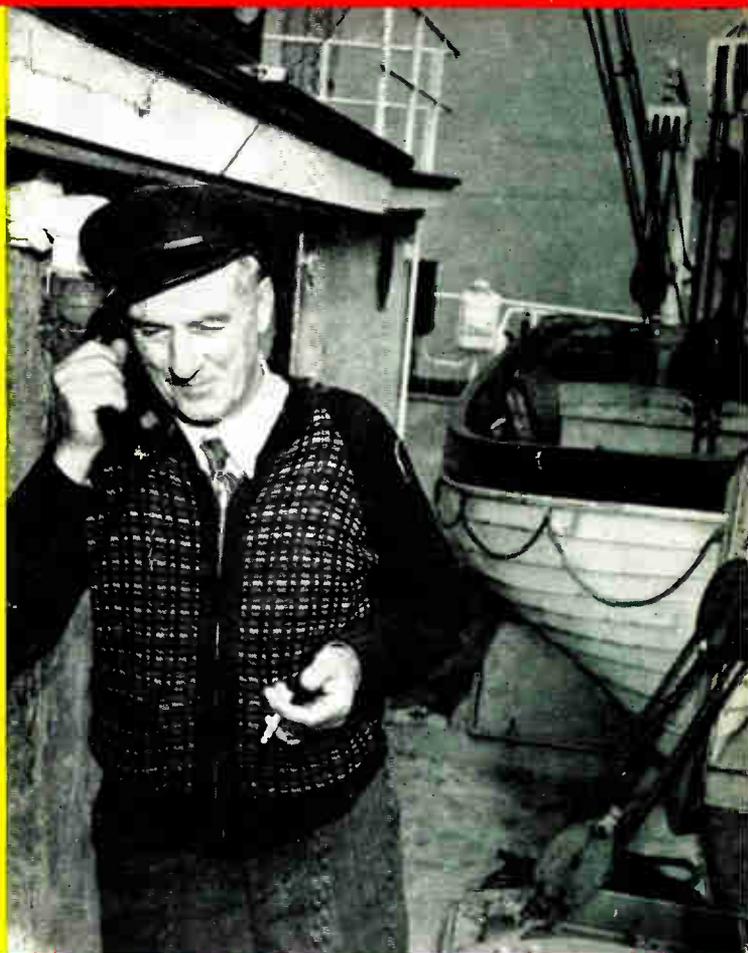


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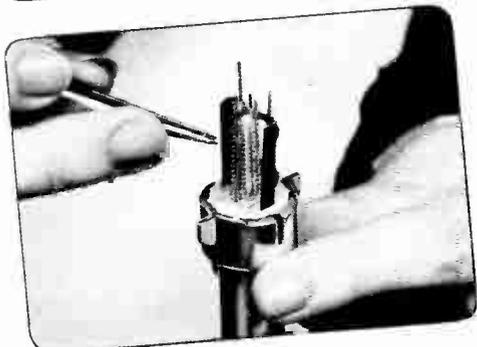
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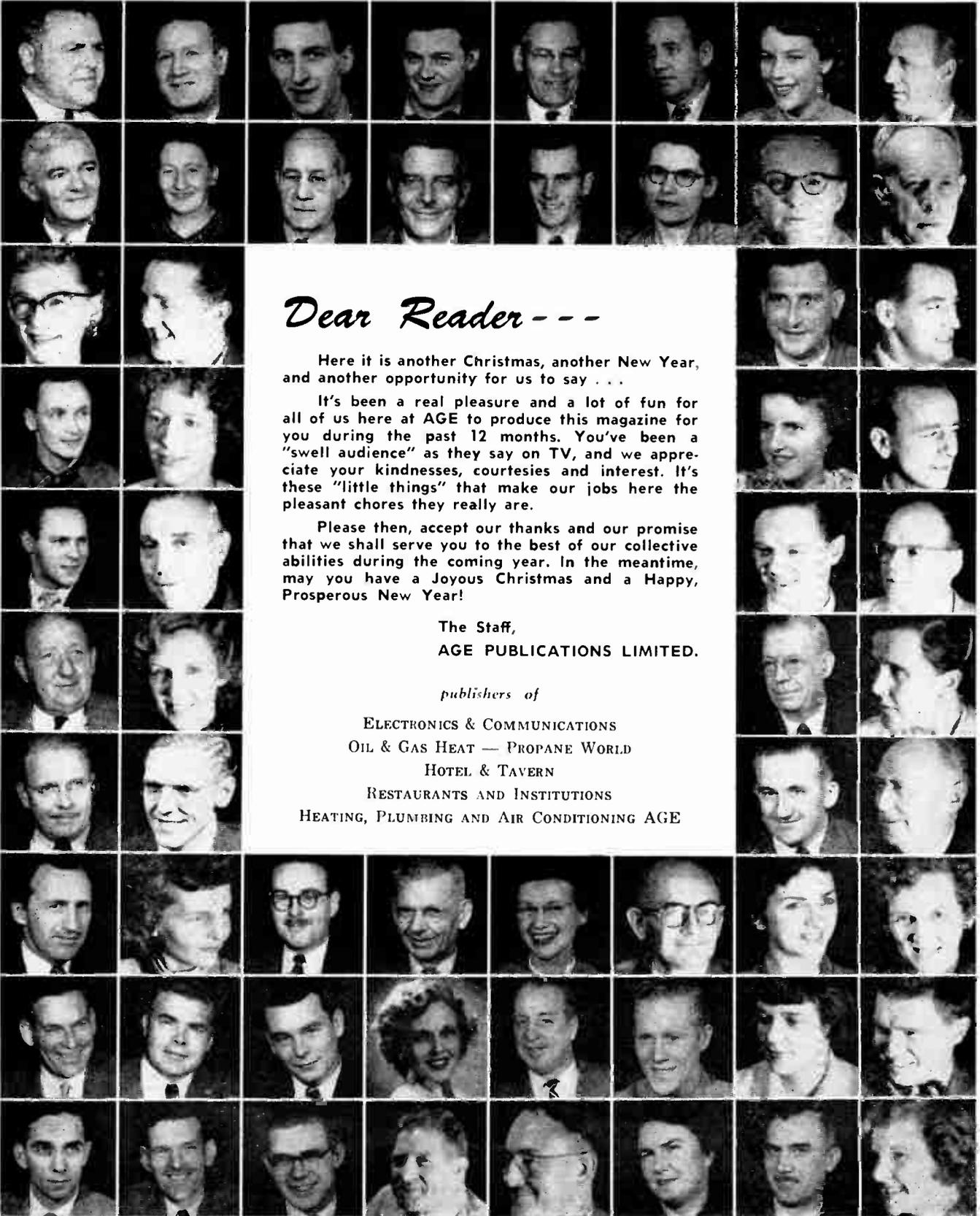
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Dear Reader ---

Here it is another Christmas, another New Year, and another opportunity for us to say . . .

It's been a real pleasure and a lot of fun for all of us here at AGE to produce this magazine for you during the past 12 months. You've been a "swell audience" as they say on TV, and we appreciate your kindnesses, courtesies and interest. It's these "little things" that make our jobs here the pleasant chores they really are.

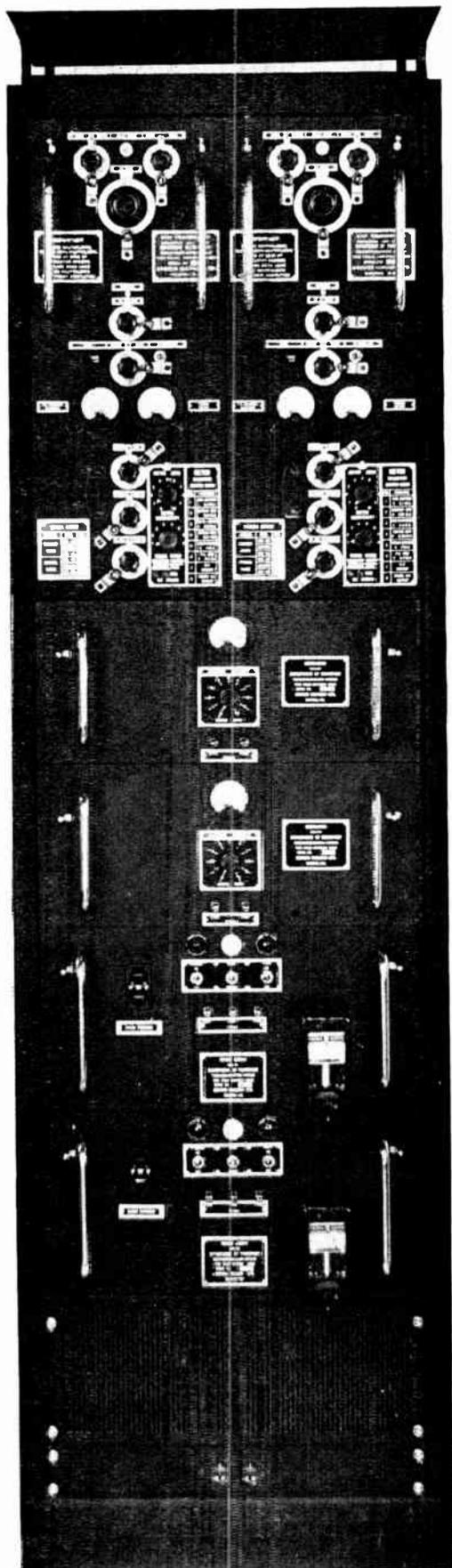
Please then, accept our thanks and our promise that we shall serve you to the best of our collective abilities during the coming year. In the meantime, may you have a Joyous Christmas and a Happy, Prosperous New Year!

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APPOINTMENTS

Frank M. Squires Sales Promotion Manager

New Sales Promotion Manager for the Ferranti Electric Limited, Mount Dennis, Ontario, is Frank M. Squires. Prior to his new appointment Mr. Squires was with the Ontario District Sales office of the company in which branch of the Ferranti organization he has served since graduation from the University of Toronto in 1949.

In the capacity of Sales Promotion Manager, Mr. Squires will be in charge of the advertising and sales promotion of Ferranti transformers, voltage regulators and kilowatt-hour meters.

K. A. Hovington To Manage Cossor Branch Office

Cossor (Canada) Limited, have opened a Montreal office at 758 Victoria Square, Montreal.

Cossor, a self-governing member of the A. C. Cossor group of companies, are designers of electronic equipment for us in industry, medicine, communications and navigation.



Mr. Kenneth A. Hovington has been appointed as branch manager and will be responsible for sales and contract

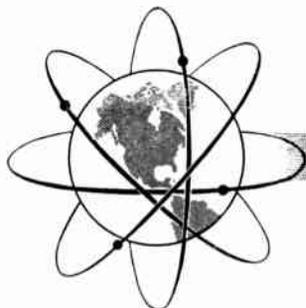
administration in the Province of Quebec and in Ottawa. Mr. Hovington was born in England, and served during the war as an observer in the Royal Naval Air Force. He also spent some years assisting in the development and procurement of radio and radar equipment for the Naval Air Service. At the end of the war, Mr. Hovington came to Canada where, before his arrival in Montreal, he was in business in Vancouver.

G. H. Pescud To Head C.P.R. Communications

George H. Pescud, Assistant General Manager of Communications of the Canadian Pacific Railway since 1950, and a veteran of 30 years' service with Canadian Pacific, has been appointed General Manager of Communications for the railway. He succeeds W. D. Neil, who retired after 48 years with the company. Mr. Pescud, formerly General Superintendent of Communications at Winnipeg, has been succeeded by Leonard H. Hamson.

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NOVEMBER-DECEMBER, 1953



ELECTRONICS *and* COMMUNICATIONS

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business briefs & TRENDS

★ **ROBERT W. OLIN**, National Chairman of the National Forest Industries Communications, states that many times the cost of the forest industries communications systems has been saved in forest wealth by the quick action brought about by communications in the prevention and fighting of forest fires.

★ **IN ORDER TO MEET** the increasing demand of orders from the Bell System and Independent Telephone companies in the United States, the Lenkurt Electric Co., of San Carlos, California, has now started full scale production. A backlog of orders for 45A equipment totalling more than 700 channel terminals is now on the company's books. The company also has further orders for nearly 300 channel terminals for a new type of 45 equipment which it is intended to introduce next year.

★ **SEVEN HOSPITALS** in the United States and Canada have now installed Betatron units. A further unit is now being installed at the Royal Victoria Hospital in Montreal. Acceptance of the Betatron in medical therapy to supplement high voltage X-ray equipment has given further impetus to the fast expanding medical electronics business.

★ **IN 1935 ONLY 6 PER CENT** of the United Kingdom's radio equipment production could be classified as industrial. Today, industrial apparatus makes up 45 per cent of its production. In 1952 Great Britain exported 21.8 million dollars worth of component parts and 22.4 millions in transmitters. Around two-thirds of Great Britain's exports went to Commonwealth countries.

