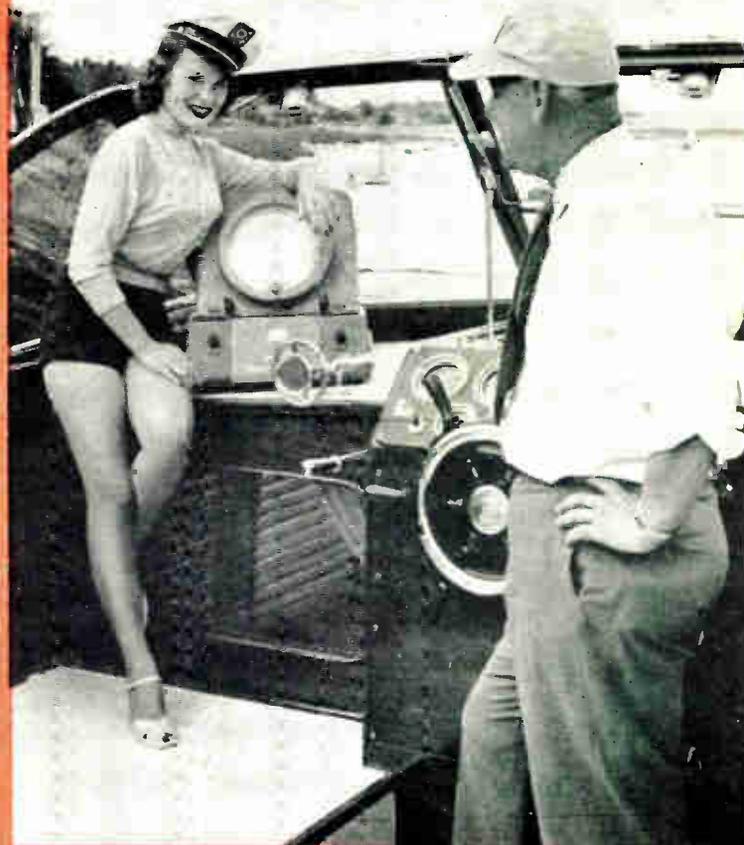


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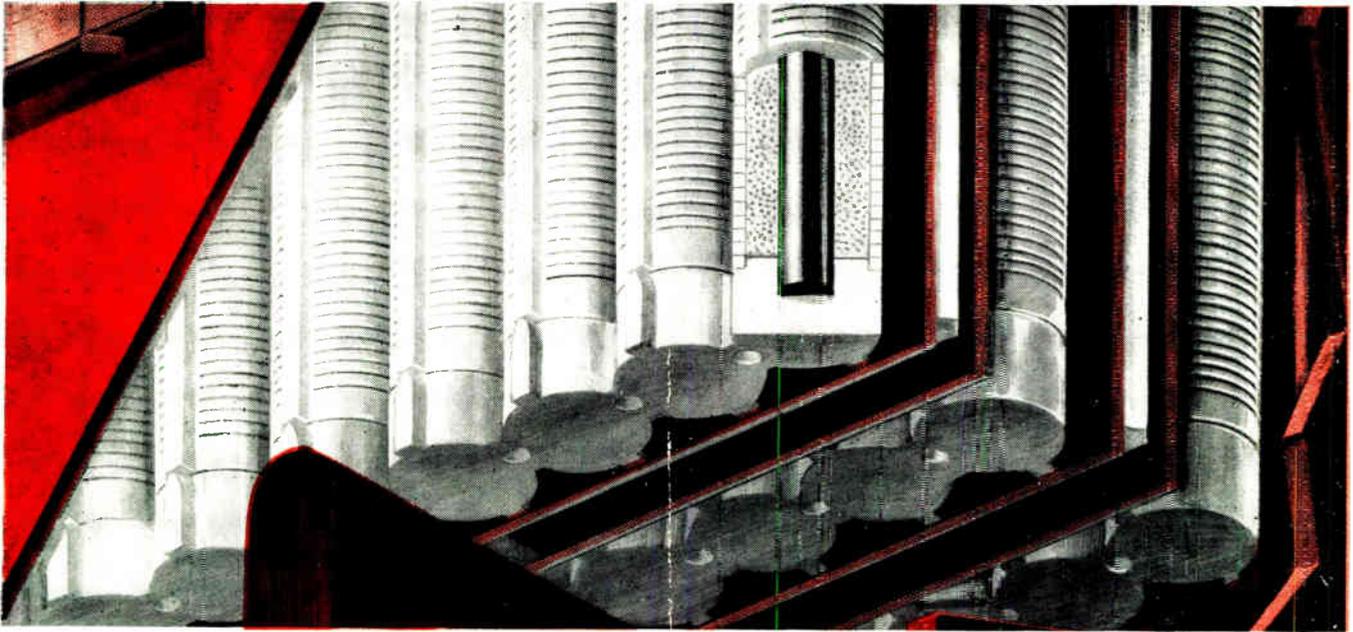


The peril of collision in fog or darkness — a major hazard to small vessels threading their way through crowded harbours or along rocky coasts — has now been reduced by the magic of a new type small ship radar as illustrated above.

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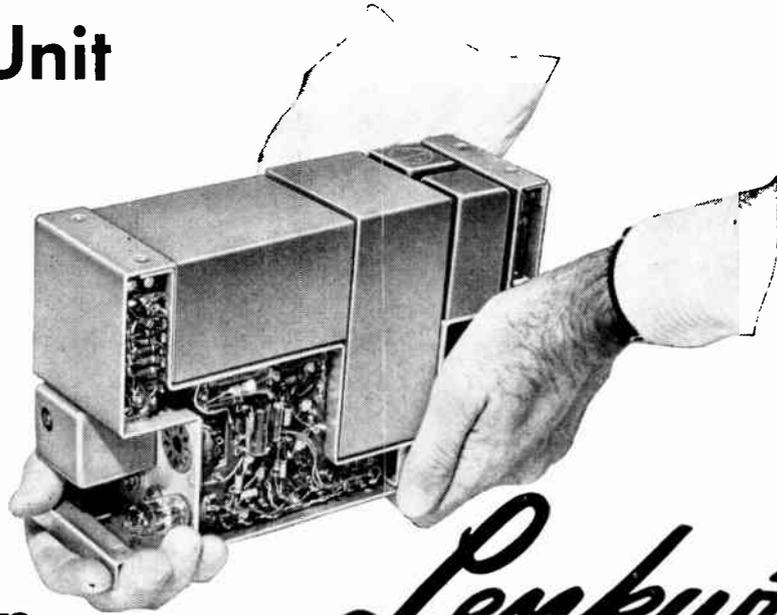
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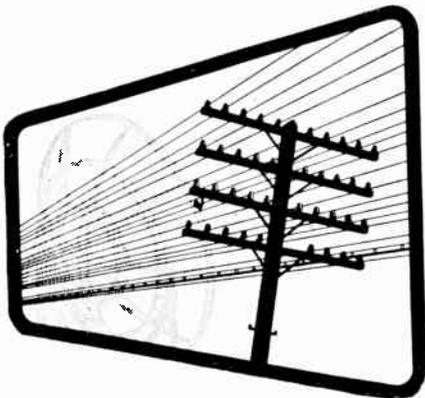


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For further data on advertised products use page 53.

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problems



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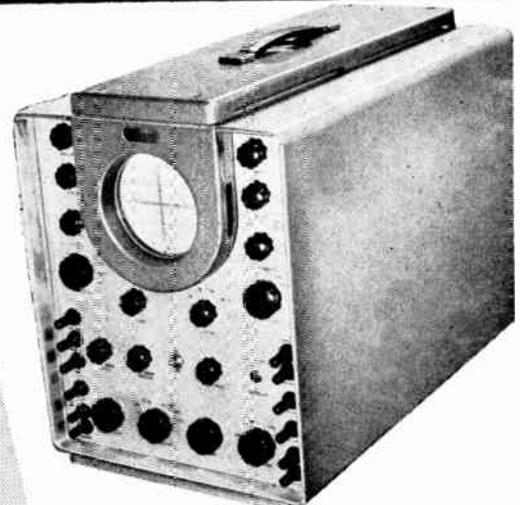
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*Further information and literature
may be obtained from:—*

COSSOR (CANADA) LIMITED.

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Halifax, N. S.

648A Yonge St.,
Toronto, Ont.

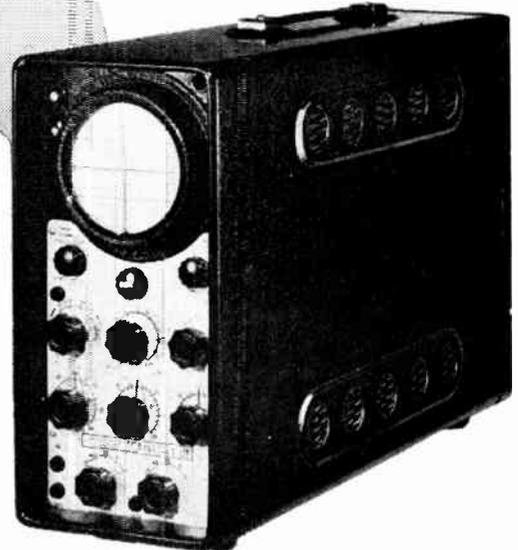


The Cossor Model 7514C oscilloscope is a versatile high gain wide band instrument for general laboratory and industrial applications. The model 7514C brings to this price range the accurate quantitative measurement found heretofore only in more elaborate and expensive equipment.

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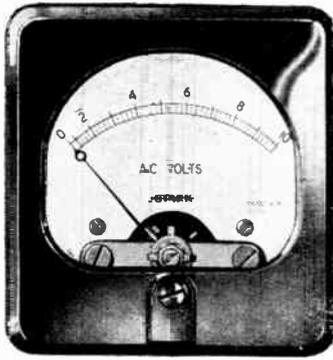
Built-in voltage and time marker generators giving 0.1 to 100 V square waves and a range of locked oscillations to 0.2 microseconds.



The Cossor Model 7511C is a portable oscilloscope for Television monitors, outside broadcast apparatus, aircraft maintenance, industrial electronics servicing, general laboratory applications and TV receiver service. Double beam system. Wideband Pulse performance. Voltage and Time Calibration. Recurrent and Triggered sweeps. Operation on supplies from 80 to 230 volts 25 to 2400 cycles.

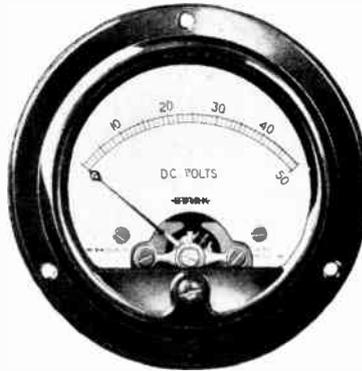
Twin amplifier channels and double beam tube for simultaneous comparison of any voltages. Each channel handles signals from 5 cycles to 3 Mc. Time base speed to 5 microseconds per inch, recurrent or triggered. Complete time and voltage calibration on each channel.

For further data on advertised products use page 53.



MODEL 704. AC volts, amperes, milliamperes. Moulded bakelite 3" rectangular case. (Also available in 3½" round case.) Flush mounting, spade or lance type pointer. Scale length 2.03".

MODEL 604R. DC volts, amperes, milli-amperes, microamperes. Moulded bakelite 3½" round case, flush mounting, spade or lance type pointer. Scale length 2.4". Also available in 2½" round case—Model 605R. **NOTE:** High overload R.F. Meters also available with internal thermocouple.



MODEL 804. DC volts, amperes, milli-amperes, microamperes. Moulded bakelite 4" rectangular case, flush mounting, spade or lance type pointer. Scale length 3.7" Also available in 3" rectangular case — Model 604. **NOTE:** High overload R.F. Meters also available with internal thermocouple.



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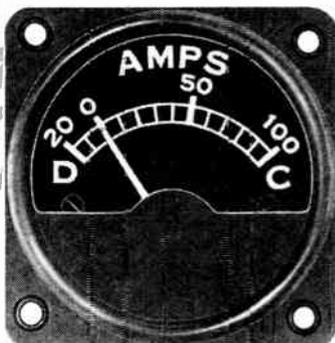
Approved MIL-M-6A Stark Hermetically Sealed Meters. Available as voltmeters, ammeters, milliammeters, microammeters and wattmeters — for precision registration under severe conditions.

FOR
indicating instruments

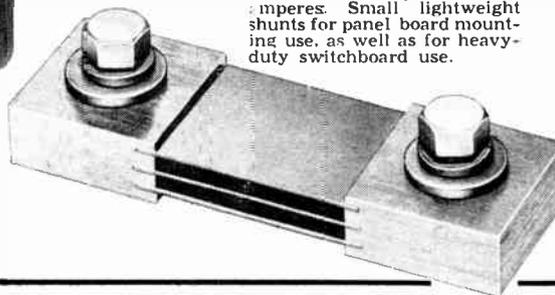
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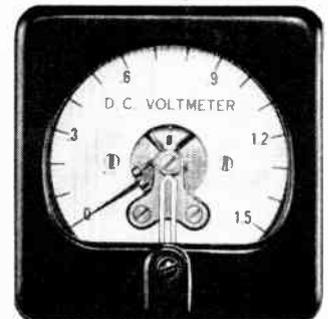
• More than 20 years of experience in design, manufacture and assembly backs every Stark Indicating Instrument. Each meter is built to rigid specifications and, in every step of manufacture they are carefully examined and checked against standard cell potentiometers. Before you buy an indicating instrument — get in touch with Stark. Our engineering department is at your disposal to assist and advise you.



MODEL 605
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MODEL 46-250. 250 DC Milli-ammeter. A most practical instrument where long scale length is important.

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5309-R

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Cables: Starkex, New York.

For further data on advertised products use page 53.

Beneficial Obstacles

From Telecommunications Reports

+

Recent experiments with long-range VHF transmission in mountainous regions have demonstrated the possibility of utilizing knife-edge obstacles as a means for increasing the received signal energy of television, FM and military communications, the National Bureau of Standards has discovered.

According to the tests, indications are that the disadvantages previously attributed to the transmission of VHF frequencies in the 30-100 megacycle range among high mountain ridges can actually become powerful aids for reducing both transmission loss and tropospheric fading. The results of these obstacle-gain experiments "may have a deciding influence on the future choice of sites for transmitting and booster station installations."

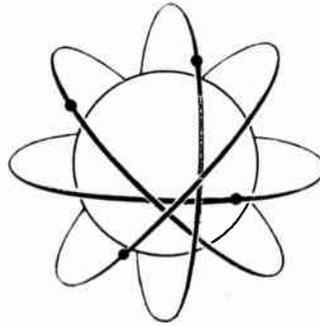
It has been pointed out that "Prior to the experimental verification of the obstacle-gain theory, which predicts the possibility of tremendous power gains for VHF propagation over mountain obstacles, long-range communication installations were located so as to be in radio line-of-sight of each other. When possible, installations were made on the tops of mountains as a means of gaining a wider service range. The extended utilization of the VHF frequencies has further intensified the quest for the best geographical site on which to establish transmitting equipment. However, the sites are usually expensive to construct and are relatively inaccessible. The obstacle-gain phenomenon appears to offer a solution to this problem."

The tests indicated, for example, that "in a region of the country like Colorado, it may prove more advantageous to locate FM and TV stations at lower elevations a short distance out on the plains away from the mountains rather than on the foothills right up against the very high mountains of the continental divide."

In compiling the report, the joint investigating team visited and examined data of the Electrical Communication Laboratory of the Japanese Ministry of Communications, the Radio Research Laboratories of the Japanese Ministry of Postal Services, the Mutual Telephone Co. of Hawaii, and the Civil Aeronautics Administration stations in Alaska.

In a test case between Yakutat and Gustavus, Alaska, a 160-mile communication circuit operated by the CAA on 38 mc., the measured transmission loss was 134 db, as contrasted with a computed loss of 207 db working on the existing smooth earth diffraction theory for an unobstructed path, and a calculated loss of 127 db — only 7 db away from the actual result — working on the obstacle-gain theory.

JANUARY-FEBRUARY, 1954



Vol. 1

No. 6

ELECTRONICS AND COMMUNICATIONS

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President and Publisher, Norton W. Kingsland; Vice-President and Director of Advertising, Norman McHardy; Editor, Thomas W. Lazenby; Editorial Director, Paul Rodney; Advertising Manager, H. E. Dallyn; Production Manager, Nevill A. Campling; Business Manager, Clifford A. Sparks; Circulation Manager, Paul A. Irwin. West Coast Representative: Duncan A. Scott & Company, Mills Building, San Francisco. New York Representative: Sam Percy, 6 East 39th St., New York, N.Y., U.S.A. Tel.: Murray Hill 4-5330.

Subscription Rates: Canada and British

Possessions . . . \$5.00 per year, \$8.00 for two years, \$10.00 for three years.
United States of America - \$7.50 per year. • Foreign - \$10.00 per year.
Authorized as second class mail, Post Office Department, Ottawa

PUBLISHED BY AGE PUBLICATIONS LIMITED

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

TORONTO, ONT., CANADA
31 Willcocks Street
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business briefs & TRENDS

★ **THERE WERE 84,200,000 TELEPHONES** in use in the world in 1952. Of this total the United States has 50,000,000, the United Kingdom 5,915,000 and Canada 3,352,000.

★ **ROBERT STORY, MANAGER, C.G.E. RADIO AND TELEVISION** Department says Canadians will likely get their first glimpse of colour TV receivers at the Canadian National Exhibition in 1954. He predicts colour sets will cost from three to four times as much as black and white sets.

★ **UNITED STATES NAVAL RESEARCH LABORATORY** tests with styroflex and other cables reports that it has been demonstrated with substantial quantities of the styroflex cables that it makes possible considerable savings in installation costs and time. Used as a coaxial transmission line conventional bead spacers are replaced with a continuous helix of polystyrene tapes and an extruded soft aluminum sheath is used instead of drawn copper tubing.

★ **ROBERT C. SPRAGUE, BOARD CHAIRMAN OF THE AMERICAN** Radio-Electronic-Television-Manufacturers Association stated that the radio-electronic industry did its greatest volume of business in 1953. As in 1952 the greater part of this business was in the defence field. Close to three billion dollars worth of electronic and communication equipment was produced for the armed services.

★ **SCIENTISTS OF THE NATIONAL RESEARCH COUNCIL** have designed and built an underwater television apparatus. The equipment was demonstrated recently — on television — the exhibition being arranged in co-operation with the United States Naval Training Station at Chicago and the National Broadcasting Company.

★ **THE INCREASING POPULARITY OF CANADIAN TV** and the prospects of a continuing Canadian prosperity has added up to increased sales of TV sets. To meet the increased demands RCA Victor is planning a large addition to their plant in Prescott, Ontario.

★ **FURTHER SIGNS OF INCREASING ACTIVITY** in the Canadian electronics industry is the reported sale of a 200 acre farm near Brampton, 12 miles northwest of Toronto. Vendor of the site is farmer Rankin Kellam who has sold his property to an unnamed electronics firm for \$110,000. Kellam bought the farm eight years ago for \$7,000.

★ **OFFICIALS OF THE RTMA IN THE UNITED STATES** have announced that sales of television sets for the first 11 months of 1953 was 62 per cent higher than for the corresponding period in 1952. During this period 6,765,000 television sets were made.

★ **SECRECY HAS BEEN REMOVED FROM A NEW AMERICAN RADAR** invention which allows international broadcasters to tell whether their transmissions are successfully reaching their destination. Raytheon Manufacturing Co., were the inventors of the device. The equipment has proved of importance to U.S. authorities in their efforts to pierce the Iron Curtain. Considerable interest is now being shown in the device by Canadian radio authorities.

★ **THE LENGTHY DISPUTE BETWEEN SOME SECTIONS** of the British radio industry and shipping circles and American interests concerning the relative merits of AM or FM modulation for VHF marine communications was brought to the fore recently as the result of a circular issued by Plye Limited and Rees Mace Marine Limited, manufacturers of AM equipment. Entitled, "The Plan For International Marine VHF", the circular supports their belief that VHF marine radio should have AM as its standard basis.

★ **BRAZIL'S DOMESTIC TELEPHONE** and radiotelegraph network now operates 21 stations and is believed to be the world's largest national radio system of communications to serve one country.

★ **IN A SUMMARY OF THE CANADIAN ELECTRICAL** industry for 1953, H. M. Turner, President, Canadian General Electric Company Limited, had the following to say with respect to television in Canada: "In the field of television, the acceptance of this new entertainment medium by the Canadian consumer during 1953 far surpassed all expectations. The rate of market saturation in areas covered by TV signals is exceeding that experienced in the United States. At year-end, some 56 per cent of Canadians were in

(Turn to page 49)

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Crystal
Transistor



VX 3136
Silicon Detector
—8mm band
SIM 8 (VX 3136)

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Radio And TV In Canada

1. There are already five TV broadcasting stations operating in Canada — Toronto, Ont., Montreal, P.Q., Ottawa, Ont., Sudbury, Ont., London, Ont.
2. Canadian manufacturers have already sold over a half million sets in Canada.
3. In January 1954, another station was scheduled to open in Montreal, P.Q.
4. In February, 1954, a station will open in Hamilton, Ont.
5. In March, 1954, stations will be operating in St. Johns, N.B., and in Winnipeg, Man.
6. Early in 1954 (actual date uncertain), stations will be operating in Regina, Sask., and in Vancouver, B.C.
7. In April, 1954, a station in Sydney, N.S. will open.
8. In May, 1954, a station at Rimouski, P.Q., will open.
9. In June, 1954, a station at Windsor, Ont., will open.
10. In August, 1954, a station at Halifax, N.S., will open.
11. Sometime during 1954 (actual date uncertain), stations at Kitchener, Ont., Calgary, Alta., Edmonton, Alta., Kingston, Ont., Quebec, P.Q., Saskatoon, Sask., will be in operation.
12. In addition, applications have been received from or will be granted to TV stations at Peterboro, Ont., Charlottetown, P.E.I., Sherbrooke, P.Q., and Port Arthur, Ont.

Busy Time Ahead For Bell Company

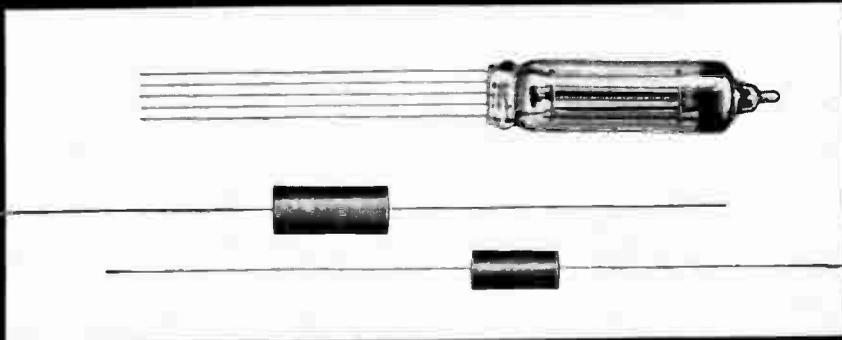
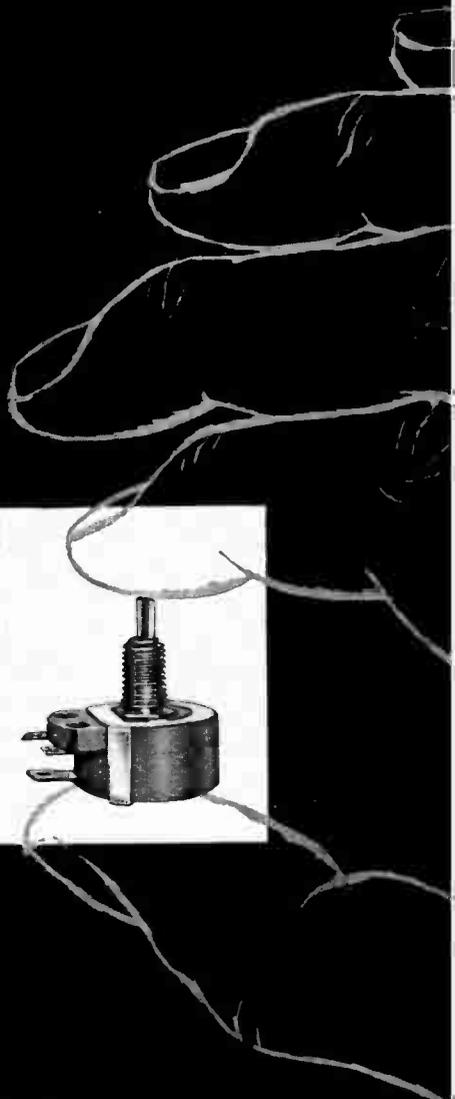
With the recent stock issue of the Bell Telephone Co. of Canada subscribed to virtually in full, the more than \$60,400,000 of new capital available for further development of telephone facilities sets a new record in permanent financing in Canada, the company pointed out recently.

At the end of the four-week subscription period, more than 1,918,000 of the 1,934,483 shares offered had been taken up at \$31.50 a share. The new issue raises the company's total capital to over \$600,000,000, up \$420,000,000 in the last eight years. Expenditures on new construction this year are expected to total \$87,000,000, with the figure to top \$100,000,000 in 1954.

100,000 Telephones Installed In Five Years

In 1948, the B.C. Telephone Company had 200,000 telephones in operation. Since that time they have been working at top speed to meet the skyrocketing demand for service that has accompanied B.C.'s tremendous population growth. It's been a time of equipment shortages and rising costs . . . but in these last five years, 100,000 new telephones have been installed in the west coast province.

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authority on
subminiatures**



In the fast expanding world of electronics specialization grows more intense. And in few fields has the specialist taken over more completely than in the manufacture and application of subminiature components. Marconi's long experience in the industry makes possible a complete technical service available to you in solving *all* your miniaturization problems, with the ability to supply the subminiature components you may require.

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CANADIAN MARCONI COMPANY

VANCOUVER, WINNIPEG, TORONTO, MONTREAL, HALIFAX, ST. JOHN'S, NFLD

the new **cae** oscilloscope (type 104) performs the functions of several types



By using interchangeable D.C. Amplifier and Time Base Units, one CAE Oscilloscope performs the operations of several different types of oscilloscopes resulting in a considerable *saving in capital expenditure*.

Highly functional, it is constructed on the unitized principle and its unique system of controls makes it simple to operate with highly accurate results.

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AMPLIFIERS provide
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- rise time down to 0.05 micro-seconds
- voltage gain up to 500,000
- inherent noise as low as 1 micro-volt

INTERCHANGEABLE
TIME BASE UNITS provide
suitable combinations of —

- sweep velocity 10 cm/micro-seconds to 5 cm seconds
- triggered or continuous sweeps
- automatic synchronization
- linearity 1%
- voltage, frequency and time calibration accuracy, 2%

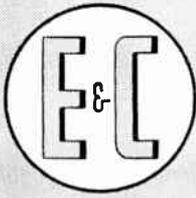
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Ask for Bulletin No. SIE-30101

For complete details of CAE Oscilloscope, Type 104, call or write the CAE office nearest you.

2368A



EDITORIAL

Canada's Future In Engineering-----

A leading Canadian industrialist recently stated that: "the future of the entire country is wrapped up in engineering and if the day comes when there are not enough engineers, then our forward progress will be seriously affected."

There seems few, however, ready to face the fact that there is virtually a shortage of engineers in Canada now.

At the present time it is estimated that there are 35,000 engineers and 25,000 scientists in Canada. The United States has 400,000 engineers and 175,000 scientists. Russia is reported to have a total of 620,000 engineers and scientists and it has been estimated that 30,000 engineers and scientists are being graduated annually from Russian universities and colleges.

It is expected that the United States will be graduating 12,400 engineers annually by 1955. Per capita comparisons notwithstanding it would appear that the

training of engineers in Canada and the United States is grievously lagging. How long then can the trend continue before the prediction of a seriously affected national progress, due to a lack of engineers, actually be upon us? To whom should we look for an answer to the problem of training more engineers?

To the prospective engineer contemplating a university course the cost of tuition may well be a serious obstacle. In this respect it may be pondered whether an adequate supply of engineers is not of sufficient national importance to merit some consideration on the part of federal and provincial authorities to the revision or establishment of appropriate subsidization of promising pupils. University faculties could well consider the advisability too of speeding up engineering courses. This could, conceivably, be accomplished by lengthening the college term for engineers and by eliminating courses of study not essential to the training of an engineer.

Electronics Significant Factor-----

In years past the measure of a country's military potential has been based on the units of manpower and steel production. Today, as pointed out by W. R. McLachlan who recently stepped down from the directorship of the Electronics Division, Department of Defence Production, the electronic design and production potential of a country is rapidly becoming a significant factor.

As evidenced by the record of the past few years the production facilities and ability of the Canadian electronic industry is second to none. In the field of electronic research too, Canada is making fast forward strides. There is little doubt however, that Canadian electronic research which is yet young compared to that of other countries, will, in the near future, result in contributions of great importance to the betterment

of the country.

It is to the credit of federal authorities that fundamental electronic research as required for the solution of problems peculiar to Canada has been initiated by the Defence Research Board. Important research work is now being carried out by this organization in their new Radio Physics Laboratory at Shirley's Bay near Ottawa. Particular emphasis is being placed on the subject of radio propagation in the Canadian north. As stated by Mr. McLachlan, reliable communications in the Canadian north are a must and when answers to many of the problems affecting such are found Canadian industry should be ready to design and build the required equipment. In effect, this may well mean millions of dollars additional business for the Canadian electronics industry.

Continued Business At High Level-----

In a recent review of the Canadian electrical industry, Mr. H. M. Turner, President of the Canadian General Electric Company stated that electronics is playing an increasingly vital role in the day-to-day activities of all of us. The electronic content of many types of defence material is growing rapidly and it is safe to assume that, even if defence preparedness reverts to a standby basis, Canadian activity in electronic work for defence will continue at a high level. In the field of communications, multi-channel microwave equipment is providing economical and reliable communications, not only over the rugged terrain in which many of the country's major developments are taking place, said C.G.E.'s President, but as a supplement to existing

communication facilities in congested areas. The confidence with which the broadcasting industry looks on the future of television is reflected in the heavy investments being made in the purchase of the complex electronic equipment necessary for television transmission, with at least one major electronic equipment manufacturer producing wholly made-in-Canada television transmitters.

Mr. Turner's outlook for the future of electronics in Canada is a bright one shared by the whole industry. It is a confidence in Canada that will do much to further establish our place among the leading industrial nations of the world.

