic Industry

Item 1252

Circon miniature, specialized electronic and instrument hardware is of the highest premium quality possible to manufacture and is not to be confused with ordinary commercial types on the market. Circon hardware is designed and manufactured to the highest specifications demanded by precision electronic and instrument assemblies for greater reliability, improved performance, rapid-sure assembly, and substantially reduced maintenance cost of the complete unit.



Each and every piece of Circon miniature precision hardware is subjected to a continuous, rigorous inspection during manufacture to bring you hardware of perfection. Circon eliminates the problems of irregular parts, burrs, poor uneven threads, imperfect platings, inaccurate sizings, etc., through superior metals, precision production, and close scrutiny of inspection control systems. Circon miniature hardware is the standard of excellence in its field. It will save many times its cost with better performance, reliability, and less costly assembly and maintenance.

(Turn to page 97)

# SIZE non-corrodible SYNCHROS EXACTLY

To  
**BuOrd Spec**

by



# MUIRHEAD

DATA SHEETS AND PRICES  
ON REQUEST

MUIRHEAD

PRECISION ELECTRICAL INSTRUMENTS

MUIRHEAD INSTRUMENTS LIMITED · STRATFORD · ONTARIO · CANADA  
MUIRHEAD INSTRUMENTS INC. · 677 Fifth Ave · New York 22 · N.Y. · U.S.A.  
MUIRHEAD & CO. LIMITED · BECKENHAM · KENT · ENGLAND

# Announcing the opening

of

## **TELECABLES & WIRES LTD.**

new Canadian producer of communication cables

O. W. Titus  
President



H. O. Coish  
Manager, Sales and  
Engineering

H. B. Carnahan  
Plant Manager



Telecables & Wires Ltd. has been formed under the joint ownership of General Cable Corporation of America, New York; Telegraph Construction and Maintenance Company Limited, London, England and Canada Wire and Cable Company Limited, Toronto. The engineering experience and research facilities of all three are now combined to serve the Canadian communications industry with their cable requirements.

We take pleasure in announcing the appointment of operating management personnel and that the new plant at Fort Garry, Manitoba will be officially opened on October 29th by Honourable Douglas L. Campbell, Premier of the Province of Manitoba. The first telephone cable plant West of the Great Lakes, it will have manufacturing and warehouse space of 42,000 square feet.



## **TELECABLES & WIRES LTD.**

FORT GARRY

MANITOBA

### SALES OFFICES

Vancouver • Victoria • Edmonton • Calgary • Lethbridge • Regina • Winnipeg  
Windsor • Hamilton • Toronto • North Bay • Ottawa • Montreal

## NEW PRODUCTS

(Continued from page 95)

### ● Super Synchros

Item 1253

Muirhead Instruments Limited, of Stratford, Ontario, Canada, are offering super synchros type 18CT4a exactly to U.S. Navy Bureau of Ordnance Specification MIL-S-16892 except that the maximum error does not exceed three minutes.

Synchros having the above performance are available for immediate delivery in limited quantities.

Each instrument is supplied complete with a certificate of test showing the maximum error, this figure is subject to a tolerance of  $\pm$  one minute to cover test equipment and reading errors.

### ● New Standard Lamination Shapes

Item 1254

Four new nickel-iron laminations are being offered for immediate delivery by Magnetics, Inc., Butler, Pennsylvania. The new shapes are UI-312, F-21, DU-1, and DU-37. These laminations are made on sectional tungsten-carbide dies, carefully grounded so that laminations are substantially burr free and flat for precision stacking.



Magnetics, Inc. laminations are "Performance-Guaranteed," meeting the highest magnetic standards. These laminations are excellent for applications requiring high initial or high maximum permeabilities.

Additional details and literature describing other Magnetics, Inc. laminations may be obtained on request.

### ● Booklet On Hospital Paging Systems

Item 1255

"Better Patient Care" is the title of a new copyrighted booklet, just published by Executone, manufacturer of electronic communication systems for hospitals.

The booklet, fully illustrated with photographs of equipment in actual use, includes a summary of a time and motion study conducted with Executone Audio Visual Nurse Call System showing how hospitals improve patient care and make maximum use of nursing time and skills.

Illustrated and described in detail are Multi Audio-Visual Nurse Call Systems which permit patient calls to be answered from many points on the floor; Doctors' Paging Systems; Bedside Radio-Sound Systems providing patient entertainment through pillow speakers; and Administrative Intercom Systems for two-way communication within and between departments.

A special section tells how audio may be added economically to the hospital's present visual domelight signalling system, utilizing existing conduit, domelights and other equipment.

"Better Patient Care" requested on your letterhead, is available, without obligation, from Executone Communication Systems Limited.

(Turn to page 98)

# Eliminate guesswork on TV SERVICING



with the  
**FREE**  
up-to-the-minute  
Aerovox  
Replacement Guide.  
Gives you  
**Exact** Equivalents  
Of original  
Electrolytic TV Capacitors  
... Fast!

**FREE!** The Aerovox Replacement Guide is a "must" for every TV serviceman and technician. This handy, pocket-size booklet lists original TV electrolytic capacitors—and gives you the *exact* Aerovox equivalents for fast replacement. With this booklet and a kit of Aerovox Capacitors, you can save time, trouble and guesswork on every replacement job you handle!



### LOOK FOR THIS DISPLAY AT YOUR JOBBERS

Get your free copy of this on-the-job time-saver from your jobber today—or write to Aerovox Canada Limited, 1551 Barton St. E., Hamilton, Ont.

# AEROVOX Capacitors

Standardize with AEROVOX

**AEROVOX CANADA LIMITED**  
HAMILTON, CANADA

Manufacturers of fixed capacitors for all radio, TV, and electronic equipment.

WESTERN SALES

Chos. L. Thompson Ltd., Vancouver, B.C.

IN U.S.A.

Aerovox Corporation, New Bedford, Mass.

5602

## NEW PRODUCTS

(Continued from page 97)

### ● Pulse Oscillator

Item 1256

The Model 3420B Pulse Oscillator is a unique instrument for applications requiring both full and half period trigger pulses. Amplitude and polarity of the two outputs are independently controlled, allowing a variety of output pulse combinations. Pulse spacing is directly indicated by a coarse-fine concentric control and decade range switch.

100 CPS — 3.3 megacycles pulse spacing directly indicated full and half period outputs pos. and neg. output pulses amplitudes variable to 40 volts.

Typical Applications: Set and reset triggers . . . Flip-flop resolving time studies . . . clock pulse generator . . . test and development of high speed circuitry . . . wide range trigger source.

### ● Time Delay Generators And Pulse Oscillators

Item 1257

Features available in this instrument are .1 CPS to 1,000 CPS internal trigger 10 sec. to 10 sec. delay, variable width initial and delayed outputs, accurate width gate pulse outputs .5% delay accuracy, .01% jitter.

Designed for use at medium to very low repetition rates, the 1000 series instruments utilize block-unitized construction to provide a choice of functions. Equipment available generates variable width millisecond range pulses, with or without calibrated delay to 10 sec. from external triggers or an integral trigger generator.

Typical Applications: Response time studies . . . synchroscope sweep delay . . . SONAR . . . gating circuit control . . . pulse spacing measurements . . . as a double pulse generator . . . timing measurements . . . biological research . . . geophysical research.

### ● Heathkit Etched Circuit Five-Inch Oscilloscope Kit Model OM-2

Item 1258

This new and improved oscilloscope retains all the outstanding features of the preceding model, but provides wider vertical frequency response, extended sweep-generator coverage, and increased stability. A new tube complement and improvements in the circuit make these new features possible. Vertical frequency response is essentially flat to over 1 mc, and down only 1½ DB at 500 kc. The sweep-generator multivibrator functions reliably from 30 to 200,000 CPS, almost twice the coverage provided



by the previous model. Deflection amplifiers are push-pull, and modern etched circuits are employed in critical parts of the design. A 5BP1 cathode-ray tube is used. The scope features external or internal sweep and sync, one volt peak-to-peak reference voltage, 3-position step-attenuated input, adjustable spot-shape control, and many other "extras" not expected at this price level. A calibrated grid screen is also provided for the face of the CRT, allowing more precise observation of wave shapes displayed. The new Model OM-2 is designed for general application wherever a reliable instrument with good response characteristics may be required.

## A CRYSTAL CALIBRATED A.M. PORTABLE RECEIVER TESTER



- ACCURATE
- VERSATILE
- LIGHTWEIGHT

Weighing only 17½ pounds, this low-cost and compact instrument combines a wide-range signal generator, a variable level tone source, and an a.f. power meter. (For battery operation, line power unit can be interchanged with battery unit.)

R.F. range: 70kc/s to 70 Mc/s. With built-in crystal checks at harmonics of 500 kc/s and 5 Mc/s. Attenuator provides calibrated outputs between 1µV and 10 mV at source impedances of 52 and 80 ohms. For general testing — higher, uncalibrated outputs up to 500mV are available.