★ **TWO-WAY RADIO EQUIPMENT** installed on six material handling vehicles of the U.S. Army at the Augusta, Georgia Arsenal, at a cost of less than \$3,500 will save the army \$20,000 during the first year of operation it has been reported by the General Electric Company, manufacturers of the equipment.

★ **WHILE THE DEVELOPMENT** of colour TV is going on a-pace in the western democracies, Russia is still having trouble after eight years of experimentation. Russian video sets are reported to be inadequate in quality with prices so high that only government financed clubs, sanitoriums and state institutes are able to purchase them.

★ **RADIO COMMUNICATIONS** for the control of oil pipe lines is growing in popularity in the United States. Latest companies to plan on its use are the Colorado Interstate Pipeline Company and the Yellowstone Pipeline Company. Here in Canada the Bell Telephone Company of Canada in cooperation with the Manitoba, Alberta and Saskatchewan provincial telephone systems have set up a communications service for the world's longest continuous pipeline. The pipeline stretches from the Alberta oil fields 1,765 miles to eastern Canada.

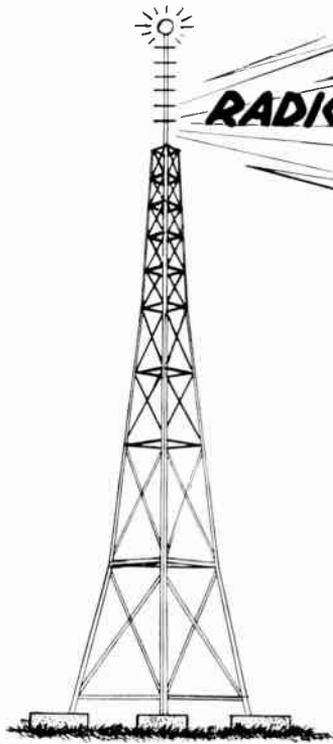
★ **DR. W. R. G. BAKER**, Vice-President of the General Electric Company has predicted that 1954 will see the production of 50,000 to 75,000 colour TV receivers and the following year this figure will be increased by four or five times. Estimates of cost for 14 inch colour sets range from \$800. to \$1,000.

★ **DEMANDS FOR SERVICE** on the Bell Telephone Company of Canada are at the highest level in the company's history. So far this year more new telephones have been added to the system than in any corresponding previous period of time, according to Mr. Thomas W. Eadie, President of the Bell Telephone Company of Canada.

★ **REFLECTING THE PACE** of the American electronics industry is the recent breaking of ground by the Stromberg-Carlson Co., for the construction of facilities which will triple the size of the firm's electronics engineering department.

★ **THE CANADIAN BOARD** of Transport Commissioners have approved plans of the Bell Telephone Company of Canada for the issue of 1,940,000 shares of capital stock. The stock will raise \$60,000,000 which is required to finance new construction for the company.

★ **THE GENERAL TELEPHONE SYSTEM**, now the second largest telephone system in the United States is now serving over 4000 communities in 19 states in that country, and have their own manufacturing company and directory company.



RADIO TELEVISION ELECTRONIC EQUIPMENT

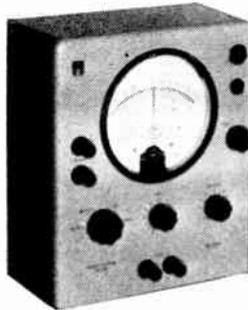
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BL-1507

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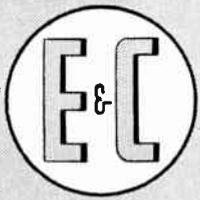
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EDITORIAL

One Way To Cut Costs----!

The National Association of Manufacturers in the United States have presented a petition to the American Federal Communications Commission seeking frequency allocations and rules for a manufacturers' radio service. This action has been prompted by the concern of the many users of two-way industrial radio regarding the uncertainty of free and uninterrupted use of existing mobile communications systems, availability of microwave frequencies for point to point communications and multiple frequency mobile use.

Prior to the presentation of the petition officials of the National Associations of Manufacturers demonstrated to F.C.C. officers the extreme significance of existing two-way radio systems to manufacturers and the still greater possibilities if adequate frequencies are made available. The demonstration pointed up how

cost savings, operating efficiency and increased industrial safety could be realized with the use of two-way radio.

The action of the National Association of Manufacturers in attempting to secure solidification of their position with respect to the use of two-way industrial radio communications is evidence of the high esteem with which responsible management now regards this form of business control.

If further proof of the value of two-way industrial radio is needed it should suffice to mention the case of the installation at the Augusta, Georgia Arsenal of the U.S. Army. The installation in this establishment cost \$3,500 and it is estimated that it will save \$20,000 in the first twelve months of its operation.

What's Your Problem----?

The electronics market is wide open! There seems to be no limit to the versatility of electronic equipment. In the short space of time since the war it has been proved capable of serving manifold functions in science, industry and commerce. But, as widespread as the use of electronics has become, it is not as great as it may be. This thought persists with us and is strengthened by the news that one large manufacturer of electronic equipment has seen fit to offer substantial cash prizes for the discovery of new applications for their products.

There seems little reason to doubt that electronics can be made to serve an ever broadening field and if

new uses are to be found it is reasonable to assume that they should be sought out from within industry itself. The importance, therefore, of educating business management generally with respect to the possibilities of electronics is of paramount significance to the manufacturer of electronic apparatus.

That this situation is now apparent to the industry is evidenced by the fact that cash prizes are being offered as an initial means of stimulating businessmen at large to search for further applications of electronics within their own plants.

Satelite Station or Community Antennas?

A bone of contention amongst some TV manufacturers in the United States has arisen as the result of criticism levelled at the merits of community antenna systems as opposed to TV satellite or booster stations. The argument would appear to devolve around the point of whether fringe and remote areas are served better by satellite stations or community antenna systems. It is pointed out that a satellite station affords no choice of programs whereas the use of community antenna systems offers the public as many as 3 to 7 channels.

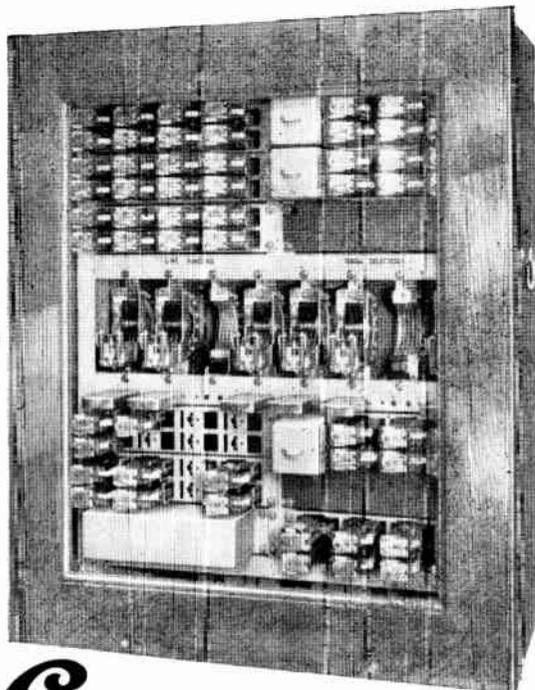
Since the selection of either a satellite station or a community antenna system would seem to us to be dictated economically by the location of the area and the number of people to be served, rather than by the program selectivity of either system, it is considered that there is little room for any justifiable argument or

criticism of the respective systems on the basis of their technical merits.

Surely, from an economic standpoint, a remote area with a small population could be served better by a satellite station rather than the laying of an expensive co-axial cable system over long distances, while a more thickly populated fringe area could be better served by a community antenna system with reasonable assurance of monetary return on the higher investment involved in providing such a system.

This, at least, is the way the situation is viewed from our position in Canada and since Canada has been mentioned in one of the arguments put forth in the controversy we herewith note our opinion. Summed up briefly, there seems to be lots of room for both types of service in this country.

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APPOINTMENTS

(Continued from page 7)

Recent CAE Appointments

Mr. K. R. Patrick, President and Managing Director of Canadian Aviation Electronics Limited, recently announced appointments to administrative posts. Mr. Charles F. Moor has been appointed Assistant to the President, while Mr. John W. Paddon will serve as Manager of the Commercial Division. In this position Mr. Paddon will guide the company's commercial policy including the direction of sales and advertising of CAE industrial products and services.

Mr. Moor's appointment as assistant to the President will co-ordinate the activities of CAE branches which extend across the country together with those of head office soon to be located in the new CAE building on Cote de Liesse Road in Montreal.

John S. Plewes Named Canadian Representative

John S. Plewes has been named sales representative in Canada for National Electric Products Corporation's line of television products, it was announced recently by Mr. Frank P. Yarussi, the firm's TV Department Sales Manager.



Mr. Plewes, until recently General Sales Manager of National Carbon (Eastern) Ltd., Singapore, will cover the provinces of Ontario, Quebec, New Brunswick, Prince Edward Island, Nova Scotia and Newfoundland.

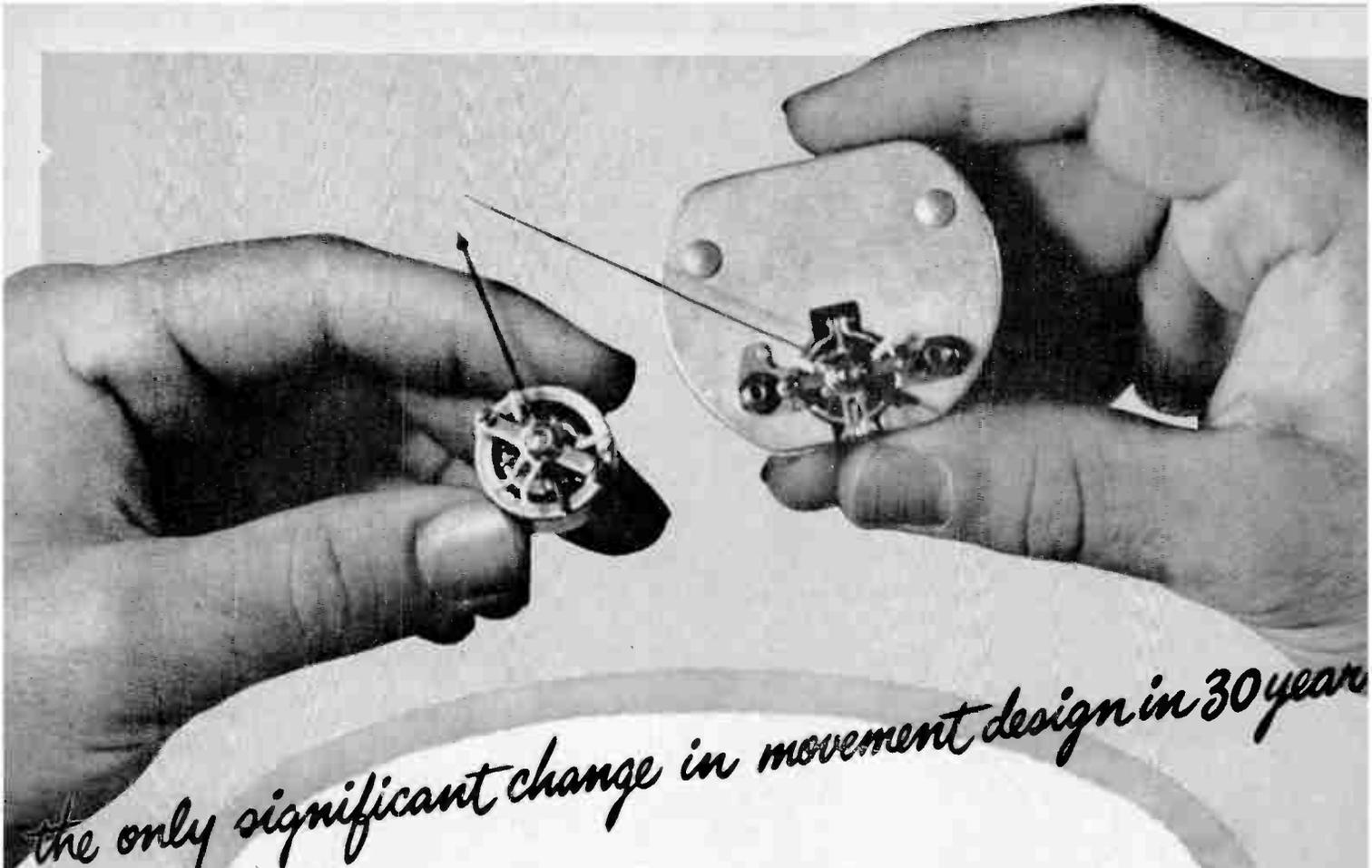
A 1930 graduate of Queen's University at Kingston, Ont., Mr. Plewes has spent many years in the Far East, Australia and London in sales and exporting.