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For insulating magnet coil windings, transformers and a variety of electrical, electronic and mechanical apparatus — engineered especially for applications involving extreme moisture and corrosive conditions coupled with heat and vibration, by the use of "DURAMAC" custom plastics.

"DURAMAC A" compound is a thermosetting plastic developed primarily as a moulding compound but often used as a potting compound. It is a most durable and almost inert material which offers the ultimate in moisture resistance when coupled with problems of heat and vibration. Coil windings and transformers moulded in "DURAMAC A" will successfully pass the rigid tests imposed by specifications MIL-T-27, Grade 1, Class A and MIL-C-16923 (ships).

"DURAMAC B" compound is also a thermosetting plastic developed primarily as a dipping or spraying compound. This compound offers low cost insulation, high structural and dimensional stability and replaces tape and varnish.



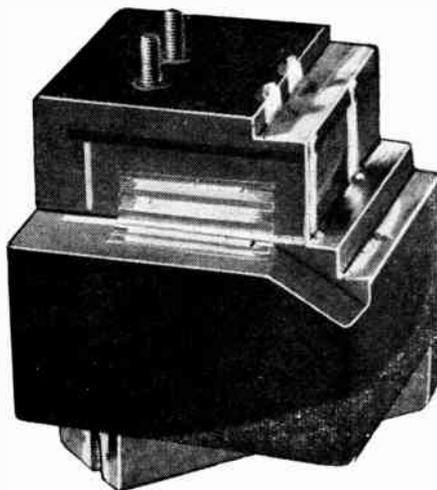
A "DURAMAC B"
Dipped Solenoid Coil

"DURAMAC C" compound is a thermosetting plastic developed primarily as a vacuum and pressure impregnating compound. It offers a high degree of moisture resistance, permits higher operating temperatures and will withstand severe mechanical shock. Moulds are not required.

Manufacturing and process services are now available to industry.



A "DURAMAC C"
Dipped Relay Coil



A "DURAMAC A" moulded transformer and capacitor assembly.

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OSBORNE ELECTRIC COMPANY LTD.
95 WESLEY STREET - TORONTO, ONTARIO, CANADA
MANUFACTURERS OF TRANSFORMERS AND CHOKES

The Editor's Space



A two-hour tour around the plant of Stark Electronic Instruments Limited in Ajax a few weeks ago proved to be something of an eye-opener. Accompanied around the plant by Milt Stark a few of the tricks of the trade in the production of electronic instruments were pointed out.

Mr. Stark's establishment at Ajax is something like one-fifth of a mile long necessitating some careful planning with respect to production lines.

From what was seen during the short visit top efficiency has been obtained at the plant and when interior renovations which are currently in progress are completed the establishment will be something of a showplace in the manufacturing plant category.

We're not quite clear on the reason for all the pipe-fitting activity going on out at Stark Electronic but to say the least it's impressive and obviously a pipe-fitter's dream.

* * *

Monthly meetings of the Toronto Section of the Institute of Radio Engineers are attracting capacity turnouts. The combination of a really enthusiastic membership and the selection of top-notch speakers has resulted in Room E23 in the Electrical Engineering Building of the University of Toronto being filled to overflowing. This was the case at the Institute's recent meeting when Mr. W. B. Whalley, Engineering Consultant of the Polytechnic Research and Development Company and Adjunct Professor, Polytechnic Institute of Brooklyn, had a few things to say about recent developments in colour television. A few last minute arrangements with university officials provided larger accommodation and all were afforded the opportunity of hearing Mr. Whalley's timely utterance concerning colour TV.

* * *

Brewer Hunt, congenial President of the Canadian Radio Television Manufacturers Association, has recently left his Montreal desk as General Manager of the Communications Equipment Division of the Northern Electric Company Limited and traded it — temporarily — for a civil servant's job in Ottawa.

As a one-dollar-a-year man in Ottawa Brewer Hunt will direct the government's \$100,000,000-a-year defence electronic programme for the armed services and other government departments.

Hope to see you in your Lyon Street office some of these days Mr. Hunt. Those old war-time temporary buildings in Ottawa are nothing to look at but some of the offices have a wonderful view overlooking the Ottawa River and the Gatineau Hills. We hope that you get one with a nice outlook.

* * *

You don't have to be in the electronics business to make money out of electronics! Proof of this is contained in a recent news item concerning a Brampton farmer who sold his 200 acre farm to an unnamed electronics manufacturer for \$110,000. The vendor bought the property eight years ago for \$7,000.

* * *

The *Financial Post* calls television aerials "Modern Monstrocities" and asks: "Must civilization expect that from now to Doomsday, every sunset, every gaze for clear blue sky, every landscape, will be wrecked by monstrocities of wires and rods rising high above the rooftops."

Come now. Who looks for clear blue sky when they can feast their eyes on Dagmar, Fay Emerson or Zza Zza Gabor. Talk about landscapes.

(Turn to page 50)

BALLANTINE

World's Leading Electronic Voltmeters

SENSITIVE AC VOLTMETERS

AUDIO to 150 kc MODEL 300

Voltage Range 1mv—100v
 Frequency Range 10cps—150kc
 Accuracy 2% ENTIRE RANGE
 Input Impedance ½ meg shunted by 30µmf



SUB-AUDIO to 150 kc MODEL 302B Battery Operated

Voltage Range 100µv—100v
 Frequency Range 2cps—150kc
 Accuracy 3% 5cps—100kc
 5% elsewhere
 Input Impedance 2 meg shunted by 15 µmf*



AUDIO to 2 mc MODEL 310A

Voltage Range 100µv—100v
 As null detector 20µv min
 Frequency Range 10cps—2mc
 As null detector 5cps—4mc
 Accuracy 3% 10cps—1mc
 5% elsewhere
 Input Impedance 2 meg shunted by 15µmf*



AUDIO to 6 mc MODEL 314

Voltage Range 1mv—1000v
 (100µv—1mv without probe)
 Frequency Range 15cps—6mc
 Accuracy 3% 15cps—3mc
 5% elsewhere
 Input Impedance 11 meg shunted by 7.5 µmf
 (1 meg shunted by 25µmf without probe)



PEAK-to-PEAK MODEL 305

Voltage Range 1mv—1000v pk-to-pk
 Frequency Range 10cps—100kc (sine wave)
 Pulse width 3µsec—250µsec
 Min Rep Rate 20 pulses per sec
 Accuracy 5% for pulses
 Input Impedance 2 meg shunted by 15 µmf*



ACCESSORIES

SENSITIVE INVERTER MODEL 700

For Measuring DC Voltages when combined with any AC Voltmeter
 Voltage Range 1µv—100v DC
 Ratios DC Input to RMS Output 1:100 & 10:1
 Accuracy 1% 100µv—100v
 Input Resistance >10 meg for 1:100
 50 meg for 10:1



DECADE AMPLIFIER MODEL 220A

For Increasing the Sensitivity of any AC Voltmeter by 10 or 100 times
 Voltage Range 10µv—50mv
 Frequency Range 10cps—150kc
 Accuracy 2% ENTIRE RANGE
 Input Impedance 5 meg shunted by 15µmf



DC OUTPUT ADAPTER MODEL 2300

For deriving DC from the Model 300 Voltmeter to drive external recorders or remote meters
 Maximum DC output 2 ma
 Source resistance (controlled) 8K to 18K
 Frequency response, total variation—
 100 cps to 100 kc 1 db
 40 cps to 150 kc 2 db
 Either output terminal may be grounded or both left isolated.



MULTIPLIERS MODEL SERIES 1300

For Extending the Voltage Ranges of Ballantine Voltmeters to 1000 and to 10,000 Volts

Voltmeter Model	For Extending Range to 1000v	10,000v
300	1300A	1300B
305		1305B
302B or 310A	1310A	1310B
314		1314B



SHUNTS MODEL SERIES 600

For Measuring Current AC or DC when used with any AC or DC Voltmeter

Model	Resistance	Max Current	Current from 0.1µo to 1a can be measured using these shunts with Ballantine Voltmeters and Accessories.
601	1 ~	1000ma	
602	10 ~	300ma	
603	100 ~	100ma	
604	1000 ~	30ma	



Famous for SENSITIVITY • ACCURACY • STABILITY

Each Ballantine Voltmeter

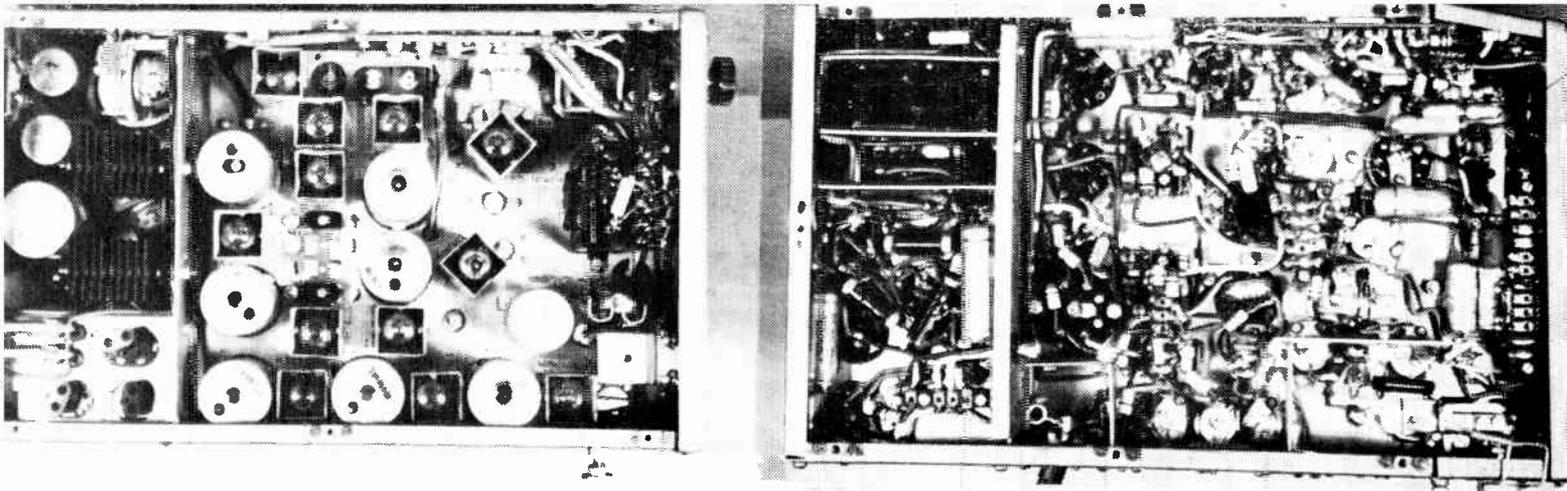
- Has only ONE voltage scale with decade range switching.
- Provides the same accuracy of reading at ALL points on the logarithmic voltage scale.
- Has a linear decibel scale.

- May be used as a high gain wide band amplifier.
- Responds to the average value of the input voltage wave, thus avoiding "turn-over" discrepancy.

WRITE FOR MORE DETAILED INFORMATION TO—

*Shunt capacitance is 8µmf on all ranges except two most sensitive ranges.

R-O-R Associates Limited
 290 LAWRENCE AVENUE WEST, TORONTO 12, CANADA



● From left to right, top and bottom views respectively of compact AM transmitter-receiver with dual power supply for 6 volts DC and 115 volts A.C.

The Case For AM-----

By IVOR NIXON

The common practice of using the term FM to denote VHF and AM to denote HF is rendered misleading by the advent on the Canadian market, of AM VHF communications equipment. The author points out how the frequencies employed, rather than the method of modulation, are responsible for the characteristics commonly attributed to the respective systems.

IN the past fifteen years which have elapsed since the characteristics of frequency modulation were brought to the attention of the radio industry, it has tended to supplant amplitude modulation in certain radiotelephony applications. As FM was primarily a United States invention, it is not unnatural that its most rapid development, and its most widespread use, should have occurred in that country. The theoretical advantages of frequency modulation suggested that they would revolutionize certain radio techniques, particularly in the field of mobile two-way communication, and its widespread adoption in the U.S. was justified on these grounds and indeed offered the only sure way of assessing the relative merits of the two systems of modulation on a controlled basis.

Elsewhere in the world, however, the adoption of FM was approached

● H. S. Traves, Ajax, Ontario, Chief of Police is shown taking down a message as it is received over a PTC 704 Model AM receiver.



with conservative caution, and the practical result of the American experimental and development work was observed with unbiased detachment. Indeed, it is only recently that competent engineering groups in other countries have reached certain conclusions that these by no means constitute blanket approval; they tend rather to indicate that the two systems should be regarded as complementary rather than competitive, although there are many applications where both are technically suitable. In broadcasting, it appears that wide-band FM will not only bring about economies in transmitter networks required to cover a given area (assuming VHF is used), but will yield a better grade of service in reception areas where the interference and static level is high. On the other hand, the listener pays for these advantages in the higher cost of his receiver; and this economic factor is one that has not been comprehensively discussed in the many published analyses of the relative advantages of the two systems of modulation.

It would be appropriate to note here, incidentally, that the better quality of music reproduction generally attributed to FM is not a function of the system of modulation but is entirely due to the fact that channels in the very-high-frequency (VHF) spectrum could be made available to accommodate the wide deviations essential to high fidelity transmission and reception, of which AM would be equally capable under similarly favourable conditions. The ability of

the layman to draw a sensible conclusion in the particular application in which he is interested is greatly hindered by the technical considerations which are invariably involved; for example, since the wide bandwidths required by FM (if its interference-rejecting properties are to be fully enjoyed) can only be accommodated in the VHF region, the difference in range between AM and FM broadcasting is due entirely to the respective frequencies employed and not at all to the method of modulation. This can be appreciated better if one stops to realize that an unmodulated carrier from an AM transmitter is identical in every respect to an unmodulated carrier from FM transmitter, and the two must therefore be



IVOR NIXON

● The author, a graduate of the University of Toronto, has been a radio amateur since 1934 and has been associated with communications in Canada since 1946. He is now Manager of the Telecommunications Division of Pye Canada Limited at Ajax, Ont.

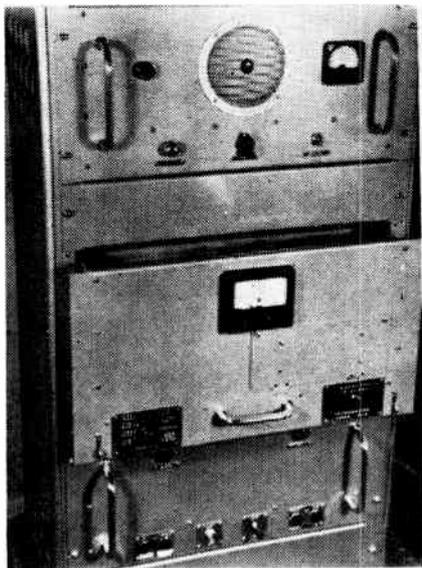
have in an identical manner. The advantages of FM are principally realized at the receiving end while range and other propagation characteristics are determined to a much greater extent by the transmitter.

Space And Cost Factors

The benefits derived from the use of frequency modulation in broadcasting were expected to be realized as well in other applications such as mobile communications. It is in these fields that world-wide unanimity has not been achieved, and is not likely to be in foreseeable future. Since the majority of channels available for relatively short range contacts with

moving vehicles (and associated point-to-point circuits) are above 30 mc/s and of late above 100 mc/s, the static and man-made interference so long a limiting factor in this type of radio communication (and to which FM is more or less immune) becomes encountered at VHF. The particular of less concern, as it is not normally type of interference which is prevalent above 100 mc/s (such as automobile ignition noise) is often constituted of short-duration pulses which are effectively wiped out by peak-clipping noise limiters which can be simply and inexpensively incorporated in AM receivers. Thus given an equivalent standard of performance, considerations of space and cost usually become the determining factors in choosing a system.

Other arguments have been put forth in defence of the higher cost, larger size and increased circuit complexity of FM equipment as used in VHF Communications systems. Chief among these is "capture effect" whereby the stronger of two signals arriving at an FM receiver takes precedence over the weaker, thus reducing the possibility of interfering signals preventing the transfer of intelligence. Whereas capture effect is much more pronounced with FM, it exists with AM as well, and allowing for such techniques as staggering of the AM carriers to eliminate heterodynes (not feasible in the case of FM), the practical differences between the two sys-



● 50-watt AM transmitter specifically designed for aviation use; by withdrawing RF drawer as shown, rapid selection up to six channels can be achieved.

tems is of little consequence in view of the frequency allocation plans followed by most governments.

A second advantage claimed for FM is the consequence of the amplitude limiters employed in the receivers, which provide instantaneous AVC (automatic volume control) over varying input signal levels, such as produced by a VHF phenomenon com-

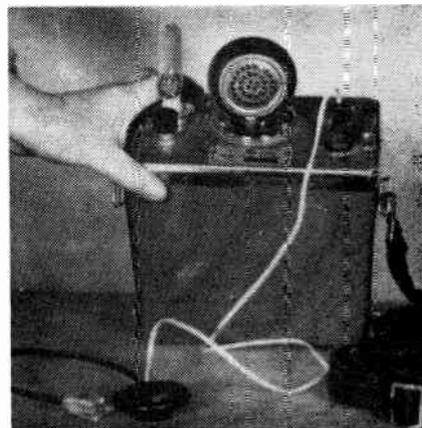
monly known as "flutter". Flutter is caused by the varying phase relationships between the direct and reflected signals from a given transmitter which is encountered with a mobile receiver in motion; while its effect on the ear can be minimized by fast acting AVC circuits, the latter are of no avail when the signal strength becomes weak or when the phase cancellation becomes complete. Flutter then is heard as rapid pulses of noise which are accentuated rather than reduced by the electronic squelch or muting commonly employed in FM receivers. Because of the lower overall gain of AM receivers, these noise pulses are in practice much less objectionable, and careful attention to AVC time constants has reduced the nuisance value of AM flutter to negligible proportions. There is every reason to believe that this comparison will apply regardless of the frequency used.

Economy in the construction and power consumption of FM transmitters is claimed because of the low modulating power required compared to AM; this is of considerable importance in high-powered broadcast transmitters, and to a lesser extent in mobile communications equipment intended for operation from the electrical system of a car or truck. In the latter case, however, the power economies due to the smaller number of tubes required for efficient AM performance compensates to some extent for the modulator power requirements, and for maximum transmitter powers normally employed in this type of service (60 watts) the difference is not significant. In the case of lower transmitter powers (5 watts or less) the trend actually reverses inasmuch as it becomes possible to perform a dual function by arranging for the receiver output tube to act as the AM transmitter modulator. In consequence, commercial AM sets are available with a transmit drain of only 8 amperes at 6 volts, and the low output power of one to two watts is entirely adequate for many of the short range applications which have sprung into being with the advent of practical VHF designs.

Features of AM

On the other side of the ledger, the proponents of amplitude modulation for VHF communications are able to point to a number of features which have deterred a great many users from embracing FM exclusively. The single fact that AM requires less tubes and other components to achieve an equivalent standard of performance automatically implies substantial economies in respect to initial cost, weight, size, and cost of maintenance; this applies in double measure to the low-powered mobile sets which constitute the vast majority of the market for VHF equipment. Furthermore the ever-increasing demand for two-way radio communication from such users as taxi operators, veterinarians, indus-

trial plants and others has necessitated drastic measures to achieve maximum utilization of available frequencies, and the most urgent requirement which has confronted designers has been a reduction in bandwidth. This requirement has been met in the case of frequency-modulated transmitters by reducing the deviation; unfortunately FM was originally envisaged as a wide-band system, and as the modulation index approaches unity



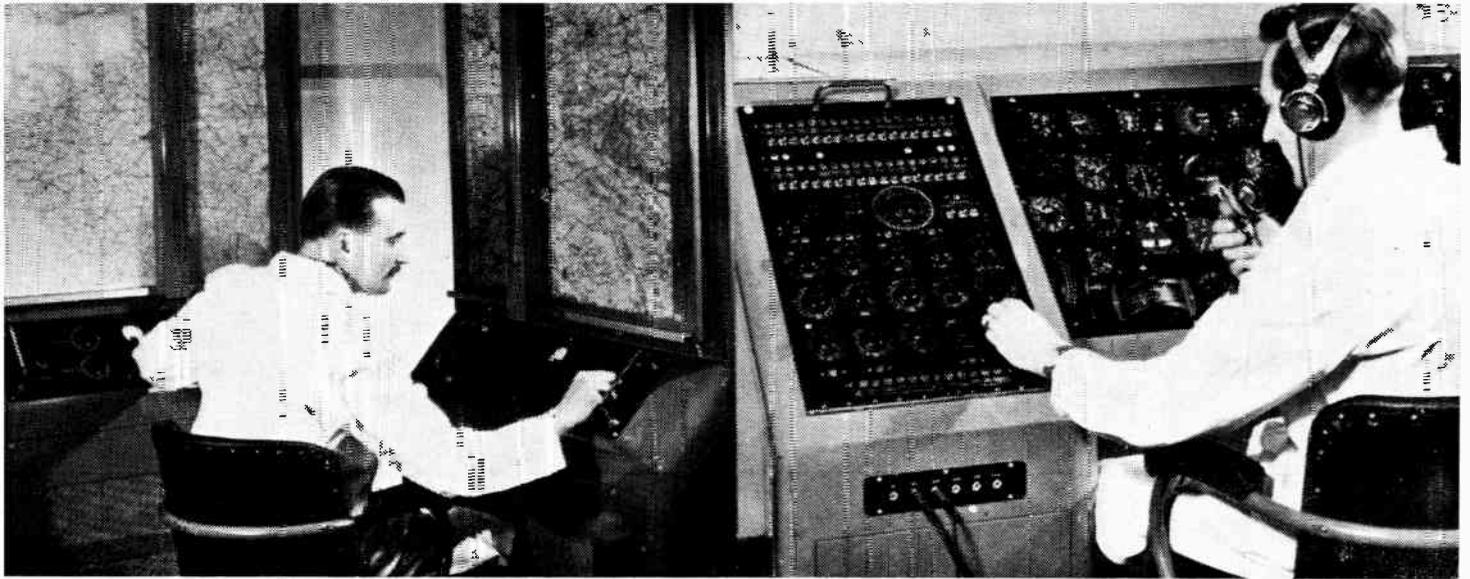
● Inexpensive AM walkie-talkie unit similar to those used by Everest expedition. Carried on the chest, it leaves both hands free.

there is a perceptible degradation in performance in respect of both noise-rejecting characteristics and voice intelligibility. Since both of these properties also are largely dependent on accurate receiver alignment, narrow bandwidths accentuate the need for skilled maintenance techniques. With AM, on the other hand, narrow bandwidths can be achieved with no reduction to either interference rejection or audio quality, and since the associated receiver is much less critical of alignment, the demands on maintenance personnel are much less onerous and the user is in general assured of a continuously high level of performance which is less apt to be disrupted by such conditions as vibration and extremes of temperature.

AM Used Extensively

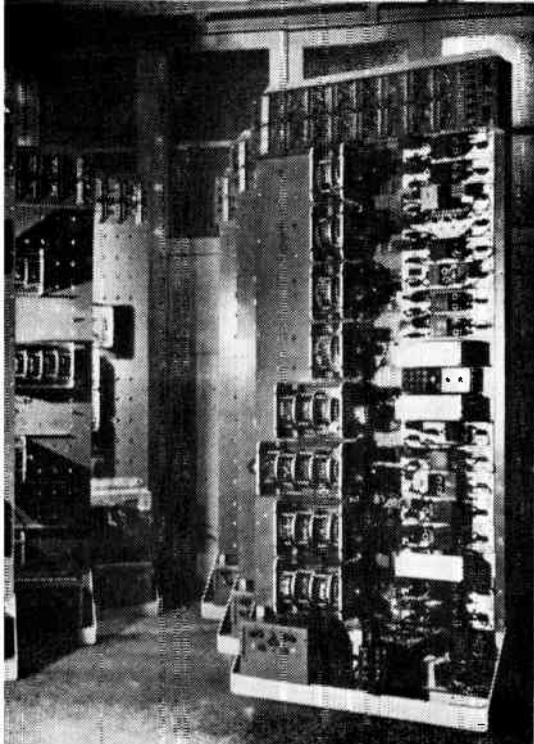
From the foregoing it becomes apparent that the user will be guided in his choice of a system by a number of considerations, of which the chief will be its ability to yield the desired grade of service, but followed closely by such factors as cost, weight and size which may be dictated by his particular requirements. Since no equipment yet designed for mobile service will deliver proper performance without competent maintenance, it is essential to ascertain that available facilities and personnel are adequate to keep the system in efficient working order. Applicants for VHF systems who have little previous experience with VHF systems are frequently led to believe that AM is an "obsolete" method of modulation;

(Turn to page 58)



● The large and small area recorders. The large area recorder (left) is electrically coupled to the second unit, which is arranged to switch in automatically the small charts at appropriate points. It also produces long range D/F facilities.

● The Instructor's console for the Redifon Sabre Flight Simulator, showing the repeated cockpit instruments and the controls used for feeding the conditions, problems and emergencies into the apparatus.



Aviation - - -

Flight Simulators For Canada

The development of the electronic flight simulator as an aid to pilot training has been the most significant advance in technique since the war.

The hourly operating cost of the Sabre Flight Simulator is \$8 against \$145 for the aircraft, while maintenance costs compared with those of one instructional aircraft are so small as to be almost negligible.

The flight simulator is being increasingly adopted by civil airlines and for military purposes. The first of a number of Sabre F86E flight simulators ordered last year under a \$3,500,000 contract by the Canadian Department of Defence Production have now been completed.

The type F86E simulator consists, basically of a replica of the Sabre cockpit with every instrument and control exactly reproduced, together with control panels and recorders for the instructor and the computing equipment is housed in a trailer and has an independent mobile power generator.

● *Top left:* The cockpit of the Redifon Sabre Flight Simulator, which is a faithful reproduction in detail of actual aircraft.

● *Lower left:* The computers, in which valve driven servo units actuated by signals originating from the controls solve equations representative of the Type F86E aircraft in flight and present appropriate instrument readings in the cockpit of the simulator.

Simulates Flight Hazards

Practically any navigational problem or emergency condition can be presented to the trainee pilot. These problems and the normal conditions of flight are translated by an analogue computer consisting of an elaborate system of electronic and electro-mechanical apparatus into instrument readings and control responses.

The pilot's handling of the controls and equipment produces the same results in the flight simulator as would be experienced in an actual aircraft—without any of the hazard and at a fraction of the cost of actual flight.

It is thus possible to feed emergency conditions into the simulator—conditions, which, with a student pilot, might in the air, easily lead to disaster. Such things as engine or instrument failures can be introduced and repeated at will until the instructor is satisfied that the trainee's actions are immediate and correct.

Appropriate aural effects and correct feel of all controls are examples of the faithfulness of simulation. In fact, the only impressions which are not given are the physical effect of accelerations and the external view through the canopy—impressions which cause no disadvantage by their absence now that pilots no longer fly "by the seat of their pants," but by instruments.

New-Improved-Vastly Better

RECORDING VOLTMETERS AND AMMETERS

BY **BRISTOL**

(REPLACING INVERTED KNIFE EDGE TYPE INSTRUMENTS)

- ✓ Electrical burden—only 1/5 that of old meters
- ✓ Ambient temperature error—only 1/10 as much
- ✓ Continuously legible recording on sudden changes—even up to 2/3 of range

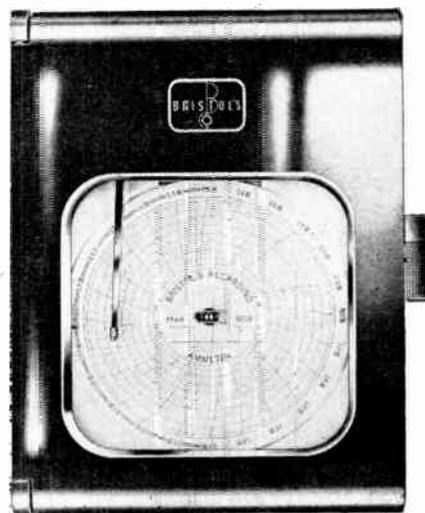
This is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years experience in building recording voltmeters and ammeters for almost every application.

The five different models of the Series 500 make them suitable for almost all electrical power circuit recording jobs.

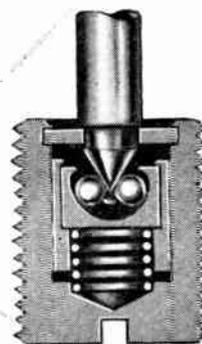
The new moving-iron measuring mechanism is a type known for the high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

Designed for utility too, with dust-and-moisture-proof die-cast aluminum case; quick-set chart hub for easy chart changing; non-obscuring pen lifter; snap-on chart plate.

Find out what these new recording voltmeters and ammeters can do for your business—write the Bristol Company of Canada, 71-79 Duchess Street. Ask for Bulletin E1111.



Permanent Mounting offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: PORTABLE INSTRUMENTS are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



New bearing suspension with pivot movement prevents damage even under severe mechanical shock. Stainless steel ball bearings are almost tool hard.

The **BRISTOL** Company of Canada Limited



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B-53

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A. R. WILLIAMS MACHINERY CO. LTD.

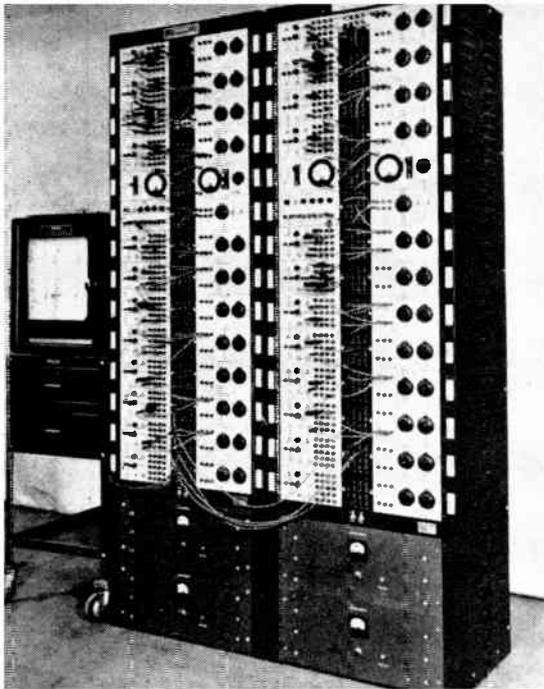
WINNIPEG
FILER-SMITH MACHINERY CO. LTD.