For full details, write Marconi Instruments Department.

# Marconi



CANADIAN MARCONI

COMPANY — MONTREAL 16, QUEBEC

Canada's Largest Electronic Specialists

### ● DC Power Supply

Item 1259

Introduction of a new adjustable-output constant voltage dc power supply — the "DC Solavolt" — is announced by Sola Electric Co., manufacturer of constant voltage transformers and fluorescent lighting ballasts.

This new, compact, low-cost unit combines a constant voltage transformer, a germanium rectifier, and a special high-capacitance filter section with small choke to yield strictly laboratory standards of performance.

Output voltage from the DC Solavolt is regulated within ± one per cent with supply voltage variations up to ± 15 per cent. Ripple voltage is held within 0.10 per cent (rms) at full load and nominal input voltage. An important feature of the new assembly is its ability to handle transient or "pulse" loads of up to twice the full load rating of the supply without failure due to severe voltage drop, and without damage to itself.

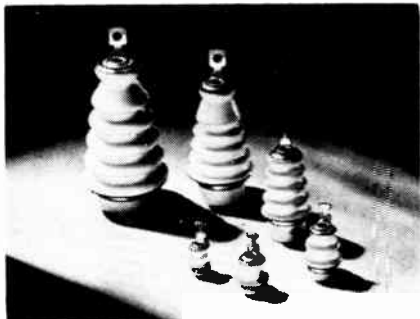
The DC Solavolt is available in six stock models that provide output adjustable in different voltage ranges between 5 to 400 volts, and currents up to 7 amps. All six assemblies are arranged for relay-rack mounting on standard, 19" frame. The front panel is 7" high and the chassis is 7¼" deep. Removable handles, for convenience when using it as a portable device, are available as accessory equipment.

For further data on advertised products use page 109.

World Radio History

## ● Metal Bonded Terminals Item 1260

A new type of metal-bonded alumina terminal for stronger, tighter soft-soldered assemblies has been developed by the Stupakoff Division of The Carborundum Company. These terminals provide a bond-strength stronger than the materials involved, with unequalled high-temperature ceramic-to-metal adherence.



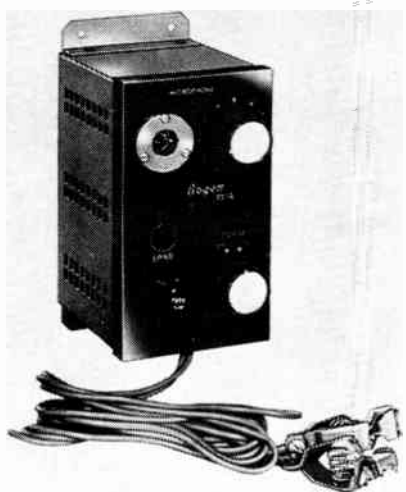
The new Stupakoff metal-bond technique is not an ordinary silver metallizing process. It is not a plating but an intimate bonding of ceramic and metal. The bond remains hermetically tight well beyond the temperature limits of soft solder, and assembly processes are simpler and more dependable. The alumina body used is a Stupakoff development which is processed under rigidly controlled conditions.

Details on Stupakoff Metal-Bonded Alumina Terminals are obtainable on request.

## ● Transistor Public Address Amplifier Item 1261

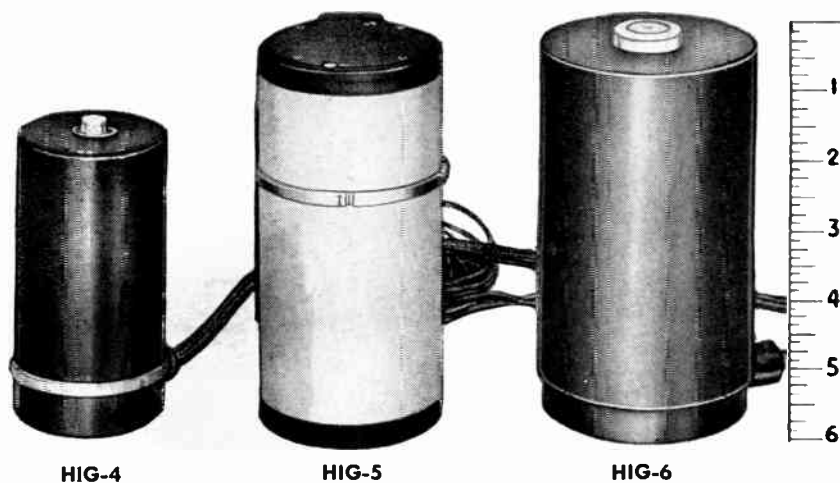
The engineering laboratories of David Bogen Co., Inc., have produced the first practical transistor public address amplifier, the BT12 pictured below. This 4-watt mobile unit, designed to operate from a 12-volt battery, is an ideal unit for emergency cars, buses and portable public address systems.

Transistor circuitry means it will outperform vacuum tube amplifiers because there are no tubes to burn out or be shattered by excess vibration. It is economical because current drain is extremely low. The BT12 is remarkably compact in size, light in weight, and mounts easily under a dashboard.



Pictured above on the front panel of this BT12 amplifier are microphone connector, speaker socket, fuse, volume control, and power on-off switch. The BT12 comes with six-foot battery cables and clamps, ready for immediate use and many years of service.

(Turn to page 100)



## HONEYWELL HIG GYRO FAMILY

# Small, Rugged WORLD'S MOST SENSITIVE

To meet your floated gyro needs, Honeywell has developed a complete line of Hermetic Integrating Gyros—the newer HIG-4 and the HIG-6, which together with the already famous HIG-5, make up the Honeywell HIG “family”!

This is a versatile line-up, as indicated by the specifications below. It gives you a wide range of performance characteristics

in a variety of weights and sizes. Honeywell HIG's can be used as rate gyros, platform gyros, directional gyros, free gyros, or precessible gyros. Other models are available as pendulous gyro accelerometers.

For full details on the HIG “family” and on our full gyro line, write Honeywell Aero Division, Dept. EC-CC-10, Leaside, Toronto 17, Ontario.

### Specifications of New Honeywell HIG “family”

	HIG-4	HIG-5	HIG-6
Angular Momentum	10 <sup>4</sup>	10 <sup>5</sup>	06
Threshold	1° per hr	.2° per hr	.01° per hr
Trimmed Drift Rate	5° per hr	1° per hr	.05° per hr
Maximum Precession Rate	5 radians/sec	1 radian/sec	.1 radian/sec
Characteristic Time Constant	3.5 millisecc	2.8 millisecc	3.1 millisecc
Damping Ratio — Output Axis/Input Axis	1 to 1	1 to 1	2.1 to 1
Torque Generator Scale Factor	1 or 10 dyne-cm/ma <sup>2</sup>	2.5 or 35 dyne-cm/ma <sup>2</sup>	.025 or 1 dyne-cm/mo <sup>2</sup>
Signal Generator Scale Factor	25 volts/radian at 100 ma 400 cps	34 volts/radian at 100 mo 400 cps	25 volts/radian at 50 ms 400 cps
Spin Motor Excitation	10 volts, 2 phase	10 volts, 3 phase	115 volts, 3 phase
Weight	1.5 lbs.	2.75 lbs.	4.5 lbs.

# Honeywell

## Aeronautical Division



AIRCRAFT • ORDNANCE CONTROLS AND INSTRUMENTATION

LEASIDE, TORONTO 17

World Radio History

## NEW PRODUCTS

(Continued from page 99)

### ● Short Form Catalog Item 1262

A new 16-page short form catalog describes the various systems, equipment and components manufactured by Servo Corporation of America.

Included are the Servomation\* Building Block Servo-synthesis equipment, Servoscope\* Servosystem Analyzer, Servoflex\* Servo Amplifiers, Servoboard\* Electro-Mechanical Assembly Kits, Spectrum Signal Generator, Servotherm\* Pyrometers, Infrared Radiation Standard, Heat Detector Cells and Accessories, UV-IR Photometer, Servoflight\*\* Dead Reckoning Tracer, High Frequency Direction Finder, VHF Communications Receiver.

A copy of Short Form Catalog SF 9901 is available on request.

### ● Miniature Variable Composition Resistor Item 1263

A New Miniature Variable Composition Resistor has been designed by Precision Electronics Components (1956) Ltd.

This is the smallest Variable Composition Resistor on the market which can be rated at 1 Watt at 70°C ambient temperature.

The unit is of rigid construction and exceeds the MIL-R-94A specs., characteristic "Y". The change in the resistance value is negligible even under extreme humidity and the insulation resistance, measured under these conditions, exceeds 100 Meg ohms. This control will easily withstand 50,000 rotational cycles under full load.

These units are manufactured entirely in Canada, and orders can be met promptly.