T. V. Sweeny Appointed Sales Manager

H. A. Rice, Manager of the Commercial Products Division of the Canadian Marconi Company, Montreal, has announced the appointment of T. V. Sweeny as Sales Manager of the division.

Mr. Sweeny is a widely known figure in the Canadian electronics industry. A graduate of Acadia University, he served for six years in the Canadian Army during the last war and following his discharge joined the Canadian Marconi Company in 1947, in the capacity as sales engineer.

Latterly Mr. Sweeny has been Product Sales Supervisor of nuclear measuring and electronic instruments in which position he worked in close cooperation with Chalk River and Marconi scientists in the development work and application of various systems and apparatus for nuclear research.



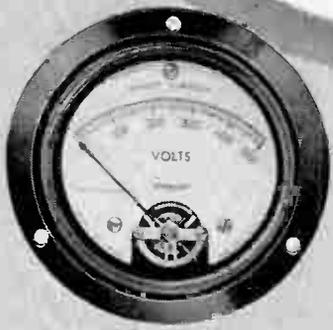
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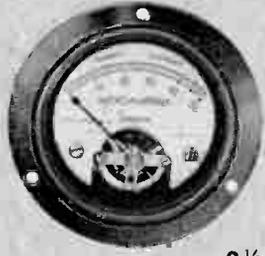
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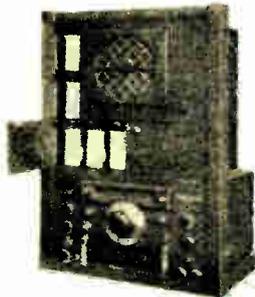
HERE NOW

Here now — the HRO Sixty — latest and greatest of a great series! Now, in addition to all the wonderful features of the HRO-50T1, you get **DUAL CONVERSION** on all frequencies above 7 mcs. **PLUS** 12 permeability-tuned circuits in the 3 456-kes. I. F. stages! Other new features include current-regulated heaters in the high-frequency oscillator and the 6BE6 mixer. High-frequency oscillator and S-meter amplifier are voltage regulated.

Be sure to see and hear the ultimate — the **HRO Sixty!**

HRO-60C (HRO-SIXTY)
Rack Receiver with rack, speaker and 10-coil compartment. Coils A, B, C, D included).

Standard finish,
smooth grey.



MAIN CHARACTERISTICS

Power Output: 8 watts undistorted, push-pull audio amplifier, fidelity ± 2 db 50-15,000 cycles at phono input.

Sensitivity: 1 microvolt or better at 6 db sig./noise.

Selectivity: Variable from 8 kc. overall to about 1200 cycles at 40db

Image Ratio: Better than 65 db. at any frequency up to 35 mc.

Drift: Negligible after warm-up.

Calibration: Direct frequency reading. 1 scale in view at a time. Additional scales can be added at any time.

Shipping Weight: 100 lbs. incl. spkr. and 4 coils.

Dimensions: Table Model — 19 $\frac{3}{4}$ " wide x 10 $\frac{1}{8}$ " high x 16 $\frac{1}{2}$ " deep. Rack Model — 19" wide x 10 $\frac{1}{2}$ " high x 17 $\frac{1}{8}$ " from rear of front panel incl. 1 $\frac{1}{8}$ " handle.

Coverage: 50-430 kc., 480 kc.-35 m.c. And 50-54 mc. Voice, C.W., N.F.M. (with adapter)

TUBE COMPLEMENT: 6BA6, 1st r.f.; 6BA6, 2nd r.f.; 6BE6; mixer; 6C4 h.f. oscillator; 6BE6, 2nd high-frequency conv.; 6SG7, 1st i.f.; 6SG7, 2nd i.f.; 6SG7, 3rd i.f.; 6H6 det. & a.v.c.; 6H6, a.n.l.; 6SJ7, 1st audio; 6SN7, phase splitter and S-meter amp.; 6V6GT (2) p.p. audio; 5V4G, rect.; 6SJ7, b.f.o.; OB2, volt reg.; 4H4 osc. Fil. Cur. Reg.

Radiotron & Radio Parts Division

CANADIAN MARCONI COMPANY

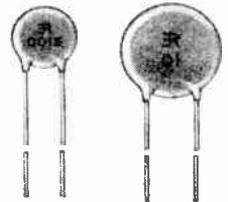
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VANCOUVER • WINNIPEG • MONTREAL • HALIFAX • ST. JOHN'S, Nfld.

OUR NEW CANADIAN PLANT—

the result of the ever increasing demand

for ERIE PRODUCTS



Erie Disc Ceramicons
Up to .02 MFD

Type 557
Ceramicon Trimmer



1.5-7 MMF
3-12 MMF
5-25 MMF
5-30 MMF
8-50 MMF



In keeping with the industrial growth of Canada and to meet the immediate and future growing demands for ERIE products, a modern new and much larger plant in Trenton, Ontario, has been erected.

The new plant covers more than four times the area of our present location in Toronto and is being equipped with the latest devices for the efficient production of CERAMIC Dielectric Capacitors. In addition to our present line of Resistors, Suppressors and CERAMIC Capacitors, sufficient space has been allotted for the production of products heretofore made only in our plants in Great Yarmouth, England, and Erie, Pennsylvania, U.S.A.

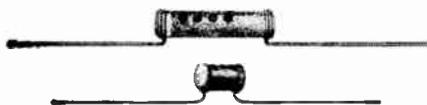
Type 535
Tubular Trimmer



Type 531 and 532
Tubular Trimmers
0.5-5 MMF
1-8 MMF

ERIE RESISTOR OF CANADA LIMITED

7 Fraser Ave. • Trenton, Ont.
Factories: Trenton, Ontario; London, England; Erie, Pa.



Temperature Compensating
Dipped Insulated Ceramicons
0.5 MMF — 1,800 MMF

Erie "GP" Dipped Insulated Ceramicons
5 MMF — 5,000 MMF

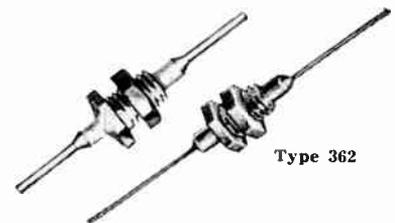
Erie "GP" Non-Insulated Ceramicons
5 MMF — 5,000 MMF



Erie Ceramic Insulated
Solid Carbon Resistors

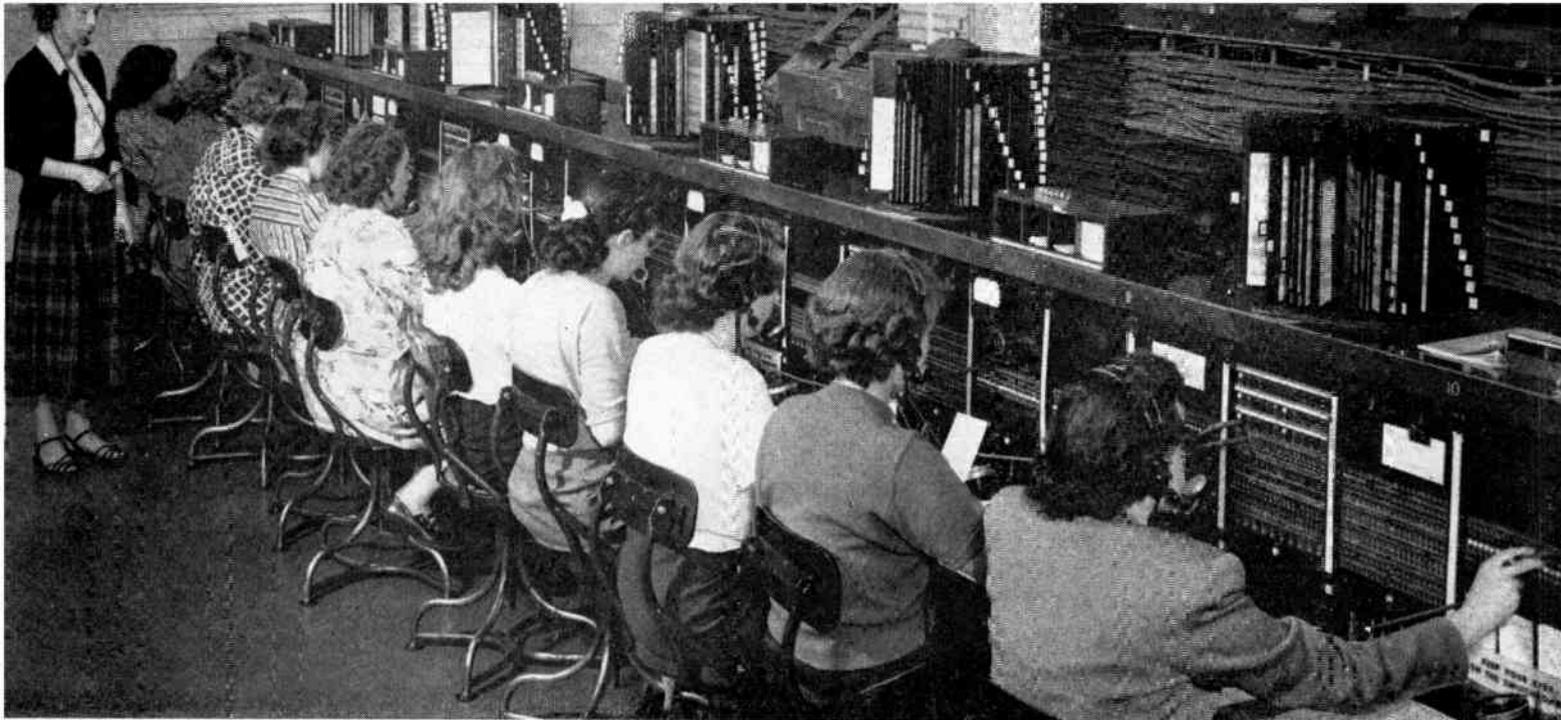
Type 9 — ½ watt
Type 8 — 1 watt
Type 10 — 2 watt

Type 357



Type 362

Feed-Thru Ceramicons
5 MMF — 1,000 MMF
5 MMF — 1,500 MMF



● The radio telephone switchboard, located in the long distance office in downtown Vancouver.

In the following account of radiotelephony in British Columbia the author claims that medium frequency AM systems are the cheapest form of radiotelephony but also the least reliable. Northwest Telephone Company engineers also feel that the AM network in Canada's westernmost province has reached its maximum expansion and no major enlargement in this phase of radiotelephony is planned for British Columbia.

In the next issue of *Electronics and Communications* a highly informative article on AM and FM systems prepared by Ivor Nixon, of Pye (Canada) Limited, describes the characteristics of both systems. In Mr. Nixon's article it is pointed out that competent engineering groups regard the two systems as complimentary rather than competitive although there are many applications where both are technically suitable.

The Editor.

ISOLATION is one of the biggest obstacles in the successful operation of British Columbia's primary industries, logging, fishing and mining. For logging camp or booming ground — for packer, seine boat or cannery — for pit-head or survey party — communication is essential.

Supplying this need for communication through a large and ever-expanding radiotelephone network is the North-west Telephone Company.

Admirably suited, not only to the large coastal fleet but also to the rugged terrain of the sparsely settled main portion of the province, radiotelephony has made great strides in the 23 years of its existence in Canada's westernmost province. Nearly 2500 vessels and more than 400 land stations and vehicles go to make up one of the largest radiotelephone networks on the North American continent.



● A technician is shown checking the equipment inside the receiving station at Point Grey.



Market For Microwave----!

RUGGED ISOLATION---

Defeated By Radiotelephony

By FRED H. MOONEN

More recently, radiotelephony has come of age in another field in which it is proving eminently successful. This is the use of FM radio channels as toll circuits where the erection of pole lines and wire circuits is made impractical by terrain difficulties.

Historically, radiotelephone service was inaugurated in British Columbia in May, 1930, when service was provided across a 30 mile stretch of water from Campbell River on Vancouver Island, to Powell River on the Mainland.

Today, with both AM and FM systems in operation, there are nearly 2500 ship stations alone. Most of these, of course, are AM.

Added to the ship services are 72 mobile sets in operation. Subscribers to this type of service include construction companies, public utility companies, private business men, commercial photographers, newspapers and other such individuals whose need for instant communication makes radiotelephone mobile service the only feasible type.

Land stations, numbering 262 AM installations and 75 FM sets, are scattered throughout the province, and are similar in nature to "toll stations" in ordinary telephone usage.

The importance of the telephone system to the residents and industrial operations in the remote sections of B.C. cannot be underestimated.