EDMONTON-CALGARY
GORMAN'S LTD.

M E A S U R E M E N T O F I N D U S T R I A L P R O G R E S S

ELECTRONICS & COMMUNICATIONS, JANUARY-FEBRUARY, 1954

For further data on advertised products use page 53.



● *Top:* The Boeing Electronic Analogue Computers which are now being installed in the A. V. Roe Canada Limited plant at Malton. The equipment is being installed by Computing Devices of Canada Limited. *Bottom:* The CRC 126 Magnetic memory tape.

CANADA'S first commercial installation of electronic computing equipment will take place shortly in

the plant of A. V. Roe Canada Limited at Malton, Ontario. Costing around \$130,000, this modern marvel, a computer system made up of a "digital computer" with "memory drums" and "memory tapes", and "analogue computer racks" will run through in two hours, problems that would take an operator on a desk-type calculator seven or eight months to solve, working eight hours every day.

This computer system will provide enormous time-saving and money-saving advantages. Problems concerned with response to control movement or external disturbances, heretofore taking weeks to solve by hand methods will now be run through in a few hours and in some cases a few minutes. In designing today's complex military aircraft, these computers are probably indispensable. They are the most useful servant mankind has devised. A. V. Roe Canada's computers will be used as well in solving problems involved in aircraft stability so important in high speed jet aircraft construction.

Some Memory

In non-technical language, these computers operate from a "memory drum", a "magnetic tape" or a combination of both. The drum will store over 40,000 electronic impulses, or "bits of information" and will deliver these back to the machine in any order required, and at unbelievable speed. The tape is also used to store data and holds over four million "bits of information" which can be fed back from it and printed on paper, all from instructions previously fed into the computer by the operator. The tape acts as an automatic filing system for the computer.

The possibilities of such equipment are being recognized more every day by business and industrial concerns, for their use in inventory control — scheduling of production and parts — actuarial work — sales information — payroll calculations and many other applications. An interesting feature of the A. V. Roe sale is that it was carried through entirely by an all-Canadian company known as Computing Devices of Canada Limited. The A. V. Roe installation is expected to be followed shortly by others, as Canadian business enters the new electronic age.

How Low Can You Go?

THIS question—the bugaboo of all flyers—often may mean the difference between life or death in fog, darkness or other conditions of poor visibility. All too often, the pilot's altimeter cannot give him a quick or accurate enough answer. Science, however, has come up with a solution.

Military secrecy has now been lifted to permit announcement of an "electronic yardstick" that keeps a pilot informed at all times of his height above the surface of the earth. It was developed by a large manufacturer of electronic equipment, under contract with the United States Navy's Bureau of Aeronautics. The device is a new and improved radar altimeter that already has proved its ability to give instant, direct and reliable altitude information. Representing a 10-year advancement in the use of radar for measuring altitude, the equipment has been accepted by the Bureau of Aeronautics and is currently being studied by the Air Force.

The new radar altimeter works by sending speed-of-light signals down to the surface of the earth. The signals bounce back in millionths of a second, and the time it takes them to return is measured electronically and converted automatically to the instrument panel, where it reads altitude in feet. The pilot has before him at all times an instant, accurate answer to the question, "How high am I?"

The era of all-weather flying is brought a step nearer with this latest engineering triumph, for it functions reliably from a few inches off the ground to the limits of its range of operation. The ability of the instrument to give a true and instantaneous height reading is considered as a tremendous help in military flying. Equipped with this new altimeter, pilots will be able to manoeuvre aircraft with greater safety. The new altimeter can be set so that a warning light will indicate to the pilot when he has gone below the desired altitude.

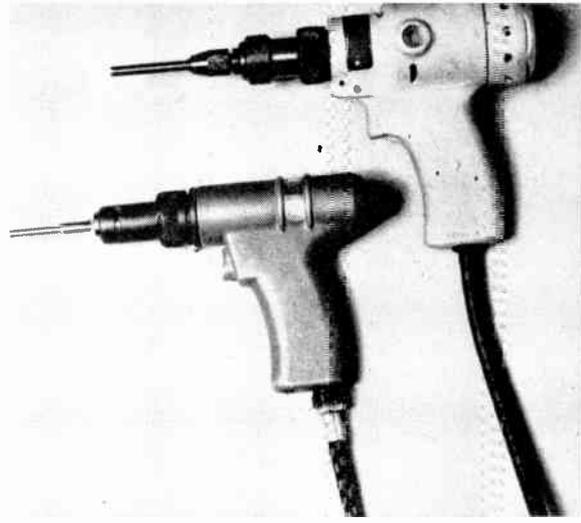
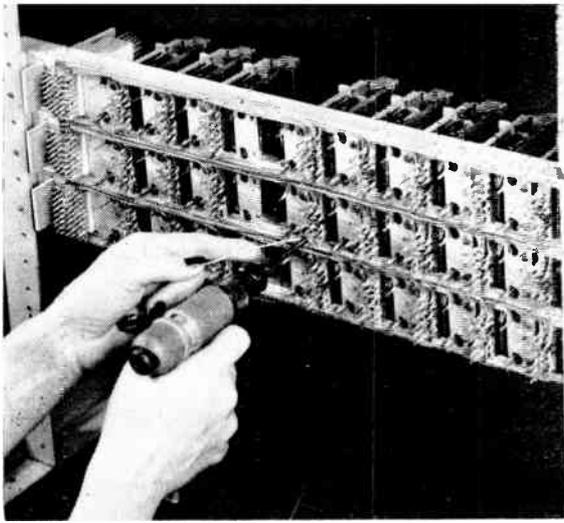
Fast Signals Required

An important advantage of the new device is the instantaneous altitude indication it affords, without "instrument lag," a pilot's term for a relatively slow instrument reaction. This is a vital factor in view of the terrific speeds attained by today's jet planes.

Errors in the new altimeter are almost impossible. If the device picks up a false or misleading signal, the indicator needle is automatically "masked out," or hidden from view temporarily. When the system has found a true reading again, the needle becomes visible.

Engineering - - -

Computer To Help Avro Build Jets Faster - - -

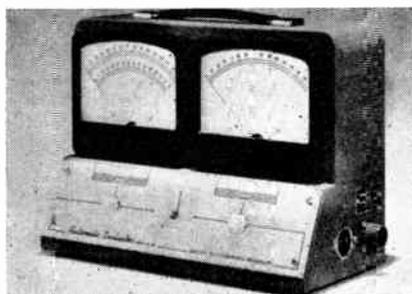


● *Left:* Typical of the uses to which the new tool will be applied is the making of the countless connections required in the assembly of telephone equipment. *Center:* The tool that makes solderless wire connections possible. Five years under development by engineers of the Bell Telephone Laboratories and the Western Electric Company it will do much to speed the work of executing the millions of wire connections made annually in the communications industry. *Right:* Indicative of the neatness with which wire connections can be made with the new technique and the ability of the new tool to carry out its job in confined spaces is shown in the above photograph. Comparative size of pencil point gives idea of the size of wired connections.

*It's All Wool
And - - -*

WOOL and fabric manufacturers faced with the problem of producing material of constant weight per unit length can now look forward to an easy solution of the problem with the use of a new uniformity analyser developed jointly by the Institute of Textile Technology, Charlottesville, Virginia, and a large manufacturer of electronic equipment. The instrument accurately measures and permanently records on paper the variations in weight per unit length of yarn, roving and sliver.

The new instrument is small enough to be carried by hand. Easy to read it provides the operator with the same average peak-to-peak readings that would otherwise be obtained from chart calculations. Thus, not only is there direct correlation between data obtained from both chart and the instrument, but defects in the material, which might be averaged out in area reading devices, are shown in their proper perspective with the use of the new instrument.



● Uniformity Analyser.

With this new development an operator can obtain complete non-uniformity data from a 1,000 foot sample of yarn in three and a half minutes practically eliminating the need for time-consuming chart calculations.

Industry - - -

Ten Billion Joints Made Every Year

IT'S BEEN estimated that close to 10-billion soldered joints are made each year in the American communications industry and a method has long been sought by which wire connections could be made without the time consuming labour that is required in making soldered connections. Now, a wire wrapping tool, jointly developed by engineers of the Bell Telephone Laboratories and the Western Electric Company is reported to be capable of making connections without the use of solder, connections which produce a gas-tight joint between terminal lug and the connecting wire in the assembly of electrical, electronic and electro-mechanical equipments.

The tool for making these solderless connections is a hand-held gun, either air or electrically operated, that has a rotating spindle with an axial opening that receives the wire terminal and a smaller axial opening into which the skinned end of the connecting wire is inserted. The gun rotates its spindle, which virtually shoots the wire around the terminal in a tight helix, making a firm mechanical metal-to-metal joint. Automatic positioning of the spindle facilitates loading; controlled tension makes highly uniform warps. Rectangular terminals, having sharp edges, are wrapped with about six turns of wire without the application of heat. Contact pressure in the finished connection is at least 15,000 psi which results in an indentation at each of the four terminal corners that

requires a 10-lb. force to strip.

Five Years To Develop

The technique of solderless wrapped-wire connections took five years of intensive scientific research to develop. It has been thoroughly tested by Bell System engineers, and the connection has been found to be mechanically stable, less apt to break through rough handling or vibration, and has an estimated life expectancy of 40 years. In manufacture, wire wrapping is faster, more uniform, and easier on the operator, than soldering.

Elimination of the soldering phase in assembly operations removes all the disadvantages of the soldering method, the stray solder droppings, the "cold" joints and the damaging of adjacent parts by heat. Clipping excess wire from a soldered connection, which is often a cause of trouble in wire equipment, is not necessary because the wire end is part of the connection. With the solderless connection, terminals can be made smaller in cross section, and spaced more closely together. Since the connection requires a minimum of space, equipment can, as a result, be reduced in size.

Although the Western Electric Company does not plan on producing the tool, it will be made commercially available to radio, television, communications and electrical manufacturing companies through licensed tool manufacturers.

Here's How To Break----

Communications Bottlenecks

By H. A. O'CONNELL

an hour. With overhead of this kind facing management it is essential that the trucks be kept on a paying basis. This means the trucks have to be kept moving. Minutes lost when the trucks are standing idle under the concrete chutes as a result of delays in informing the mix tower operators of the required specification for concrete adds up to many dollars in the course of a day. Now the required concrete mix is ready and waiting for the truck as it pulls under the chute. Rapid transmission of instructions through the use of modern communications makes this possible.

Paper Mill Control

In the production of fine quality special finish papers made to customers specifications, constant control and checking of the paper is required as it comes off the huge rolls. Consistency of the exacting formulas to which this paper is manufactured is checked by testing samples of the paper as it comes off the machines. When there is any deviation from the required standards reports have to be relayed from the testing laboratories to the beating and mixing departments with the least possible delay. Minutes lost in the transmission of these reports means that hundreds of feet of paper are being processed through the rolls all of which has to be scrapped due to deviation from the required specification. At the Lybster Mill of the Alliance Paper Mills Limited in Merriton, Ontario, quality control of their high grade papers is maintained by the use of TelAutograph apparatus.

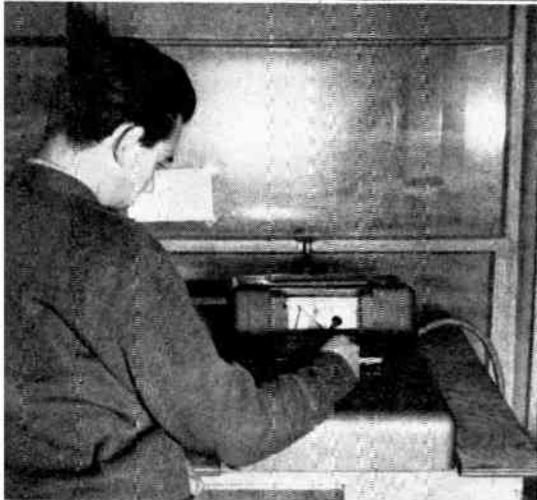
Perhaps one of the largest users of

the TelAutograph system of communications are the credit bureaux offices which are located in every large Canadian city and most of the larger towns. These offices are members of the Associated Credit Bureaux of Canada which means that information on file in any one of the many branch offices is available to any one of them. If a person has ever bought merchandise on credit, applied for a loan, opened a charge account or established his or her credit in any other way, one or more of these credit offices will have a file on them. This file will show the persons paying habits, approximate salary, place of employment, address, whether he or she rents or owns their home, how long they have held their present employment and their former job, as well as other pertinent information that gives a pretty clear picture of the character and habits of the person concerned.

Since an extremely large percentage of the sales made in all types of stores is on a credit basis so their procedures have been streamlined in order to give the best possible service to their customers. This has been done in many instances by the installation of TelAutograph equipment by members of the Associated Credit Bureaux of Canada who handle credit negotiations for most of the large retail business houses in Canada.

Experience with this type of equipment has shown that if there's a communications bottleneck in any industry or business it's one neck that can be broken in a hurry with the use of modern communications apparatus.

● The TelAutograph installation the Ottawa-Hull Credit Bureau. Through this installation credit ratings of customers can be obtained by any of the business enterprises in the district who are served by the credit bureau.



● *Top:* Ready mix concrete tower operator receives instructions from the control room where specifications for concrete are received. *Bottom:* The control room installation of the TelAutograph system.

IN the search to increase efficiency, speed operations, effect closer control and reduce costs many types of industry have taken advantage of the TelAutograph telescriber system of handling their communications problems. One of the bottlenecks that many firms have to contend with is the delivery of written production orders, instructions or reports. This condition has been successfully eliminated by the use of TelAutograph telescribers since the application of this system permits orders, instructions or reports to be delivered as they are written.

Indicative of the wide use of this system in industry is the use of this form of communication by such diverse types of business as ready-mix concrete firms, newsprint mills and credit bureaux.

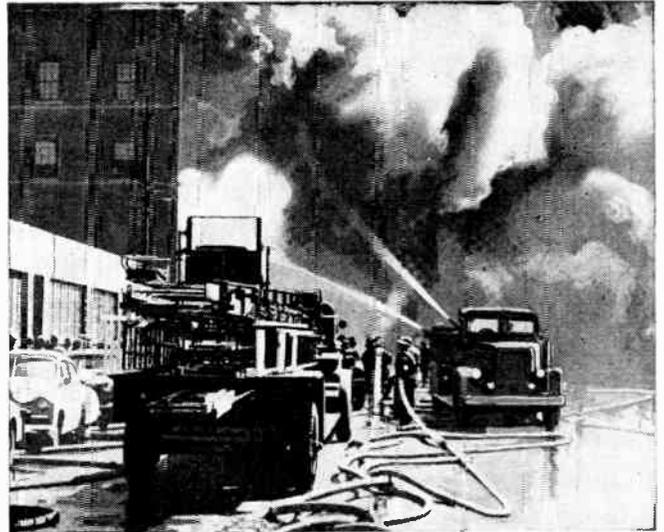
In Toronto the Associated Quarries and Construction Limited use the TelAutograph system of communication to control the specification mixes of concrete. Operating costs of ready mix concrete trucks run at ten dollars





POLICE OPERATIONS

Police Cruisers equipped with two-way radio reach the scene of trouble faster. Result . . . vandalism and traffic jams are controlled quickly and economically.



FIRE OPERATIONS

Two-way radio equipment can save precious lives by directing fire-fighting units to schools, homes and buildings. Fire Chiefs can muster fire-fighting equipment and other services with a minimum of delay.

Only G-E gives you . . .
24 HOUR DUTY
2 way radio equipment

Only with G-E 2-way station equipment could you hold the button down for 24 hours of continuous transmission and know that nothing will burn out. Here's further proof of rugged G-E design and construction that provides dependable service in any

emergency . . . built-in reserve power for Police and Fire operations. Besides, G-E 2-way radio gives you power to spare for long-life performance, low maintenance and maximum economy.



**MOBILE RADIO
EQUIPMENT**

Communications Advisory Service 471W-1353
 Mobile Radio Sales
 Canadian General Electric Co. Ltd.
 830 Lansdowne Ave., Toronto, Ontario
 Please send full particulars on G-E Two-Way Radio Equipment to:
 Name Company
 Address
 City Prov.

Electronic Equipment Department

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

ELECTRONICS & COMMUNICATIONS, JANUARY - FEBRUARY, 1954

For further data on advertised products use page 53.

Factors Affecting The Accuracy Of Oscillographic Records . . .

By ARTHUR MILLER, ScD.
Chief Electronic Engineer, Sanborn Company

Part Two

THE previous article (ELECTRONICS AND COMMUNICATIONS, November-December 1953) described the class of errors which are a function of static conditions, and showed how these static errors can arise and how they may be measured. These static errors do not depend on the rate of change of the input signal. Those which do depend on the rate of change are known as the dynamic errors, and will be considered in this article.

The characteristics of a linear recording system can be completely specified by the relative magnitude and phase of input and output sine wave test signals. Since the magnitude and phase vary with frequency, these characteristics must be given as a pair of curves; a curve of relative magnitude with respect to frequency, and the curve of phase shift with respect to frequency.

By having these two curves, it is theoretically possible to predict ahead of time exactly how any complex wave would be distorted. This would be done by first analyzing the input signal into its equivalent sine wave components, then determining the corresponding output signal for each of these sine wave components (from the amplitude and phase curves of the system), and then finally combining these output

sine wave components to show the resulting output signal.

For practical applications this procedure is usually too unwieldy to be of much use. In spite of this, it is possible to state the requirements of the theoretically ideal recording system. These are: (1) constant amplitude response for all frequencies from zero to infinity, and (2) a phase shift which is either zero for all frequencies, or which is proportional to frequency. The slope of the phase shift* curve equals the "time delay" of the recording system, a term which will be illustrated later with respect to the recording of a pulse type signal.

No physically realizable system can meet these requirements, and the problem then becomes one of trying to correlate departure from ideal with the distortion which will result in a particular recording. Such a correlation is still difficult to make.

Square Wave or Step Voltage Test

Another approach to this problem of testing the ability of a recording system to accurately reproduce varying quantities is by way of the "square wave" or "step voltage" response.

The step voltage test is based upon the idea that no physically realizable

recording system can reproduce such a wave form without distortion but the degree and kind of distortion is immediately apparent. It will be recalled that the sine wave test signal couldn't

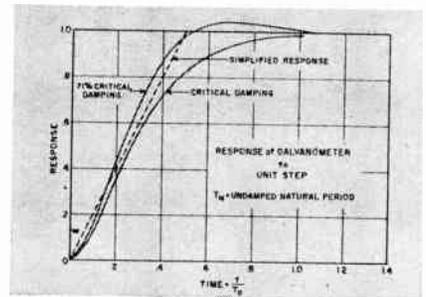


Figure 3.

be distorted, and that the recording system performance had to be represented in terms of a pair of curves.

The "step" function contains within itself two features which encompass the two extremes of speed and slowness in signal variation. The initial rise represents infinite speed, while the subsequent step represents absolute zero variation with time. It would seem therefore, that a study of the way in which the rise and step are recorded would give some clue as to the way in which the rapidly and slowly varying components of an actual input signal would be recorded.

The manner in which the step is recorded is described in terms of three figures. These are the "rise time," the percentage of "overshoot," and the slope of the recorded step following the initial rise.

A typical response to a step input is shown in Figure 1 below.

In this figure, and in the remainder of this discussion the rise time will be defined on the basis of the straight line which most closely approximates the actual response to the vertical rise of the input step.

One of the most commonly used recording instruments is the D'Arsonval moving coil galvanometer, and it is of interest to examine the response of this instrument as described in terms of both sine wave and step voltage test signals.

*For a typical Sanborn DC amplifier and direct writing galvanometer combination, the "rise time" is about 8 milliseconds, and the "delay time" is about 4 milliseconds. Differences between units will be less than 10% of these figures.

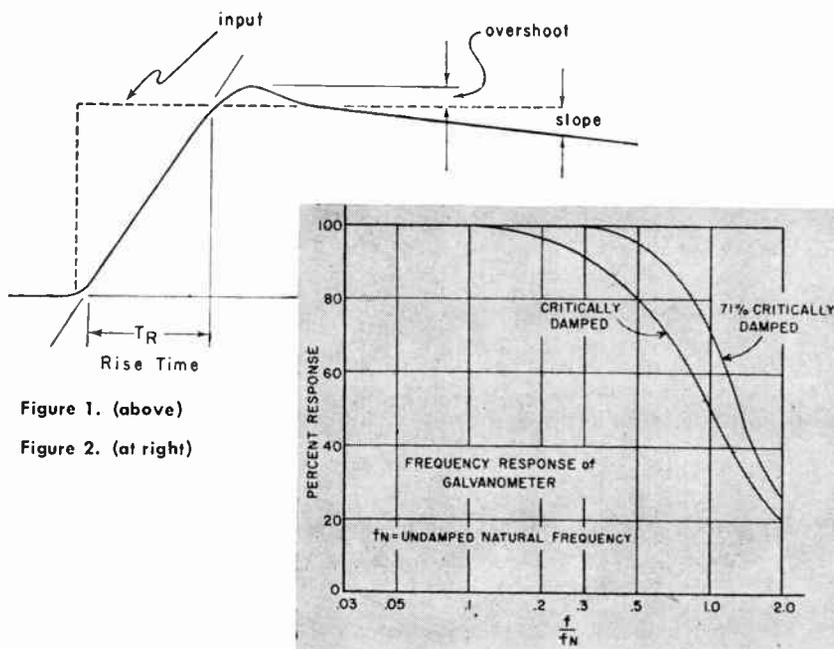


Figure 1. (above)

Figure 2. (at right)

Figure 2 shows the frequency response curve of such a galvanometer for two adjustments of its damping. The frequency scale is plotted in terms of the ratio of the frequency to the undamped natural frequency, of the instrument. Please note that the curve which corresponds to the critically damped condition seems to have a rather restricted flat response range. In fact, if one examines the formula from

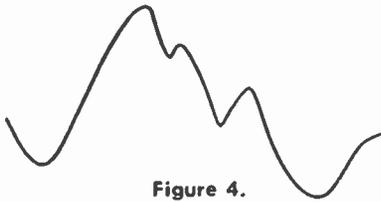


Figure 4.

which the plot is made, it appears that 100% response is obtained *only* at zero cycles, and that the response starts to droop immediately thereafter. When the natural frequency is reached, the sensitivity has fallen to 50% of the D.C. value.

As the damping is reduced, the range of "flat" response is increased. If the damping is reduced below a value which is 71% of critical," the response curve will actually rise *above* the 100% level. Further reduction in damping will give the response curve a hump which grows in magnitude and slides over towards the natural frequency. In other words the damping cannot be reduced below the 71% of "critical level" without raising the response above 100%.

Looking at the two curves shown in Figure 2, how would one rate them on

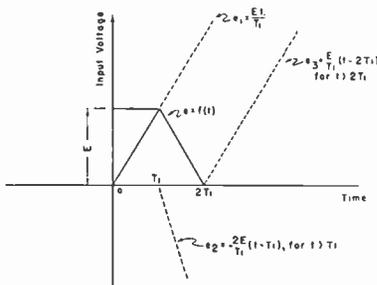


Figure 5. Straight line synthesis of isosceles triangle

a comparative basis? If one defines frequency range on the basis of, say 90% response as tolerable performance, then the 71% damping curve extends to a frequency of 68% of the natural frequency of the galvanometer, while the critically damped curve reaches that response at 33% of the natural frequency. On that basis, one would reach the conclusion that the 71% damping curve is twice as good as the critically damped curve. If, on the other hand one were more generous with the tolerance and allowed the upper frequency limit to be defined as the frequency for 50% response, then the critically damped curve reaches that point at the undamped natural frequency, while the 71% curve holds out to 1.3 times the natural frequency, giving a band width ratio here of 1.3 to one.

As will be shown later, the second one of these comparisons gives a much more realistic appraisal of the relative merits of the two adjustments.

Now let us look at the response of the same galvanometer to a step voltage as seen in Figure 3.

For the critically damped condition, the response to a step voltage approaches the final value asymptotically and never exceeds it. Any reduction of the dumping below that value will allow the response to exceed the final value momentarily, and, in fact, the criterion for critical damping is that a reduction will allow overshoot. At 71% of critical, the adjustment which gave the best looking frequency response curve, there is a slight overshoot of 4% of the final deflection.

The 71% curve can be very closely approximated by a straight line which reaches the final response value at a time equal to *one-half* the undamped period of the galvanometer, and this can be taken as the rise time of the instrument. For the critically damped case, it is a little harder to fit a straight line approximately to the curve, but a reasonable one will yield a rise time figure which is *not much greater* than half the galvanometer period.

Recording Complex Signals

When one is recording a complex signal of arbitrary wave form, one is dealing with neither a sine wave nor a step function. The points of greatest interest in such a record are usually the peaks, or points where the trace changes direction. These points are also the ones most difficult for the recording system to trace out.

A sample of such a wave form is shown below.

It is seen that the peaks and points of inflection look like the vertices of triangles, and, in fact, it would not require too great an effort of the imagination to think of the wave as the sum of a series of triangular components, just as Fourier analyzed a wave into a series of sinusoidal components.

This brings us to the point of calculating the response of a recording system to a triangular impulse.

A triangle can be considered to be the sum of three sloping straight lines as follows:

The response of a recording system to a voltage which is represented by a sloping line can be calculated; and if the response of the system to a step voltage can be approximated by a broken line as shown in Figure 6, the calculation is simple.

The response to a sloping straight line then is as shown in Figure 7.

It turns out that the time displace-

ment between input and response is equal to one-half the rise time.

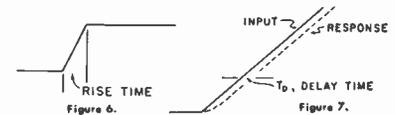
Furthermore, after a time equal to the delay time, the recorder is making an exact copy of the sloping straight line. In other words it was the corner which was distorted, because the corner represented a point of rapid change of slope of the input signal.

Now if this calculation is carried out for each of the three sloping lines which makes up the triangle, and the results are added together, the recorded triangular pulse is reassembled.

The results are shown in Figure 8, for a triangle whose base width is four times the rise time of the recording system.

It is seen that the input triangular pulse is fairly well reproduced, but is shifted in time by an amount equal to the "delay time." The most serious distortion which the triangular pulse suffered is a loss in true amplitude.

As the base width of the triangular pulse is reduced, the loss in amplitude becomes greater, until, when the base of the triangle becomes only twice the rise time of the recording system, the recorded pulse bears only a slight resemblance to the original.



If we limit ourselves to isosceles triangular pulses whose bases are at least twice the rise time of the recording system, then a simple formula can be deduced which gives the percentage by which the recorded pulse misses the true amplitude of the original pulse.

$$\text{Percent Loss} = \frac{50 \text{ TR}}{\text{Base Width of Triangle}}$$

Applying this formula to the narrowest triangle for which it is valid, the error is seen to be 25%.

Furthermore, if the error is to be less than 1%, then the triangular pulse must be wider than 50 rise times.

Thus, if we are dealing with a recording system whose rise time is .01 seconds, and whose static accuracy is of the order of 1%, then a similar order of accuracy for dynamic conditions will be achieved only for signals whose rate of change is so slow that a time interval of about .2 seconds is required for the signal to move from one level to another.

These figures are a little pessimistic because the razor sharp vertex of the triangular test pulse does not occur in actual physical phenomena, but the

(Turn to page 61)

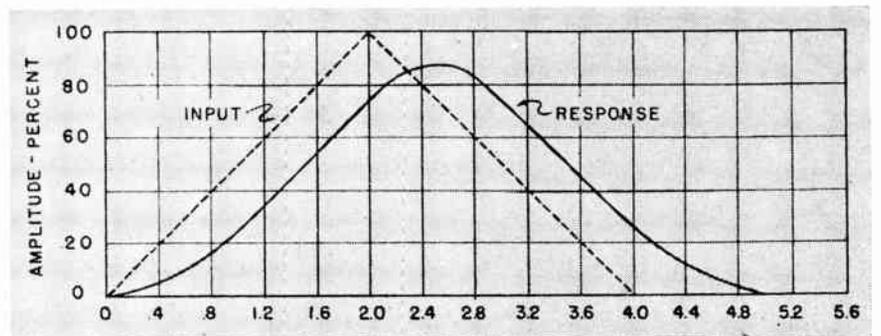


Figure 8. Reproduction of triangular impulse by recording system with idealized step function response.



MARCONI *has it!*

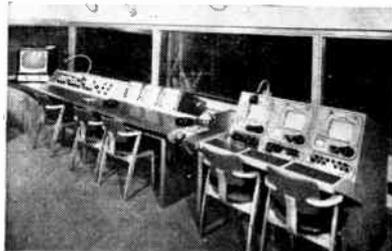
The engineering, research and manufacture of television broadcasting and station equipment is one of the most highly demanding in the field of communication. For many years before TV broadcasting reached North America, Marconi's Wireless Telegraph Company of England was designing and installing such equipment throughout Britain and the Continent.

As television grows in Canada, Marconi world-wide experience and "know-how" in furnishing all studio and transmitter requirements will help assure that the technical quality of TV broadcasting in this country will be beyond compare.

- MOBILE UNITS
- TRANSMITTERS
- CONTROL DESKS
- CAMERAS
- VISION SWITCHING
- VISION MIXERS
- AMPLIFIERS
- SYNCHRONIZING GENERATORS
- MONITORS
- TELECINE



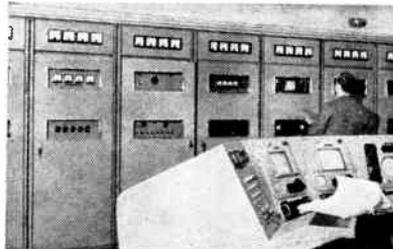
Mobile unit equipped by Marconi for CBC stations in Montreal and Toronto.



Control room as installed by Marconi for CBC in Montreal.



Interior view of the most up-to-date mobile unit, equipped by Marconi.



Typical medium power installation with all control and monitoring equipment housed in the desk in foreground.

Write today for further data and illustrated booklet on the complete line of Marconi television equipment.

CANADIAN MARCONI COMPANY
2442 Trenton Avenue, Montreal 16, P.Q.

Established 1902

VANCOUVER • TORONTO
MONTREAL • HALIFAX • ST. JOHN'S

Marconi

the greatest name in Radio and Television

For further data on advertised products use page 53.