### ● Multi-Purpose Oscillator For Low Frequencies 1 cps to 100 KC Item 1264

Model 202C is a new, multi-purpose low frequency oscillator providing pure wave-forms for subsonic, audio, and supersonic measurements in the laboratory, field or factory.

Manufactured by the Hewlett-Packard Company of Palo Alto, California, the new 202C offers a high output power of 160 milliwatts delivered from a transformer-coupled balanced matched source. The instrument covers frequencies 1 cps to 100 KC in five ranges. Accuracy is  $\pm 2\%$  under normal conditions including warm-up and tube aging. Frequency response is  $\pm 1$  db



full range, output is either 160 milliwatts or 10 volts into 600 ohms or 20 volts open circuit. Output balance is better than 0.1% at lower frequencies and approximately 1% at 100 KC. Distortion is less than 0.5% above 5 cps and is independent of load impedance. Hum voltage is less than 0.1% of rated output. Recovery time is less than 5 seconds at 1 cps. Model 202C contains extra quality features such as long-life electrolytic condensers and ceramic insulation at high impedance points. Further information is available on request.

### ● Fractional Horsepower Motors Item 1265

By redesigning the gear box of their basic Series 500 fractional horsepower motor, Gleason-Avery, Inc. has greatly extended the range of final shaft speeds that can be supplied through standard gearing. The redesigned motor operates in a reduction range from 4.5 to 1 through 2,592,000 to 1. This makes final shaft speeds available from 600 r.p.m. to one revolution in seven days. Shaft speeds between these limits are available in a virtually continuous range, although not all torques are available in all shaft speeds.

Gleason-Avery fhp motors operate on AC only on all normal voltages and on 25, 50 or 60 cycle current. Either synchronous or non-synchronous motors are available. Speed of synchronous motors before reduction is 1800 r.p.m. Mounting space,  $2\frac{1}{8}$ " x  $2\frac{7}{8}$ " x  $2\frac{1}{4}$ "- $2\frac{5}{8}$ ", exclusive of shaft. Gear box is  $3\frac{1}{4}$ " in diameter.

These motors can be built as reversing motors or ganged to produce motors of higher power. Due to the nature of the Gleason-Avery winding, these motors cannot be harmed, even though they are jammed indefinitely with current on.

(Turn to page 102)

## WHAT'S IN A NAME?

# QUALITY

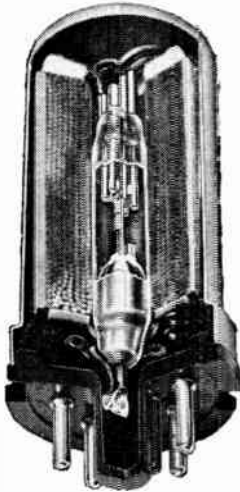
## IF IT'S BOHNE

You can count on quality when you buy from Bohne because they are specialists in the field of precision spring making. Industry is constantly calling on Bohne "know-how" for economical spring production. Send your sample, blueprint or specifications for quotation.

**BOHNE INDUSTRIES LIMITED**  
1153 QUEEN ST. W. • TORONTO 3

For further data on advertised products use page 109.

It will take  
still more years of testing—  
at  $1.89 \times 10^9$  operations a year—  
to fix the life span of this relay



• When we first claimed a life of a billion operations for CLARE Mercury-wetted Contact Relays, we were guilty of a serious understatement.

**Here is the proof:**

A life test was started in January, 1955. The relays on test are carrying a contact load of 5 amperes at 50 volts d-c (resistive load). A suitable spark suppressor is employed.

These relays have been operating continuously at a rate of 5,184,000 operations a day ever since, without any attention whatsoever.

As this is written they are closely approaching the 3 billion mark with every indication they will go on operating for years.

Think of it! Here is a relay that in normal service will outlast a man's lifetime.

Have you a job for which none but the best relay is good enough? It can cost you much more to settle for less than this CLARE RELAY.

Price is reasonable. Prices for Multi-element Mercury-wetted Contact Relays have recently been reduced. Delivery is quick—a few days to a few weeks, depending on assembly desired and size of order.

**FOR COMPLETE INFORMATION** on CLARE Mercury-wetted Contact Relays for single or multiple circuits contact your nearest CLARE representative or address: C. P. CLARE & CO., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: C. P. CLARE & Co., 659 Bayview Ave., Toronto 17. Cable address: CLARELAY.

Send for CLARE Sales Engineering Bulletins Nos. 120 and 122

**CLARE RELAYS**  
FIRST IN THE INDUSTRIAL FIELD

True Hermetic Sealing  
assures Maximum Stability in  
**AMPERITE**  
RELAYS and REGULATORS  
Simplest • Most Compact • Most Economical



STANDARD

PROBLEM? Send for  
Bulletin No. TR-81

**Thermostatic  
DELAY RELAYS**  
2 to 180 Seconds



MINIATURE

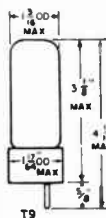
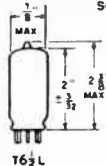
- Actuated by a heater, they operate on A.C., D.C., or Pulsating Current.
- Hermetically sealed. Not affected by altitude, moisture, or other climate changes.
- Circuits: SPST only — normally open or normally closed.

Amperite Thermostatic Delay Relays are compensated for ambient temperature changes from  $-55^{\circ}$  to  $+70^{\circ}$ C. Heaters consume approximately 2 W. and may be operated continuously. The units are most compact, rugged, explosion-proof, long-lived, and — very inexpensive!  
TYPES: Standard Radio Octal, and 9-Pin Miniature.

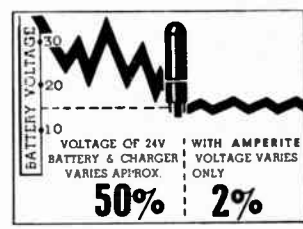
Also — Amperite Differential Relays: Used for automatic overload, under-voltage or under-current protection.

**BALLAST REGULATORS**

Amperite Regulators are designed to keep the current in a circuit automatically regulated at a definite value (for example, 0.5 amp.) ... For currents of 60 ma. to 5 amps. Operate on A.C. D.C. Pulsating Current.



Hermetically sealed, they are not affected by changes in altitude, ambient temperature ( $-55^{\circ}$  to  $+90^{\circ}$  C.), or humidity. Rugged, light, compact, most inexpensive.



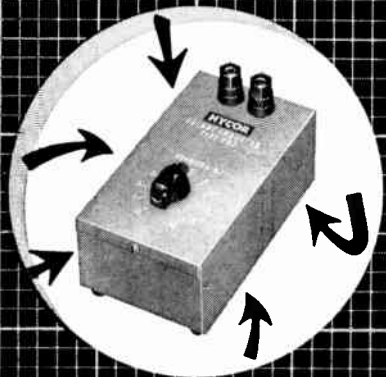
Write for 4-page Bulletin No. AB-51  
**AMPERITE CO., Inc.**  
561 Broadway, New York 12, N. Y  
Telephone: CAnal 6-1446  
In Canada: Atlas Radio Corp. Ltd.  
50 Wingold Ave., Toronto 10



Individual inspection and double-checking assures top quality of Amperite products

# LOW COST DECADE INDUCTORS

the NEW 700 series



Indispensable for design and experimental work on audio filters, equalizers and tuned circuits at frequencies between 150 to 20,000 cycles.

Four units are available in ranges from 10 x .001 Henry to 10 x 1.0 Henry. When all four units are connecting in series, 11,110 steps from .001 Henry to 11.11 Henries are obtained.

Four HYCOR type EM-1 toroid coils are used as elements in each unit. The 10 steps are obtained by series switching. "Q" factor remains essentially constant over all ranges.

The Decade-Units have excellent stability in respect to current and temperature changes and reasonable amounts of D.C. may be run through the units with small effect on inductance.

Dimensions of all types: 5 1/4" L. x 3" W. x 2 1/4" H.

Net Price: \$29.90  
f.o.b. North Hollywood, Calif.

Representatives  
in Principal Cities

**HYCOR**  
Company, Inc.

Subsidiary of  
International Resistance Company

11423 Vanowen Street  
North Hollywood 9, Calif.

## NEW PRODUCTS (Continued from page 100)

### ● Transmitting Tetrode Item 1266

Eitel-McCullough, Inc., San Bruno, California, manufacturer of Eimac electron power tubes, has announced a new 300 watt anode dissipation ceramic power transmitting tetrode. Designated the 4CX300A, the new tube is approximately 2 1/2 inches in length by 1 1/2 inches in diameter and was developed specifically for severe environments.

Made entirely of ceramic and metal, and incorporating ceramic support of internal electrodes, this new tube produces low noise output despite heavy accelerative forces from shock and vibration. Supported solely at its base by a standard Eimac air system socket, the 4CX300A will withstand repeated 11 millisecond 50g shocks in any plane without internal shorts or mechanical damage. Further, there are no major electrode resonances when the tube is vibrated from 30 to 2000 cps.