In a strict dollars and cents matter, a coastal logging operator pointed out that the airplane and the radiotelephone — with which he has never been without — have been the two main reasons for a lot of operators staying in business. As he said, "You break a piece of rigging, or a donkey boiler blows . . . you just 'phone Vancouver, and the part is on the plane and out to you without any delay. Before, it meant a hike down to the nearest port of call for the weekly steamer, a wait 'til it got in and went to Vancouver, and then another week's wait until the part was back. If it was a major item, you'd be shut down for a long while. Thank God it's not that way now — you're never shut down for more than a few hours."

Medium frequency AM systems are the cheapest form of radiotelephony but also the least reliable. For example, there are times in the area served by the North-west Company that atmospheric conditions cause the signal to weaken and become inoperable. Then, too, there are not enough channels to serve everybody since the overall group of frequencies in which the company's 12 channels are located is crowded with assignments for air line companies, regular shortwave broadcasts and other such groups.

The situation is further complicated because in joining the radio system with land toll lines it is necessary to use a pair of assignments for each of the channels. Then too on smaller craft, of which the majority of the

system is made up, the receiver and transmitter are so close together that they would interfere with each other if operated at the same time. The distance between the Vancouver transmitter and receiver (the former being located on Lulu Island, and the latter on Point Grey, several miles away) is made necessary because both the receiver and the transmitter of the terminal must be in operation at the same time.

Once again, AM's limitations make it necessary to allow considerable distance between re-uses of frequency assignments.

North-west Telephone Company engineers feel that the AM network has about reached its maximum expansion because of the lack of new frequencies, although stations can still be added. However, no major expansion in this phase of radiotelephony on Canada's west coast is planned.

The higher frequencies, employing FM, are being exploited as quickly as equipment can be designed and manufactured for use. Greatest use is being made of 150-170 megacycle range. Point-to-point, mobile and ship stations



● The exterior of the receiving station at Point Grey, near Vancouver. This is a ship-to-shore receiving station.

are using the FM system, with more and more former AM users switching over.

One of the greatest advantages of Frequency Modulation equipment is its adaptability to carrier. Thus, in place of one conversation on each pair of frequency assignments, many voice circuits can be superimposed on the one frequency. In its use as a toll line, then, this type of radiotelephone communication rivals ordinary wire transmission, because the number of relay points for the radio circuit roughly corresponds to the number of repeater stations needed on a long-haul carrier toll line, thereby equalizing the cost. The higher cost of terminal equipment is balanced by obviating the construction of the toll line.

In this regard, the North-west Telephone Company has undertaken two major toll circuit projects. The first of these extends up the coast from Vancouver to the northernmost tip of Vancouver Island.

The usefulness of this chain of stations is not limited to the provision
(Turn to page 36)

Guinea Pig--- TV TUBE

AN electronic "guinea pig" is being employed in RCA's Lancaster (Pa.) picture tube plant to help produce a new video tube that will provide a sharper picture and longer life than those made by conventional methods.

The unique device, developed in collaboration with engineers from Minneapolis-Honeywell's industrial division in Philadelphia, is used to monitor temperatures in straight-line exhaust ovens at the plant. As the tube passes through these ovens the glass envelope is freed of gas by baking at high temperatures.

According to engineers this is one of the most important production stages in the manufacture of picture tubes. The high temperatures must be rigidly controlled for each type of picture tube and held to the prescribed limits. If this isn't done, strains may be set up in the glass, particularly at the face-plate and wall of the tube, which lead to breakage.

Guinea Pig Tube

By monitoring the exhaust oven temperatures, the "guinea pig" furnishes a consistently reliable measurement of critical temperatures, permitting adjustment to be made if needed.

The "guinea pig" consists of a sample tube with five thermo-couples attached outside. These are, in turn, attached to an electronic potentiometer — a temperature measuring instrument developed by Honeywell.

At intervals during the day the "guinea pig" travels through the exhaust ovens, emerging with a charted temperature reading for the particular tube in production. Temperature deviations are quickly spotted and necessary adjustments made immediately. Corrections can be made quickly because the recorder indicates the exact location in the oven of such temperature deviations. Exhaust schedules for new tube types can be readily established and evaluated by running "a curve" as the "guinea pig" rides through the oven.

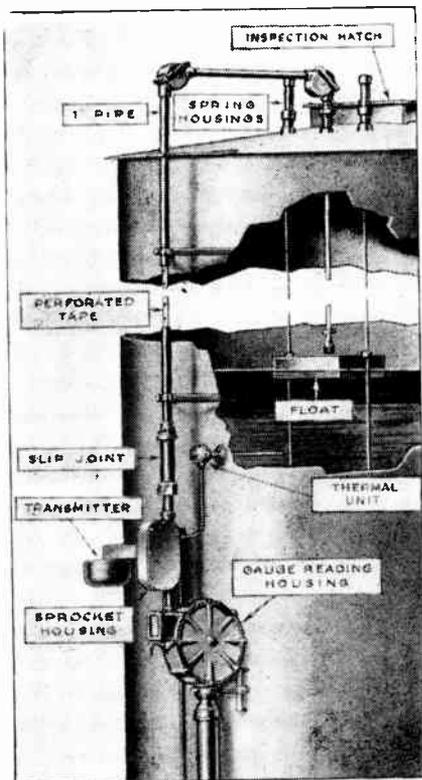
Larger Tubes Now Possible

In conventional tube manufacturing, engineers point out, the lack of precise temperature control too often results in erratic baking temperatures and subsequent too rapid cooling. These two factors set up internal stresses which lead to breakage.

The virtual elimination of breakage should not only have an effect on reducing manufacturing costs, but make feasible the manufacture of larger picture tubes than are available today.

Split Gallon Accuracy For OIL STORAGE CONTROL

UNTIL comparatively recently stock-taking in large oil refineries presented a problem involving considerable time and labour. Even in smaller refineries with installations of no more than one or two dozen tanks measurement of bulk oil storage required the services of gaugers to visit each tank to determine the contents by means of measuring with a steel tape. In the larger refineries with many hundreds of tanks, gaugers rode around the installations on a bicycle or in a truck in pursuit of their task, confronted with the laborious chore of climbing to the top of each tank, dropping in their steel measuring tape, taking their reading, recording it, re-winding their tape and proceeding to the next tank to repeat the performance.



● The versatility of Varioplex makes its application to other remote control problems of industry entirely practicable and in keeping with the responsibilities placed on management for accurate control equipment.

Inventory control of oil storage installations is a highly important part of the business, and exact measurements are essential. In a 60-foot diameter tank, for instance, a discrepancy of one inch in the sounding would mean an error of 1600 gallons of oil.

With more and more tank storage capacity being built to cope with the increasing demands and production of oil it became apparent that some would have to be devised. The answer was provided by the development of an automatic electrical system which enabled gaugers to read the quantity of oil in a tank from gauge meters at the bottom of the tanks. Although this system was an improvement over the earlier method of measuring oil it did not provide the perfect answer. Motors used with this type of system were difficult to keep synchronized and the system, due to the high cost of wire installations, became uneconomical for distant reading systems in excess of 10,000 feet.

Electronic System Solves Problem

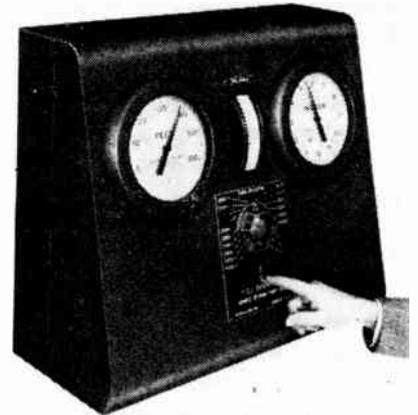
Recently however, an American company of engineers specializing in the manufacture of remote gauging systems have perfected an electronic method known as Varioplex. Varioplex, it is claimed, has practically no distance limitations and operates on the principle of changing measurements of depth into electrical impulses which are carried over wire circuits to a central recording point where they are converted to gauge readings. It is claimed that the new system of electronic depth determination can be readily adapted to existing gauge installations.

Perhaps one of the most unique features of the Varioplex system is that the electrical impulses which measures the depth of oil in a tank can be carried over existing telephone wire circuits without interrupting the voice channel facilities of the telephone circuit.

As a precautionary measure many oil companies have their installations at a safe distance from their administration offices but maintain line communications between the two establishments. The ability of Varioplex to carry depth reading impulses over existing communications on lines is

a point of great importance to such companies as it obviates the necessity to install special communication circuits for the new method of stock control. The need of line communications between bulk storage installations and the recording centre is not, however, necessary as the depth measuring impulses can also be transmitted by microwave.

At the present time the manufacturers of Varioplex are concentrating their production capacity on the manufacture of equipment for the petroleum industry. When the requirements of this industry have been satisfied it is anticipated that Varioplex equipment will be produced for the electronic gauging of fluid materials held in bulk storage and for the measure-



● The control panel and receiver are housed within a common cabinet installed at the remote level gauging station.

ment of grain in grain elevators. The equipment, it is understood, may also be used in the future by hydro electric companies for the measurement of head-waters behind dams and for other similar applications.

Economy, Speed and Accuracy

Varioplex can do in seconds the work that it would take a gauger hours to perform. A gauger would have to climb a ladder to the tank top, in daylight or darkness, and regardless of weather conditions. He would open a gauge hatch and lower a steel tape to the bottom of the tank, withdraw it, and record the measurement in his note book. This might be in bright daylight, balmy weather — it might be in pitch darkness with the weather at 20 degrees below zero and the wind a howling gale. With the reading taken and recorded in the dim light of a flashlight, with the hazards of climbing up and down steel ladders, of walking over tank-tops, the dangers of asphyxiation from escaping gases to say nothing of the loss of valuable vapours — there is little to recommend manual gauging. This fact has already been recognized by three large oil companies who have ordered Varioplex systems which are now in the course of manufacture.



Trouble Shooter For Electronic Trades - - -

● Production line runs of electronic equipment can be tested at the rate of 400 checks a minute with the use of the Supertester. Simple to operate it can be used by inexperienced personnel. It is the forerunner of equipment in the electronic testing field that will impart automatic testing techniques to the electronic industry that modern garage equipment has made possible in the automotive trade.

The Supertester

Puts Maintenance On Routine Basis!

A NEW scientific measuring instrument is now being produced to put radio and television set repairs on a mechanized basis where troubles can be detected automatically and corrected on a routine basis. The unit, introduced at the 1953 Western Electronic Show & Convention is called a Supertester. Operated by a complex assortment of motors, shafts, and switches, the Supertester is plugged in to a radio or television unit, a starting button is pressed, and individual voltages, currents, connections, and various functions are checked at a rate of several per second — taking about five minutes to check a complete set. The machine automatically prints a ticket which shows what the trouble may be.

Basically, the tester was produced to make checks of this type on complete equipment as it is manufactured. However, as the unit comes into more general use, factories will be able to supply their service dealers with the special attachments fitting the procedure to their particular sets. A service organization, by having dif-

ferent attachments for each type, will be able to run these checks on widely different types of sets by simply interchanging the attachments on the one basic instrument they will require.

Diagnosis and repair of sets by this new procedure will bring the kind of scientific accuracy to set repairs that present-day instruments have imparted to the automobile servicing field.

The Bell Means Trouble

The instrument provides facilities in a standard model for as many as 400 individual automatic sequence tests.

The tests themselves can be distributed as required among the following six basic types; continuity, leakage, d-c voltage, a-c voltage, resistance, and impedance. In addition, derivative characteristics such as gain, frequency response, phase relationships, and noise levels are determined automatically through the combination of two or more of the standard tests. Circuitry is included to allow manual dialing to any one of the tests at will.

Facilities are also provided for utilizing accessory signal generators, dropping resistors, etc., to permit tests

at frequencies or voltages outside the scope of the standard instrument.

Flexibility and rapid interchange between different setups are the objectives of the dual-unit design of the instrument. The master cabinet contains the basic switching units and electronic measuring circuits. No internal changes or adjustments are required for any test sequence. Adapters, which are plugged into the top of the master unit, are individually laid out and wired to meet the requirements of each particular type of production equipment under test.

In operation, the attendant attaches the adapter leads to the equipment to be tested and presses the starter button. The instrument proceeds through the sequence of tests, sounding an alarm on the discovery of a fault, on reaching a test which requires an adjustment to the product, and on reaching the end of the entire test sequence. Like all standard tests, the adjustment step can be made on a go/no-go basis with the attendant not being required to measure or even understand the particular adjustment.

Electronic Thermometer Boon To Hospital Staffs



● To speed processing time of blood donors, engineers from Minneapolis-Honeywell's Industrial Division developed the "thermotron," shown above, an electronic instrument twice as accurate as a doctor's thermometer and 60 times as fast.

A BODY-TEMPERATURE measuring device reported to be two to four times more accurate than a clinical thermometer and as much as 60 times as fast in registering temperatures was tested at a blood donor tour held recently.