NEW PRODUCTS

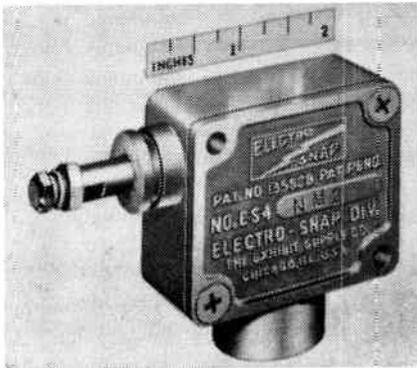
New Product specifications published in Electronics and Communications have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our Readers' Service, Page 53. Just mark the products you are interested in on the coupon on Page 53 and the information will be in your hands within a few days.

● Limit Switch

Item 443

A limit switch designed especially for use with momentary pulsed, solenoid operated valves for air and hydraulic cylinder circuits is now available to the trade.

The "on" type length is varied so that, depending on the speed of the actuating member, an "on" time can be selected that will give $\frac{1}{10}$ to $\frac{2}{10}$ second impulse to the momentarily pulsed valve. A slowly actuated switch, for instance, need only be "on" for $\frac{1}{16}$ " of plunger travel. Faster switch actuation may require as much as $\frac{3}{16}$ " "on" period to furnish a $\frac{1}{10}$ second impulse.



The switches are furnished in $\frac{1}{16}$ ", $\frac{1}{8}$ " and $\frac{3}{16}$ " standard lengths and can be furnished with "on" time lengths up to $\frac{3}{8}$ " on special order. Use of the switches eliminates the costly construction of one-way dogs. A simple flat dog can be attached to cylinder piston rods to actuate this new type switch.

An adjustable plunger head is another important feature of the switch. This is made possible by a built-in 10-32 screw that allows lengthening of the plunger up to $\frac{1}{2}$ ".

● Explosion-Proof Limit Switch

Item 444

A new explosion-proof heavy duty precision limit switch, designed for use on all types of machinery and industrial equipment in explosive gas or vapour-air atmosphere, has been developed. It is listed by Underwriters' Laboratories as suitable for hazardous locations of Class 1, Group C and D.

This is the smallest explosion-proof snap action switch available, the makers claim. Including the adjustable head, the switch case measures 6 inches high, 2 $\frac{1}{8}$ inches wide and 1 $\frac{11}{16}$ inches in depth.

The die cast aluminum enclosure has a $\frac{1}{8}$ inch thick porous bronze plate fitted over the enclosure opening to vent the basic switch cavity. This porous plate prevents any great pressure build-up in the switch cavity due to the ignition of any explosive atmosphere present. The path through the plate also serves to extinguish the flame and cool the hot gases below the ignition point of the surrounding explosive atmosphere.

Underwriters' Laboratories list the new switch for 20 amperes, 110, 220 or 440 volts a-c; $\frac{1}{2}$ ampere, 115 volts d-c; $\frac{1}{4}$ ampere, 230 volts d-c; $\frac{3}{4}$ h.p. 110 volts a-c; $1\frac{1}{2}$ h.p. 220 volts a-c. Pilot duty rating is 125 volts a-c; 6 amperes normal, 60 amperes inrush; 250 volts a-c; 3 amperes normal, 30 amperes inrush; 480 volts a-c, 1.5 amperes normal, 15 amperes inrush; 600 volts a-c, 1.2 amperes normal, 12 amperes inrush.

● Low Noise Voltage Amplifying Pentode

Item 445

Valve Z 729, which is the latest addition to the range of valves marketed by a large British manufacturer is a low microphony, low hum, voltage amplifying pentode of all-glass construction on a B9A (Noval) base.

The new valve has been designed primarily for use in the early stages of high gain amplifiers where the hum and microphony introduced by the valve must be kept to a minimum. Typical applications include record reproduction and sound reinforcement equipment, tape recording and microphone head amplifiers, as well as tone control apparatus incorporating bass boost circuits.

The rigid electrode structure materially assists the reduction of microphony and specialized design including a double helical heater, internal screening and the disposition of the pin connections have enabled the very low hum level of 1.5 micro volts referred to the control grid to be realised. This figure represents at least a sevenfold improvement on that given by a valve of normal construction, and has been obtained without the necessity for specialized circuitry. A hum balancing resistor is not necessary if the heater is supplied from a winding with an earthed centre-tap.

A stage gain of the order of 180 is obtainable.

● Transistor Test Set

Item 446

A new transistor test set, Model T-61 is used to test the small signal behaviour of all point-contact and junction transistors. Its function is to measure 4 independent parameters of the 4-terminal equivalent circuit of the transistors. Overall accuracy is two per cent. The unit contains separate metering circuits for all applied single frequency audio oscillator, and a precision vtvm



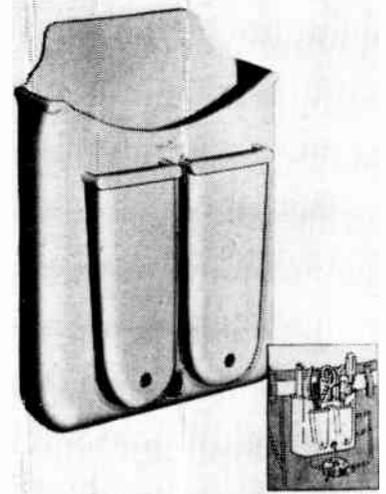
for direct reading of the parameters under test. It is powered by eight separate self-contained regulated power supplies, making

possible operation without adjustment over all normal line voltage variations. The cabinet measures 28" x 21 $\frac{1}{2}$ " x 15".

● TV Tool Case

Item 447

A remarkably handy new tool case for television and radio servicemen has just been developed. Designed to be worn on the belt, the new case is fitted to hold an unusually large number of always-needed hand tools.



The new tool case is moulded of "Alathon" a material developed during World War II, that is tough and flexible and equal to the most rigorous service conditions. The case is said to retain both its shape and its original appearance far longer than similar products; being resistant to oil and most chemicals, it may be washed with soap and water without any harmful effects.

The new G.C. Tool Case (No. 8943) is available through leading parts distributors everywhere.

● Miniature Hermetic Terminal

Item 448

The announcement of a new group of miniature, hermetic terminals has recently been received. The series No. 199 terminals utilize the superior properties of Teflon and silicone rubber for improved performance and simplified construction. The new design avoids the need of expensive secondary operations such as specially extruded holes for mounting. The terminals are mounted in drilled or punched holes with a minimum center distance of $1\frac{1}{16}$ inches, still providing ample wiring space after assembly. These terminals are designed for operation at a conservative rating of 500 volts, with a test voltage of 1500 volts RMS. The current rating is 8 amperes. For oil-filled units the inner insulator is of neoprene instead of silicone. To assure trouble-free performance these terminals have been production proved. They have successfully passed cycling tests under MIL-T-27 military specifications. Assembly of the terminals needs only very simple tooling. Depending upon the type of electrode, the assembly is accomplished by clinching in a press with rudimentary jigg, or by a drive fit of the electrode with a press.

● New Colour TV Coils Kit

Item 449

Just announced is a new Colour TV Coil Kit containing 32 items for use with shadow mask tubes. Included are a new distributed constant delay line, a new horizontal output transformer, horizontal dynamic-converging and dynamic-focusing transformer, horizontal dynamic-convergency phase control, width control, linearity control and a complete set of I.F., video and colour information circuit coils. The Kit is available for immediate delivery in small quantities. Delivery on production quantities is 4-6 weeks.

(Turn to page 28)

NEW PRODUCTS

(Continued from page 27)

● Model TAA-16B SWR Amplifier

Item 450

This is a new instrument for determining standing wave ratios or the comparison of any two demodulated signals. Designated as Model TAA-16B, this instrument incorporates all the features of former Models TAA-16 and TAA-16A and provides additional features and conveniences at less cost than the previous models. The TAA-16B features dual input channels with gain sufficient for full scale meter deflections with less than 2 microvolts input. The amplifier may be used broadband from 500 to 5000 cycles or may be sharply tuned over this



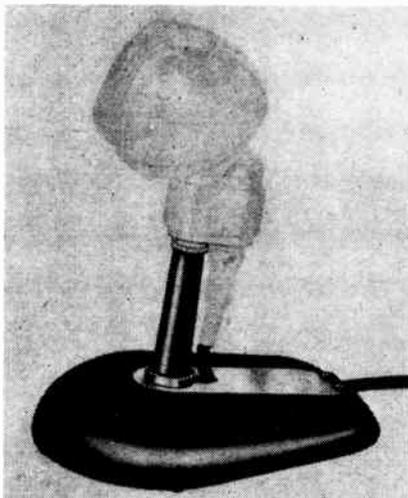
range by means of panel controls. For use with bolometers, an internal voltage source is supplied and bolometer current for either input is metered and adjustable from the front panel. A crystal protective circuit is incorporated to minimize possibility of burn-out due to accidental application of bolometer voltage. The meter scale is calibrated in SWR and DB of SWR with a precision attenuator permitting DB of SWR readings up to 50 DB. Jacks are provided for remote metering and for a DC recorder where a permanent record is desired.

● Microphone Desk Stand

Item 451

The new Model DS-10 "Streamliner" Desk Stand for all types and styles of microphones is said to retain both its shape and its incorporates a new modern-design feature of "Rear Cable Exit" that greatly enhances the stability and appearance of the stand.

By means of this new feature, the microphone cable is concealed in a slot under-



neath the center section of chromium trim and is directed out at the rear of the base. Thus no removal of plugs or connectors is necessary.

All parts are die cast and finished in gun metal enamel and chromium.

● Insuloid Bushings and Clips

Item 452

Insuloid Bushings and Clips, long known to, and widely accepted by, British industrialists are appearing for the first time in North America. The Bushings it is claimed will improve your products and will eliminate many production problems. Being extremely easy to assemble, Insuloid Bushings will save you much valuable time. As they are difficult to take apart, Insuloid Bushings are virtually indestructible.

Regarding the Clips, they will prove to have great possibilities in the aircraft and automobile industry because of their durability and light weight and in the shipbuilding industry, chiefly where aluminum fixing problems are present (in other words, where corrosion must be avoided) and in all fields of radio, recorder, television, instrument, electronics, switchboard, telephone, etc., installation.

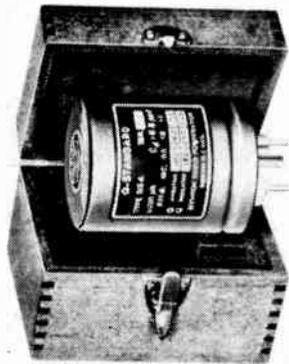
● New Q-Standard

Item 453

A new Type 513-A Q-Standard which, for the first time, provides an accurately known Q and reactance for precise measurements is now available. The unit also offers a convenient means for checking overall Q Meter performance.

This new Q-Standard consists of a specially developed winding of Litz wire on a low loss, stable steatite coil form which is mounted in a hermetically sealed copper shield can filled with dry helium; a convenient carrying and storage case is included with each unit.

Nominal inductance (L) is 250 uh and is specified to ± 1 per cent. Distributed capacitance (Cd), when mounted on either the



Type 160-A or 260-A Q-Meter, is approximately 9.0 uuf and is specified to ± 2 per cent. Each inductor will be individually calibrated to an accuracy of ± 3 per cent in terms of effective Q (Q_e) at frequencies of 0.5, 1.0, and 1.5 mc. and at a temperature of 22°C.; nominal circuit Q (Q_c) readings for the Types 160-A and 260-A Q-Meters will also be provided.

Due to the construction of the unit, humidity will have negligible effect on the electrical characteristics. Temperature correction data for Q_e will be available; L and Cd have negligible temperature coefficients.

● Communications Planning Aid

Item 454

An aid to communication in the development of airborne line-of-sight survey equipment which has been service-tested by Photographic Survey Corp., by siting, in record time, an Ontario microwave link, is now on the market.

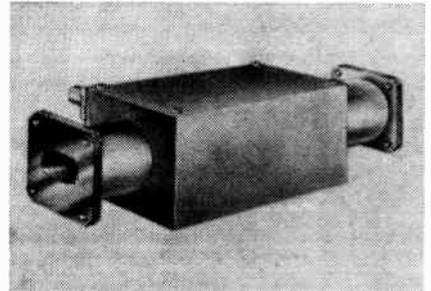
Other airborne micro-wave equipment and components, developed primarily for aerial survey, are available to the industry.

● Gyratine Microwave Amplitude Modulator

Item 455

This new device consists essentially of a coil surrounding a section of cylindrical waveguide containing a ferromagnetic core. When external voltage is applied to this coil a magnetic field is produced which acts on the ferrite material to produce Faraday rotation of the microwave energy being transmitted through the waveguide. Attenuation of the microwave signal is a function of the plane of polarization of the microwave energy — the latter being indirectly controlled by the externally applied modulation signal voltage.

The Gyratine may be used to provide direct amplitude modulation, (0 to over 90 per cent) of a CW signal. It may also be used as a continuously variable microwave attenuator merely by varying the voltages applied to the input coil. Other uses include a unidirectional



microwave transmission line or load isolator by applying a fixed D.C. bias voltage to the coil. In this application, microwave energy may be transmitted through the Gyratine with negligible attenuation while energy propagated in the opposite direction will be almost completely absorbed.

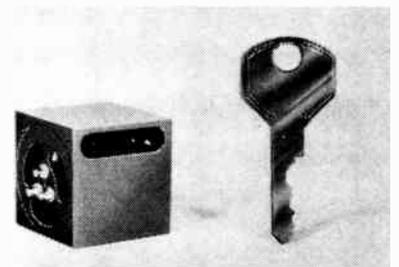
Five models available: 5900-6400, 6400-6900, 6900-7400, 8500-9900, 9600-11,200 megacycles. V.S.W.R. is 1.4 to 1. (or less). Insertion loss is less than 1 DB. Technical literature is available.

● Subminiature Blower

Item 456

Production is announced of the "Minicube" Subminiature Blower. This 1 inch cube weighing only 1 ounce includes the motor and blower housing and delivers 3 cubic feet of air per minute.

It is designed for the circulation of air and the cooling of electronic parts and equipment. Intended for subminiature applications, its universal mounting, small size and light weight allow the "Minicube" to be used in almost any type of equipment. The unit can be mounted next to a component for spot cooling or anywhere else for general circulation of air.



Standard models are available for operation over a temperature range of -55°C. to $+85^{\circ}\text{C.}$ with an expected life of 1000 hours. Other models are also available for extremely wide temperature ranges. The "Minicube" utilizes an integral hysteresis type synchronous motor turning at a speed of 24,000 R.P.M. Motors can be supplied for either 6.3 V., 3 Watt, of 26 V., 4 Watt, 400 cycle operation. The motor is normally 2 phase, but can be operated from a three phase source or a single phase source with a phase shifting capacitor.

USE NEW PRODUCTS
COUPON . . . PAGE 53

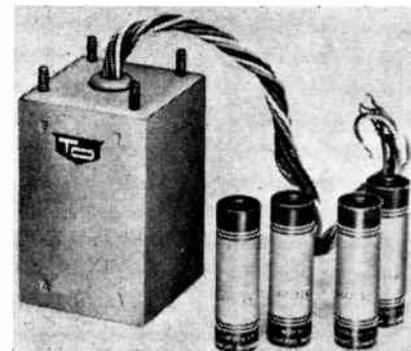
NEW PRODUCTS

(Continued from page 28)

● Transistorized Sub-Miniature High-Voltage Supply

Item 457

Announcement of the development of a sub-miniature, transistorized, high-voltage power supply, for use in high-voltage, low-current applications. Typical uses include nuclear radiation detectors, photomultiplier photometers and infrared image converters. This new-type power supply is especially useful where small size, light weight, high DC energy conversion efficiencies and reliable operation over a long period are required. It measures 2 $\frac{3}{4}$ " x 1 $\frac{3}{4}$ " x 1 $\frac{1}{8}$ " and weighs only 7 $\frac{1}{2}$ ounces. Battery operated (4 penlite cells can be used), its DC energy conversion efficiency ranges from 30 per cent to 50 per cent depending upon the operating point and input voltage. The input can be connected to operate on voltages from 3v to 22.5v. Under most conditions the higher voltages give the higher efficiencies. There are no moving parts; no thermionic tubes. Hermetically sealed junction transistors are used in the conversion unit. Expected life is 50,000 hours of operation.



Two models are available, with voltage regulated to plus or minus 15v: Ps-1, at 700 volts and Ps-2, at 900 volts. Both have a maximum current output of 50 microamps and an AC ripple voltage of MV.

● Variable Composition Resistor

Item 458

A precision electronic equipment manufacturer announces the availability of a 2 watt variable composition resistor, built to JAN-R-94, Type RV-4 specifications, for which it has interim approval. The control, model VJ, is the culmination of many months of exhaustive research and life tests, and offers many features such as low humidity drift, high dielectric strength and low noise level. It is dust proof.

Previously announced is model VJ 1/2 watt control, also to the above JAN specifications, Type RV-3.

● 1200 Foot Reel

Item 459

A new 1200-foot reel, using the standard NARTB hub to eliminate tape stretch, breakage, and pitch changes as the tape approaches the end of the reel is now available in Canada.

The new 8-inch, all metal reel can be used on any machine which takes the NARTB hub. Until now, the critical recordist has had to use a 10 $\frac{1}{2}$ -inch reel, regardless of the length of his tape, to avoid the effects caused by the extreme tension on the tape near the end of a small reel. Because of their smaller hubs, standard 7-inch plastic reels introduce tension that distorts the tape, causing changes in pitch, and sometimes is great enough to break the tape. All these difficulties stemming from the under-sized hub are eliminated with the new 8-inch reel, according to the makers.

(Turn to page 36)



● Wing Commander J. J. E. Cantey, Supply Officer R.C.A.F. Downsview, Ontario, and Mr. Arthur D. Margison, Vice-President and General Manager Margison Babcock and Associates Limited, consulting professional engineers who worked with the R.C.A.F. in the design and construction of the Downsview Stores Depot, are shown examining the smoke detection equipment, a part of the modern equipment installed to give fire protection at the big building.

'Where There's Smoke - - - Electronics Finds It!

A LARGE, single-storey reinforced concrete warehouse more than one-quarter of a mile long and covering 18 $\frac{1}{2}$ acres has recently been completed at Downsview, Ontario, for the Royal Canadian Air Force. The building has more than ten million cubic feet of storage space and is capable of containing at one time stores from 10 to 20 times the cost of the building.

In designing the building engineers at once realized the importance of minimizing the hazards of possible loss by fire and tackled the problem of providing facilities with the logical reasoning that the sooner a fire is discovered and located, the more quickly it can be attacked and the more readily it can be brought under control and extinguished.

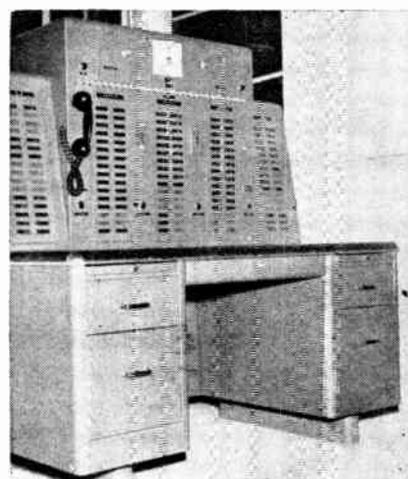
Electronic Smoke Detector

Included among the many modern devices for detecting and fighting fire at the Downsview depot is an electronic CO₂ smoke detector. The device continually samples air from 29 zones in the sprawling structure by the use of sensitive photoelectric cells. When smoke is detected an alarm is automatically sounded in the central supervisory station at the fire hall and the zone of the building in which the smoke is detected is readily identified at the central supervisory station.

Supplemented by a modern communication system the fire fighting installation at the Downsview depot is perhaps one of the most modern on the continent.

The organizational efficiency required in the operation of a store's

establishment covering 18 $\frac{1}{2}$ acres of ground is not hard to envisage and the effective utilization of such facilities is to a great extent made possible by the accurate and rapid transmission and receipt of instructions and other information, in other words, by modern communications methods. To tie together all centres and levels for the proper handling of different types of information a communications network has been installed



● Control and indicating console of the fire protection system at the Downsview R.C.A.F. Stores Depot.

comprising a loudspeaker system; intercommunication system; and a special over size pneumatic tube system which is capable of transporting business machine stock control cards as well as all other paper work.

NEWS

RECENT MARCONI APPOINTMENTS . . .

The Canadian Marconi Company has recently announced the appointment of George Frederick Bates as Sales Manager for the Province of Ontario, and will make his headquarters at the company's branch office in Toronto. Mr. Bates brings with him to Marconi an unusually broad and thorough background of experi-

Rogers Majestic Ltd., and most recently with the Canadian Comstock Co. Ltd., Frequency Conversion Division, as Senior Equipment Specialist.

Mr. G. F. Bates, Ontario Sales Manager, Canadian Marconi Company, Commercial Products Division, has recently announced the appointment of Mr. Arthur Kingsnorth, as Instru-



● R. Kelman.



● D. Provan.



● A. Kingsnorth.

ence in sales and the technical aspects of electronics. Prior to joining Marconi, Mr. Bates was Sales Manager for Canada for Cossor's serving with them for five years in the fields of instrument manufacturing and pulse electronics.

ment Sales Specialist, covering the Ontario district.

Mr. Kingsnorth hails from England, where prior to joining Marconi, served with the Royal Air Force during the last war as Technical Instructor in charge of the Instrument



● R. Stewart.



● G. F. Bates.



● W. E. Jones.

The recent appointment of Mr. Wally E. Jones as Ontario Supervisor, Broadcast and Mobile Radio equipment, Commercial Products Division, Ontario district, has been announced by the Canadian Marconi Company.

Mr. Jones will be attached to the Toronto office, and has been actively engaged in the Radio and Communications fields for the past fifteen years.

Prior to joining Marconi, he was formerly with Northern Electric, The Hydro Power Commission of Ontario,

Laboratory No. 1 School of Technical Training, R.A.F. Halton, Buckinghamshire.

His wide scope of experience in the Instrument fields will enable him to offer invaluable assistance to his contacts in the instrumentation equipment which Marconi represents.

Mr. G. F. Bates, Ontario Sales Manager, Canadian Marconi Company, Commercial Products Division, Toronto Office, has recently announced the following appointments of Mr. Rod Stewart, Mr. Ross Kelman and

Mr. Dick Provan, as Technical Salesmen.

Mr. Rod Stewart is well known in both the Broadcast and Mobile Radio fields, as he has been covering the Ontario territory for Marconi and his new territory assignment in the Southern Ontario area will enable him to offer invaluable assistance to contacts in this new district.

Mr. Ross Kelman has been assigned the Eastern and Northern Ontario territories, and will be handling the Marconi Broadcast and Mobile Radio equipment in this area.

Mr. Dick Provan, has been assigned the Western Ontario territory, and will be handling the Mobile and Broadcast Radio equipments in this area.

Mr. Provan, was formerly with the Canadian General Electric Co. Ltd., for the past five years, and has been actively engaged with them on Industrial Electronics and Equipment Testing.

Collins Radio Company Opens Canadian Office

Organization of a wholly owned subsidiary, Collins Radio Company of Canada, Limited was established recently. The new company will be located in Ottawa, and will maintain liaison between Collins engineering laboratories and the operations personnel of the Canadian Armed Forces and promote the sale of Collins commercial equipment in Canada.

Under contract with the Canadian government the new company will initially provide technical assistance to the Canadian Marconi Company in the manufacture of the AN/GRC-27. Resident Manager of the recently established Canadian company is W. S. Kendall.

Canadian Electronics Firm Purchased By U.S. Interests

Industrial Electronics of Canada Limited was recently taken over as a subsidiary of Servomechanisms Incorporated, manufacturers of electro-mechanical and electronic equipment in the United States. Canadian offices of the company will be at 83 Torbarrie Road, in Toronto.

Industrial Electronics will continue to do business under its present name and continue to manufacture its present line of products. Under the new arrangement it will now become one of the more important sources in Canada of servo controls and instrumentation as well as designers and manufacturers of analog and digital computers.

To meet the demands for the latter types of equipment the engineering department of Industrial Electronics will be enlarged to provide design and development facilities for the production of their new lines of electronic apparatus.

(Turn to page 32)

**for
windability
and trouble-free
performance**

...count on

Phillips

MAGNET WIRE



Whether you're winding relay coils, motor armatures or any other equipment requiring this type of wire, you'll find that Phillips Magnet Wire will do your job better . . . because it is a perfectly finished product, made of the finest materials. In its manufacture, the most modern methods of drawing and annealing are used. And, the wire is constantly inspected during production to ensure uniform gauge and softness. As a result, the Phillips Magnet Wire you buy is easier to wind and form on your product.

Phillips Magnet Wire can be supplied to standard or special specifications—in round, rectangular or square shapes—covered with glass, cotton, paper, asbestos or bare. Round shapes are also available in nylon, formel or enamel. And all types are conveniently packaged for the operator, in a range of spools and reels. Stocks are maintained at distributing centres across Canada to assure you prompt delivery.

Representatives and agents in all major centres from coast to coast.

Phillips
ELECTRICAL COMPANY (1953) LIMITED

WIRES & CABLES

THE CANADIAN AFFILIATE OF THE B.I.C.C. GROUP

26 Hollinger Road, Toronto 16

MONTREAL • OTTAWA • BROCKVILLE • HAMILTON • WINNIPEG
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PHILLIPS ELECTRICAL CO. (1953) LTD.
26 Hollinger Road, Toronto 16

Please send further information.

NAME
FIRM NAME
ADDRESS
CITY or TOWN PROV.

5359 E.&C.

NEWS

(Continued from page 30)

Walter Hindle To Head Westinghouse Division

The appointment of Walter Hindle as Manager, manufacturing department, of the Canadian Westinghouse Company's Power Products Division has been announced by Division General Manager J. W. Kerr.

A University of Alberta graduate, Mr. Hindle joined Westinghouse in



WALTER HINDLE

1937 as a Graduate Student trainee and spent ten years as an erecting engineer in the Apparatus Service Department. From 1949 to 1952 he was Manager of field installation and earlier this year was appointed General Superintendent of the Power Products Division.

Phillips Wire & Cable To Be Marketed By Own Sales Organization

Effective January 1st, 1954, the national sales of Phillips wires and cables will be transferred from Automatic Electric Sales (Canada) Ltd., to the Phillips Electrical Company (1953) Ltd., sales organization with headquarters in Toronto and offices and warehouses from coast to coast.

Phillips, Canada's longest established wire and cable company with factories in Brockville and Montreal, recently became an affiliate company of British Insulated Callander's Cables Limited of England and the transfer of sales authority marks a final step in severance of its former relationship with Automatic Electric. The transfer of authority is accompanied by a transfer of sales personnel so that Phillips customers will be served in future by exactly the same wire and cable personnel as formerly.

Nife And Britannia Batteries Now Marketed In Canada

Two of Britain's largest manufacturers of Alkaline storage batteries have announced the appointment of The British General Electric Co. (Canadian) Ltd., as Sales Agent for their products in all Provinces except British Columbia and Alberta. This is the first time that a British made alkaline battery has been available, with distribution and service facilities, to the Canadian market. Among the many uses for which the alkaline battery is used is railway signalling and telecommunications.

Automatic Electric Expands Sales And Service Facilities

Automatic Electric Sales (Canada) Limited, the selling organization of Automatic Electric Canada (1953) Limited, announces, effective January 1st, 1954, the termination of its general distribution agreement with Phillips Electrical Company (1953) Limited for the sale of Phillips wire and cable products. The company will, however, continue to act as exclusive distributors of Phillips communication wires and cables as part of its complete service to the communications field in Canada.

Concurrently, the organization will continue its expansion in the distribution of automatic telephone apparatus and supplies, Lenkurt carrier equipment and electronic component, Paragon time controls, Stromberg time equipment, Telautograph service and associated communications and control equipment.

A new head office, district sales office, and central warehouse has been erected by Automatic Electric Sales (Canada) Limited at 185 Bartley Drive in Toronto; and other district sales offices are located in all principal Canadian cities. The staff has been augmented to provide a competent sales and advisory service to Canadian telephone companies and industries, as well as regular contacts with wholesalers on resale merchandise.

The affiliated manufacturing organization, Automatic Electric (Canada) 1953 Ltd., is presently building a \$1.5 million plant at Brockville, Ontario, which will be staffed by fully experienced personnel for the Canadian production of communications equipment and electrical control apparatus.

Pointon Now Represents Brook Electronics Incorporated

Charles W. Pointon, Toronto electronics firm has recently been appointed the agents for Brook Electronics Incorporated of Elizabeth, New Jersey.

Brook Electronics Incorporated are manufacturers of the Brook line of Audio Amplifiers which the local firm will now carry.

R. C. Walker Eastern Sales Manager For Northern Electric

Appointed as eastern Sales Manager of the Communications Equipment Division of the Northern Electric Company, R. C. Walker, succeeds C. M. Wootan presently on retirement leave from the company.



R. C. WALKER

Mr. Walker joined Northern Electric in 1920 in the capacity of office boy and file clerk in the installation department of the company. After lengthy service with the company Mr. Walker became a sales specialist with the firm and in 1950 was appointed Sales Supervisor a position held until his recent appointment as Sales Manager of the Communications Equipment Division.

Polypenco Incorporated Open Montreal Office

Polypenco Incorporated of Reading, Pennsylvania, have announced the opening of a sales office in Montreal. The new office of the company will stock Polypenco nylon, Teflon, Kel-F and styrene copolymer Q-200.5 for the Canadian market.

Address of the company's Montreal office is Polypenco, Inc., 2052 St. Catherine Street West, Montreal.

William R. May Appointed Fellow In The AIEE

William R. May, Vice-President in charge of generation and transmission, Shawinigan Water and Power Company, has been raised to the grade of Fellow in the American Institute of Electrical Engineers. This honour has been awarded to Mr. May in recognition of his contribution to the electrical industry



W. R. MAY

in the matter of administrative and technical development of utility engineering and operating practices and intersystem collaboration.

Before appointment to his present position in 1951 Mr. May was General Superintendent in charge of the generation, transmission system operation, system planning and communication departments.

Mr. May is numbered among the leaders who have pioneered the movement of intersystem collaboration in Canada.

(Turn to page 38)

Who Reads *Electronics and Communications*?

Probably the best indication as to who reads **ELECTRONICS AND COMMUNICATIONS** and how they read it, comes from the many enquiries from readers with regard to new applications, new products reported and other articles published in it. Below we list a few of the important organizations from whom such enquiries were received, signed by responsible people, from engineers to top management. Enquiries of this character from readers are averaging around 350 per issue.