The metal-ceramic construction of the tube inhibits deterioration of electrical characteristics while operating continuously at envelope temperatures of 250 degrees centigrade. Also, high temperature processing has produced an extremely clean tube with more thorough outgassing.

The 4CX300A operates at full ratings through 500 megacycles . . . five hundred watts input as a radio-frequency amplifier or oscillator, and three hundred watts input as a plate-modulated radio-frequency amplifier.

### ● Booklet On Infrared Spectrophotometry

Item 1267

Infrared spectrophotometry in the pharmaceutical field highlights the latest edition of the Beckman Infrared Notes, a quarterly publication written for infrared spectroscopists.

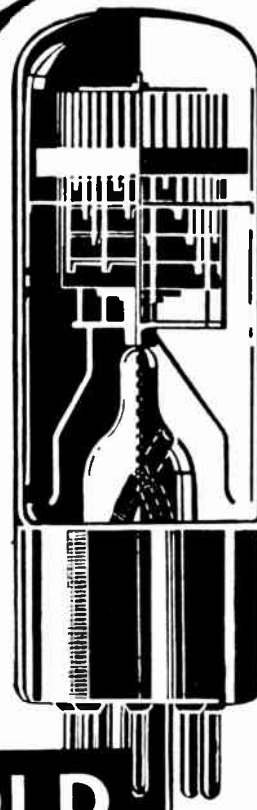
In this article, Thomas V. Parke, manager of Beckman's Scientific Instruments research and former chief spectroscopist with Eli Lilly, traces the use of infrared spectrophotometry in the pharmaceutical industry from the isolation of crystalline sodium benzyl-penicillin in 1942 to its present extensive use in pharmaceutical research and control. He has included a selected bibliography of infrared applications in this field.

Also of major interest is the article outlining conversion of Beckman IR-2's and IR-2T's with resulting %T-type presentation information on the new Micro-Beam accessory, KBr Micro-Die, KBr Die and the Automatic Air Dryer is also contained in the publication as well as other interesting articles.

Infrared Notes can be obtained on request.

(Continued on opposite page)

*Eitelco*



# COLD CATHODE TUBES

for electronic counting applications

A convenient method of dividing down from one frequency to another; or by registering the number of cycles of a stable frequency occurring between two events, give a measure of the time interval. These tubes have also been used to provide time marker pulses for oscillographic work. Technical information will be readily supplied by Pye Canada Limited, distributors of Eitelco products.

SEND FOR  
THIS NEW  
TECHNICAL  
PUBLICATION  
TO:



Telephone Division



CANADA LIMITED

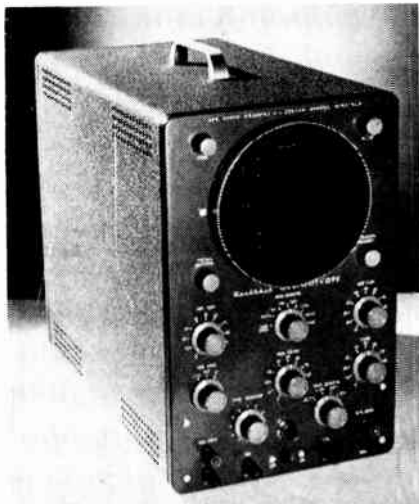
Head Office and Plant  
82 NORTHLINE RD., TORONTO 16  
193 E. Hastings St. 1191 University St.  
VANCOUVER MONTREAL  
3 Duke St. 78 Bank St.  
HALIFAX OTTAWA



● **Etched Circuit, Push-Pull 5" Oscilloscope Kit Color TV Model 0-11**

Item 1268

The previous Heathkit oscilloscope model 0-10, which was already a most remarkable instrument, has been improved even further with the release of the Heathkit Model 0-11. It incorporates all the outstanding features of the preceding model, plus improved vertical linearity, better sync stability, especially at low frequencies, and much-improved over-all stability of operation, including less vertical bounce with changes in level. These improvements in the Model 0-11 circuit make it even more ideally suited for color TV servicing, and for critical observations in the electronic laboratory. Response only down 1½ DB at 3.58 mc. The 11-tube circuit features a



5U1 cathode-ray tube. Sync circuit functions effectively from 20 CPS to better than 500 kc in five steps. Modern etched circuit boards employed in the oscilloscope circuit cut assembly time almost in half, permit a level of circuit stability never before achieved in an oscilloscope of this type, and insure against errors in assembly. Both vertical and horizontal output amplifiers are push-pull. Built-in peak-to-peak calibrating source — step-attenuated input — plastic molded capacitors and top-quality parts throughout — pre-formed and cabled wiring harness — and numerous other "extra" features. A professional instrument for the service shop or laboratory.

● **Ultrasonic Cleaner For Small Parts**

Item 1269

A new ultrasonic cleaning apparatus, Model AP-10-B, the latest in the SONO-GEN(R) series of similar units, has been developed by Branson Ultrasonic Corporation, specialists in the design and manufacture of ultrasonic equipment since 1946.

The AP-10-B is a small, compact instrument, designed specifically for bench-top operation in the washing of delicate, intricate parts that must be "surgically" clean, such as watch mechanisms, instrument components, small and miniature ball-bearings, electronic parts, etc.

The new instrument comprises a 36-40 kc/sec. power generator, and a cylindrical cleaning tank, with transducers hermetically sealed into the base. RF power output of the generator is 50 watts average, 200 watts peak on pulses. Tanks are of 1-pint, 1-quart, or ½-gallon capacity, giving a maximum effective cleaning area of 18 square inches. Two of the smaller tanks may be operated simultaneously, and two of the larger tanks alternately, depending on tank size specified.

(Continued on page 105)

**Direct-reading, multi-purpose**

# SIGNAL GENERATORS

**10 to 21,000 MC**



-hp- 608D

Hewlett-Packard offers nine precision signal generators providing, collectively, direct-reading test signals between 10 and 21,000 MC. Whether you are measuring gain, selectivity, sensitivity, image rejection; driving bridges, slotted lines, antennas, filter networks; determining signal-noise ratio, SWR or transmission line characteristics, there is one of these wide range, high power instruments to answer the need. All have broadest usefulness, simple operation, wide modulating, pulsing and other output choices. Direct output calibration; no charts or tedious interpolation.

**Only Hewlett-Packard offers this broad selection of direct-reading signal generators**

Instrument	Frequency Range	Characteristics	Price
-hp- 608C	10-480 MC	Output 0.1 $\mu$ v to 1 v into 50 ohm load. Pulse or CW modulation. Direct calibration.	\$ 950.00
-hp- 608D	10-420 MC	Output 0.1 $\mu$ v to 0.5 v into 50 ohm load. Pulse or CW modulation. Direct calibration.	1,050.00
-hp- 612A	450 to 1,200 MC	Output 0.1 $\mu$ v to 0.5 v into 50 ohm load. Pulse, CW or AM to 5 mc. Direct calibration.	1,200.00
-hp- 614A	800 to 2,100 MC	Output 0.1 $\mu$ v to 0.223 v into 50 ohm load. Pulse, CW or FM modulation. Direct calib.	1,950.00
-hp- 616A	1,800 to 4,000 MC	Output 0.1 $\mu$ v to 0.223 v into 50 ohm load. Pulse, CW or FM modulation. Direct calib.	1,950.00
-hp- 618B	3,800 to 7,600 MC	Output 0.1 $\mu$ v to 0.223 v into 50 ohm load. Pulse, CW, FM, square wave mod. Direct calib.	2,250.00
-hp- 620A	7,000 to 11,000 MC	Output 0.1 $\mu$ v to 0.071 v into 50 ohm load. Pulse, CW, FM, square wave mod. Direct calib.	2,250.00
-hp- 626A	10,000 to 15,000 MC	Output 1 $\mu$ watt to 10 mw. Internal or external pulse, FM, or square wave mod. Direct calib.	3,250.00
-hp- 628A	15,000 to 21,000 MC	Output 1 $\mu$ watt to 10 mw. Internal or external pulse, FM, or square wave mod. Direct calib.	3,000.00



Data subject to change without notice  
Prices f.o.b. factory

**HEWLETT-PACKARD COMPANY**

3037G Page Mill Road • Palo Alto, Calif.  
Cable: "HEWPACK"

Represented in Canada by

**ATLAS RADIO CORPORATION, LTD.**

50 Wingold Avenue, Toronto 10, Ontario  
505 McIntyre Bldg., Winnipeg, Manitoba

Another  
Esco  
First!



For the first time anywhere — a Radio Parts Catalogue devoted solely to the specialized electronic components and devices used in the Industrial, Military, Laboratory and Engineering fields. Ensure getting your FREE copy of this unique and informative book — write us today!

free!