The importance of such an instrument in times of emergency when it is necessary to handle hundreds of blood donors an hour can not be underestimated. Minutes shaved off any part of the examination routine will proportionately speed up the number of donors processed per hour.

Using conventional thermometers, which are not accurate in less than two minutes, the average number of temperatures which can be taken runs at about eight in 15 minutes. With the new instrument, eight persons could be handled in less than one minute.

Use of the new temperature taking device was set up during the recent blood donor tour for the specific purpose of demonstrating its sensitivity and speed of response. A comparison

of its efficiency with the older type of clinical thermometer is little less than spectacular. A clinical thermometer must be left in a donor's mouth for a minimum of two minutes to get an accurate reading and most nurses will leave the thermometer in longer to make doubly sure of the reading after bringing the time up to five minutes. With the electronic instrument a reading two to four times as accurate can be registered in less than four and a half seconds. Further advantages of the electronic instrument are that no preliminary "shake-downs" of the thermocouples is necessary and there is no breakage problem with the stainless steel thermocouples.

The body-temperature measuring device known industrially as an electronic precision indicator, was specially adapted for the blood donor drive by engineers from the Minneapolis-Honeywell Regulator Company. The instrument is box-like in appearance and temperatures are sensed by stainless steel thermocouples which are

attached to the instrument. Temperatures are indicated on a rotating scale which is read through a window in the front door of the instrument case.

Although the experimental instrument had only two thermocouples attached to it, it would be possible to construct an instrument capable of serving as many as 36 thermocouples. By pressing a push-button switch readings could be taken for 36 donors at a rate of less than four and a half seconds apiece.

In industry, electronic precision indicators are the most versatile type of instrument used for measuring or indicating a variety of conditions. These include: temperature, pressure, humidity, density, flow and liquid level. It can measure temperatures as low as minus 400 degrees and as high as 7,000 degrees F. Modified for clinical use the new electronic temperature measuring device could save hours of time for the hard pressed nursing staffs of large hospitals and could conceivably be the means of saving many lives in time of emergency.

For TERMINAL SEALS
and STAND OFFS
to Your Design

**CONSOLIDATED ELECTRIC
EQUIPMENT CO. LIMITED**

1156 YONGE ST.

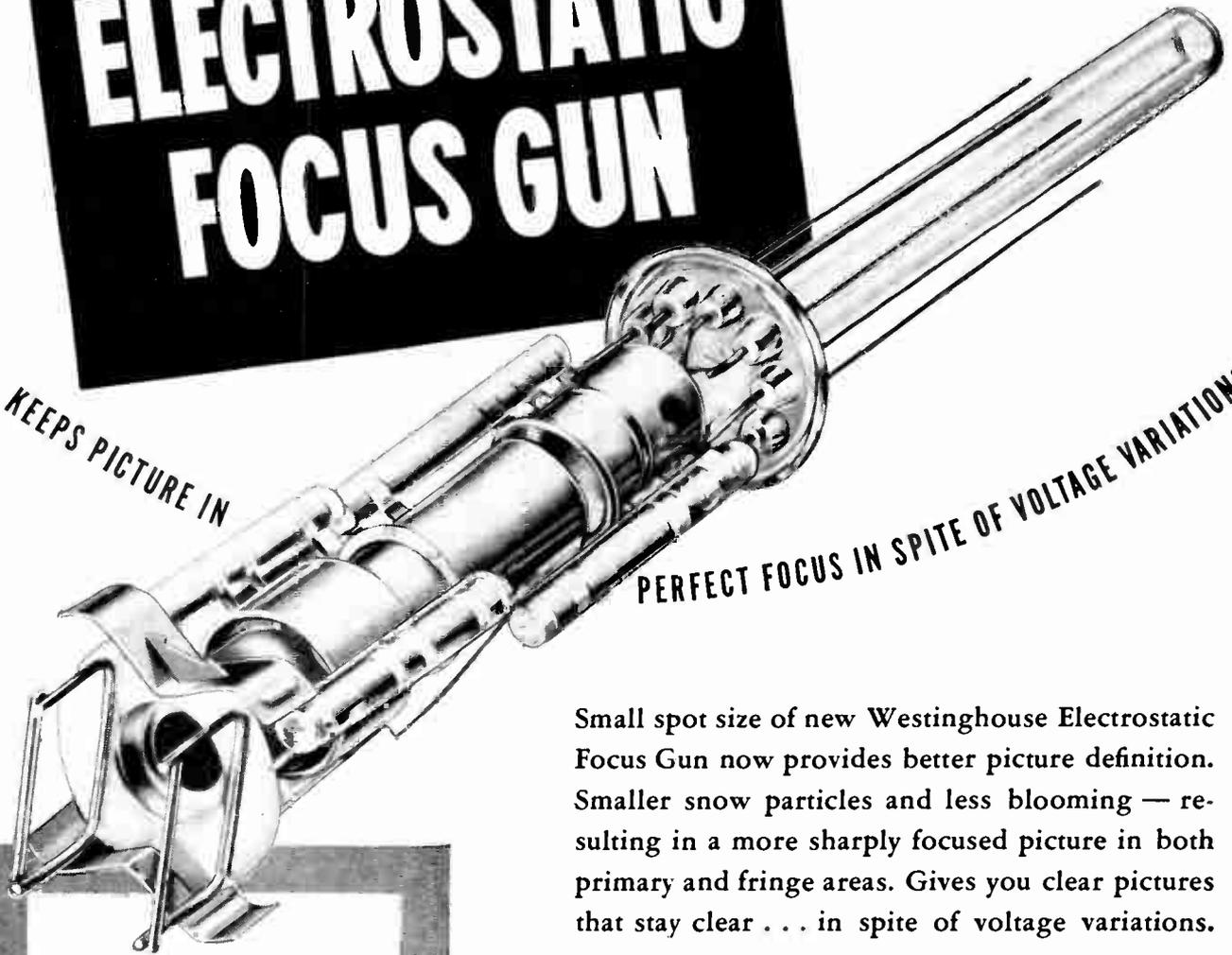
TORONTO, ONT.

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

NEW PRODUCTS

● Snap Action Switches

Item 414

An expanded line of small size, precision, snap-action, electrical switches for industrial use is now available to the trade. Positive, snap-action of contacts is extremely rapid, arcing is greatly reduced and there is no dead center position. Switching action, is independent of the speed of the actuator. Other advantages are extremely accurate repeatability, long contact life and double-break contacts that provide two separate circuits to increase the high electrical capacity. The basic Electro-Snap switch is designed for adaptability to many operating requirements. It is made with a broad selection of operating characteristics and actuating devices. Possible applications include uses as control, limit and safety switches.



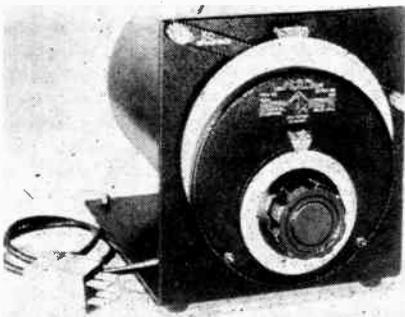
Features emphasized are the small size, compact design and light weight. The switch mechanism is enclosed in an accurately molded plastic case. A variety of protective metal housings are available for basic Electro-Snap switches to adapt them as general-purpose enclosed, splash-proof units.

● Unit Oscillator — 0.5 To 50 Megacycles

Item 415

Type 1211-A Unit Oscillator is the latest addition to the versatile GR line of Unit Instruments. The frequency span of the oscillator is 0.5 to 50 megacycles which is covered in two 10-to-1 logarithmic ranges. Frequency is read directly from a 6-inch dial, with a slow-motion-drive dial indicating frequency increments of 0.2% per division. Output power is well over one watt over the 0.5-to-5 megacycle range and is at least 0.2 watt over the 5-to-50 megacycle range.

The construction of the Type 1211-A Unit Oscillator provides very effective shielding so that the instrument can be used as a power source in bridge measurements. The Type 874 Coaxial Output Connector permits extension of the shield system to the bridge.



The Type 1203-A Unit Power Supply is available for a-c operation. Batteries can be used for field applications. Direct amplitude modulation over the audio-frequency range is possible with an external audio oscillator.

● Pipe Straps

Item 416

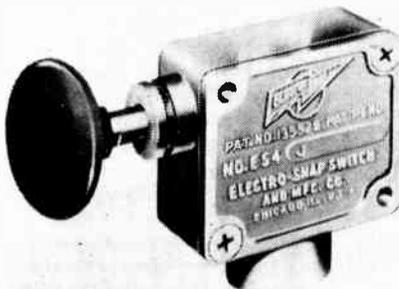
A new line of galvanized, malleable iron pipe straps for rigid conduit and E.M.T. features greater strength, less weight and more base area according to its manufacturer. The firm claims that the new development creates a uniform line of straps, which are easier to handle and install.

By designing a rectangular base, company engineers were able to develop a narrower fitting with increased base area compared to the tapered base previously used. They say that the greater area provides a more stable base making possible easier and better installations on rough masonry. Since the straps are narrower, they can be placed closer together or to equipment where necessary. Annealing of the castings previously was done in conventional coal or oil-fired batch furnaces. Now automatic cycle electric furnaces permit more accurately timed annealing for the exact hardness required, says the company. Galvanizing is used to protect the straps from corrosion.

● Switch Type ES4-J

Item 417

A new industrial limit switch designed to make possible more inexpensive circuit controls by minimizing the need for relays in automatic sequencing or interlock operations is now available. The switch, Type ES4-J, has a diecast case and integral plunger-type actuator. A 1 3/4" diameter phenolic plastic button attached to the end of the actuator makes the switch easy to operate manually for stop and start control of motors, etc.



The switch is also recommended for use as a safety switch. With two switches of this type connected as interlock switches in the control circuit of, for example, a punch press, a worker must depress both switches with his hands before the press will operate.

The switch has a high electrical rating (10 amps at 125 v. AC) and long life; is available with a single-pole, double-throw circuit arrangement only. Mounting is extremely versatile and the switch is easily wired into a circuit through a standard industrial connection.

● Small Soldering Pencil

Item 418

A small specially designed soldering pencil for hard-to-reach soldering jobs in the radio and electronics industry where there are many such tasks to perform, is now available to the trade.

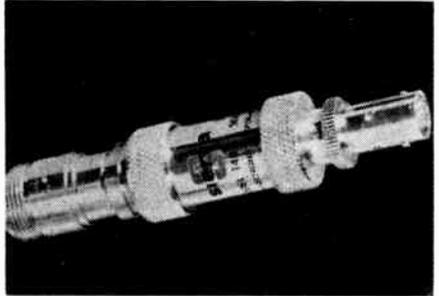
It is feather-light, yet ruggedly constructed. Its handle is of durable moulded plastic, which remains cool to the touch. And it includes ceramic separators for double safety. The extra length brass shell on the pencil firmly engages all threads, keeping the heating unit tight. And the full length tinsel cord is joined to the pencil by a protective

rubber sleeve. To protect the bench surface from the hot tip, a special form-fitted cork bushing on the handle holds the tip away from the bench. One feature of special interest on this tool is the Elkaloy Tiptets. The unit is equipped with seven of these interchangeable quick-heating tips. And the complete unit is fully CSA approved.

● Crystal Detector

Item 419

A new crystal detector that makes available sensitive readout from VHF-UHF directional couplers is now available to industry. Typical sensitivity realizable with the instrument when used with a 50 microampere, 1140 ohm meter is at least 30 microamperes of rectified dc output for an rf input of 140 millivolts rms.



The new detector, Model 148, is designed for use with 50 ohm transmission lines operating at frequencies from 30 to 1,500 mc. The instrument includes a 1N21B crystal and a built-in low pass output filter. Construction is of heavily plated brass tubing with a BNC output jack and Type N input fittings mating with terminals on other directional couplers.

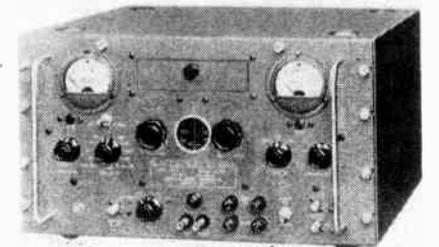
● Slope Signal Generator

Item 420

A new Type 232-A Glide Slope Signal Generator which provides, for the first time in a single self-contained instrument, complete testing and calibration facilities for Glide Slope Receiving Equipment as used in the CAA Instrument Landing System is now on the market.

Crystal Controlled RF and IF Signal voltages, coupled through carefully designed piston attenuators, permit the accurate study, alignment, and calibration of the system under test; internal modulation is available for both the simulation of on and off-course signals and for general purpose work.

Extreme simplicity of operation is afforded through the use of functional front panel controls common to both RF and IF operation. Modulation and output level are indicated on large panel meters; RF frequency and output voltage are conveniently selected by reference to the legible dials grouped at the center of the instrument panel.