Alpha Electronic Products Company
Aluminum Company of Canada
Amalgamated Electric Corporation
Aviation Electric Limited

Lawrence Baker Limited
Bailey Meter Company Limited
Bell Telephone Co. of Canada —
Montreal
British Columbia Power Commission
British Columbia Telephone Co. Ltd.

CJOR Radio Station
CKAC Radio Station
CKBL Radio Station
Calgary Power Company
Canadian Admiral Corporation
Canadian Aviation Electronics
Canadian Arsenals Limited
Canadian Celanese Limited
Canadian Comstock Company Limited
Canadian Electronics Limited
Canadian General Electric Co. Limited
Canadian Industries Limited
Canadian International Paper Co.
Canadian Marconi Company Limited
Canadian National Carbon Co. Limited
Canadian National Telegraphs
Canadian Oil Refineries Limited
Canadian Overseas Telecommunica-
tions Corp.
Canadian Pacific Railway
Canadian Research Institute
Canadian Armature Works Inc.
Canadian Electric Resistors
Campbell Soup Co. Limited
Canadian Vickers Limited
Canadian Westinghouse Co. Ltd.
City of Outremount
Civil Service of Canada — Ottawa
Community Hotel Company Limited
Copper Wire Products Limited

Decca Radar (Canada) Limited
Department of Electrical Engineering
Department Public Works — Ottawa

Department of Physics
University of Manitoba
Department National Defense —
Inspection Service — Electronic
Division
Department of Transport — Ottawa
Telecommunications Division
Dominion Fasteners
Dominion Tar and Chemical Co.
Dunlop Tire and Rubber Company Ltd.
Department of Electrical Engineering
University of Alberta
Geo. P. Dowe Sales Limited

Eastern Power Devices
E. B. Eddy Company Limited
Electrical Mfg. Company Limited
Electronics Associates
Electronics Enterprises Limited
Elk Falls Company Limited

Ford Instrument Company
Ford Motor Car Co. of Canada Ltd.

H. E. P. C. of Ontario — Toronto
Hygrade Radio Limited — Jobbers

Instantaneous Recording Co. Ltd.

Kamro Lighting Products
Karp Metal Products Company
Kenny Consolidated Electrical
Engineering Company Limited

Link-Belt Limited
Luma Electric Equipment Company

Manitoba Telephone System
Marsland Engineering Company
Maritime Central Airways Ltd.
Maritime Industries Limited
Mersia Municipal Telephone
Mersey Paper Company
Mathers and Haldenby
(Consulting Engineers)

Metal Fabricators Limited
Minneapolis-Honeywell Company
Muskoka Hospital
MPS Electronics — Newfoundland

National Research Council
New Brunswick Telephone Co. Ltd.
Northern Electric Company Ltd.
Norton Company

Ontario Reformatory

Pacific Coast Pile Driving Co.
Phillips Petroleum
Polytronics Co. Limited
Potter Instrument Company

Quebec North Shore Paper Co. Ltd.
Quebec Power Company

Ray-O-Vac (Canada) Limited
R.C.A. Victor Mfg. Co. Limited
Radio and TV Service
Rexall Drug Company Limited
Rogers Majestic Company Limited
Royal Typewriter Company
Royal Canadian Mounted Police
(Communication Headquarters)

Sangamo Company Limited
Shawinigan Water and Power Co.
Shawinigan Falls
Simplicity Products Limited
Sinclair Radio Laboratories
Spruce Falls Power & Paper Co.
Standard Gravel and Surfacing
Steel Company of Canada Limited

Tamper Electric Company Limited
F. W. Taylor — Consulting Engineer
Thor Canadian Company Limited
Trans-Canada Air Lines
Supervisor of Telecommunications

University of Manitoba

WHO ADVERTISES IN IT?

Over ninety per cent of the advertisers who used space in it during 1953 and they include most of the blue chip suppliers, have committed themselves to as much or more space for 1954. In addition word has got around about this different publication's performance for its advertisers and a fine list of new advertisers have contracted for space for this year.

WHY NOW IS THE TIME TO ADVERTISE

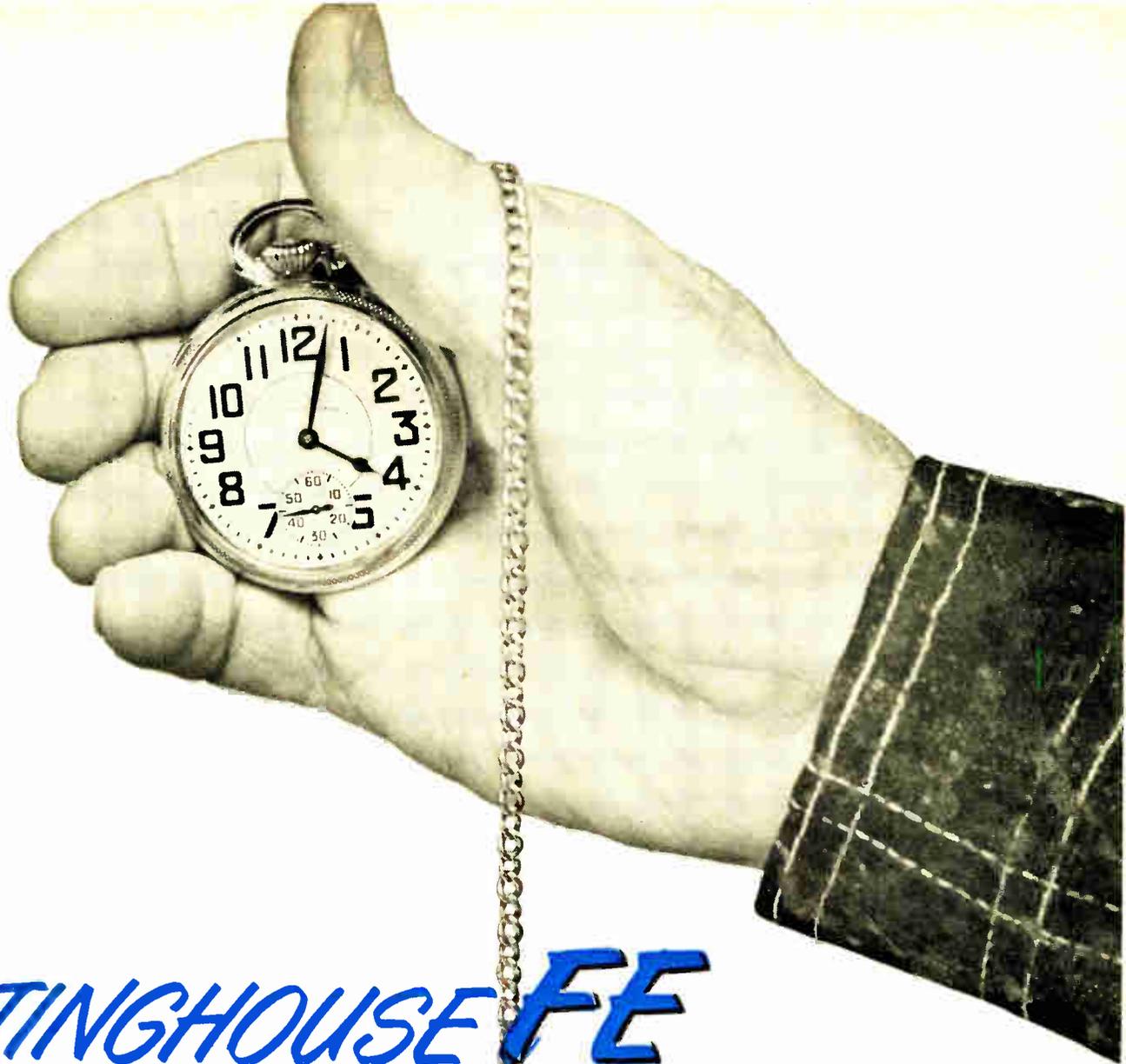
The electronic and communications market in Canada is a comparatively young one — much of its potential buying power has yet to make up its mind as to "who is who" among suppliers or "what is what" among products. This market is at a most impressionable stage in its development. Now therefore, is the time to register — now is the time when your advertising will have an extra strong impact — make a long lasting impression.

ELECTRONICS and COMMUNICATIONS

One of the streamlined — practical — AGE Publications

31 WILLCOCKS STREET

TORONTO 5, ONTARIO



WESTINGHOUSE FE

RAILROAD RADIO

...as available as the
finest railroad watch

The railroad man's watch, dependable and enduring, is a symbol of topmost availability and efficiency.

The reliability of the jewelled masterpieces is a byword; railroad men depend upon these watches.

Like a fine railroad watch, the Westinghouse FE railroad radio is dependable, available, and efficient. Even more—the FE is tough and rugged, designed to withstand the heaviest railroad shocks, bumps and jars, designed to remain in continuous service.

Designed solely for one job—railroad communications—the Westinghouse FE is the answer to railroad communication needs.

YOU CAN BE SURE...IF IT'S
Westinghouse

FE—the railroad radio
that fully meets
railroad needs

ONE: Meets railroad needs as defined by railroad men; exceeds AAR standards; meets FCC adjacent channel operating requirements.

TWO: Adaptable to each specific railroad requirement: front-to-rear; train-to-wayside; train-to-train; base station-to-base station when emergencies require.

THREE: Simple maintenance; easily removed units; unit-replacement; open construction allows servicing "elbow room."

FOUR: Chassis of corrosion-resistant aluminum; heavy steel cabinet included if desired; simple hand-operated lock nuts for easy removal of units.

FIVE: Front panel checking; all metering can be done without removing units; units cannot be replaced in wrong rack positions.

SIX: Automatic signal-to-noise ratio squelch control to insure optimum reception at all times. Ratio can be adjusted from front panel . . . unit need not be removed from rack.

SEVEN: Complete accessories including talk-back speakers, knee controls, intercom facilities, all readily available from a single supplier—Westinghouse.

EIGHT: Two-channel to four-channel changeover by adding a simple part in a few minutes in any shop, thus permitting four frequency operation—by turning a switch—over the full railroad radio band of 2.4 megacycles.

No other radio combines all of the features of the FE. No other railroad radio has FE's dependability. The new Westinghouse FE is the answer to your railroad's communication needs.



For a complete listing of all FE features, ask your local representative for a copy of the FE booklet, B-4748; for a copy of the Westinghouse Booklet, "Analyze Your Adjacent Channel Problems," specify SA-6736. Or write to:

Canadian Westinghouse Electric Co. Ltd.
Electronics Division
HAMILTON - ONT.



IN CHOOSING RADIO FOR
RAILROADS . . . **SEE . . . CHECK . . .**
COMPARE THE WESTINGHOUSE **FE**



The underside of the Transmitter shows the freedom for inspection and maintenance. No component need be moved or removed to reach another.

Three-unit construction separates basic parts of the equipment. Minimum component weight and easy interchangeability result. Units may be checked individually.



Westinghouse
RAILROAD RADIO

Manufacturing - - - -

X-Ray Gauging Speeds Production!

MANUFACTURERS of hot and cold strip steel, steel pipe, nonferrous and nonmetallic sheet products need no longer be concerned with the prospect of having to scrap long runs of off-gauge material caused by delays in detecting errors in thickness. Oftimes in the past, with the old method of taking manual micrometer readings, it was found that large quantities of material had passed through the rolling mills before errors in the thickness of the stock was detected. At the best, the old manner of taking micrometer readings, gave only an indication of the overall thickness of the stock as edge readings of the material could only be taken with micrometers.

The New Method

In the manufacture of cold steel strip magnetic micrometers designed to have a continuous contact with the stock were used for some time but this system of gauging became unreliable as the speed of rolling mills was increased. The answer to the need for a non-contacting type of gauge has now been found by use of radiation gauges. Two types of this unit have been developed and are in use. One of the units operates on X-rays and the other on beta rays.

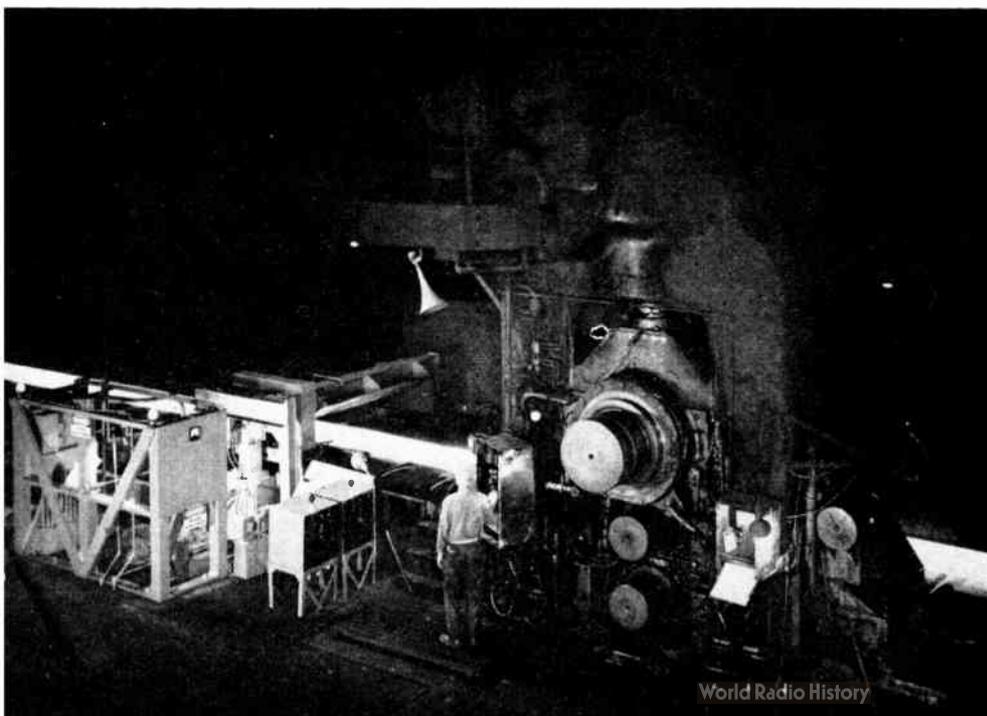
Both types employ radiation energy which is directed on to one side of the stock being manufactured. In the case of the X-ray gauge energy is obtained from an X-ray tube while the beta ray application employs radioactive isotopes as the means of energizing it.

Continuous Accurate Readings

The method of gauging stock thickness is simple and is based on the knowledge that the stock to be measured absorbs a known amount of the propagated energy. That part of the energy which passes through the stock is picked up by a measuring device which affords a continuous gauge reading of the stock thickness. Not only does this type of gauge give continuous readings but readings which show the thickness of the entire width of the stock being produced.

Beta ray and X-ray thickness gauges are being used in no less than 109 manufacturing plants at the present time. Thirty-one of these applications are being employed by manufacturers of nonferrous products and twenty-three by producers of nonmetallic products. The other fifty-five applications are being employed by the manufacturers of steel in one form or another.

- Hot strip mill installation of an X-ray thickness gauge.



World Radio History

NEW PRODUCTS

(Continued from page 29)

- **Universal Microphone Clamp**
Item 460

A new Model SK-1 Sky Hook universal clamp designed to solve many difficult problems of microphone positioning is now obtainable.



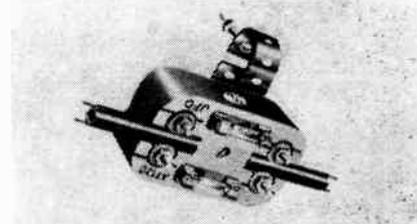
The SK-1 securely fastens to almost every type of surface ledge, round pipe or irregularly shaped stanchion. A microphone can be attached directly to the $\frac{5}{8}$ " — 20 tube supplied with the clamp — offering a versatile means of positioning an additional microphone to a floor stand, etc.

The casting is finished in gun metal shrivel; the chrome tube is 3" long.

- **Lightning Arrester**
Item 461

The announcement of full-scale production of a new patented "Lightning Sentry" lightning arrester and static discharger, model AT120 has recently been made by the makers.

The Lightning Sentry includes both an internal resistor network and two replaceable fuses. The resistor network will bypass all regular picture-smearing static charges to ground, as well as lightning charges.



However, strong lightning charges that normally would destroy an arrester before reaching ground, will merely blow the two replaceable fuses on the Lightning Sentry, leaving the arrester as good as new when new fuses are slipped into place.

This "Lightning Sentry" will secure oval, tubular, flat ribbon and open-wire twin-leads. Contact is made electrically at four points.

The Lightning Sentry is constructed entirely of high-dielectric porcelain with UL-approved nickel-plated brass hardware.

- **Speed Clamp**
Item 462

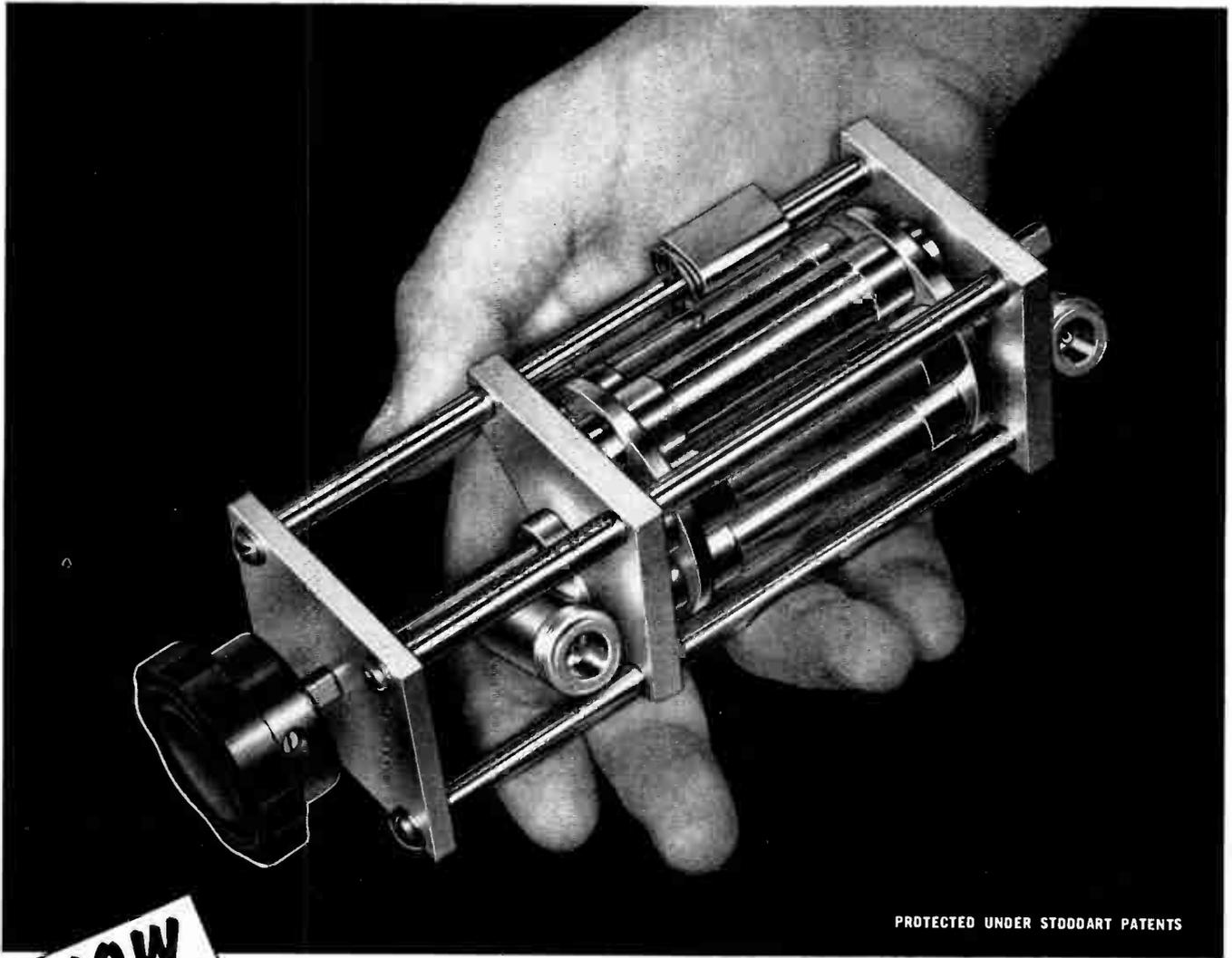
Another of many Speed Clamp fasteners to overcome a fastening problem in the assembly of radios, television sets and other electronic devices has now been developed.

Where previously a loop or condenser antenna had to be used in conjunction with a fastener, the new Speed Clamp serves both as an antenna for radios by acting as a 15 MMF condenser and as a strain relief clip.

Permitting vast reductions in materials handling and installation time, insulated wires are merely slipped into the Speed Clamp and a contact terminal is positioned under the panel in alignment with the mounting hole.

A single rivet, inserted through the terminal, panel and dual-functioning Speed Clamp, then secures the entire unit.

(Turn to page 40)



PROTECTED UNDER STODDART PATENTS

NOW

Precision Attenuation to 3000 mc!

**SINGLE "IN-THE-LINE"
ATTENUATOR PADS
and
50 ohm COAXIAL
TERMINATION**



TURRET ATTENUATOR
featuring "PULL-TURN-PUSH" action...

FREQUENCY RANGE: dc to 3000 mc.

CHARACTERISTIC IMPEDANCE: 50 ohms

CONNECTORS: Type "N" Coaxial female fittings each end

AVAILABLE ATTENUATION: Any value from .1 db to 60 db

VSWR: <1.2, dc to 3000 mc., for all values from 10 to 60 db

<1.5, dc to 3000 mc., for values from .1 to 9 db

ACCURACY: ± 0.5 db

POWER RATING: One watt sine wave power dissipation

*Send for free bulletin entitled
"Measurement of RF Attenuation"*

*Inquiries invited concerning pads or
turrets with different connector styles*

STODDART AIRCRAFT RADIO CO., INC.

6644-D SANTA MONICA BLVD., HOLLYWOOD 38, CALIFORNIA
Hollywood 4-9294

NEWS

(Continued from page 32)

Toronto Section I.R.E. Inspects Bell's Microwave Facilities

On January 25th, in the Bell Telephone Bldg., Adelaide St., the Toronto section, I.R.E. were addressed by A. J. Groleau, Bell's Area Chief Engineer. The speaker outlined in some detail the microwave relay system connecting Buffalo, Toronto, Ottawa and Montreal. He described the engineering problems involved which happily were overcome with the result that TV programs as well as hundreds of long distance calls are handled efficiently between these centres.

The talk was followed by a tour of the building for an inspection and description of the microwave set-up as well as all other long distance facilities. Had the accommodation not limited the attendance to 150, a record turnout would likely have been on hand.

The meeting was preceded by the usual informal dinner at Hart House and an interesting discussion of Canada's future in TV programming.

Hunt Capacitors (Canada) Limited

S. M. Finlayson, President, Canadian Marconi Company, Montreal, and S. H. Brewell, Managing Director of Messrs. A. H. Hunt (Capacitors) Limited, London, England, announce the formation of Hunt Capacitors (Canada) Limited and the appointment of K. A. Jackson as General Manager, formerly with Canadian Marconi Company and R. A. Grouse as Chief Engineer, formerly with Messrs. A. H. Hunt.



K. A. JACKSON

R. A. GROUSE

The new company with plant located in Ajax, Ontario, will manufacture condensers. Fast transportation from Ajax will provide the Canadian electrical and electronic industries with complete and immediate service on condenser requirements.

The products of the new company will be marketed by the Electronic Tube and Components Division of the Canadian Marconi Company, Toronto.

Automatic Electric Announce Executive Changes . . .

Concurrent with the general expansion of Automatic Electric Sales (Canada) Ltd., the Directors announce effective January 1st, 1954, the election of Carman R. Hughes as President

zation. Mr. Bird has been with Automatic Electric since 1940 and since 1945, has been Manager of industrial sales.

Mr. Hughes is also President of the



C. R. HUGHES



S. R. BIRD

and the appointment of Stuart C. Bird as General Manager of the Company. Mr. Hughes, who joined the Company in 1941, was formerly Manager of the telephone sales division and, more recently, Vice President of the organi-

associate manufacturing organization Automatic Electric Canada (1953) Ltd., who are currently building a large factory in Brockville, Ontario, for the Canadian manufacture of communication equipment.

I.R.E. National Convention March 22 - 25

The 1954 I.R.E. National Convention will be held on March 22-25 at the Waldorf-Astoria Hotel and Kingsbridge Armory in New York City. The comprehensive program of over 200 technical papers and 600 engineering exhibits, revealing a host of recent advances in the radio-electronics field, makes this convention the most outstanding event of its kind in the world.

Non-members of the institute may register and pay the \$3.00 registration fee, which will entitle them to attend all technical sessions, as well as exhibits during the four days of the convention.

New Quarters For Automatic Electric

With the separation of Automatic Electric Sales (Canada) Limited from the Phillips Electrical Company Ltd. (1953) the former company has moved to new premises at 185 Bartley Drive, Toronto. The move will provide for the expansion of the company's sales organization and service facilities. The new building will accommodate the company's head office, Toronto district office and the central warehouse.

John C. MacFarlane Passes On At 64

John C. Macfarlane, a Director and Vice-President of Canadian General Electric Company, died in Toronto on January 8, 1954. He was 64.

Mr. Macfarlane was born in Ashton, Ont., and was educated at Carleton Place High School, Queen's University, where he obtained his M.A., and Osgoode Hall. He began practicing law in 1915 and joined C.G.E. as general counsel and solicitor in 1935.

Goldsmith Brothers Changes Hands

Announcement has been made of the purchase by Baker Platinum of Canada Limited of Goldsmith Bros. Smelting and Refining Co., Limited.

George H. Scott, Bakers' Vice-President and General Manager, has been named Vice-President and General Manager of the subsidiary company.

The business of the Goldsmith Company will be conducted in Toronto from the King Street East premises the Baker Company, and Baker will use the Goldsmith Sales Office in Montreal.

(Turn to page 43)

*if your business requires
communications*

AUTOMATIC ELECTRIC

A GREAT NAME IN COMMUNICATIONS

*can serve your needs
better in 1954*

The year 1954 marks an advantageous advance in the supply of communications systems and services to Canadian telephone companies, utilities and private industries. Effective January 1st, Automatic Electric Canada (1953) Limited and its sales organization Automatic Electric Sales (Canada) Ltd. are expanding both manufacturing and distribution facilities. Sales and service will be directed from a new head office and central warehouse with district offices in principal cities. Staff has been augmented. A new factory is under construction at Brockville.

Automatic Electric in Canada is an active and expanding member of the Automatic Electric group of companies which serve two hemispheres with a wide range of telephone and communications products . . . qualified "headquarters" for your communication needs.

Distributor in Canada

AUTOMATIC ELECTRIC

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STROWGER AUTO-MATIC telephone systems for public service.



C-A-X (Community Automatic Exchange) to serve small communities.



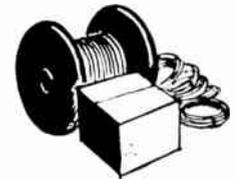
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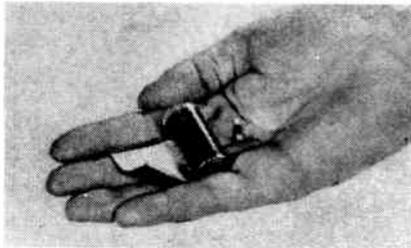
NEW PRODUCTS

(Continued from page 36)

● **Tape Resistors For Printed Circuits**

Item 463

Now available is a stable tape resistor for a wide range of printed circuit applications. They are available either as cured, ready-to-use resistors only 1/2" long, 1/8" wide and 1/100" thick, or as uncut, uncured tape rolls. Both types have a resistance range of 100 ohms to 10 megohms. They have an excellent degree of performance and reliability, and can be used in circuitry where exacting requirements must be met — they conform to all JAN-R-11 specifications. These resistors are suitable for semi-automatic applications in which a single operation, requiring less than one second, fastens them permanently to the chassis and connects them into the circuit, without soldering, bending of leads or punching holes in chassis. Characteristics (for "ready-to-use" resistors) are as follows:

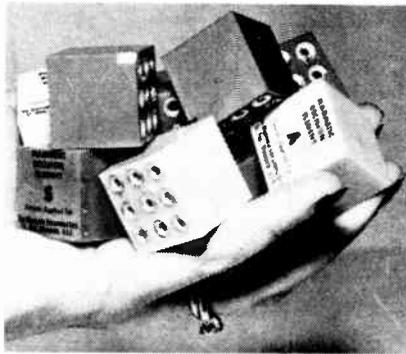


Power rating 1/4 at 150°C.; Resistance tolerance: ± 10 per cent. Operating temperature range — 55°C. to + 200°C.; Humidity: 95 per cent to 40°C. for 250 hours; Temperature Coefficient: within requirements of JAN-R-11; Shelf life: 18 months minimum; Load life: 500 hours minimum 1/4 watt at 150°C.

● **Magnetic Building Blocks**

Item 464

Standard magnetic building blocks for making up digital computers which look somewhat like children's building blocks can be arranged rapidly in any desired performance pattern.



They are completely flexible, basic components which can be used to build speedily the entire arithmetic, program, control and memory sections of digital computers. The blocks are one inch square. They can be employed for both serial and parallel systems, anything from simple flip-flops and binary counters to large-scale general purpose computers and digital differential analyzers. The elements contain no electron tubes. They are cast in an epoxy-type resin for maximum resistance to shock and environmental conditions and lend themselves to volume production, for applications "where absolute minimums in weight are of primary importance."

Use of the blocks will lengthen the useful life of computers, as they can be shifted around to meet new demands on the computer. The time cycle of design and construction of computers can be shortened to

weeks, days and hours, instead of years using these blocks as the foundation of computing systems.

● **New PM Series Tubular Capacitors**

Item 465

The new PM series of moulded tubular capacitors are designed to meet the need for a rugged, high-temperature moulded unit. These fine capacitors are fabricated with the Du Pont Company's latest new dielectric material, "Mylar" which maintains excellent electrical characteristics at temperatures up to + 130°C. Over the temperature range of from — 55°C. to + 100°C. full rated voltage can be applied, and to + 130°C. voltage is derated only to 75 per cent. Insulation resistance values are exceptionally good at any operating temperature and capacitance variation with thermal change is relatively small. The dielectric absorption and the power factor of the new capacitors is low.

Non-inductive construction is employed with lead wires solidly soldered to the extended foils, insuring low resistance connections and low radio frequency impedance. The durable thermo-setting plastic case construction holds lead wires and sections firmly in place to withstand extremes of handling, soldering temperatures, vibration and shock.