Industrial Catalogue No. 561

**ELECTRO SONIC**  
SUPPLY CO. LTD.  
543 YONGE ST., TORONTO 5  
WA. 4-9301



FOR PRECISION LABORATORY OR  
PRODUCTION TESTING



**FREED 1110-AB**  
**INCREMENTAL INDUCTANCE BRIDGE**  
AND ACCESSORIES

Accurate inductance measurement with or without superimposed D.C., for all types of iron core components.

- INDUCTANCE — 1 Millihenry to 1000 Henry
- FREQUENCY — 20 to 10,000 Cycles
- ACCURACY — 1% to 1000 Cycle, 2% to 10KC
- CONDUCTANCE — 1 Micromho to 1 MHO
- "Q" — 0.5 to 100
- SUPERIMPOSED D.C. — Up to 1 Ampere
- DIRECT READING — For use by unskilled operators.

ACCESSORIES AVAILABLE:

- 1140-A Null Detector, 1210-A Null Detector — V.T.V.M.,
- 1170 D.C. Supply and 1180 A.C. Supply.

INSTRUMENT DIVISION  
**FREED TRANSFORMER CO., INC.**  
1716 Weirfield St., Brooklyn (Ridgewood) 27, N.Y.

**THERE AND BACK**



*-in a jiffy!*

From you to the factory — and back again . . . Snelgrove crystal service is fast, efficient and completely dependable. It's yet another reason for the growing preference for Snelgrove quality crystals . . . yet another major benefit Snelgrove offers you.

Insist on Snelgrove standards of crystal quality, long life and dependability. And use Snelgrove's expert crystal service. Like everything else at Snelgrove's it assures you of extra satisfaction — at no extra cost.

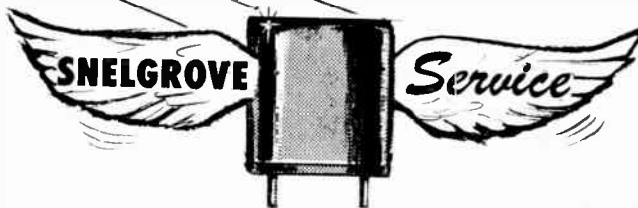
The *SPEEDY SERVICE* of  
*EXPERTS*—in Canada's most  
up-to-date plant.

Approved by DND

All Types and Frequencies  
— For Every Application  
**QUARTZ CRYSTALS BY SNELGROVE**

Snelgrove Security *EXTRAS* include —

- Exacting pre-tests to prevent field failures.
- Ageing reduced to minimum.



Made To Your Exact Specifications

**C. R. SNELGROVE CO. LIMITED**

Telephone: Hickory  
4-1107-1108, 141 Bond  
Avenue, Don Mills,  
Ontario.

For further data on advertised products use page 109.

**NEW PRODUCTS**

(Continued from page 103)

● **Dual Channel Oscilloscope**  
*Item 1270*

A new dual channel oscilloscope, 100 mc nominal, has been custom-designed by Electronic Tube Corporation, Philadelphia, for the study of non-repetitive phenomena having rapid rise time.

Model 2100-A-1 has amplitude amplifiers with better than 70 db gain; attenuation: 40 db in 20 db steps, 20 db vernier control. Input impedance is 200 ohms nominal, and amplitude axis positioning is individual for each channel.

Sweep is variable in steps from 50 milli-microseconds to 100 microseconds per inch. Time axis positioning is common for both channels; sweep gain expansion as required. Automatic lock-out is provided; maximum repetition rate approximately 25 per minute.

Calibration marks are provided at one microsecond and 2/10 microsecond intervals; controlled from a 1000 kilocycle crystal. Comb-type presentation with amplitude variable.

Synchronization is from channel No. 1; channel No. 2; external pulse; calibrator.

The instrument is provided with a control desk handling time axis position and gain, synchronization selection, calibration gain, amplitude axis position, sweep duration, polarity of synchronization. Intensity and focus controls are located adjacent to the desk.

The dual beam cathode ray tube is of interesting conformation: No. 52WSP2X is of the electrostatic deflection type, with spiral third anode. Amplitude axis deflection leads are brought out through the sides of the tube with 0.08-in. diameter contacts. The location of terminals is suitable for use with distributed amplifier construction. Deflection sensitivity 1D2: 125 volts per inch. 3D4, 65 volts per inch. Screen is P2X, giving highlight omission in the blue, persistence in the green. It was developed by ETC primarily for single-trace photographic use.

Overall dimensions of the instrument are 60-in. high, 44-in. deep, 65-in. wide. The control desk projects an additional 18½-in. The entire instrument is mounted on casters for portability, either as separate sections or as an integral unit.

● **DC Amplifier**  
*Type N855*

*Item 1271*

This instrument is a chopper-type D.C. amplifier suitable for amplifying signals from millivolt level to volt level. It has a high input impedance and low output impedance and may thus be used to operate relays, meters or other indicating or recording devices from sources of very low voltage or current.

The unit is housed in a robust dust proof case, the door of which is fitted with a compartment lock to prevent unauthorized adjustment of the controls. Connections are made to a terminal block mounted inside the case near a cable entry hole situated in the top of the casing. The amplifier itself is mounted on the door of the case, and all components are immediately accessible when the door is opened.

Three valves are employed in the circuit which operates as an A.C. amplifier using two pentodes in cascade, the first of which is a low noise, low microphony valve specially developed for this purpose. The output stage is a push-pull double triode valve connected as an anode follower. Conversion of the D.C. input signal to A.C. and rectification of the A.C. output signal after amplification is effected by two Carpenter Relays operating from the 50 c/s supply. A.C. feedback is applied from the secondary of the output transformer to the second stage, and overall D.C. feedback is provided from the output to the input. The forward gain which is normally set to 1000 may be varied from 700 to 1200.

(Continued on page 107)



Centralab transistor amplifier used in Goldentone hearing aid. Four-stage unit measures only ½" x 1" x ¼"

*Today's smallest complete amplifier demonstrates*  
**a new technique  
for packaging  
electronic components**

**Another first by Centralab,  
pioneer in miniaturization**

One-, three-, and four-stage transistor amplifiers are ideal for:

- Hearing aids
- Small radios
- Recorders
- Microphones
- Military equipment
- Television
- Electro-medical units
- Other space-saving applications

Special transistors and diodes developed by Centralab are hermetically sealed into a ceramic base plate in this unique Packaged Electronic Circuit which also includes capacitance, resistance, inductance, and wiring.

Not laboratory specimens — standard one-, three-, and four-stage transistor amplifiers that are being used successfully in industry on many applications. Special designs can be adapted to your requirements.

Complete amplifier units reduce your production costs — there are fewer individual parts to buy, inventory, assemble, and test. For example, a four-stage transistor amplifier replaces 21 parts — four transistors, five capacitors, 12 resistors, plus wiring. Soldering connections are reduced from 46 to 7.

Write for Technical Bulletin EP-75

**Centralab Canada Ltd.**

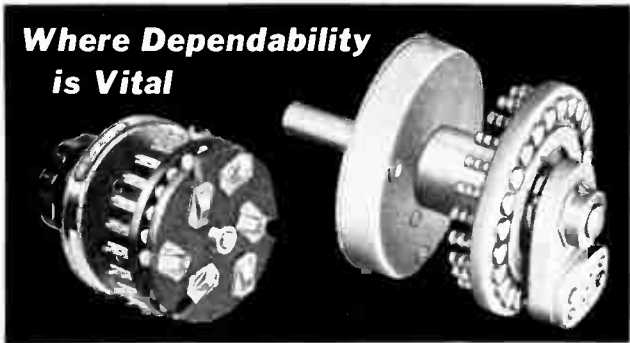
804 Mt. Pleasant Rd, Toronto 12, Ontario  
Y-2656

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

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



**Where Dependability  
is Vital**



**Daven Rotary Switches  
Are Specified**

**HERE'S WHY:**

- Patented knee-action rotor—ensures low, uniform contact resistance, trouble-free operation.
- One-piece combination contact and solder lug—solid-silver alloy contacts, gold plated to resist corrosion.
- Turret-type solder lugs—provide excellent mechanical and electrical connections.
- Roller-type detent—gives positive indexing action.
- Minimum space—as many as eight poles on each deck.



Write for complete data, catalog.

THE **DAVEN** CO.