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(Turn to page 30)



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Factors Affecting The Accuracy Of Oscillographic Records . . .

By ARTHUR MILLER, Sc.D.

Chief Electronic Engineer, Sanborn Company

With the extensive use of oscillographic work in the electronics industry this article by Dr. Miller outlining the factors affecting the accuracy of oscillographic records will be of timely interest to many who use this type of instrument in their daily work.

THERE are two general classes of errors in oscillographic recording. The first, which will be discussed in this article, deals with the class of error which is a function of static conditions or, in other words, not dependent upon the rate of change of the signal to be recorded. Linearity can be defined as the constant proportionality between input signal and recorded deflection. This is a typical example of the static sort of difficulty.

In a following article inaccuracies resulting from the inability of the recording system to follow the variations of the input signal because of the rate of variation will be discussed. This is based on dynamic conditions. The method of calibration is important in checking the static conditions.

Let us assume that we know the rela-

tion between input voltage and resulting deflection for a particular recording system. A typical characteristic of this sort is shown in Figure 1. In this figure is illustrated the performance of a recording system which is capable of producing deflections of 50 units above and below the neutral or zero point of the recording device. The portion of the characteristic between B and C is a straight line passing through the origin, and with a slope such that each unit of input produces a unit of deflection. From B back to A and from C up to D the deflection no longer increases at the same rate due to some overloading with which this particular recording system is assumed to be plagued.

It is obvious that if the quantity to be recorded is expected to have approximately equal peak amplitudes in both positive and negative directions, then

the operator would use the centering control of the recording system to set the recorder at the zero point.

The next problem would be to check the sensitivity of the system by applying a known input and observing the resulting deflection. If that calibration signal has a value of less than 30 units, and if the operator were to assume no nonlinearity in the recording system, then he would be under the impression that the input vs deflection characteristic of the recording system was represented by the straight line from A' to D'.

Under these conditions it is seen that for all deflections which are within the 35 unit limits, there would be no error due to nonlinearity. For greater deflections, however, there would be a gradually increasing error until, for a deflection of 50 units, corresponding to an assumed input of 50 units, as at the point A, the actual input would have been 60 units, leading to an error of 10 units. Since the total chart width is 100 units, error at this point, for this assumed characteristic, would be 10 per cent of full scale.

Suppose, however, that the calibration signal is large enough to deflect the recorder from its center position to the chart edge, and that such a signal is used to judge system sensitivity. Now, if nonlinearity is ignored, the operator assumes that the recording characteristic is represented by the straight line AOD.

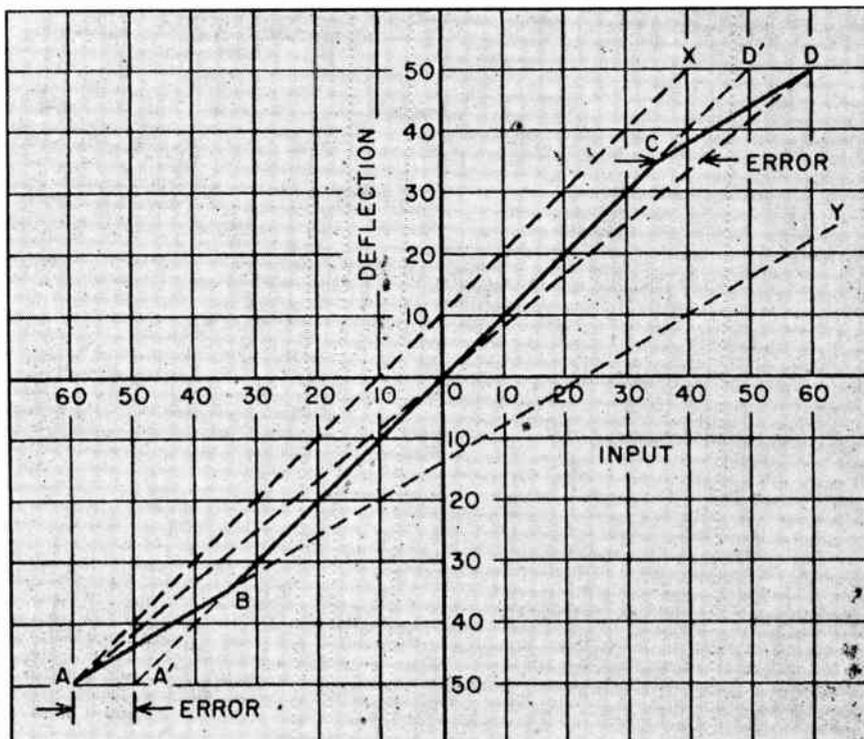
Here, therefore, deflections near the center of the chart, and near the chart edges, would be read accurately. Intermediate points, however, would be read incorrectly with the maximum error being made at points B and C, and, in this example, its magnitude at these points would be 7 units.

Comparing these two methods of calibration, then, we have a choice in the first instance of zero error over most of the chart, accompanied by a maximum error at the chart edges of 10 per cent, or, in the second instance, the presence of some error over most of the chart, but with its maximum value only 7 per cent.

In most cases the first of these methods of calibration would be preferable, because, although this maximum possible error is greater (10 per cent compared to 7 per cent) the error exceeds the 7 per cent maximum of the second method only for deflections which exceed the 45 unit level, while for deflections between 35 and 45 units the two methods are comparable, but for deflections of less than 35 units the

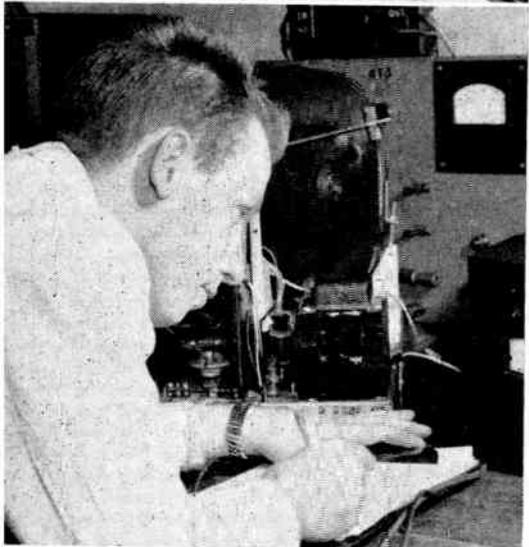
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● Figure 1. Effect of calibration methods on reading errors due to non-linearity of deflection vs. input characteristic.



PROTECTION FOR THE PUBLIC

By G. R. CATES, B.A.Sc., P.Eng.



● *Top:* C.S.A. technician Alex Milne tests leakage current of radio receiver of the a-c/d-c type. Current in excess of 5 ma at exposed parts such as control shafts is considered hazardous. *Bottom:* Electrostatic voltmeter is used to measure TV high voltage.

AS members of the Institute of Radio Engineers I assume you are primarily concerned with radio and television, and I would like to discuss specifically the approval of radio equipment. Radio equipment presents a particular problem to the Canadian Standards Association. This is primarily due to the fact that radios and television receivers are designed with a relatively short life in view and are mass-produced for a highly competitive market.

While we recognize that deterioration must occur, we must also guard users against any serious hazards resulting from such deterioration. Now, to consider radio receiving sets, (and by this I mean sound receivers as opposed to television), I would like to divide them into two categories. First there is the transformer or a-c operated type of set. This gives us very little trouble in the laboratory. The reason for this is that in a transformer-operated set the output circuits, that is, the secondary circuits of the transformer, are limited in power procedure. So as a result of this we have by the current-limiting effects of the power transformer and rectifier and

filter combination. In addition to that, the shock hazard is reduced to almost nil by the fact that all secondary circuits are isolated from the supply line by the power transformer. Shock hazard is involved only if the primary circuit such as the primary of the power transformer or the a-c switch fails and shorts to the chassis.

Main Concerns

Our main concern is with the a-c/d-c or conductively coupled type of circuit. In this there are two main features to be considered. One is shock hazard and the other is fire hazard. Considering shock hazard, obviously the ideal condition from our viewpoint would be to design a circuit such that the chassis and all other exposed metal parts are completely isolated from the supply line. Unfortunately, design considerations are such that the ideal condition for the manufacturer would be to connect the supply line directly to one side of the chassis. This would obviously result in a definite shock hazard unless particular precautions are taken to ensure that the chassis, control shafts, and other metal parts cannot come in contact with the user. In the case of certain frequency-modulation receivers this has been done, but it is an expensive

the problem of designing an a-c/d-c circuit in which the chassis and control shaft will be isolated from the line as far as shock hazard is concerned but connected thereto as far as radio and possibly audio-frequencies are concerned. This brought about the question of leakage. Up until 1949 the maximum leakage permitted at any exposed part was 1.5 ma. With the publication of the existing specification on radio appliances this was increased to 5 ma. This increase was done after intensive research and consideration by both the radio industry and the Approvals Laboratories (and is still being questioned in some degree by some of the Inspection authorities). We at the Laboratories are firmly convinced, and I think the radio industry is also firmly convinced, that this leakage currents is not, and never will be, lethal. However, under certain conditions such as that of a person in a precarious mechanical position, a shock of 5 ma, which is quite a jolt, could result in a fall or in non-electrical injury to a person. However, we believe that the radio industry is conversant with these hazards and takes all reasonable steps to ensure that under normal conditions of operation a shock of 5 ma will not be received.

While manufacturers of radio and television sets and associated equipment are fully qualified in the design and production of equipment and have without exception established a reputation for the production of merchandise of the highest calibre and efficiency there remains one final and important obligation they owe to the public. It is to insure the public — the end users of their products — the utmost protection from the possible dangers inherent in any type of apparatus which depends on electrical force to energise it.

Few users of radio and television sets are aware of the possible dangers which may conceivably be effected by improbable but nevertheless possible circumstances which may obtain in their domestic electric equipment. This is particularly so in the case of television sets where the voltage used is far in excess of that used in other types of domestic appliances.

Although manufacturers exercise every precaution in the construction of their equipment they wisely subscribe to the final safety assessment of their products by The Canadian Standards Association.

The following article by G. R. Cates, B.A.Sc., P.Eng., Electronic Engineer of the Toronto laboratories of the Canadian Standards Association is based on an address delivered before the Hamilton Section of The Institute of Radio Engineers. It portrays clearly the function and objectives of The Canadian Standards Association in the assessment and safety approval of domestic appliances and the service it renders to the manufacturers of electrical and electronic domestic equipment and to the public who buy it.

This shock hazard consideration results in many problems for the designer of an a-c/d-c type of radio receiver or electronic phonograph.

Special TV Problems

With the advent of television in Canada, some special problems arose. There were two major considerations. In the first place, the voltages used in TV receivers were far in excess of those encountered previously on radio equipment. The second particular hazard was concerned with the breakage of the evacuated picture tube.

Insofar as shock hazard from the high-voltage of anode connection of the picture tube is concerned, in most cases the short-circuit current was well below our 5 ma leakage limit. However, the electrical effects of a shock on the human body are not dependent entirely upon the steady-state current through the body but also upon the max amount of energy which is discharged through the body. As a result of this we had to concern ourselves not only with the max leakage current from such high voltage components, but also with the rate of decay of voltage. As a result of this consideration and with the knowledge already obtained through earlier experience by the Underwriters' Laboratories in the United States, the appendix to Spec No. 1 covering television incorporates a clause specifying the rate of decay of the voltage when a resistance, such as that of the human body, is applied to the anode connection of the picture tube. This has not resulted in any difficulty with the manufacturer since it is relatively easy to either enclose all high-potential parts and provide a series resistance in the anode lead or to provide an interlock on the rear cover so that contact with such high-voltage components is not possible.

Picture-Tube Implosions

Insofar as hazard from the possible breakage of a picture tube is concerned, the Laboratory has had many interesting experiences, and I would like to describe to you the effects of the implosion of a picture tube in a television receiver when inadequate protection in the form of safety glass is provided.

Our first experience with this was

during the early days of television in Canada. In those days the first set which we approved was a 10 in. receiver. It was not considered that any particular hazard existed in this particular case because a safety glass of $\frac{1}{4}$ in. armour plate was provided over the tube. Our next set was a 7 in. receiver and here again no particular hazard was considered to exist in view of the thickness of the safety glass provided. However, later on, a manufacturer submitted a round 15 in. picture tube receiver. As a result of bulletins issued by other testing laboratories, the possibility of hazard due to the breakage of such a tube was apparent and the manufacturer was advised that it would be necessary to break a picture tube in his particular receiver to observe the effects. A hole was drilled through the cabinet of the set and a steel rod was inserted in such a manner as to touch the picture tube just back of the face. The steel rod was struck and the resulting explosion was rather tremendous. The safety glass in this particular set, which was of laminated construction shattered completely on both sides but retained its shape due to the strength of the plastic centre. However, the rear cover which was of plywood and was secured by 7 $\frac{3}{4}$ in. wood screws was completely ripped from its mountings and particles of glass were hurled for a distance of 18 ft. from the rear of the set. This gave us a rather dramatic demonstration of the forces involved in breaking an evacuated picture tube.