Standard sizes in 400, 600, 1000 and 1600 VDC ranges are listed in the accompanying table.

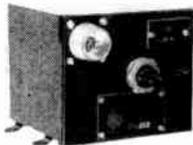
● **New Xcelite Plier**

Item 466

A new tool line for electronic uses is the new No. 64 Standoff Insulator Plier that simplifies opening and closing of standoff insulators.

Fully drop-forged rib joints and jaws give the plier maximum strength and long life. A groove on the lower jaw, and recess on the upper provide non-slip gripping action, according to the manufacturer. The tool is also suitable for heavy-duty, all-purpose work.

(Turn to page 46)



Sensitive Pressure Switch, 3 1/2" x 4 1/2" x 4 1/4". Wt. 2 lbs.



Ice Detector. Wt. 6 ozs. 3" Probe



Shedding Area Controller. 8 1/4" x 4 3/4" x 6 1/4". Wt. 9 lbs. 4 ozs.

The first fully automatic
Aircraft Ice Detector*

AND
Shedding Control System**

NOW AVAILABLE FOR GENERAL APPLICATION

* Ice detector currently used for F86E engine protection.

**Ice detector and Shedding Control System currently used for CF-100 all-weather fighter.

This system was described at the Anglo-American Aeronautical Conference, Sept. 17, 1953, at London, England.



Enquiries invited by:

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Specialists in instrumentation for northern flying.

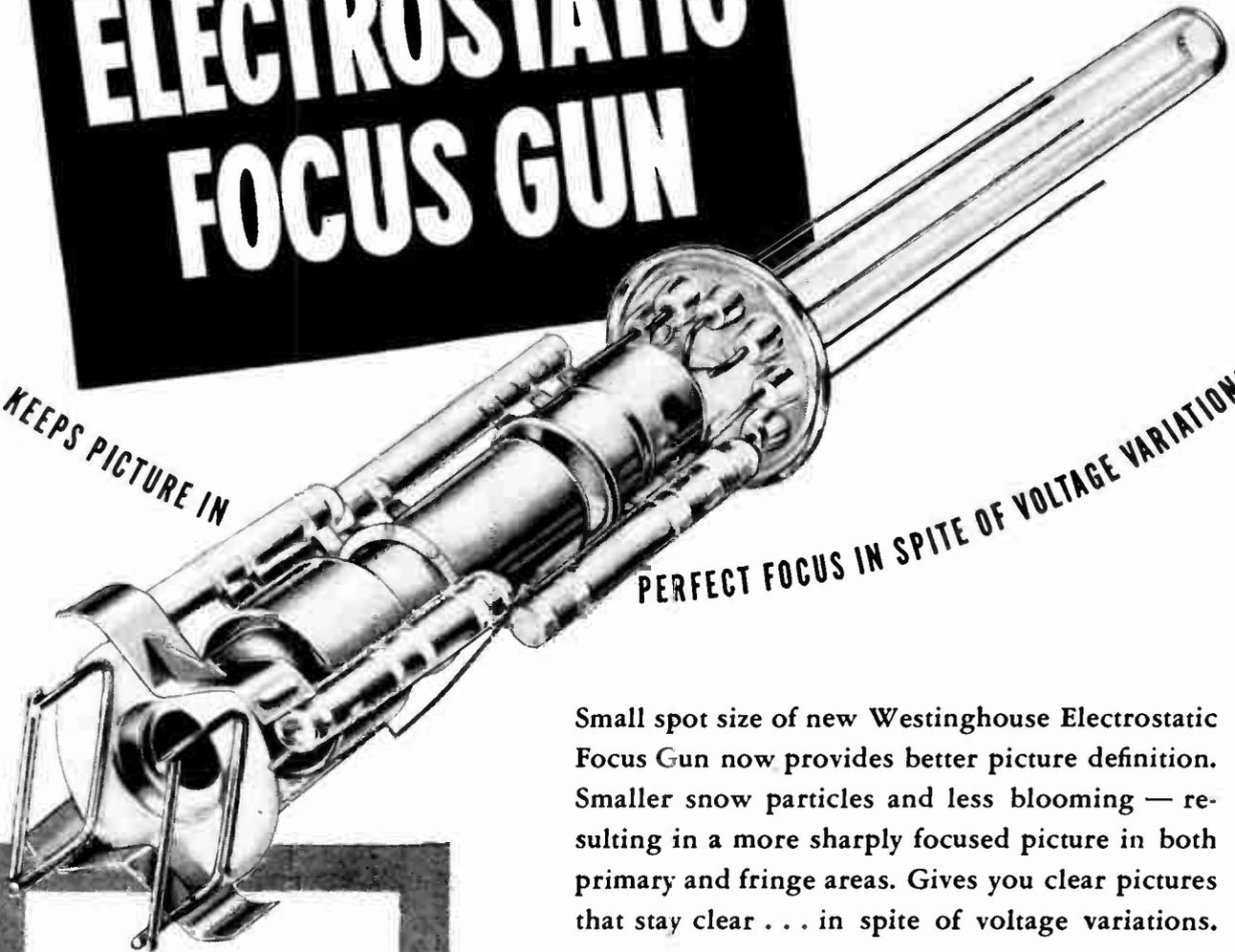
ARI-54

NOW! IN WESTINGHOUSE PICTURE TUBES

**NEW IMPROVED
ELECTROSTATIC
FOCUS GUN**

KEEPS PICTURE IN

PERFECT FOCUS IN SPITE OF VOLTAGE VARIATIONS!



New Electrostatic Focus Gun stabilizes focus through more precise shaping and control of electrostatic field. It's the first electrostatic focus gun to give you a continuously sharp picture in spite of voltage variations. Picture remains in focus despite variations in house voltage, despite variations in set components.

Small spot size of new Westinghouse Electrostatic Focus Gun now provides better picture definition. Smaller snow particles and less blooming — resulting in a more sharply focused picture in both primary and fringe areas. Gives you clear pictures that stay clear . . . in spite of voltage variations.

Westinghouse
ELECTRONIC TUBES

CANADIAN WESTINGHOUSE CO. LIMITED • HAMILTON, CANADA

Electronic Tube Division

BOOK REVIEW

GUIDE TO AUDIO REPRODUCTION by David Fidelman has just been published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, New York. The book is a complete exposition of the subject of audio reproduction covering all phases of the audio system beginning at the input or pick-up circuit and carrying right through to the loudspeaker. It has been written for use by the audio enthusiast who has some technical leaning and by the service technician whose responsibility it is to maintain these equipments. Special emphasis has been placed on such items as the requirements of sound systems, the principles and practical applications of phonograph and microphone pick-up units, loudspeakers, enclosures and magnetic recording.

The principles underlying the organization of audio amplifiers are thoroughly explained, inclusive of audio frequency corrective circuits. The author has taken special pains to completely correlate principles underlying the selection of equipments for audio amplifiers with the practical audio amplifier circuits. A section of the book is devoted to the servicing of audio amplifiers and high fidelity systems and the book concludes with a chapter of the description of the techniques used for the measurement of audio quality from audio amplifying systems. It is completely indexed. The book has 232 pages, 5½" by 8½", paper covered and sells for \$3.70.

INTRODUCTORY CIRCUIT THEORY, by Ernst A. Guillemin, is an introductory treatment of all the basic principles and concepts needed for complete understanding of advanced work in network analysis and synthesis, and has been prepared to meet the needs of flexibility and unconventionality produced by recent trends in industrial and technological activities. It provides an indispensable introduction for anyone who plans a continued interest in any area in which electric circuits play a part. The work begins with first principles, then provides a coherent exposition of the method of steady-state and transient circuit analysis — as well as giving the basic concepts essential to synthesis procedures which may later be studied in more advanced work. This volume provides all of the tools and concepts, all of the graphical interpretations and computational aids required in today's advanced research in network theory. In place of the conventional "Simplified Version for Beginners" it deals with the real tools of the trade — tools which will never be discarded or supplanted but which will be understood better as time goes on, and more dexterity is acquired in their use.

Introductory Circuit Theory is published by John Wiley & Sons Incorporated, 440 Fourth Avenue, New York 16; contains 550 pages; price \$8.50.

PRINCIPLES AND PRACTICE OF RADAR, by H. E. Penrose and R. S. H. Boulding, O.B.E., B.Sc., A.C.G.I., M.I.E.E., F.Inst.P., is a thoroughly revised edition in which the introductory chapters on the basic principles of radio practice have been summarized to form a single chapter. The space so saved by the authors has been used to amplify those parts of the book which experience has shown to be of most practical use to students, operators and technicians. The section dealing with actual equipment has been greatly enlarged; in addition to the B.T.H. Sperry, Kelvin-Hughes and Liverpool Harbour Radars, sections on the Decca, Cossor and Marconi radars are now included, together with an interesting section on airfield control radar. A new chapter on radar test gear has also been added.

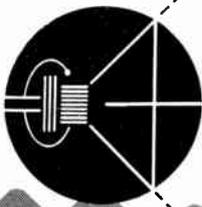
Among the techniques to which detailed consideration is given are: pulses and pulse forming circuits, calibration and applications of micro-wave technique to transmitters, receivers and feeder and arial systems. A revised chapter discusses the resonant cavity magnetron in the light of present day knowledge. Appendices deal respectively with transmission line theory, wave guides and cavity resonators.

Indispensable to Radar Engineers, this comprehensive work will also be found invaluable to those interested in the technique of modern radio communications.

Principles and Practice of Radar is published by Newnes; contains 775 pages; price \$10.00; available from The British Book Service (Canada) Ltd., 1068 Broadview Avenue, Toronto 6, Canada.

Orders for the books reviewed may be placed with Electronics and Communications, 31 Willcocks Street, Toronto 5, Ontario.

- Focus Devices
- Deflection Yokes
- Electronic Coils

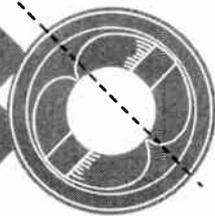
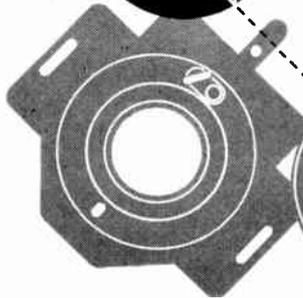


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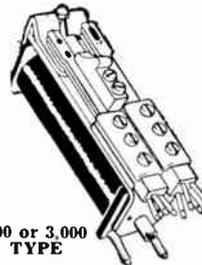
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ALSO LARGE STOCKS OF
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CONTACTS

3,000 TYPES: up to 8 sets.
600 TYPES: up to 4 sets.

3,000 TYPES: Make (M), Break (B), in Twin-silver Twin-Platinum, Dome-silver (2 amp.), Tungsten (5 amp.), and Flat-silver (8 amp.). Change-Over (C), in all but Tungsten: Make-Before-Break (K), in Twin-silver and Twin-platinum.

600 TYPES: (M), (B) and (C), in Twin-silver and Twin-platinum.

KEY SWITCHES.

2 C/O, to 8 C/O. Special types made up to order.

AS SUPPLIED TO H.M. GOVERNMENT
AND ALL LEADING MANUFACTURERS

For further data on advertised products use page 53.

NEWS

(Continued from page 38)

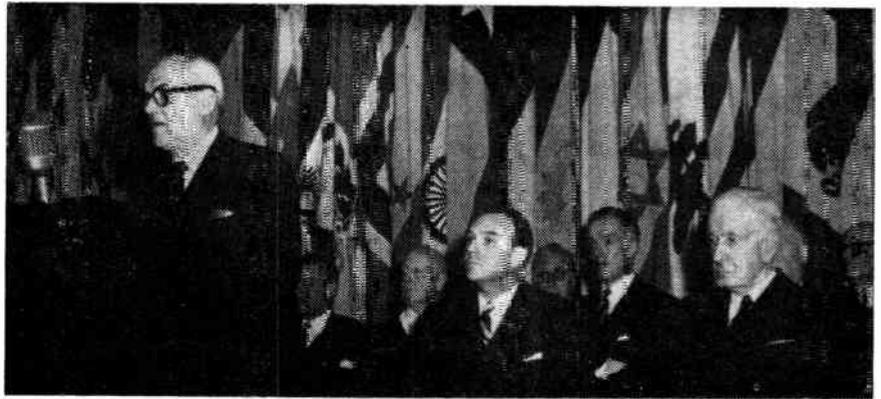
Canadian Admissions And Transfers In The I.R.E.

R. J. Wallace, 9600 St. Lawrence Blvd., Montreal, has been transferred to the class of senior member in the I.R.E. with date of transfer effective from January 1st, 1954. Transferred to the grade of member in the I.R.E. is A. Jamroz, 287 Verdun Road, Oshawa, Ontario. Admitted as members in the Institute are: G. Moes, 77 Florence Street, Toronto and J. W. Davidson, 9 Elward Blvd., Toronto.

Elected to associate grades with date of seniority effective from December 1, 1953 are: J. F. Filippino, 728 Cooper Street, Ottawa, and K. H. Horn, 30 Gair Drive, Toronto.

Admiral Appoints Design Engineer

The appointment of Harry Hanson as Chief Designer for Canadian Admiral Corp. has been announced. Over a period of 20 years Mr. Hanson has gained a wealth of experience in radio, television and appliance design and manufacture. He has been directly connected with production design during the past eight years.



I.B.M. Plant Dedicated

An impressive dedication ceremony marked the official opening of I.B.M.'s new building on Don Mills Road recently. Thomas J. Watson, Chairman of the Boards of the International Business Machine's Corp. and the I.B.M. World Trade Corp. and Mrs. Watson, a Director of the World Trade Corp., headed the group of company officials attending the ceremony.

G. Harry Sheppard, President of the I.B.M. of Canada, welcomed the guests. The Rt. Hon. C. D. Howe delivered the address at the opening ceremony of the new building, one of the most up-to-date industrial plants in Canada engaged in the manufacture of electronic equipment.

● Rt. Hon. C. D. Howe, addressing the large gathering present at the official dedication ceremonies of the new I.B.M. plant. To the right of Mr. Howe is J. C. King, President of I.B.M. Canada and on Mr. King's right Thomas J. Watson, Chairman of the Board of I.B.M. Corp. and I.B.M. World Trade Corp.

E. Whittaker Appointed Branch Supervisor

Stanley Lundy, Canadian Admiral Corporation Limited, has announced the appointment of Edwin Whittaker as Supervisor of Branches. Mr. Whittaker is a Vice-President of Canadian Admiral Sales, Limited, a wholly owned distributing company for Canadian Admiral Corporation.

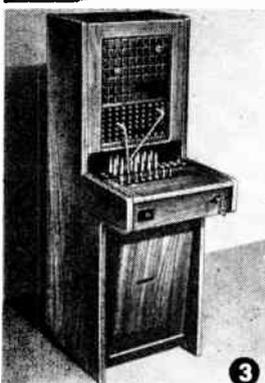
(Turn to page 44)



The Most Satisfactory SERVICE To Your SUBSCRIBERS is the Most PROFITABLE TO YOU!

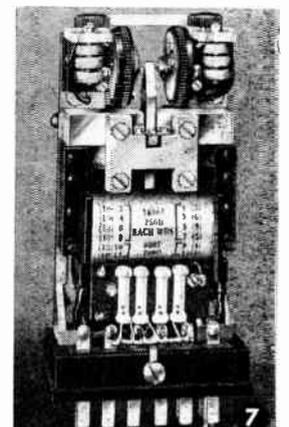
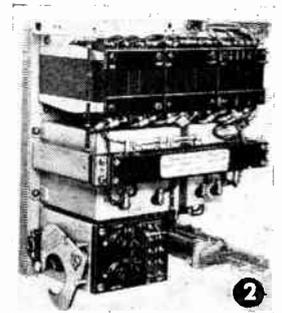
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EQUIPMENT



A visit to our spacious showroom is worth your while. There you can see everything in the most up-to-date equipment for efficiency and economy in the operation of a Telephone company or station. There you can inspect and test this T.M.C. equipment that is helping to keep Telephone subscribers satisfied and Telephone companies happy all over Canada and the rest of the world — and you will be pleasantly surprised at the low cost.

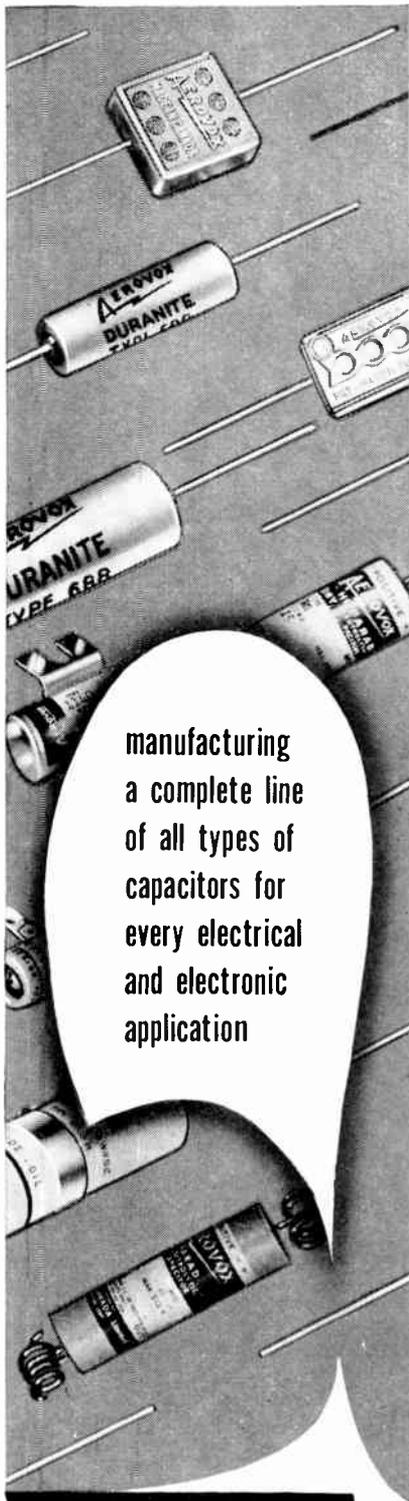
2. "Syncycle" ringing frequency converters.
3. Magneto Telephone Switchboards.
4. Magneto and C. B. Telephones.
5. Illustrated literature available on request.
6. "Carpenter" high-speed polarized relays . . . repeat signal impulses of varying time duration with utmost accuracy as in telegraph, measurement, protection and tele-control schemes.



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NEWS

(Continued from page 43)

W. Ornstein Promoted Supervising Engineer

Canadian Marconi Company has announced the promotion of W. Ornstein to Supervising Engineer. In his new position Mr. Ornstein will be responsible for all engineering projects in the development of equipment in the Mobile and Marine Communication field. In his new position Mr. Ornstein will be responsible to Mr. L. T. Bird, Chief Engineer of Marconi's Commercial Products Division. Mr. Ornstein is Chairman of the Land Mobile Engineering Sub-Committee of the Canadian RTMA. He is also an associate member of the I.R.E.

New Carboloy Plant Planned By C.G.E.

Plans for the construction of a 40,000 square foot single-storey plant for the production of Carboloy have been prepared, and will be built for the Canadian General Electric Company, producers of the harder-than-diamond material. The announcement was made recently by J. S. Keenan, General Manager of the Company's Industrial Products Division.

Carboloy, now produced at the Carboloy works of the C.G.E. in Toronto, is used extensively in metal-working, tool cutting for blanking and piercing dies and other uses where metal of extreme hardness is required.

C. A. Peachey Becomes Communications Manager

C. A. Peachey, formerly Works Manager of the Communications Equipment Division of Northern Electric Company will succeed A. B. Hunt as General Manager of the division. Mr. Hunt took over the directorship of the Electronics Division, Department of Defence Production in Ottawa last February 15.

Mr. Peachey who is a graduate of the University of Toronto has been associated with the Northern Electric Company since 1927. In 1945 Mr. Peachey became Works Manager of the Telephone Division and retained the position of Works Manager with the establishment of the company's Communications Equipment Division in 1950. During the period between 1927 and 1950 Mr. Peachey has held many important positions with the company.

Admiral Appoints L. S. Westman Credit Manager

William M. Hummel, Vice-President and Treasurer of Canadian Admiral Corporation, Ltd., has announced the appointment of Lloyd S. Westman as General Credit Manager for Canadian Admiral with headquarters at the company's Head Office in Port Credit, Ontario. Mr. Westman, previous to his new appointment was Supervisor of Credits for Canadian Admiral Sales, Limited, Toronto, wholly owned distributing company, with branches in Toronto, Windsor, Montreal, Vancouver, London and Sudbury.

Phillips Wires And Cables Announce New Appointments



L. A. G. HAWKINS

A. SANDILANDS

W. MULROY

Mr. T. A. Lindsay, Vice-President (Sales) of Phillips Electrical Co. (1953) Ltd., announces the appointment of Mr. L. G. A. Hawkins as Manager Eastern Region, Mr. A. Sandilands — Manager Western Region, and Mr. W. Mulroy as Manager Pacific Region. Mr. Hawkins has been with the company for 16 years and is well known throughout the industry. Mr. Sandilands was formerly Winnipeg branch

manager for Automatic Electric Sales (Canada) Ltd., and has more than 15 years specialized knowledge of the wire and cable field in the West. Mr. Mulroy has a particularly wide experience in electrical conductors on the Pacific Coast. He has been with the company for 26 years and has served in a management capacity since 1947.

(Turn to page 45)

NEWS

(Continued from page 44)

W. A. Wilson To Manage Northland Radio Supply

Wm. A. "Bill" Wilson has been appointed Manager of Northland Radio Supply, Kirkland Lake, Ont., replacing W. R. Chapman. Mr. Wilson brings to his new position several years of sales experience and during the past 11 months was employed in the Sales Department of J. R. Longstaffe Co. Ltd., Toronto.

Early Reservations Urged For Chicago Parts Show

Faced with the prospect of the tightest housing situation yet to confront the annual Electronics Parts Show, the Show committee has urged those intending to visit the 1954 Parts Show at the Conrad Hilton Hotel in Chicago May 17 to 20 to expedite their advance registrations.

With every indication that all available display and exhibit space will be occupied at the show, and with a number of other national conventions and exhibits planned for the same week, Chicago hotels, it is reported, are confronted with the possibility of having to turn away late applicants for accommodation.



• Canadian Marconi officials in charge of the company's exhibit at the recent Canadian National Boat Show are left to right: Mr. Baillie, Mr. Ralph Banks and Mr. Jack Morphet.

RCA Smiths Falls Plant Now In Operation

The new Smiths Falls plant of the RCA Company Limited is now in operation. Occupying an area of 50,000 sq. ft., it has been especially designed for the manufacture of the world-famous RCA Victor records. Modern in every respect, the Smiths Falls plant incorporates the latest technological developments in the manufacturing of phonograph records, and combines maximum efficiency with the best possible working conditions.

Mr. L. I. DelMotte, one of the top engineers in the recording industry in North America, and who for the past several years has been Manager of Record Manufacturing and Engineering at RCA Victor in Montreal, has been appointed Manager of the Smiths Falls plant.

R. P. Mathews Appointed Manager, Sales Engineering

The Federal Electric Manufacturing Company recently announced the appointment of Richard P. Mathews as Manager, Sales Engineering for the company. Mr. Mathews has been with the company since 1946 and served as chief engineer since 1949.



Mr. Mathews is a senior member of the Institute of Radio Engineers and a member of American Institute of Electrical Engineers.

(Turn to page 47)

Terminal Boards...
Made to Customer Print Specifications

Quality boards in any quantity. Made of certified materials to all JAN and MIL specifications - cloth, paper, glass, melamine, silicone, etc. Fungus treating either spray or vacuum processing. Silk screen or engraved lettering. Etched circuitry to print. 24-hour service on quotations. Prompt deliveries. Complete line of electronic hardware. Write today.

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NEW! in North America

**INSULOID
 "RING LOCK"
 BUSH**

The Insuloid "Ring Lock" Bush according to British industrialists provides the ultimate in effective protection to cables which pass through metal partitions, panels, etc.

Impervious to water, oil, gasoline, acids or any climatic condition, the shaped plastic sleeve and the elastic locking ring, though easily assembled, are practically indestructible.

Snap action assembly! Absolute security during wiring and service. Think what a saving this can mean.

Recommended by National Defense Department
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Write for your FREE descriptive booklet to

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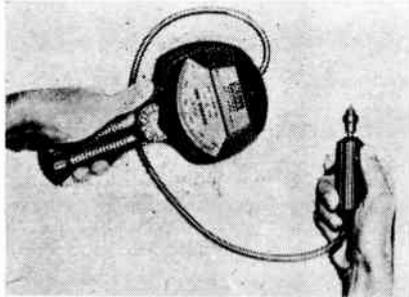
NEW PRODUCTS

(Continued from page 40)

● **Hand Tachometer**

Item 467

Confusion and reading errors are minimized, when measuring speeds with this new hand tachometer, by a novel thumb operated range selector which automatically changes the scale numbers for each range. The same mechanism also brings into view the correct number of R.P.M. per scale division, eliminating the need to "figure out" the scale markings for each range. The extra long scale is sub-divided for maximum readability. Other outstanding features include: sustained high accuracy; long life; low operating torque; rapid response; permanent lubrication; and rugged but light weight construction.



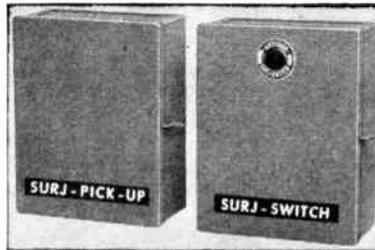
Commutated capacitor principle of operation provides inherent freedom from damage due to overspeeding or selection of wrong range. A built-in calibration circuit provides a quick, positive check on performance. Different types of tachometers and range extending adapters are available, to measure speeds as low as 2 R.P.M. and as high as 100,000 R.P.M.

● **Surj-Switch**

Item 468

Used for actuating electric counters, protecting dies, motors and machines, indicating work stoppage.

A new electric control, which is electronically operated by increased amplitude or surge of electric current when work is being done.



Known as the Surj-Switch, the control is connected into one side or one phase of the power circuit. Current surges produced by surge occurs, the relay does not operate.

In timer-equipped models, both Surj-Switch the work operate a relay. When no work and timer have relays, either or both relays may be used for control functions. A series of Surj-Switch and timer combinations provide flexibility to meet greatly varied conditions and requirements.

A complete unit includes a Surj-Pickup and a Surj-Switch, independently housed in identical cabinets 10 3/4" high, 8 3/4" wide and 4 1/4" deep. The Surj-Pickup may be used with power circuit ranging from 0 to 80 amperes, any voltage, 50-60 cycles, AC. The Surj-Switch can be furnished for either 115 or 230 volts, 50-60 cycles, AC. Both Surj-Relay and Timer Relay contacts are rated at 5 amperes, 115 V, AC, non-inductive load. Timers are adjustable for any timing period from 1 to 15 seconds, accuracy, 2%.

● **Molecular Vacuum Gauge**

Item 469

A new molecular vacuum gauge designed to measure pressures without external detectors is now available from a Canadian manufacturer.

The instrument is available in two types, both covering the range of 0-20 millimeters of dry air. Identical except for scale marking, one is calibrated directly for dry air and the other has a linear scale for use where individual calibration for dry air or other gases is preferred.

According to company engineers, two types of scale markings are used since it is preferable to have a direct reading gauge when used with dry air. They pointed out that users might prefer the arbitrary scale for applying their own calibration. Lighter gas (hydrogen) will have a higher full scale pressure limit, while heavier gases (xenon) will have a lower full scale pressure.

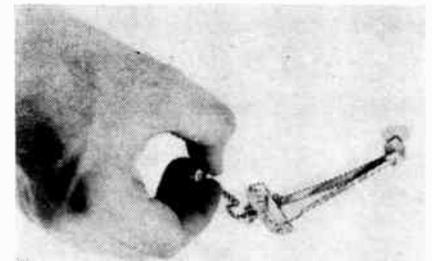
It is expected that the new gauge will be useful in applications involving: vacuum metallurgy and purification, refrigeration unit manufacturing, electronic tube manufacturing, vacuum coating and plating, food, chemical, and pharmaceutical processes, laboratory and research installations, and many others.

● **Inch-Gram Torque Wrench**

Item 470

A world leader and exclusive manufacturer of torque wrenches and associated products, introduces a new Standard Model Torque Wrench, the F80-I-G, 0 to 80 inch-gram range, believed to be the lowest capacity instrument of this type ever offered.

This smallest of torque wrenches can be made only because it is possible for the operator to concentrate the load position by means of a patented pivoted handle.



The simplicity of design of this sturdy little torque wrench means that it may be handled as any ordinary small tool, and yet it is guaranteed to remain permanently accurate over its entire life.

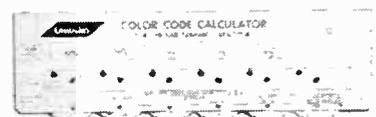
Widely spaced increment markings on the scale are in steps of 5 inch-grams, and are easily read by an operator from any working position. Other models are available in the same style in ranges from 0 to 8 inch-ounces and 0 to 16 inch-ounces.

These torque wrenches are designed for use in the electronics, instrument and precision equipment field and are ideally suited for applications requiring special torque testing fixtures.

● **Colour Code Calculator**

Item 471

A colour code calculator covering both capacitors and resistors is now being produced. The calculator is printed in full colour. By setting seven rotating wheels, capacitance or resistance, tolerance, and tem-



perature co-efficient can be read directly. The calculator covers RTMA colour code specifications on normal and extended range tubular ceramic capacitors and radial or axial lead resistors.

(Turn to page 51)

KESTER



Since the most important single step in Radio-Television Servicing is soldering . . . it's just plain good sense to use the best — KESTER SOLDER . . . Key Name in Solder for More Than 50 Years.

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

SOLDER

For further data on advertised products use page 53.

NEWS

(Continued from page 45)

A. B. Hunt To Direct Government's Electronic Program

The Rt. Hon. C. D. Howe, Minister of Production, recently announced the appointment of A. B. Hunt to head the Canadian government's \$100,000,000-a-year electronics defense program.



A. B. HUNT

Mr. Hunt's predecessor in this important position was W. R. McLachlan of Toronto who has been appointed to head the gas turbine division of A. V. Roe's plant at Malton.

Brewer Hunt will go to Ottawa from Montreal where he was General Manager of the communications equipment division of the Northern Electric Company Limited and will serve the government on a \$1-a year basis.

Mr. Hunt who is President of the Canadian Radio Television Manufacturers Association will take to Ottawa a wide experience in the electronics and communications field gained from many years' association with the Canadian industry.