550 West Mt. Pleasant Ave., Route 10, Livingston, N.J.  
IN CANADA: Adams Engineering Ltd., Montreal & Toronto

**FOR ONLY \$42<sup>50</sup>\***

**YOU CAN BUY THE NEW METRAWATT  
"METRAVO" Universal Test Meter**

*which measures:*

- Voltage A.C. & D.C.  
Range: 0-6, 0-60, 0-600
- Current A.C. & D.C.  
Range: 1.8mA-6A
- Resistance
- Temperature
- Illumination



*note:*

**Special logarithmic scale.**

**Accuracy: 1% full scale.**

**Weight: 14 oz.**

**Snap-on transformer also available.**

*\*Can. price includes leather carrying case. F.S.T. extra if applicable.*

*Distributor and quantity discount applicable*

*Stocked by*

**electrodesign**  
INSTRUMENTS — CONTROLS

736 Notre Dame W.  
MONTREAL, P.Q.  
Tel: UN. 6-7367

**CASCADE  
RESEARCH**  
CORPORATION



**Microwave**

**FERRITE COMPONENTS**

**TEST EQUIPMENT**

**VACUUM TUBES**

**X-521 Backward  
Wave Oscillator**

Leaders in the field of Ferrite components, Cascade Research Corporation introduces a new, more rugged and efficient microwave oscillator.

**SPECIFICATIONS:**

Frequency .....	8 - 13 kmc
Power Output .....	1 Watt nominal
First Anode Voltage (to cathode) .....	1500 volts
Second Anode Voltage (to cathode) .....	500-1500 volts
Beam Current .....	30 milliamperes
Heater Voltage .....	12.5 volts
Heater Current .....	1.0 amperes
Estimated Tube Weight (including magnet) .....	15 lbs.

**FEATURES:**

1. The frequency of oscillation is variable over the entire X-band by the adjustment of the second anode voltage. No mechanical tuning is necessary.
2. The power output of 1 watt makes it ideally suited for microwave measurements, for test purposes and for microwave relay applications.
3. Frequency of oscillation is relatively unaffected by the load.
4. It operates at a nominal 4% efficiency which is better power utilization than can be obtained with most low power oscillators.
5. The tube is of extremely rugged mechanical construction. It is made entirely of ceramic and metal parts. It has no fragile glass parts or precision wound helices.

*For Further Information Contact*

**Microwave Systems**

891 O'Connor Drive - Toronto, Ontario - PLymouth 5-0763

## NEW PRODUCTS

(Continued from page 105)

### ● High Resistance Millivoltmeter

Item 1272

Basically a high-resistance millivoltmeter, the new General Radio Type 1230-A D-C Amplifier and Electrometer indicates voltage, current, and resistance on a panel meter according to an announcement by Canadian Marconi Company, Canadian distributors for General Radio Company. A graphic recorder can also be connected directly to output terminals. Excellent stability and high sensitivity make this instrument useful for the measurement of: ionization currents, photo currents, electron tube grid currents, time-current curves of cables and electrical equipment, and contact potentials; pH indications; silicon-diode back resistance, insulation resistance of cables an delectrical equipment, and voltage coefficient of resistance.

The amplifier circuit is strictly direct coupled and has three stages. Grid current at the input is negligible because an electrometer tube is used in the first stage. The open-circuit input resistance is about  $10^{14}$  ohms. Guard terminals are provided for use when needed, and a component shield is available.

Internal resistance standards determine the input resistance, which can be set in decade steps from 10,000 ohms to 100,000 megohms ( $10^{11}$  ohms). Full-scale voltage ranges extend from 30 millivolts to 10 volts. These ranges, coupled with the wide range of resistance standards, permit full-scale current ranges from 0.3 micro-microampere to 1 milliampere. The instrument also has 16 direct-reading resistance ranges allowing measurements from 300 kilohms to  $5 \times 10^{11}$  ohms.

Bulletins on the new General Radio Type 1230-A D-C Amplifier and Electrometer and other electronic devices are available on request.

### ● Antenna Handbook

Item 1273

A new 14-page handbook containing a selected group of curves of antenna characteristics has just been announced as an aid for engineers working with microwave antennas or systems involving such antennas.

To the engineer concerned with microwave antennas or systems involving such antennas, it is desirable to be able to estimate the performance of a given antenna or to estimate the physical characteristics required of an antenna to achieve a particular electrical performance goal. This handbook has been created by the Engineering Products Section of I-T-E as a tool to aid the engineer in such estimates.

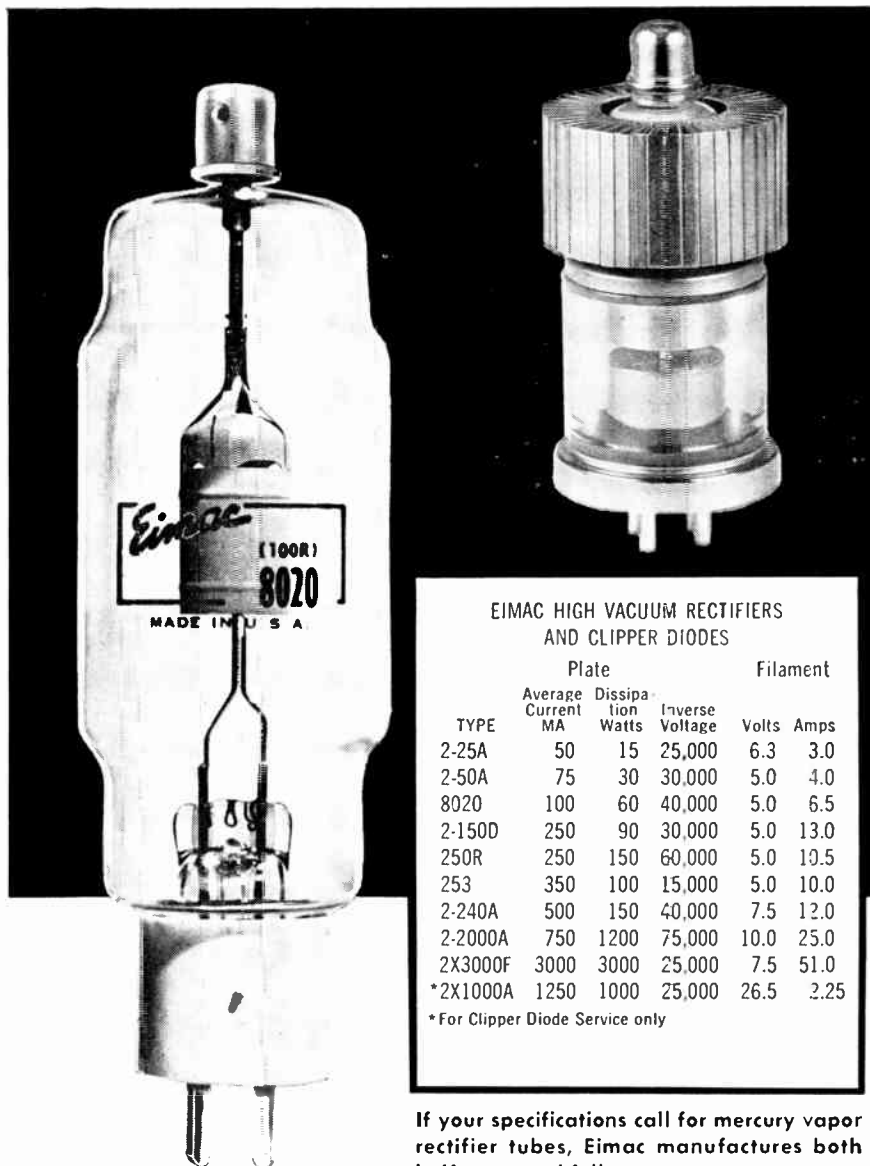
### ● Calibrator For Wire Strain Gages, Transducers, Thermocouples

Item 1274

A new, versatile instrument for the universal calibration of wire strain gages, their transducers, and thermocouples has been developed by Allegany Instrument Company.

The devices, designated Type C Calibrator, will calibrate one-, two-, or four-arm systems without the necessity of complicated hookups. Employing the electrical equivalent method of calibration, the Type C provides time-saving performance by making dead-weight testing necessary only once for each transducer. All loads applied to a transducer are read directly in force, acceleration, torque, pressure, etc., and the usual tedious arithmetic is eliminated in a linearity check. Accuracy of the instrument is  $\pm 0.05\%$  while total thermal EMF is less than 3 microvolts.

(Continued on page 108)



TYPE	Plate			Filament	
	Average Current MA	Dissipation Watts	Inverse Voltage	Volts	Amps
2-25A	50	15	25,000	6.3	3.0
2-50A	75	30	30,000	5.0	4.0
8020	100	60	40,000	5.0	6.5
2-150D	250	90	30,000	5.0	13.0
250R	250	150	60,000	5.0	10.5
253	350	100	15,000	5.0	10.0
2-240A	500	150	40,000	7.5	12.0
2-2000A	750	1200	75,000	10.0	25.0
2X3000F	3000	3000	25,000	7.5	51.0
*2X1000A	1250	1000	25,000	26.5	2.25

\* For Clipper Diode Service only

If your specifications call for mercury vapor rectifier tubes, Eimac manufactures both half wave and full wave types.

## Eimac's High Vacuum Rectifiers Handle Peak Inverse Voltages from 15,000 to 75,000 Volts

Used in standard rectifiers and special applications involving extreme ambient temperatures, high operating frequencies, or high peak inverse voltages, Eimac's broad line of high vacuum rectifiers and clipper diodes is the finest in the industry, both electronically and physically.