Cabinet Strength

As a result of this, and many other tests, the laboratories in conjunction with the industry have arrived at a specification which requires that the cabinet, including the safety glass of a television receiver be capable of withstanding the implosion of the picture tube within the set without the expulsion of glass particles except at the rear of the set. We have had receivers submitted to the laboratory in which the safety glass was of a thickness and size and type that we were reasonably sure would pass the required tests. These tests are based on the correlation between implosion tests and impact tests by a steel sphere dropped on

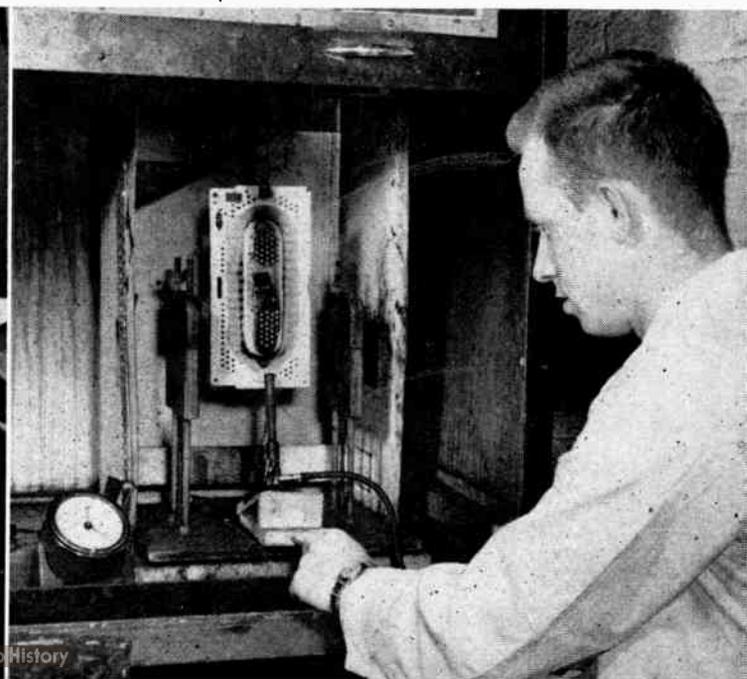
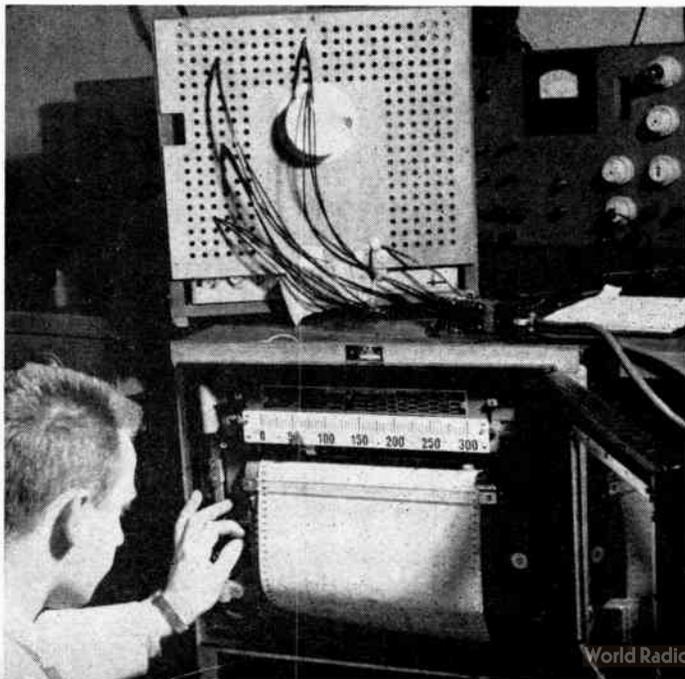
the face of the tube. However, in several instances, it was found that while the safety glass successfully withstood the effects of the implosion, the cabinet mounting was insufficiently strong and the entire safety glass, intact, was expelled from the front of the cabinet and was followed by large pieces of glass shrapnel. So our problem is not only to ensure that the safety glass be of sufficient strength to withstand the effect of the impact resulting from an implosion, but also to be secured in the cabinet sufficiently rigidly. As a matter of fact, in some cases, it was found that the mounting of the safety glass fails not in the outward direction but in the inward direction. This would indicate that the failure of the picture



G. R. CATES, B.A.Sc. P. Eng.

tube results in a vacuum being formed immediately behind the safety glass and that in some cases this glass is driven inwards initially and then the particles of glass impinge on the inside of the cabinet and drive it out through the front with a sort of running start of an inch or so. The problem of implosion hazard on some of the new, larger picture tubes is a serious one and must be very carefully considered before approval is granted. We have granted approval on 24 in. and 30 in. picture tubes, but only after the result of careful investigation and reports by reliable testing laboratories indicating that successful implosion of numerous sets has been carried out with no failure of the
(Turn to page 28)

●Left: Thermocouples are placed at various points in a TV receiver and connected to a recording instrument which records the temperatures and leaves the technician free to do other work until the test is completed. Right: Flame test is applied to back cover of small radio receiver. Material must pass this test if it is used as enclosure for live parts.



PROTECTION

(Continued from page 27)

Antenna Grounding

In the case of a television receiver the user usually employs an outdoor antenna mounted on the top of a steel mast of considerable height. It is quite usual in these cases for the manufacturer, for the purpose of radio interference reduction, to provide capacitors connected between the supply line and the chassis. This can result in a hazard. I would like to illustrate this by citing a particular case which was brought to our attention by the Provincial Inspection authorities. A woman reported that while washing her dishes she had one hand in the kitchen sink and reached out to turn on the water tap and received a violent electrical shock. The provincial inspection authorities were called in and they measured the potential between the drain in the sink and the water tap and found a potential of 115 v. They then proceeded to go through the house and disconnect various electrical appliances. When they disconnected the television receiver the

potential disappeared. Now what had happened was this. The dealer who had installed the television set, being conscientious but not familiar with proper procedures, had insisted on proper grounding of the receiver and consequently connected a piece of copper wire between the base of the mast and the soil pipe or vent pipe on the roof of the house. The antenna was of the folded dipole type connected directly to the steel mast. The soil pipe on this particular house and in many houses, especially the older ones, does not constitute a good electrical connection through to ground. During a thunderstorm or during some electrical disturbance, static potential had built up on the antenna to the point where the ceramic capacitors connected between the chassis and the earth ground had failed. Remember that one side of the supply line is connected solidly and directly to earth ground and the antenna circuit it usually connected conductively to the chassis of the set. As a result of one of these capacitors failing, the chassis became connected directly to one side of the a-c line, and therefore so did the antenna and the drain system. The set, of course, operated normally

and it was fortunate indeed that this particular woman was not electrocuted. We have had reports from the United States of two known fatalities and several other near fatalities as a result of this particular fault. Consequently, special tests on ceramic capacitors are required by the Laboratories. This same effect could have occurred had the user during attempts at servicing tubes or tampering with the set come into contact with the picture tube anode lead and had, at the same time, been grounded. This would have, in effect, placed the high-voltage picture tube voltage across the ceramic capacitor and may have resulted in a similar failure. Therefore both ourselves and the Underwriters' Laboratories in the United States require that a conductive coupling of not more than 1 megohm be provided between antenna terminals and one side of the supply line to drain off static charges and that ceramic capacitors withstand a-c dielectric strength test of 1500v and that in addition when the picture tube anode is shorted to either side of the supply line, a voltage of not more than 1000v will develop across such line to chassis capacitors.

Oscillographic Records . . . (Continued from page 28)

first method yields no error at all.

Recording in ONE Direction

So far we have been talking about the problem of recording quantities which might require equal positive and negative deflections. Suppose, however, that the recording problem involves one direction only, so that the operator, in order to utilize all of the available chart width, uses the centering control to set the recorder initially at the chart edge, as at point A.

Now, if the sensitivity calibration had been made near the chart center using a relatively small deflection, then the sensitivity so obtained would correspond to the slope of the line BOC. The operator would then be making readings as though the recording characteristic were represented by the line AX.

In that case, the *only* point which

could be recorded accurately would be the starting point at A. The error would increase to a value of 10 per cent at B, would remain 10 per cent all the way to C, and would then increase again to a final maximum of 20 per cent when the deflection reached the opposite edge of the chart.

On the other hand, the calibration which included the center and one edge of the chart, would mean a supposed recording characteristic represented by the line AOD, and the maximum error would be the 7 per cent mentioned above for this characteristic.

It is seen, therefore, that when the starting point for the recording is at the edge of the chart, it is the second calibration method which is definitely preferable.

It is obvious, also, that if one is willing to trade a slight reduction in chart width for a large reduction in error, one could start with point B as the initial point in the recording and calibrate in accordance with the slope of the line BC.

One error of technique which is made sometimes is to start at point A, and then using a small calibrating signal, arrive at the conclusion that the slope of the line AB is a measure of system sensitivity, and that the recording characteristic would be given by the line ABY, with obviously disastrous results.

It is therefore seen that a knowledge of the input vs deflection characteristics plus a little thought will lead to a calibration technique which will minimize error, whereas failure to think through this procedure will exaggerate errors.

Measuring Deflection vs Input

This brings up the subject of the measurement of the deflection vs input characteristic of a recording system.

The obvious method is to connect an adjustable signal source to a "good" meter, and apply the signal as monitored by the meter to the recording system input. A plot of meter reading vs recorded deflections is supposed to provide the

required input vs deflection characteristic.

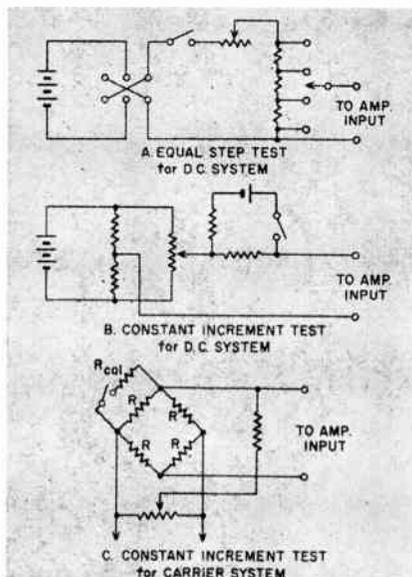
This method is open to certain objections. Too often a cheap pocket voltmeter, or a vacuum tube voltmeter is used as the "good" meter, even though the non-linearities of its own meter movements or vacuum tube circuits may be as great as those of the recording equipment being tested. Even if the monitoring meter were perfect, there would still remain the problem of overcoming the "reading" error on the part of the operator.

A more reliable measurement method is the use of a resistance voltage divider as shown in sketch (A) of Figure 2. Here the important point is the equality of the resistors in the divider. Their absolute value is not important as long as the input impedance of the amplifier under test is more than one hundred times as great as the maximum impedance one can see looking back into the voltage divider.

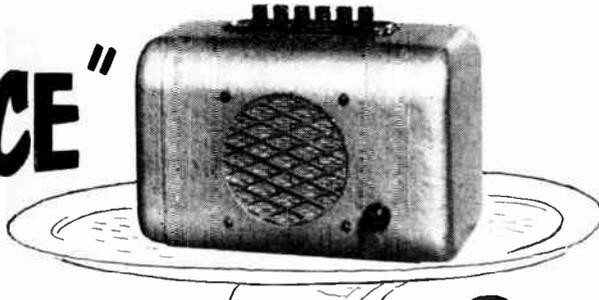
Still another method for plotting the input vs deflection characteristic is shown in sketch (B) of Figure 2. Here we have a combination of a smoothly variable input voltage in series with a fixed amplitude voltage increment. This circuit requires no accurately known voltages or components. The push button produces a constant voltage pulse which checks the slope of the characteristic at any point chosen by the potentiometer. Using several such points, the complete curve is explored.

Sketch (C) shows how a similar technique can be applied to a recording system which contains a carrier amplifier. The four resistors labeled R constitute a bridge which need be only approximately balanced. Closing the switch shunts one arm of the bridge with a large resistor and changes the balance slightly, thus providing a step signal. The combination of the potentiometer and its associated fixed resistor provide a smoothly variable signal upon which to superimpose the pulses produced by the push button.

● Figure 2. Recommended methods of measuring deflection vs. input characteristic of a recording system.