Erie Resistor Represented By A. T. R. Armstrong Ltd.

Allen K. Shenk, Vice-President in charge of Sales for Erie Resistor Corporation, Erie, Pa., has announced the appointment of A. T. R. Armstrong Limited, 700 Weston Road, Toronto 9, Ontario, as distributor and industrial sales agents for the company's Canadian subsidiary.

Mr. Shenk stated that the appointment of this well known Canadian electronics agency is but another step in the program of Erie Resistor of Canada Limited to better serve the expanding Canadian electronics market.

Erie Resistor of Canada is also now completing a strategically located, new and larger factory in Trenton, Ontario, Canada. This factory has the most modern equipment available to produce quality electronic components.

● Left to right: J. T. Pfeiffer, General Manager of Erie Resistor of Canada Limited; Frank P. Taylor, and Allen T. R. Armstrong of A. T. R. Armstrong Limited and Mr. Shenk.

R. W. Cooke Appointed To C.A.E. Engineering Post

R. W. Cooke, whose appointment to Vice-President in charge of engineering and manufacturing of Canadian Aviation Electronics Ltd. has been announced by Company President K. R. Patrick. A native of Montreal, Mr. Cooke has had over 20 years' experience in military and civil engineering.



R. W. COOKE

(Turn to page 48)



This name makes ^{TV} news!



Ask PYE — if you want to know about VHF-AM ground equipment, point-to-point circuits, or how to get the best in mobile communications.

Ontario and Quebec representatives for
ETELCO Telephone Equipment

Mobile television units — made by PYE for the CBC, BBC and a host of world broadcasters — are another sound reason for PYE leadership in the field of electronic communication . . . across the world! Canadian communications and electronics men acknowledge PYE leadership in Microwave and VHF links from the mobile unit to the studio. And it's only a part of the complete PYE telecommunications equipment line.



Telecommunications

DIVISION OF PYE
AJAX



CANADA LIMITED
ONTARIO

SERVICE FROM COAST TO COAST

193 E. Hastings St.
Vancouver

Suite 320, 630 Dorchester St. W.
Montreal

Box No. 321, St. John's, Nfld.

NEWS

(Continued from page 47)

R.C.A. Gets Million Dollar TV Order

A comprehensive television installation program — first of its kind in Canadian hotel history — has been announced by Elmer E. Boswell, Executive Vice-President of Sheraton Hotels Limited, Montreal.

Five prominent units of the chain are involved in the program: Sheraton-Mt. Royal Hotel, Montreal; King Edward, Toronto; Royal Connaught, Hamilton; Sheraton-Brock, Niagara Falls, and Prince Edward, Windsor.

The complete project will represent an investment close to \$1,000,000, and marks the largest single purchase of sets in the country's young television industry. Initial phase of the program will witness a total of 1,000 receivers installed in the five hotels, with all guestrooms of these units featuring television at a later date.

Work on master antennae systems and intricate cabling of the some 3,000 rooms involved is already underway. The 1,000-set installation is scheduled for completion by April, with first sets in operation as early as mid-February.

I.R.E. Meeting Hears Frank Opinion On Colour TV

The January 11th meeting of the Toronto Section, Institute of Radio Engineers, was addressed by W. B. Whalley, Engineering Consultant, Polytechnic Research and Development Company and Adjunct Professor, Polytechnic Institute of Brooklyn, at the University of Toronto. Mr. Whalley's subject was Recent Developments in Colour Television.



After a brief summary of early attempts of colour TV, the speaker divided present-day methods into basic groups and discussed the advantages and disadvantages of each. This was followed by a discussion of the 3-gun and the Lawrence tubes and the special problems involved in each case.

Advance interest in Mr. Whalley's resulted in the reserved accommodation for the meeting being overcrowded making it necessary to transfer the meeting to larger quarters in the University of Toronto Physics building before the meeting could be opened.

Mr. Whalley's frank expression of

opinion on all questions relating to colour TV was highly appreciated by the audience and the vote of thanks, proposed by Mr. Frank Pounsett, received an unusually large measure of applause.

C.A.E. Forms Armament Maintenance Department

The formation of an armament department in the electronics maintenance division of Canadian Aviation Electronics new plant in Montreal will now enable this company to carry out the complete servicing of extremely complex radar-controlled weapon-firing equipment. Skilled technicians of the company have undergone extensive training in the latest techniques in automatic radar devices which form a vital part of the Canadian defence services. The new facility, with the added test equipment now involves this company in practically every phase of electronic maintenance. Over 5,000 units are serviced annually by this company varying in size from a microphone to a 50 kilowatt transmitter weighing ten tons.

Intricate Job Taken On By Canadian Firm

The Department of Defense Production has just awarded a contract to C.A.E. for the construction of five more C.A.E. Flight Simulators, thus increasing the value of the contract to 4.3 million dollars. The Curtiss Wright Dehmel Flight Simulator is manufactured in Canada by Canadian Aviation Electronics Ltd. under license from the Curtiss-Wright Corporation.

One of the most intricate electronic devices yet produced by a Canadian Company, the C.A.E. Flight Simulator is capable of duplicating with astounding accuracy the instrument indications of actual flight conditions. From the control panel the instructor can simulate the effect of rough air, wind velocities, icing, engine failures, stalls, fires and many other emergency flight conditions.

J. C. McCarthy Represents Robertshaw-Fulton Controls

Robertshaw-Fulton Controls Company has announced the appointment of Joseph C. McCarthy of Toronto as Canadian Sales Representative for the company's Robertshaw Thermostat, American Thermostat and Grayson Divisions.



Robertshaw-Fulton is a leading U.S. manufacturer of controls for home and industry, electronic Recorders and controllers, and other devices.

(Turn to page 52)

DALOHM

**MATCHLESS STABILITY
EXCEPTIONAL ACCURACY**

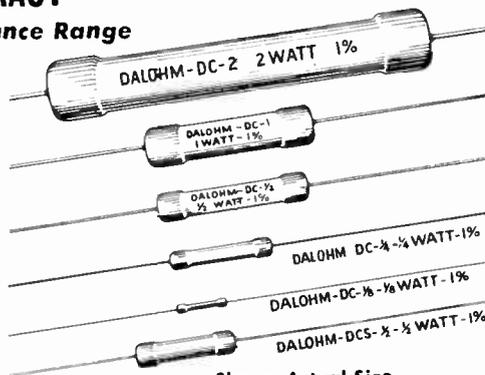
in any High-Low Resistance Range

Dalohm resistors are manufactured under rigid controls and sealed against moisture with special silicone coating having high dielectric strength, excellent thermal conductivity, and high resistance to abrasion.

From 1 ohm to 200 megohms, depending on type.

Temperature coefficient 200 PPM per degree C for lower resistance ranges up to 500 PPM per degree C for higher ranges. 1% accuracy. Also available in 2, 5 and 10% tolerances.

Deposited CARBON Resistors



Shown Actual Size

Write, Wire or Phone 1322 28th Avenue, Columbus, Nebr. for price and delivery. (Wire wound miniature power resistors also available). Phone 2139

DALE
PRODUCTS
INC.

DALE PRODUCTS, INC.
COLUMBUS, NEBRASKA

In Canada: TELETRONICS CORP., LTD., Toronto & Montreal

For further data on advertised products use page 53.

TRENDS . . .

(Continued from page 9)

range of television reception, and this is expected to rise to 85 per cent by the end of 1954, when 15 or more television stations, largely privately-owned, will be added in Canada. Colour television receivers will reach the market in test quantities during 1954, but intensive development is still under way and heavy volume production will probably not take place for several years. The first colour receivers to appear on the market will be several times the price of black and white models, and will be of a considerably smaller screen size than existing sets.

★ **THE ONLY TELEPHONE BOOTH OF ITS KIND** has been installed in the South Station in Boston. The new booth allows a caller the free use of his two hands to facilitate the writing of messages or for reference purposes. The booth is part of a Bell Telephone Laboratories experiment to see how the public accept the new style unit.

★ **PRODUCTION METHODS OF "PROJECT TINKERTOY"** the American government's new technique of mass producing electronic components is now available to the electronic industry. Drawings for hand tools required to set up pilot runs or for model shop use and an engineering handbook of the hand tool process are available through the Office of Technical Services, of the Commerce Department in Washington.

★ **SALES OF RADIO RECEIVING SETS** by Canadian producers during September, 1953, totalled 46,422 units valued at \$3,719,101 at list prices. The provincial distribution of the sales was as follows: Ontario, 19,121; Quebec, 9,947; British Columbia, 3,535; Manitoba, 3,383; Atlantic Provinces, 4,281; Alberta, 4,326; and Saskatchewan, 1,829.

★ **THE NORTHWEST NUT GROWERS PROCESSING PLANT** in the United States is perhaps the first such enterprise to employ electronics for cracking nuts. John E. Trunk, General Manager of the firm says that his firm is establishing new records of production. The new device will shell 1,200 pounds of walnuts an hour.

★ **SALES OF TELEVISION SETS** by Canadian producers during September, 1953, totalled 42,706 sets of which 25,128 were table models, 15,768 were consoles and 1,810 were three-way combinations. Distribution by provinces of these sales is as follows: Ontario, 27,503; Quebec, 13,776; British Columbia, 1,298; Atlantic Provinces, 74 and Prairie Provinces, 55. Total dollar value of the September sales of television sets was \$17,014,132.

★ **THE ALLEN B. DUMONT LABORATORIES**, long a recognized name in the electronics manufacturing industry, is finalizing plans for full-scale entry into the mobile radio communications manufacturing field. Dr. DuMont, in making the announcement, said the action "launches the company as a major competitor on a nationwide basis in a broad new field with many major markets."

★ **PLANS FOR THE LARGEST INSTITUTE OF RADIO Engineers convention** in history, with an expected attendance of 35,000, have been announced by IRE President William R. Hewlett. Dates set for the convention are March 22-25, and IRE reported that through the use of the Kingsbridge Army, there will be a 600-exhibit radio engineering show. Convention headquarters, as usual, will be the Waldorf-Astoria Hotel.

★ **CONTINUING ITS POSTWAR EXPANSION** and improvement program that has now involved expenditures of more than \$70,000,000, the British Columbia Telephone Co. has cut over to completely automatic dial operation its exchanges in the North Vancouver, B.C., area at a cost of about \$3,000,000. At cutover ceremonies, W. S. Pipes, Vice-President and General Manager of the company, pointed out that British Columbia now serves some 300,000 telephones, with one-third of that total added during the past five years.

ANNOUNCING

another first* for



CANADIAN BUILT "RUGGED AND HERMETICALLY SEALED" METERS — APPROVED

(with specifications set by JCNAAF-M-36)

It is with pleasure and pride we announce the approval by the Electronic Standards Sub-committee of the Department of National Defence, under certificates LA-46 and LA-47, the new Stark line of 2½" and 3½" rugged and hermetically sealed meters, manufactured in our plant at Ajax, Ontario.

These new meters have successfully met and passed all tests including the shock and tumbling requirements of specifications JCNAAF-M-36. The qualification report submitted by the Department of National Defence has indicated that the quality of performance of these rugged and hermetically sealed meters (the first approved in Canada are comparable to the best in the world. Electrical and electronic manufacturers will be pleased to know they can now obtain these outstanding meters on short notice.

The approval of Stark rugged and hermetically sealed meters is the climax of a long and successful history of this pioneer manufacturer of fine test instruments.

*OTHER STARK FIRSTS

1933 Fine Test Instruments
1940 Electrical Indicating Panel Meters
1952 Hermetically Sealed Meters
1953 Rugged and Hermetically Sealed Meters

Write today for complete details to dept. ECM-RS

STARK ELECTRONIC INSTRUMENTS LIMITED

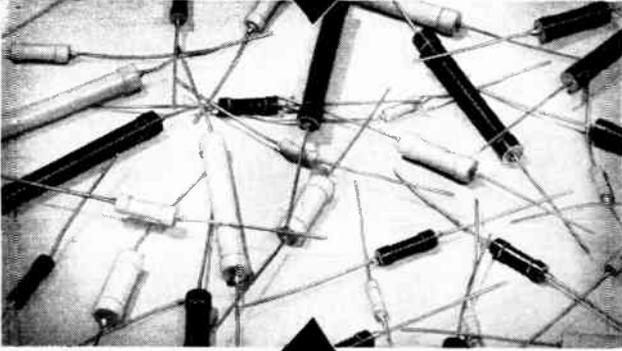
HEAD OFFICE AND FACTORIES: AJAX, ONTARIO

FOREIGN DIVISION: 276 West 43rd St., New York 36, N.Y., U.S.A.

CANADIAN SALES: M. J. S. Electronic Sales Ltd., 2028 Avenue Rd., Toronto, Ont.

CABLES: STARTEX, New York

**NOW
AVAILABLE!**



**Welwyn
High Stability
CARBON RESISTORS**

**with the new
PANCLIMATIC
PROTECTION**

Welwyn, who pioneered silicone protection for pyrolytic carbon resistors, now break new ground with the PANCLIMATIC protection for use under the greatest extremes of temperature.

PERFORMANCE

1. Operate reliably up to 300°F.
2. Have the lowest temperature coefficient consistent with reliability.
3. Are individually designed to give optimum performance at high voltage.
4. Are load tested before despatch.
5. Are fitted with machine-turned caps to give lowest noise.

PROTECTION

1. Gives complete reliability at all temperatures from -90°F. to +300°F.
2. Gives such moisture protection as ensures a stability of better than 1% over most of the range rising to around 2% at the very highest values in each range.
3. Gives a storage stability of better than 1% over the whole range.
4. Gives a stability of better than 1% when operated at 212°F. ambient temperature at 50% of nominal rating.
5. Gives greatest resistance to abrasion and impact.
6. Is completely inert chemically to all common solvents and plasticizers, and can be enclosed in any type of sleeving without deterioration.



Welwyn Canada Limited

1255 BRYDGES ST. LONDON, ONTARIO

The Editor's Space

(Continued from page 14)

It's been noticed that a public address system is used at the monthly meetings of the Society of Heating and Ventilating Engineers. It's also been noticed that some of the speakers at the monthly meetings of the Toronto Section of the Institute of Radio Engineers . . . and believe me they have some interesting speakers . . . are rather hard to hear on occasion. It's humbly suggested that a small PA system, begged, borrowed or stolen, would permit those in the rear of the room to hear the interesting subjects discussed at the I.R.E. meetings.

* * *

Paid a short visit to Mr. O'Connell and Mr. Shier of Automatic Electric (Canada) Limited at the company's new home recently. Have to admit that we're a little envious of their new facilities. It's certainly a grand building and indicative of the progress that's been made in the design of industrial buildings. It has everything that's needed to foster happy personnel relations and is more than a credit to the company.

* * *

Mr. H. A. O'Connell, Automatic Electric's TelAutograph specialist, says he's booked for a trip to Newfoundland in the near future. Wisely enough Mr. O'Connell expresses the hope that the trip won't be in the too near future. That is to say not before May or June. Can't say that we blame Mr. O'Connell as the weather in Newfoundland at this time of the year is rather inclement and besides, the fishing is much better in Newfoundland around May and June, we understand.



OK. Pop, Here's Today's Homework

For further data on advertised products use page 53.

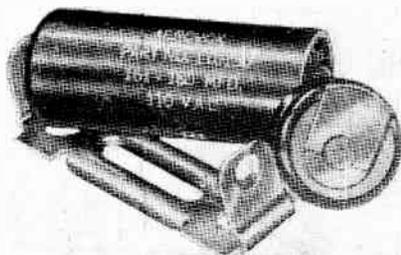
NEW PRODUCTS

(Continued from page 46)

● Motor Starting Capacitors Item 472

Round, compact, extra-protected electrolytic motor-starting capacitors housed in moulded plastic cases, Type MSRP, are now available.

The moulded plastic cases provides better insulation quality — no possibility of case grounding. Type MSRP units are normally supplied with etched foil. High-purity aluminum is used throughout the internal construction to avoid corrosion which might otherwise arise from contacts between dissimilar metals. The case is provided with a vent which operates to relieve excessive gas pressure.

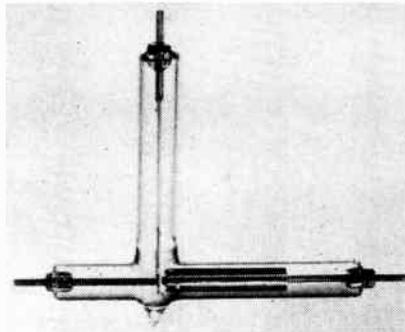


Where desired, Type MSRP capacitors are furnished with moulded end caps and can be clipped in sturdy mounting brackets. The standard end cap allows the leads to come out on either the side nearest the mounting bracket, or opposite the mounting bracket.

Four case sizes are available, ranging from 6 $\frac{7}{8}$ " L x 1 $\frac{3}{16}$ " D, to 4 $\frac{7}{8}$ " L x 2 $\frac{1}{8}$ " D. Voltage ratings of 110, 125, 150, 165, and 220 V.A.C. with capacitance values of 25 to 650 mfd.

● High Voltage Vacuum Relay Item 473

The Penta PI-RI vacuum relay is a single pole double throw switch enclosed in an evacuated envelope. The switch is operated by an external actuating coil. An armature assembly in the envelope acts to complete the magnetic circuit.



The PI-RI vacuum relay is suitable for applications where a fast-acting relay is needed to switch high voltage circuits under a wide range of atmospheric conditions. It may be used for antenna changeover applications in airborne equipment, for switching pulse forming radar networks and similar applications. The unit is particularly well suited to switching applications in explosive atmospheres.

● Mylar Metal Cased Capacitors Item 474

The prime feature of Mylar Metal Cased Capacitors are their ability to maintain exceptional insulation characteristics at temperatures to plus 160 degrees Centigrade. Through the temperature range of minus

55 degrees to plus 130 degrees Centigrade inclusive, no voltage derating is required; to plus 160 degrees Centigrade derating is only 75 per cent.

Insulation resistance is extremely good at any operating temperature and the variation of capacitance with thermal change and life is small. In addition the power factor and dielectric absorption of this new material is low.

Hermetic sealing of the capacitor within the metal housing is accomplished with glass-to-metal sealed terminals.

These capacitors are available in six variations of the basic style. The outer metal shell can either be connected to one side of the capacitor or left floating.

● UHF Multi-Channel Converter Item 475

A multi-channel converter designed for single channel use has recently been introduced to the market.



Easily tunable to receive any channel within a 20 channel range, without instruments.

(Turn to page 54)

HAMMOND

gives you SERVICE on
standard or special items

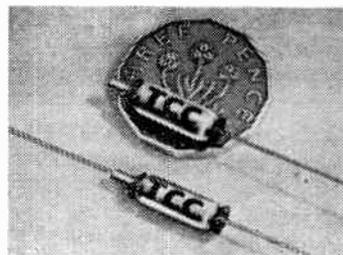
TRANSFORMERS

- FOR REPLACEMENT WORK
- FOR SOUND EQUIPMENT
- FOR TRANSMITTING EQUIPMENT
- FOR INDUSTRIAL APPLICATIONS
- FOR TEST AND DEVELOPMENT PURPOSES

DISTRIBUTED FROM COAST TO COAST
BY CANADA'S LEADING PARTS JOBBERS

HAMMOND MANUFACTURING CO. LTD. - GUELPH, CANADA

ELECTRONICS & COMMUNICATIONS, JANUARY - FEBRUARY, 1954



SUB-MINIATURE ELECTROLYTICS

TCC sub-miniature electrolytics are designed for special applications such as transistor circuits, hearing aids and miniature Walkie-Talkie equipment where extremely small size is of importance. These capacitors are housed in hermetically sealed aluminum containers. They can be supplied with an insulating plastic sleeve. Either wire terminations or a "plug pin" at one end is available.

Type	Length	Diameter	
CE68	.64"	.18"	6mfd/3v, 2mfd/12v, 1mfd/25v, 5mfd/50v
CE69	.71"	.2"	8mfd/6v, 4mfd/12v, 2mfd/25v, 1mfd/50v
CE67	.75"	.26"	8mfd/15v

The GLENDON COMPANY, LTD.

67 YONGE STREET

TORONTO, ONT.

EMpire 6-5781

For further data on advertised products use page 53.

NEWS

(Continued from page 48)

Dale M. Farnham Made Fellow In AIEE

For his contributions to high-voltage underground and submarine practice in transmission and distribution systems, Dale M. Farnham, Chief Engineer, Design Division, Quebec Hydro Electric Commission has been transferred to the grade of fellow in the American Institute of Electrical Engineers.

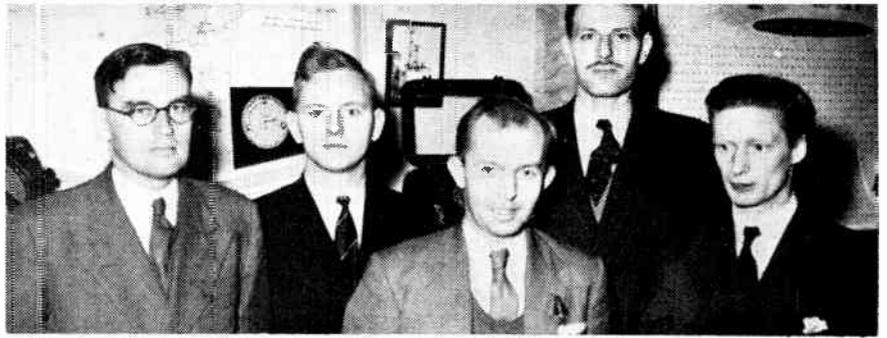


D. M. FARNHAM

Mr. Farnham was responsible for introducing into Canada the use of insulated cables above 69-kv rating and for the use of the first self-contained compression type cable in Canada.

Another first in Mr. Farnham's Canadian engineering experience was the application for the first time of 120-kv aluminum sheathed oil-filled cable in Canada.

Mr. Farnham is in charge of the Quebec Hydro Commission's system planning department, substation design and construction department, distribution engineering department, transmission engineering department and the communication department.



● Officials in charge of the Decca exhibit at the recent Canadian National Boat Show held in Toronto are left to right: R. D. R. Evans, D. H. Wardell, L. J. Baker, R. L. Sinclair and W. E. Mills.

Canadian Room At Hotel Commodore For IRE Visitors

Canadian visitors to the National Convention of the Institute of Radio Engineers to be held in the Waldorf-Astoria Hotel and Kingsbridge Armory, New York from March 22 to 25 will this year have their own headquarters. Known as The Canadian Room the facilities will be located in the Hotel Commodore and will provide a long felt need in the matter of affording Canadian visitors a focal point at which to gather, entertain their wives and meet their friends from home.

Members of the Canadian Room Committee are representative of the Canadian electronics and communications industries and include J. Cartwright, Aerovox Canada Limited; Len A. Davidge, Hackbusch Electronics

Limited; J. D. Houlding, Canadian Westinghouse Company Limited; P. J. Heenan, P. J. Heenan Limited; John Root, R-O-R Associates Limited; D. Peacock, Computing Devices of Canada Limited; W. H. Holroyd, Canadian General Electric Company Limited; and C. Adams, Adams Engineering Limited.

It is hoped by the committee that all Canadians attending the I.R.E. Convention will make a point of visiting the Canadian Room and will take advantage of its facilities. Further information may be obtained by writing or telephoning T. W. Lazenby, Editor, Electronics and Communications Magazine, 31 Willcocks St., Toronto 5, K1. 3115.

(Turn to page 60)

Announcing...

Complete Manufacturing Facilities In Canada

FOR

TERMINAL SEALS — STAND OFFS — TERMINAL HEADERS

BY

Sperti Faraday inc.

Pioneer Specialists in Glass to Metal Seals

Address inquiries to:

CONSOLIDATED ELECTRONIC EQUIPMENT CO. LTD.
1156 YONGE STREET • TORONTO, ONT.

For further data on advertised products use page 53.

Broadcasting-----

The New Look In Tape Recorders!

A CENSUS among broadcasting officials and recording engineers to ascertain the most desired features sought in magnetic recording apparatus has resulted in one manufacturer of this equipment producing a model which is certain to be well received in the professional broadcasting and recording professions.

As a start the design of the cabinet is a departure from previous studio recorders. Sloped at a 30-degree angle, the tape transport mechanism is within easy reach of an operator, sitting or standing. The electronic control panel, also slanted, is just in front of the tape transport.

Since all operative units are contained in the upper portion of the console, the machine may be placed on a desk or table if the user does not desire to use the base which is furnished.

Push button control permits rapid shuttling between fast forward and

rewind, facilitating rapid editing. All tape motion and record controls are push button operated, allowing full remote control of these functions.

To avoid tape stretch and breakage when small plastic reels are used, a switch has been added that automatically compensates for the increased tape tensions encountered with such reels.

Easy To Service

For servicing, the top plate is pivoted at the balance point, on the cabinet frame member. For routine checks and adjustments, the tape transport may be secured in a vertical position with its underside exposed, even while the machine is operating. Likewise, both the top and bottom of the electronic unit may be serviced while the recorder is in operation by sliding the unit partially out of the cabinet on the special runners provided. All electro-mechanical components, including takeup and rewind



● The new look for broadcasting studio recording apparatus features a sloped front console with easily accessible controls for the operator's convenience.

motor assemblies, drive motor assembly and the unitized control strip, are plugged into a central relay and power source. For emergency repairs, these plug-in components can be quickly removed as units and replaced.

A two-speed machine, it may be obtained to operate at 3¾ and 7½ inches per second, or at 7½ and 15 inches per second. Frequency response to 15,000 cycles per second is available at both the 7½ and 15 inch speeds. At the 3¾ inch speed, response is flat from 50 to 7,500 cycles per second.

VACUUM COATING

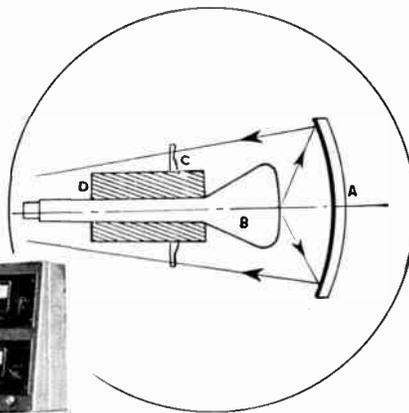
Delivers the Picture . . .

. . . via highly-reflecting non-tarnishing front-surface mirrors . . .

Highly-reflecting, front-aluminized mirrors play a vital part in the production of optical systems for large screen projection television.

Progress in this field has depended largely on the vacuum engineer producing the plant, including special pumps, gauges and valves that are needed for the rapid coating and faultless operation so essential to industrial processing.

Illustrated is a typical Edwards production plant which fulfills all the needs of large scale processing, but other research and production units are available for the processing of many other electrical and electronic devices, such as precision resistors, condensers, photo-cells, high-frequency crystal electrodes, C.R.T. screens, etc.



A SIMPLE OPTICAL SYSTEM FOR TELEVISION PROJECTION

- (a) Front-aluminized mirror
- (b) Cathode ray tube
- (c) Schmidt correction plate
- (d) Focusing & deflexion coils

Manufactured by
W. EDWARDS & CO.
(LONDON) LTD.
ENGLAND

CANADIAN ORGANIZATION

SCIEX (CANADA) LTD.

50 YORK STREET

TORONTO 1, ONTARIO

For further data on advertised products use page 53.

ATTENTION CANADIANS!

If You Plan On Attending The IRE
Convention In New York, March 22-25

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WE INVITE YOUR ENQUIRIES FOR

FIXED, WIREBOUND, POWER TYPE, RESISTORS

5 — 450 Watts

Good Commercial and JAN Quality

(Meeting requirements of Specifications JCNAAF-R-12 and
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WIREBOUND, POWER RHEOSTATS
25 — 50 — 75 — 100 — 150 Watts

HERMETICALLY SEALED
POTENTIOMETERS

SLIDING TYPE RHEOSTATS
AND POTENTIOMETERS
150 to 2500 Watts

ROTARY TAP SWITCHES

INSTRUMENT TYPE ROTARY
POTENTIOMETERS

4 — 8 — 10 — 20 Watts

MOLDED CONTROL KNOBS
AND HANDWHEELS

SPECIAL RESISTANCE EQUIPMENT TO
CUSTOMERS' OWN SPECIFICATIONS

WRITE FOR COMPLETE INFORMATION

CANADIAN ELECTRIC RESISTORS LIMITED

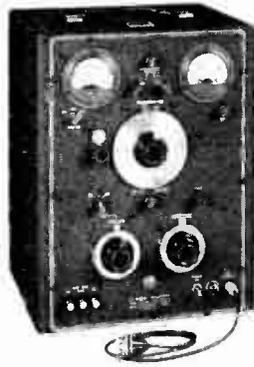
CURITY AVENUE

TELEPHONE PL. 6-1891

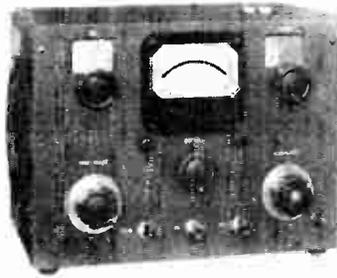
TORONTO 16, ONT.

For further data on advertised products use page 53.