Superior exhausting techniques, high quality materials, clean electrode design and absence of internal insulators minimize chances of contamination and arc-over. These, and other production and design features, are assured by Eimac's high standards of quality control.

For additional information, contact our Technical Services Department.



**EITEL-McCULLOUGH, INC.** SAN BRUNO CALIFORNIA

The World's Largest Manufacturer of Transmitting Tubes

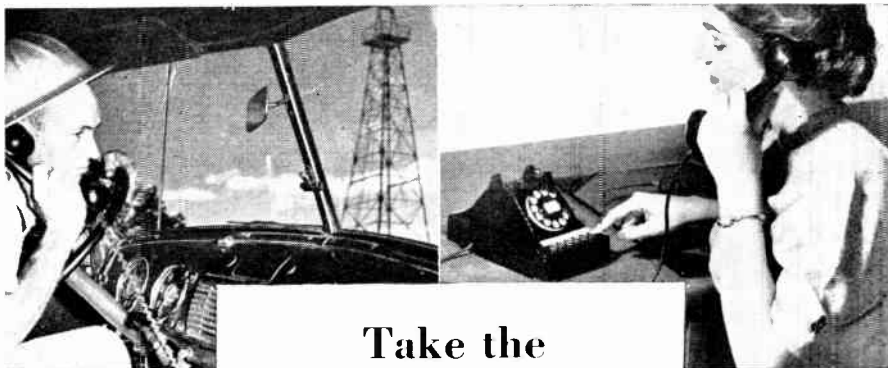


Represented in Canada by

**THE AHEARN AND SOPER COMPANY LIMITED**

P.O. Box 715,  
Ottawa, Ontario

## 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.*

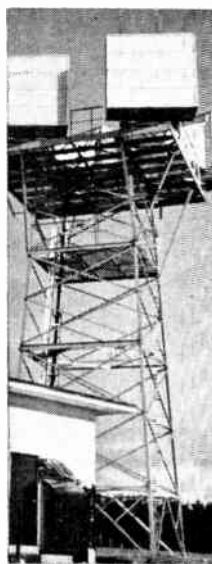
Why not let us analyse your problem? Just telephone us and we'll be glad to call on you. There's no charge!

**THE BELL TELEPHONE  
COMPANY  
OF CANADA**



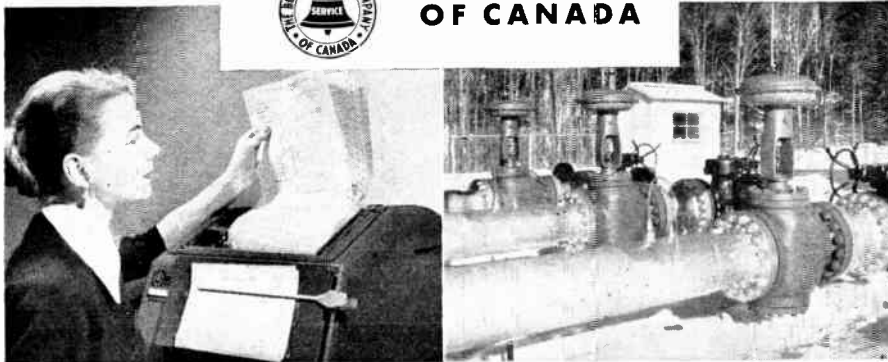
**PBX (Private Branch Exchange)**—a dial switchboard system which is faster and more efficient.

**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 Telemetering and Supervisory Control**—as used by the Oil, Gas and Power Industries.



Whatever your communication needs be sure to consult the BELL

## NEW PRODUCTS

(Continued from page 107)

### ● "Secundus" Electric Soldering Instrument Item 1275

The recent introduction of the Adcola "Secundus" superfine electric soldering instrument as an addition to the normal group of Adcola soldering products provides yet another valuable essential to the art of fine soft soldering practice.

With a view to the ever increasing trend of modern design to reduce the physical shape and bulk of solderable components allied to the Electronic, Radio, and like industries, Adcola Products in anticipation of this trend have designed the new Adcola "Secundus" to a reduced size, yet to a practical minimum degree consistent with the critical requirements of this more advanced and delicate class of work.

Two very important features are incorporated in the design of the heater unit. These features form the very essence of quality soldering in that the power rating of the unit has been very carefully calibrated in relation to the cross sectional area of the soldering bit, and indeed also to that of its housing. These essential and desirable measures tend to ensure that the saturation temperature of the soldering bit is maintained to a safe and constant level, and alternatively the thermal loss occasioned by the normal process of soldering is kept at a safe "high".

Excessive soldering bit temperatures tend to promote oxidation of the solderable parts, carbonise the fluxing media, and adversely affect the physical properties of the solder, so making the soldering operation tedious and difficult, and producing a resultant joint of doubtful electrical and mechanical qualities.

### ● Power Measuring Kit Item 1276

A new power measuring kit, suitable for use on three phase, balanced or unbalanced circuits, three or four wire systems, has recently been announced by Metrawatt AG. This instrument offers some very unusual facilities. The instrument has five meters, all guaranteed to 1% accuracy. Three of these meters are current meters, thus permitting simultaneous reading on all three phases. Range of the meters is from 5 amperes to 100 amperes with built in current transformers.

The voltage meter is a single instrument which can be switched easily to measure either phase to phase or phase to neutral voltages, as desired. The range is from 110 volts to 550 volts, in four steps, 110-220-440-550.

The wattmeter is a three element unit, so that each phase is separately measured, and the total power indicated. The accuracy of the wattmeter is 1%, an accuracy considerably better than that generally available. In addition, it is a simple matter to read vars rather than watts, by simply changing one switch.

The phase rotation is clearly shown by a built in indicator. This allows the user to note clearly whether the vars are inductive or reactive.

On the main switch a cut out indicates clearly the scale factors to be used, so thus eliminating a possible source of error. The range in watts for three phase power is from 1kw to 100 kw.

The instrument can be used for single phase measurements as well as three phase. In this connection, it is possible to measure wattages as low as 330 watts full scale to the same accuracy, namely 1%.

To obtain further information  
on New Product items,  
use coupons on page 109.

# INDEX TO ADVERTISERS

Page number is on the right. Key number for use with READER SERVICE CARDS is on the left.

Key No.	Name	Page No.
1.	Aerovox (Canada) Ltd.	97
2.	Ahearn & Soper Co. Ltd., The	6
3.	Ahearn & Soper Co. Ltd., The	107
4.	Aircraft-Marine Products of Canada Ltd.	31
5.	Airtron Canada Ltd.	2
6.	Amperite Co.	101
7.	Ampex Corp.	12
8.	Andrew Corp. Ltd.	45
9.	Astral Electric Co. Ltd.	40
10.	Automatic Electric Sales (Canada) Ltd.	9
11.	Automatic Electric Sales (Canada) Ltd.	16
12.	Automatic Electric Sales (Canada) Ltd.	33
13.	Automatic Electric Sales (Canada) Ltd.	83
14.	Aviation Electric Ltd.	7
15.	Bell Telephone Co. of Canada, The	108
16.	Bohne Industries Ltd.	100
17.	Burndy Canada Ltd.	8
18.	Canada Wire & Cable Co. Ltd.	37
19.	Canadian General Electric Co. Ltd.	85
20.	Canadian Lister-Blackstone Ltd.	10
21.	Canadian Marconi Co.	3
22.	Canadian Marconi Co.	98
23.	Canadian Stackpole Ltd.	112
24.	Cannon Electric (Canada) Ltd.	14
25.	Central Bridge Co. Ltd.	18
26.	Centralab (Div. Globe Union Inc.)	105
27.	Century Electronics & Instruments, Inc.	13
28.	Clare & Co., C. P.	101
29.	Collins Radio Co. of Canada Ltd.	88
30.	Computing Devices of Canada Ltd.	93
31.	Cossor (Canada) Ltd.	5
32.	Daven Co., The	106
33.	Daystrom Pacific Corp.	48

Mr. Circulation Manager:

My proper address is shown below.  
Check

(My old address is \_\_\_\_\_ City \_\_\_\_\_)

Please add my name to your Electronics & Communications' mailing list.  
(No obligation)  
Check

Name \_\_\_\_\_ Position \_\_\_\_\_  
Company \_\_\_\_\_ Nature of Business \_\_\_\_\_  
Company Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
Signature \_\_\_\_\_  
10-56 (Not valid without signature)

PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING NEW PRODUCT ITEMS AS NUMBERED BELOW — USE PRODUCT ITEM NUMBERS


PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING ADVERTISEMENTS AS NUMBERED BELOW — USE KEY NUMBER


Company \_\_\_\_\_ Nature of Business \_\_\_\_\_  
Name \_\_\_\_\_ Position \_\_\_\_\_  
Street \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
10-56

PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING NEW PRODUCT ITEMS AS NUMBERED BELOW — USE PRODUCT ITEM NUMBERS


PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING ADVERTISEMENTS AS NUMBERED BELOW — USE KEY NUMBER


Name \_\_\_\_\_ Position \_\_\_\_\_  
Company \_\_\_\_\_  
Street \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
10-56

**BUSINESS REPLY CARD**  
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

**ELECTRONICS AND COMMUNICATIONS**

31 - 35 Willcocks Street

Toronto 5, Ontario

**BUSINESS REPLY CARD**  
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

**ELECTRONICS AND COMMUNICATIONS**

31 - 35 Willcocks Street

Toronto 5, Ontario

**BUSINESS REPLY CARD**  
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

**ELECTRONICS AND COMMUNICATIONS**

31 - 35 Willcocks Street

Toronto 5, Ontario



**INDEX — Continued**

Key No.	Name	Page No.
34.	Eitel-McCullough, Inc.	6
35.	Eitel-McCullough, Inc.	107
36.	Electrodesign	106
37.	Electronic Associates, Inc	82
38.	Electro Measurements Inc.	87
39.	Electro-Sonic Supply Co. Ltd.	104
40.	Eriasson Telephone Sales of Canada Ltd.	90
41.	Freed Transformer Co., Inc.	104
42.	Helipot Corp.	111
43.	Hewlett-Packard Co.	103
44.	Hycor Co. Inc.	102
45.	International Electronic Research Corp.	46
46.	Kester Solder Co.	90
47.	Krohn-Hite Instruments Co.	89
48.	Micro Wave Systems	106
49.	Minneapolis-Honeywell Regulator Co. Ltd.	42
50.	Minneapolis-Honeywell Regulator Co. Ltd.	86
51.	Minneapolis-Honeywell Regulator Co. Ltd.	99
52.	Minnesota Mining & Mfg. of Canada Ltd.	49
53.	Moloney Electric Co. of Canada Ltd.	94
54.	Muirhead & Co. Ltd.	95
55.	National Fibre Co. of Canada Ltd.	21
56.	New Yorker Hotel	29
57.	Ohmite Mfg. Co.	4
58.	P.S.C. Applied Research Ltd.	23
59.	Phillips Electrical Co. Ltd.	19-20
60.	Polarad Electronics Corp.	41
61.	Pye Canada Ltd.	43
62.	Pye Canada Ltd.	102
63.	Radio Electronic Television Schools of Canada Ltd.	47
64.	Radio Engineering Products Ltd.	89
65.	Rogers Majestic Electronics Ltd.	84
66.	Sanborn Co.	35
67.	Sigma Instruments, Inc.	44
68.	Snelgrove Co. Ltd., C. R.	104
69.	Sola Electric Co.	39
70.	Stark Electronic Instruments Ltd.	87
71.	Telecables & Wires Ltd.	96
72.	Telephone Mfg. Co. Ltd.	94
73.	Varian Associates of Canada Ltd.	27
74.	Ward Leonard of Canada Ltd.	25




## Non-Linear Dinner

What a bill of fare! Seventy-five standard<sup>†</sup> non-linear precision potentiometers  
... six of them in stock ... available for your prototype electromechanical system.

The service is excellent. No waiting, no cover, no minimum • And that's just the  
table d'hote menu ... to satisfy your breadboard appetite • To order a la carte,  
send us your empiricals. We'll feed them into our digital computer ... to save hungry  
hours and eliminate human error ... to check for practicability of manufacture  
... and to confirm the points in your data curve. Then, before you can say, "HELIPOT<sup>®</sup>  
custom-made non-linear potentiometer", you'll have one on the table!

<sup>†</sup>Standard functions include:

360° sine-cosine		single-sided square
360° sine or cosine		double-sided square
180° sine		20 db log
90° sine		40 db log
tangential ±75°		50 db log

... available in nine series of  
single-turn and multi-turn potentiometers

Our engineers have cooked up a detailed  
breakdown of standard functions  
and models, with varying resistance ranges  
and conformities. Send for your  
copy. It's data file 1027.



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

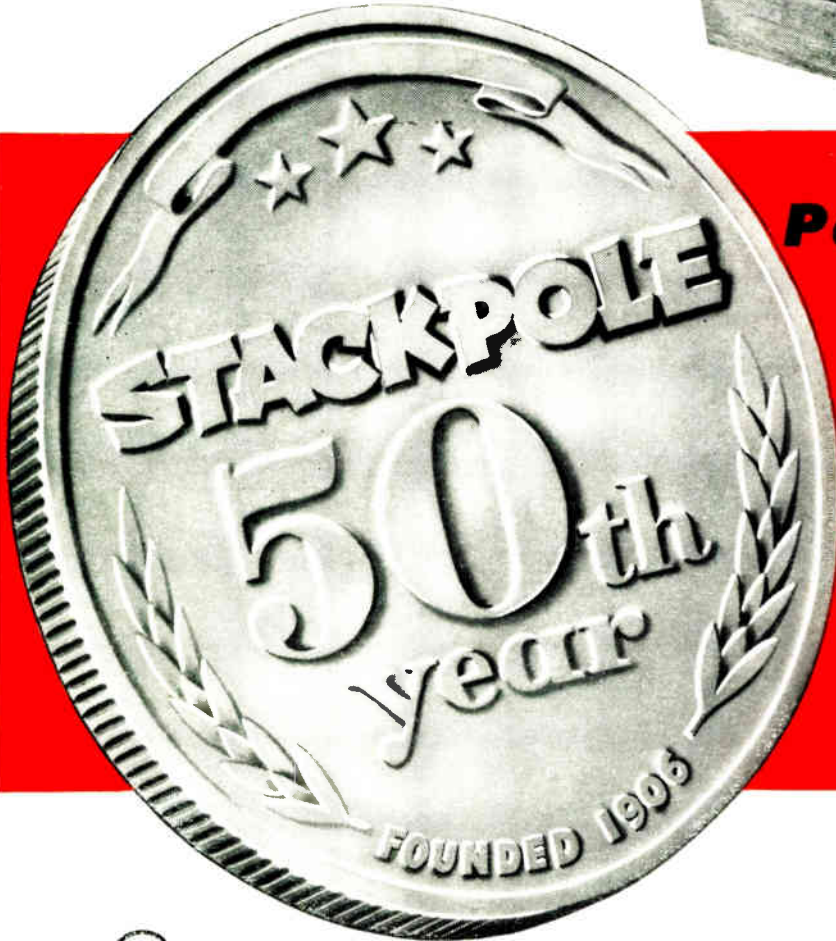
765<sup>®</sup> REG. U. S. PAT. OFF.

## STACKPOLE RESISTORS IN 1928

Half a century ago, Stackpole engineering centered around components developed from two of the most basic, versatile elements . . . carbon and graphite.

With the advent of radio, this experience provided a head start for the production of composition resistors as shown in this sample kit of almost 30 years ago.

Since these "knee pants" days, the Stackpole Electronic Components Division has expanded rapidly—both in the United States and Canada—in full keeping with the remarkable growth of the industries it serves.



*Pacing*

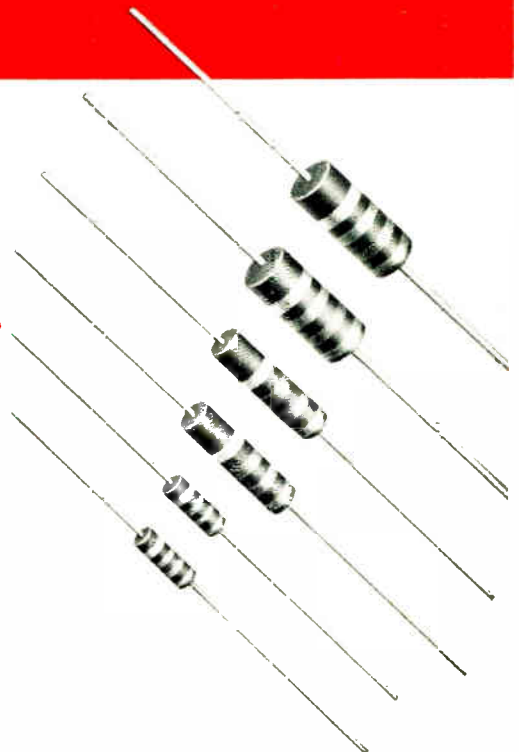
**ELECTRICAL-  
ELECTRONIC  
COMPONENT**

*Progress*



### STACKPOLE RESISTORS *today*

Stackpole's position as one of today's major suppliers of fixed composition resistors is based on two factors: (1) Consistently dependable, quality-controlled resistors; and (2) close personal service in matching resistor requirements and in assuring "on time" deliveries.



**CANADIAN STACKPOLE LIMITED**  
550 Evans Avenue, Etobicoke, Toronto 14, Ontario