PRECISION ELECTRONIC MEASURING INSTRUMENTS



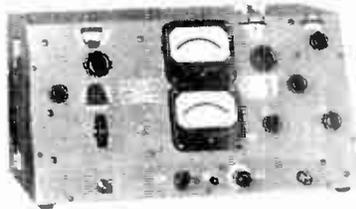
FM-AM SIGNAL GENERATOR
TYPE 202-B



Q METER
TYPE 190-A



RX METER
TYPE 250-A



C METER
TYPE 260-A

Signal Generators
Frequency and Amplitude Modulated
For Aircraft Navigation Receivers
For Mobile Communications Receivers

Q Meters
Low, Medium and High Frequencies
Very High Frequencies

Univerters
Low, Medium and High Frequencies
Impedance Measurements

Write for complete information

Q METERS					
Type	Freq. Range	Q Range	Tuning Capacity Range	Q Accuracy	Price
260-A	50 kc to 50 mc	10 to 625	30-450 mmf	5% to 30 mc	\$725.
190-A	20 mc to 260 mc	5 to 1200	7.5 to 100 mmf	7% to 100 mc	\$625.
FM-AM SIGNAL GENERATORS					
Type	Freq. Range	Output Range	Modulation FM AM	Application	Price
202-B	54-216 mc	0.1 to 200,000 uv	0-240 kc 0-50%	General	\$975.
202-C	54-216 mc	0.1 to 200,000 uv	0-240 kc 0-50%	Mobile	\$1090.
202-D	175-250 mc	0.1 to 200,000 uv	0-240 kc 0-100%	Telemetry	\$980.
WIDE BAND IMPEDANCE MEASURING EQUIPMENT — RX Meter					
Type	Freq. Range	R Range	C Range	L Range	Price
250-A	0.5 to 250 mc	15 to 100,000 ohms	0-20 uuf	0.001 uh-100 mh	\$1250.
OMNI-RANGE SIGNAL GENERATOR (Crystal Monitored)					
Type	Freq. Range	Output Range	Modulation	Application	Price
211-A	88-140 mc	0.1 to 200,000 uv	0-100% am	Omni-Range Rcvrs.	\$1800.
GLIDE SLOPE SIGNAL GENERATOR					
Type	Freq. Range	Output Range	Modulation	Application	Price
232-A	329-335 mc	1.0 to 200,000 uv	0-100% am	Glide Slope Rcvrs.	\$1500.
UNIVERTERS					
Type	Freq. Range	Output Range	Modulation FM AM	Accessory to	Price
207-A	0.1 to 55 mc	0.1 to 100,000 uv	0-240 kc 0-50%	202-B and 202-C	\$345.
207-B	0.1 to 55 mc	0.1 to 100,000 uv	0-240 kc 0-50%	202-D	345.

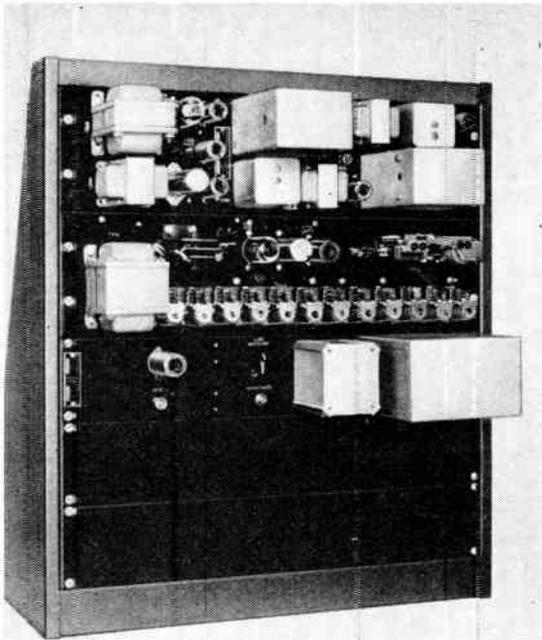


BOONTON RADIO

BOONTON · N.J. · U.S.A.

Corporation

RCA VICTOR COMPANY LTD.
1001 Lenoir St.,
Montreal 30, Quebec, Canada



● Equipment for installation at airports or along the air routes for single-circuit, audio-tone remote control of transmitters and receivers used for air-ground communications.

voice characteristics to carry all the standard operations required for rapid switching between transmitter and receiver, and for switching between equipment groups to cover the various frequency channels. A high frequency radio signal or a microwave link are equally suitable as transmission media. The dispatcher, when using the new equipment, may select up to ten transmitter-receiver combinations, any one of which may be operated as a complete communications facility on a press-to-talk basis.

Equipment

The multiple telephone circuits,

and high reliability at low initial cost and with minimum operating expense is achieved.

At the control point, equipment consists of two audio-frequency tone generators, a telephone dial and the press-to-talk switching mechanism, all of which is easily added to the existing speech amplifiers used for the transmission reception of voice communications. The equipment at the transmitter site consists of two audio frequency tone selector amplifiers, a relay control mechanism, a narrow band "notching" filter, and a high-brid transformer.

The development of this system of remote control equipment is an indication of the continuing effort of manufacturers to further the safety of flying operations through more efficient communications equipment.

It's 'E' For Easy With - - -

Communication Remote Control

A REMOTE control system using tones in the audio frequency spectrum, and eliminating the need for DC circuitry is the latest communication gimmick for operating airline radio transmitting and receiving equipment located away from control points, both at airports and along the air routes.

The system requires only a single telephone line having conventional

commonly used between the dispatch office and the radio site, which in the past provided for voice transmission in both directions as well as control functions by means of DC switching, is no longer necessary.

As a result of the use of standard unitized components made by the builder combined with special switching apparatus, convenience of operation, flexibility in system planning,

THE CASE FOR AM

(Continued from page 17)

whereas it is true that FM has been adopted as standard for certain purposes, it is wise to remember that AM always has been used (and still is) for all standard broadcast transmissions, all long-range marine radiotelephony, all aviation radio communication including VHF systems, for the transmission of all television pictures, and in literally thousands of fixed-to-mobile and point-to-point schemes throughout the world. It can therefore be seen that AM techniques are founded upon a wealth of engineering experience embracing almost every conceivable application over the past forty years, and for this reason the user can safely base his choice on practical local considerations in the knowledge that both FM and AM have a permanent and well-deserved place in the future plans of those who are charged with the responsibility for the development of radio communication.

You're in Good Company when you buy from . . .

MEASUREMENT ENGINEERING LIMITED

Listed below are a few of the many customers we have served recently. Their requirements have been as varied as our facilities.

Aeromagnetic Services.
Aluminum Co. of Canada.
Addison Industries Ltd.
Atomic Energy of Canada Ltd.
Canadian Aero Services Ltd.
Canadian Admiral Ltd.
Canadian Arsenals Ltd.
Canadian Aviation Electronics
Canadian General Electric Co.
Canadian Marconi Co.
Canadian National Railway.

Canadian Standards Association.
Canadian Westinghouse Ltd.
Computing Devices of Canada Ltd.
Department of Mines & Technical Surveys.
Department of National Defence.
Department of Transport.
Hydro Electric Power Commission of Ontario.
International Nickel Co.
McGill University.

Motorola Canada Ltd.
National Research Council.
Northern Electric.
R.C.A. Victor Co.
Radio Valve Co. of Canada.
A. V. Roe Canada Ltd.
Royal Canadian Mounted Police.
Sperry Gyroscope Co.
Trans-Canada Airlines.
University of New Brunswick.

MEASUREMENT ENGINEERING LIMITED

Rendering A Complete Service

as Consultants, Field Research Engineers, and Equipment Specialists in every phase of Broadcasting, Electronics and Communications

Head Office and Plant: ARNPRIOR, ONTARIO

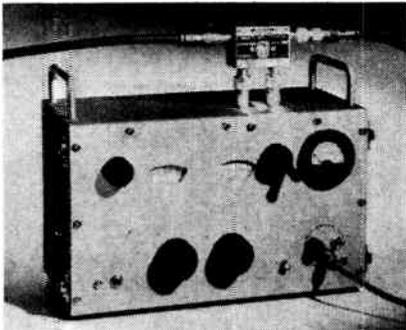
PHONE 400

For further data on advertised products use page 53.

NEW PRODUCTS

(Continued from page 54)

355 megacycles and an IF amplifier centered at 60 ± 2 megacycles. Each instrument is supplied with a detachable directional coupler for insertion into the transmission line under test. Reflection coefficient and VSWR are read directly on a front panel dial.

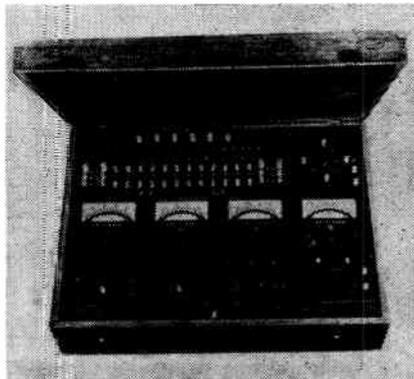


Model 136A operates from a 105/120 volt 60 cycle power supply. A phone jack is provided on the front panel for use of a headset.

• **Universal Measuring Test Set**

Item 481

A universal measuring test set for direct currents is now immediately available on the market. Capable of over 200 separate instru-



ment ranges the makers claim the instrument to be the last word in DC test sets.

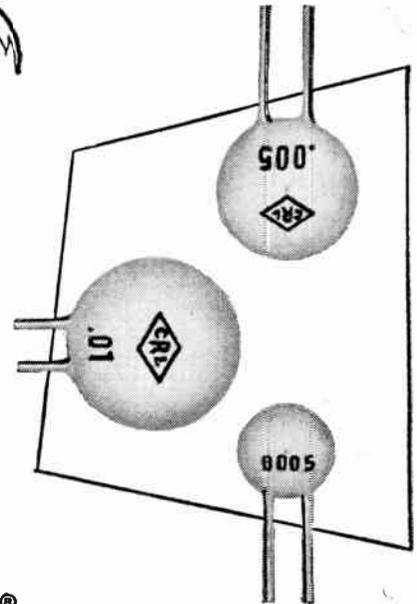
The set will directly measure microamperes, milliamperes, amperes, millivolts, volts, from 1 microampere to 60 amperes and 1 millivolt to over 750 volts. It can be readily connected in a few moments for use as a Wheatstone Bridge, Potentiometer, Millivoltmeter and Voltmeter, Zero Resistance Microammeter, or Milliammeter, High Resistance Voltmeter, Radio Frequency Voltmeter, Radio Frequency Milliammeter or Ammeter, or used for D.C. power measurements, bridge type A.C. rectifier, circuit tester and other uses.

• **Williamson Amplifier Kit**

Item 482

This is the original Williamson circuit, closely following the specifications laid down by Mr. Williamson in his articles in *Wireless World*. The frequency response is essentially flat from 2 cycles to 100,000 cycles. Distortion at 15 watts full output is less than 1 per cent, and at room listening levels literally disappears. Noise level better than 85 db. below full output. Kit uses famous Partridge WWFB output transformer, and the punched chassis and potted power transformer and chokes have been especially designed for smart appearance. Output taps 6-8 and 15-16 ohms. A special feature of this kit is the exclusive use of Nobeliolow low noise resistors throughout. Tubes: 2-6SN7GT; 2-KT66 (matched pair); 1-5V4G. 2 chassis, 12" long by 5½" wide, hammerlin finish.

I'm continually amazed

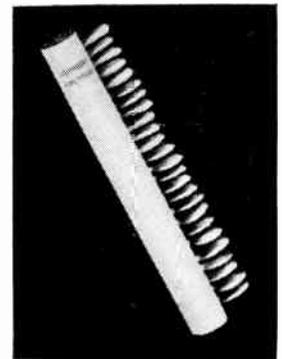


at how

BC Disc Hi-Kaps[®] solve space and design problems

Centralab BC Disc Hi-Kaps can amaze you too — Here's why —

- BC Discs are small in size, cut the third dimension (thickness) to a minimum. (5/32" thin.)
- Stable power factor — Initial, 1.5% at 1 KC.
- High Insulation Resistance—10,000 Megohms.
- Safe Rated Voltages — Rated at 500 VDCW, but tested continuously at 1,250 VDCW. High voltage types to 6000 VDCW available.
- Wide range of capacities — 10mmf to 20,000-mmf.
- No "intermittents" — Positive high temperature bond between ceramic and silver guarantees no movements, plus sure electrical contact.



CENTRALAB BC Discs are so small that 25 of them occupy the space of one cigarette.

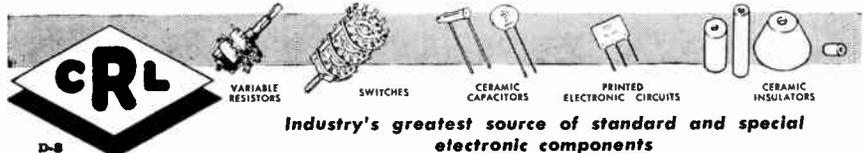
CENTRALAB knows the ceramic capacitor field better than any other supplier...

- CRL introduced ceramic capacitors in the U.S. many years before any other supplier entered the field.
- Centralab manufactures from basic powders to finished product right in its own plant . . . complete laboratory control over every step in the process.
- CRL has the largest staff of development engineers of any comparable company . . . over 150 men available for consultation on your capacitor problems.
- CRL's many plants are highly mechanized for efficient, quality manufacture, and located strategically for best delivery.

Write now for Bulletin 42-4.

Centralab

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Industry's greatest source of standard and special electronic components

NEWS

(Continued from page 52)

John W. Paddon To Head C.A.E.'s Commercial Division

John W. Paddon, whose appointment as Manager of the commercial division, Canadian Aviation Electronics Ltd. has been announced by K. R. Patrick, Company President. Mr. Paddon's international business background includes service as chief of electronics division of the Department of Defence Production in Washington, D.C.



J. W. PADDON

Electronics Firm Conducts "Shrinkage" Contest

The Misses Blanche Tulk and Betty Price, employees of the Radio Valve Company of Canada featured as winners in the company's "shrinkage contest" winning, in the case of Miss Tulk, an all expense trip to Bermuda for six days plus normal earnings for one week and in the case of Miss Price who came second in the contest, a wardrobe ensemble for the value of \$150 to be selected by herself at Simpson's.

The purpose of the contest is to reduce losses — known in the radio and picture tube industry as "shrinkage". The amount of shrinkage usually depends on the experience of the manufacturing staff and the effort applied to keep it to a minimum. The Radio Valve Company conducts a contest too with any general increase in staff — to encourage and educate the new employees.

To operate the contest, the factory is divided into those groups working on each particular type of tube. Each tube has a fixed shrinkage bogey. Therefore, the group that finishes the week with the best realization of their shrinkage bogey is considered the winning group. Each member of the winning group receives a \$2.00 gift certificate and a chance to participate in the draw for the "weekly prize". The weekly prize is a mantel radio set or some article of similar value.

Electronic Engineers To Study Human Relations

Normally concerned with the hard, cold facts of electronics theory and development, the Institute of Radio Engineers has made a radical departure into the field of human relations to organize a Professional Group on Engineering Management in electronics.

This group is sponsoring a course



● Miss Betty Price (left) and Miss Blanche Tulk—winners of the two Grand Prizes awarded in the recently completed Radio Valve Company of Canada Limited "shrinkage" contest.

in "Engineering Management in the Electronics Industry". Conference sessions began on November 6 and will continue through 15 meetings until March 5 according to Chairman T. W. Jarmie.

Jarmie said that a new series should begin shortly after March 5 because of the intense interest shown in the course by IRE members. The first session was immediately oversubscribed. Discussion groups are limited to 40 persons in order to make free discussion possible.

(Turn to page 61)

**A HELPING HAND IN MAKING
OUR COUNTRY'S DEFENCES STRONGER**

C.D.C. with its large staff of highly skilled research and development engineers, is privileged to provide valuable aid towards making our country's defences stronger and more effective — through the designing and building of special electronic computing equipment and servo-mechanisms. The pressing need for such a service to our Armed Forces brought C.D.C. into being in 1948 as the first in the Canadian field and this service continues as one of the major functions of our fast-growing organization.

Computing DEVICES
OF CANADA LIMITED
OTTAWA, ONTARIO
Research and Development Laboratories: 303 Richmond Road
Head Office and Production: 338 Queen Street

NEWS

(Continued from page 60)

New Montreal TV Antenna

Antiference (Canada) Ltd., have produced a new model of TV Antenna designed especially for reception within the range of Montreal. The new antenna is a double-driven 10-element broad-band yagi to cover all low band channels from channel 2 to channel 6. It has heretofore been the practice to offer this type of antenna in a choice of two models, one for channels 2 to 5, and the other for channels 3 to 6. The opening of Montreal's new station on channel 6, in addition to the station on channel 2, has created a demand for this new type of antenna.

Bunston Limited of Vancouver Appointed Canadian Agents

The firm of Bunston, Ltd., 2532 Wey Street, Vancouver, B.C., has been appointed sales representative in Western Canada for the Abolite Lighting Division of Jones Metal Products Co., West Lafayette, Ohio, U.S.A. Through their branch offices in Calgary and Winnipeg, they serve the electrical industry in British Columbia, Alberta, Saskatchewan, Manitoba and the Ontario lakehead regions.



ROY BUNSTON

Roy F. E. Bunston, General Manager, has been widely associated with the electrical industry in Canada for over 18 years. Before establishing the sales firm, he served in sales and electrical engineering capacities with Burndy Canada, Ltd., where he held the position of chief engineer.



NORMAN HANEY

Mr. Norman L. Haney, Branch Manager for Bunston, Ltd., Winnipeg office, has a wide industrial acquaintance in the electrical industry in Manitoba and Northern Ontario where he represented Canada Wire and Cable Co. Ltd.



J. A. LOBB

The Bunston, Ltd., Calgary branch is under the capable direction of James A. Lobb who has had 15 years of varied experience in the electrical industry. He was formerly with Cable and Wireless, Ltd.

Thor Acquires New Company

Thor - Canadian Company Limited have announced the purchase by their parent Company, Thor Corporation of Chicago, of the Phillips Control Corporation of Joliette, Michigan. The newly acquired corporation will be operated by Thor as a wholly owned subsidiary. Phillips Control products have a wide application in radar and microwave equipment, as well as electronic computing machines which play an important part in the nations defense programme. Civilian uses include manufacturers of radios, phonographs, broadcasting equipment, major home appliances, vending machines, welding equipment and machine tools. The addition of the Phillips Company to the Thor organization is another step in the planned expansion and diversification program of Thor.



F. M. MCGOVERN

Emphasis on the development of quality controls and a heavy programme of research and development which have been first line endeavours of the Phillips Control Corporation will be continued under Thor ownership.

(Turn to page 62)

OSCILLOGRAPH

(Continued from page 25)

order of magnitude of the errors which can be encountered are close to those calculated above.

These facts are often not fully realized, and the plots of relatively rapidly varying quantities are read to extreme tolerances simply because the chart happens to be a wide one, or because static calibrations have been made to such close tolerances, even though the finite response time of the recording system has provided errors five or ten times as great as the supposed accuracy of the measurement.

To summarize this discussion:

- The ability of a recording system to properly record rapidly varying signals of complex wave form is most easily and directly judged in terms of the "rise time" of the system as measured from the response to a "step" or square wave input.
- The conventional frequency response curve can vary widely in shape with only small differences appearing in the square wave response.
- The "delay time," which represents the interval by which the recorded trace is shifted bodily is equal to one half the "rise time."
- The rate of variation of input signals must be quite slow in relation to the rise time in order to insure good accuracy in the resulting record.

COAXIAL CONNECTORS R. F. COMPONENTS of proven quality



BNC SERIES
UG - 274 / U



TYPE C SERIES
UG - 707 / U



INDUSTRIAL PRODUCTS COMPANY
DANBURY, CONN.
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Manufacturers of a complete line of coaxial connectors of all types. Each component features the best electrical and mechanical characteristics proven necessary by laboratory tests.

Suppliers of a wide variety of allied components including coaxial switches, wave guide assemblies, panel connectors and cable assemblies.

Our catalog #7 gives complete data on the entire line. Write to attention Sales Department, Box 148, Danbury, Conn., U.S.A., or J. R. G. McVity & Company, 51 Dalewood Rd., Toronto 12, Ont. (Telephone HUdson 8-9457).

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**PRECISION ELECTRONIC
 COMPONENTS LTD.**

(Canadian representatives
 of G. M. Giannini Co.)
 560 KING ST. W. · TORONTO, ONT.

NEWS

(Continued from page 61)

**E. J. L. Kuhn President
 Ericsson Telephone Sales**

Announcement has been made of the opening of the first Canadian office of the world-wide L. M. Ericsson organization in the Castle Building here. Incorporated as Ericsson Telephone Sales of Canada Limited, the new company president is E. J. L. Kuhn.



The parent company, with head office and main factories located in Stockholm, Sweden, was established in 1876, and has been manufacturing equipment ever since. Today Ericsson intercommunication and telesignal operations cover all continents, with subsidiaries, factories or affiliated companies in about 75 countries.



● G. C. Freshwater, recently appointed to Manufacturing Project Co-Ordinator (Flight Simulators) at Canadian Aviation Electronics Ltd.

**D. M. Fraser Limited
 Celebrate 33rd Year**

D. M. Fraser Limited, manufacturers of electrical and mechanical equipment celebrated their 33rd year of business with the opening of a new plant at 1070 Birchmount Road recently.



G. M. FRASER



Late D. M. FRASER

The new building has been designed to give more spacious and modern facilities for office, engineering, warehousing and manufacturing activities.

Established almost 33 years ago by the late D. M. Fraser the firm is now headed by George M. Fraser who became President of the company on the death of his father three years ago.



● C. J. Konzuk, whose appointment to manager of installation and maintenance division of Canadian Aviation Electronics Ltd. has been announced by K. R. Patrick, President.

Stark Expands Plant At Ajax With Two Additional Buildings

Stark Electronic Instruments Limited has recently added two more buildings to their manufacturing facilities at Ajax, Ont. The new buildings give the company a total of 58,000 square feet of floor space in the Ajax industrial area.

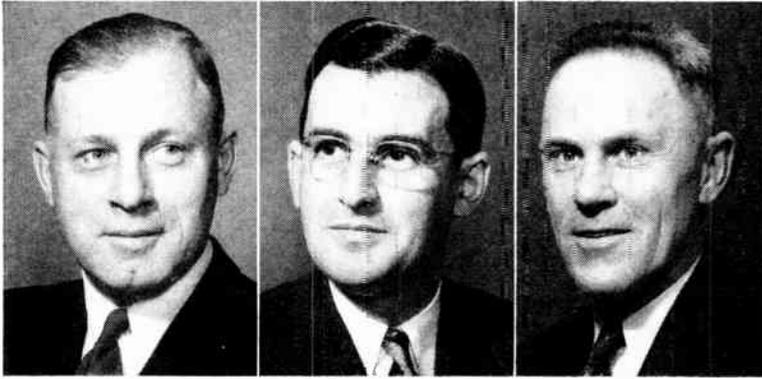
The Stark plant now consists of four buildings—the original plant of 16,000 square feet—the south plant, with 18,000 square feet of floor space, which the company moved into in 1950 and which is used for special

defense work. The central plant, consists of 14,000 square feet, which contains the general offices and the assembly department. And the north plant, consisting of 10,000 square feet, which houses the woodworking department, machine and paint shops. The three new buildings are joined by connecting hallways. And the whole plant, including parking space for more than 100 cars, covers an area of about 13 acres. The plant is now in full-swing and provides work for over 200 employees.

Appointments At Phillips Wires And Cables

Mr. T. A. Lindsay, Vice-President (Sales) of Phillips Electrical Co. (1953) Ltd., announces the appointment of Mr. F. W. Barnhouse as Sales Manager (General) Mr. E. M. Lloyd as Sales Manager (Specialties), and Mr. D. C. Brazier as Manager Central Region. Mr. Barnhouse was formerly manager of the wire and cable section of Canadian General Electric Co., Ltd., and has more than 18 years experi-

ence in this field. Mr. Lloyd has been the Canadian representative of British Insulated Callender's Cables and will continue to specialize in the sale of B.I.C.C. products in his new capacity with Phillips. Mr. Brazier was formerly Toronto District Manager, Automatic Electric (Sales) Ltd., and brings an extensive knowledge of the wire and cable industry to his new position.



D. C. BRAZIER

E. M. LLOYD

F. W. BARNHOUSE

Allen-Bradley Open New Galt Plant

Officers of the new Allen-Bradley plant recently opened in Galt, Ontario are: Keith H. Rapsey, Vice-President

and General Manager; William C. Smith, Sales Manager; George C. Burnham, Chief Engineer; John T. Dilly, Shop Superintendent; and John H. Heywood, Office Manager.

The new plant was recently opened

with an open-house party which was attended by more than 2,500 guests.

Nova Scotia Power Commission Installs Submarine Cable

The Nova Scotia Power Commission recently installed a submarine cable in the passage between Grandique and Lennox in Cape Breton. The Lennox Passage is about 2,780 feet wide and the cable laying job was made difficult by available cable handling equipment and weather conditions.

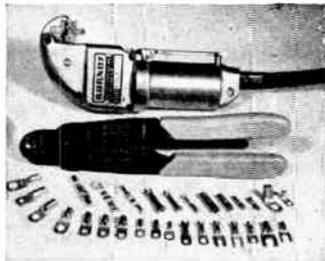
The Power Commission conducted scale model tests and consulted Naval Architects on the job of handling the loaded reel of cable weighing about 40,000 pounds as there was some doubt of the stability of the available barge.

The cable supplied by Canadian General Electric Company is a three conductor paper insulated lead covered submarine type with steel wire armour rated at 25,000 volts.

From the special 108 inch reel on the flat car the cable was rewound to a reel on the barge and then towed to the site of laying. Reeling the cable, from the flat car to barge, towing the barge to the starting point and laying the cable in slack tide required considerable planning and co-ordination. Unfavourable weather conditions could have played havoc with the heavily loaded barge.

Now in service, this cable is feeding a 600 KVA substation on Isle Madame.

COMPRESSION TERMINALS and LINKS



All types, all sizes quickly, easily installed with wide variety of matched tooling

All sizes of solderless lugs and links for all conductors and all applications in manufacturing and plant wiring can be rapidly, economically installed by means of Burndy tooling, coordinated with specific manufacturing methods and production requirements.

Burndy Hylugs and Hylinks are of one-piece, pure copper construction, so they can be indented on any side of the barrel and they can't split. There are no intermediate contact surfaces — current is carried by the entire cross-section. Plated to resist corrosion. Listed by Underwriters' for #22 through 2000 Mcm.

Intimate high-pressure contact between conductor and connector is assured by Burndy matched installation tools. Manual, hydraulic, and pneumatic tools are designed for portable, on-the-job use and for production bench operation.

For complete details and catalogs, write

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"Helineers" Characteristics of Precision Servo Computer Potentiometers

by Donald C. Duncan

Reprints of a talk presented at the American Institute of Electrical Engineers Conference on Feedback Control Systems are now available. A copy is yours for the asking.



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SOUTH PASADENA, CALIFORNIA
...first in precision potentiometers

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available **NOW . . .**



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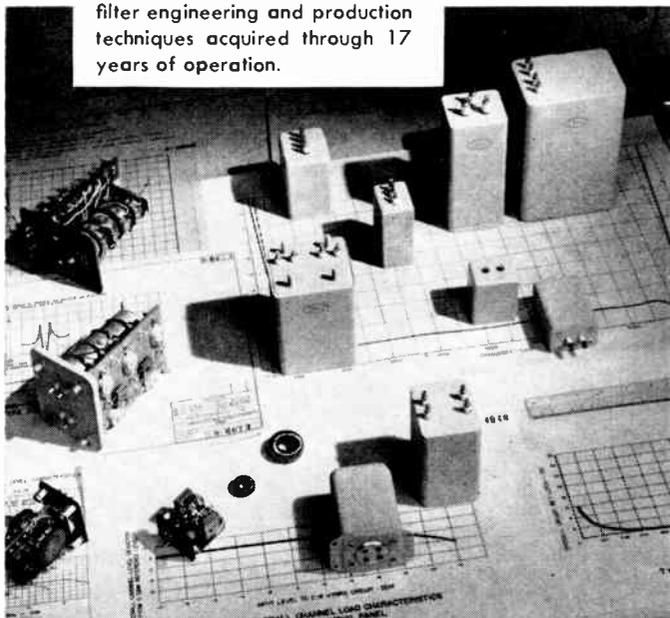
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FILTERS

POWDERED IRON CORES

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—each component backed by the comprehensive knowledge of filter engineering and production techniques acquired through 17 years of operation.



L-5318

Distributor in Canada

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LETTERS TO THE EDITOR

Dear Sir:

I read with interest each month the progress of electronics in Canada through your fine magazine. I notice in your December issue an article entitled "Satellite Station or Community Antennas." You are certainly correct in that this is a controversial subject here in the United States.

One of the most controversial phases of this subject, is the inability to economically get a community antenna signal or a satellite signal to the point of remote pickup to cover the fringe or rural area. The fact is that the community TV broadcasters or those desiring to install satellite transmitters are unable to use microwave in this country, and until such time as the FCC renders a decision on this matter, the progress will be slow.

Since there is no microwave frequency problem in Canada, it would seem logical that many rural areas could be served network programs and support a satellite of community TV system provided it were possible to interconnect with the main station transmitter.

Very truly yours,

RAYTHEON MANUFACTURING COMPANY,
L. A. Rooney, Manager,
Communications Equipment Sales.

Dear Sir:

We were very much interested in the Editorial on Page 13 of your July-August issue under the heading "Is This Tax Worthwhile"?

As industrial instrument manufacturers we have been faced with the fact that for the most part we get less tariff protection than the manufacturers of machinery. Furthermore, as pointed out in your editorial, instruments become duty free not only to hospitals, universities and research bodies but to companies engaged in the manufacture of fertilizer or in the production of oil. Other companies are allowed to bring in instruments duty free under Special Orders-in-Council for individual projects.

Many of the basic parts going into instrument production must be brought in according to materials at much higher rates of duty than are applicable to the finished product. On the other hand television manufacturers in Canada have an exclusive sales franchise on sets using a screen 14" or larger. These same manufacturers may bring in most of their parts on a duty free basis.

We do feel that present tariff regulations are detrimental to scientific instrument manufacturing in Canada.

Yours sincerely,

John H. Bolton
The Foxboro Company Ltd.
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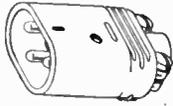
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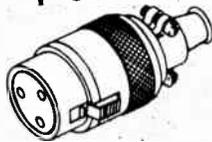
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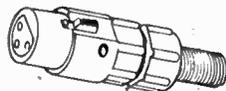
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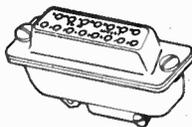
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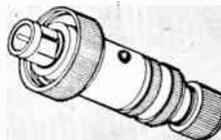
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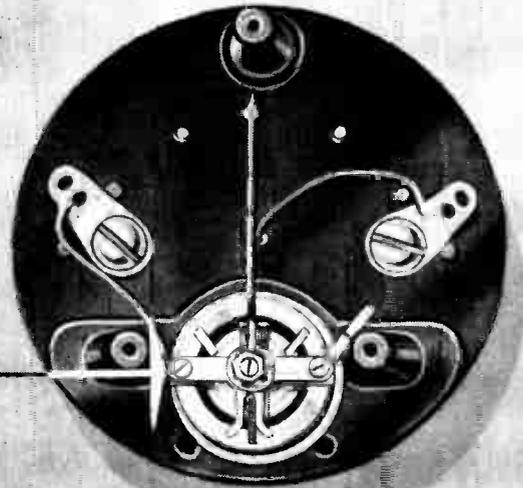
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