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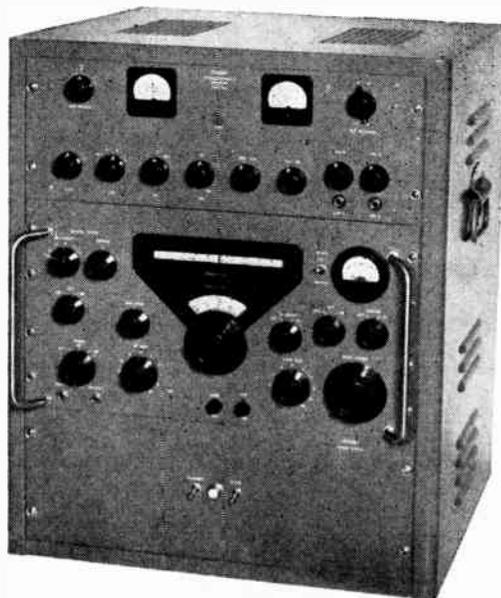
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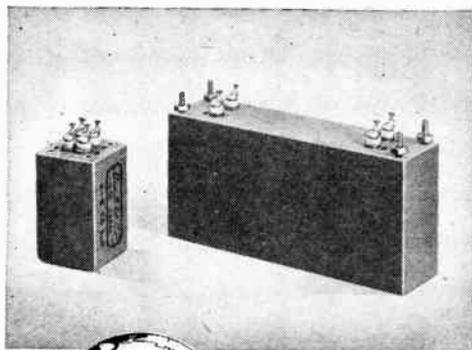
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3. The upper sideband filter
4. The bridging or "roofing" filter
5. The discriminator filter—AFC circuit
6. The demodulation filter



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PRODUCTS

(Continued from page 22)

per cent demodulated carrier distortion, average reading modulation indication, and minimum peak modulation phasing of the 90/150 cps alternator.

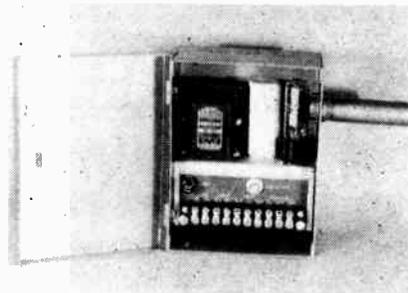
Input power requirements are 105-125 volts, 60 plus-minus 1 cps, 50 watts (electronically regulated).

● *Photoelectric Relay*

Item 421

The type EA-PE-16 photoelectric relay was designed to provide a sensitive, inexpensive reliable and simple unit, to meet the majority of photoelectric requirements. The unit above, with an external light source such as an ordinary 60 watt light bulb, is all that is necessary for a great number of simple counting or indicating applications.

The photocell and light shield are mounted on the chassis and cabinet, so that they can "look out" either the side or front to meet separate requirements.



A 5 ampere A.C. single pole double throw relay is built into the chassis so that indicator light, annunciators, solenoids or counters operating on voltages up to 110 volts may be used in conjunction with the unit.

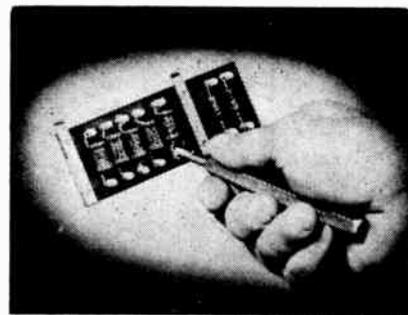
All electrical connections to the unit are easily made through a connecting strip inside the front door of the cabinet.

Size: 8 1/4" high, 4 1/4" deep and 6 1/2" wide.
Light hood: 3 1/2" long.
Weight: 8 lbs.

● *Wire Wrench*

Item 422

This simple tool is used for wrapping either stranded or solid wire around terminals on boards or hermetic seals. It is as easy to use as a small screwdriver. One or more wires can be wrapped around a terminal with a single twist of the wrist. With this tool, time consumed in wire-wrapping operations can be appreciably cut. The tool is used in the following manner: (1) the



wire is placed against the terminal; (2) the tool is placed over the terminal so that the wire is caught in the notch of the tool; (3) a simple twisting motion is applied, wrapping the wire around the terminal in a neat, tight connection, ready for soldering. "Wire-Wrench" has, as an auxiliary feature, a drilled hole and a milled flat, to be used for putting a hook in a wire, whenever needed. The tool can also be used for straightening bent terminals. Three sizes are available: No. WW1, for miniature terminals; No. WW2, for medium-size terminals; No. WW3, for large terminals.

(Turn to page 34)

NEWS

R. A. Hackbusch Re-elected President of C.R.T.P.B.

R. A. Hackbusch of Toronto, President of Hackbusch Electronics Ltd., was re-elected President of the Canadian Radio Technical Planning Board at the Ninth Annual Meeting of the Board here today.

C. W. Boadway, Communications Engineer, Ontario Hydro Electric Power Commission, was re-elected Vice-President and Stuart D. Brownlee of Toronto was re-elected Secretary-Treasurer.

Mr. Hackbusch in his Annual Report pointed out that 160 of the top-ranking engineers, scientists, and specialists of all kinds in the electronic fields have been devoting a considerable portion of their time and effort to planning the future of electronics in this country.

This planning by the members of the C.R.T.P.B. is a co-operative effort of all branches and phases of industry, resulting from:

- (1) The need to use and share a common medium — the air waves;
- (2) The fact that space in this common medium is controlled and allocated by a Government Agency;
- (3) The fact that the equipment utilizing this common medium must be synchronized and designed for non-interfering operation.

The C.R.T.P.B. is the medium through which this work has been carried on for the past nine years. Its stated objectives are to formulate sound engineering principles and to organize technical facts which will assist in the development, in accordance with public interest, of the electronic industry and electronic services of the nation, to advise Government, Industry and the People of its findings and recommendations.

Canadian-Built Equipment For Indonesia and British Honduras

The trade mark "Made in Canada" is making its appearance in distant

parts of the world on electronic communications equipment produced by the Canadian electronics industry.

To support international aviation Canadian Aviation Electronics has just completed the design and manufacture of an improved air-to-ground communications system which will be installed in Djakarta, Indonesia. Another recently completed contract by the same company was for broadcast transmission equipment for the government of the British Honduras.

At the present time the company is carrying out negotiations for other export contracts which will be installed in Kenya Colony, East Africa and India.

Institute of Radio Engineers Hear A. L. Rosenthal

On December 7th, 1953 the Toronto Section I.R.E. heard an address by A. L. Rosenthal of the Canadian Radio Mfg. Corp. in the Electrical Building, University of Toronto. Mr. Rosenthal's subject was Production Engineering Aspects of a Light-Weight Military Equipment. He outlined the engineering effort involved in taking the one-mile set from the development stage to full-scale production. Constructional details and techniques involved in its production were described. Sub-assemblies and finished units were displayed and demonstrated.

(Turn to page 33)

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OTTAWA, ONTARIO

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TRENDS

(Continued from page 9)

★ **THE LONGEST UNDERSEAS VOICE** cable in the world, the result of 25 years research and development is scheduled to go into operation in three years. Plans for the project which will cost \$35,000,000 calls for the provision of 36 telephone circuits between Canada, Great Britain and the United States.

★ **THE THIRD LONG-DISTANCE DIALING** exchange in the United States was inaugurated last December 3rd. It is the Valley exchange of the Bell Telephone Company of Pennsylvania. The system permits individual and two-party customers to dial directly to more than 12,000,000 telephones in the United States.

★ **A NEW TYPE TRANSISTOR** known as the "surface barrier" type has been developed by the Philco Corporation. Described as "the most important advance in electronics since the discovery of the point-contact transistor," the new unit is expected to open up an entirely new realm for transistors in both the military and civilian fields.

★ **CABINET APPROVAL OF THE CANADIAN PARLIAMENT** has been granted for the sale of the Dominion Government Telephone and Telegraph System in British Columbia. Purchasers of the system are the British Columbia Telephone Company, its associate Northwest Telephone Company and the Canadian National Telegraphs. Price paid for the system by the new owners is reported as \$1,500,000.

★ **THE FIRST PUBLIC DEMONSTRATION** of a magnetic tape system of recording colour and black and white television pictures has been made by the Radio Corporation of America. David Sarnoff, Board Chairman of RCA, has described the new system as the first major step into an era of "electronic photography."

★ **THE JIM CREEK, WASHINGTON**, transmitter of the United States Navy is the world's strongest radio trans-

mitter. Operating on 1,250,000 watts, it can be heard by any surface vessel, submarine or airplane, regardless of distance away from the transmitter at any point in the world.

★ **THE USE OF UNDERWATER** television as used by the British Admiralty for the location of sunken objects and as utilized by eight allied navies in the naval maneuvers held last September promises to become a highly potent weapon in the waging of anti-mine and anti-submarine warfare.

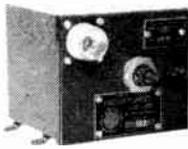
★ **FOR THE FIRST TIME** in Canada coloured television cabinets are making their appearance on the market. A new 17-inch table model in a range of seven decorator colours has just been introduced by the RCA Victor Company.

★ **CBS-HYTRON, ELECTRONIC** tube manufacturing division of the Columbia Broadcasting System Inc., have established a price of \$125 for its new colour television picture tube. This is the price that will be charged television set manufacturers for sample tubes in the 15-inch size.

★ **HER MAJESTY'S ROYAL MAIL** will be sorted electronically in Canadian post offices in the near future. Described as "Thinking Machines" electronic apparatus capable of sorting 130,000 letters an hour will be installed in Canadian postal terminals within the next three years. The machines, it is reported, will route a letter from Vancouver to Montreal in a fraction of the time it takes to do it by hand.

★ **ELECTRONIC EQUIPMENT** valued at \$3,600 dollars has been developed and installed in the plant of the Frank H. Fleer Corp., in Philadelphia. The equipment will control the production of a one cent item — to wit — bubble gum.

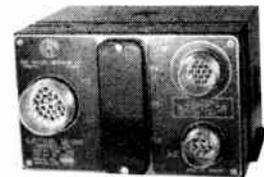
★ **THE DEVELOPMENT** of equipment for the British armed services has produced a radiotelephone which enables a pilot flying at 40,000 feet to talk to a land base 300 miles distant. (Turn to page 38)



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



Ice Detector. Wt. 6 ozs.



Shedding Area Controller. 8 1/4" x 4 1/4" 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:

PSC APPLIED RESEARCH LTD.
1450 O'CONNOR DRIVE, TORONTO, CANADA.

Specialists in instrumentation for northern flying.

ARI-54

NEWS

(Continued from page 31)

Mechron Engineering Appointed Agents

Electric Regulator Corporation, Norwalk, Connecticut, has appointed Mechron Engineering Products, Ltd., Ottawa, Canada, as its exclusive sales and engineering representatives in Canada.

Electric Regulator manufactures the Regohm, a voltage, current and speed regulator that has found wide application in power equipment for defense and civilian use.

The appointment of Mechron Engineering Ltd., represents an expansion of Electric Regulator's sales activities in Canada. All sales were handled previously from the United States.

New Exhibitors For Electronics Parts Show

Booth space reservations for the 1954 Electronic Parts Show to be held at the Conrad Hilton Hotel, Chicago, May 17-20 are running about forty per cent higher than the number received at this time last year, while reservations for display rooms are more than double those received at mid-November of 1953, according to Kenneth C. Prince, Show Manager.

Over eight per cent of contracts received at headquarters so far for the 1954 Show are from firms which did not exhibit last year.



● Elected as executive officers of the Canadian Independent Telephone Association for 1953-1954 at the 48th Annual Convention of the Association held in Toronto recently were: James A. McDonald, Honorary President; Spencer McConnell, President; Karl Austin, Vice-President; Thos. B. Rae, Treasurer; G. W. Turner, Executive Secretary, Immediate Past President, Earl H. Moore is third from right in photo. Governors for the current year are James Thomson, Ross McEwing, Don McKelvie and Frank Tackaberry.

C.I.T.A. Hold 48th Annual Convention

The 48th annual convention of the Canadian Independent Telephone Association held at the Royal York Hotel, October 29th and 30 was attended by more than 175 delegates.

In addition to the business sessions of the convention the meeting was addressed by prominent people in the telephone industry.

Executive officers for the 1953-54 season elected at the convention were: Honorary President, James A. McDonald, President, Spencer McConnell, Aylmer and Malahide Telephone Co., Port Burwell; Vice-President, Carl Austin, Wooler, Ontario; Treasurer, Thomas B. Rae, Stouffville, Ontario; Executive Secretary, G. W. Turner, Forest, Ontario. The immediate Past-President of the Association was Earl H. Moore, Orton, Ontario.

The Board of Governors for the current term are: James Thomson, Buckingham, P.Q., Ross McEwing, Drayton; Don McKelvie, New Liskeard; and Frank Tackaberry, Eastern Counties. Chairman of the executive committee is George McKenzie of Ilderton, Ontario.

Pointon Moves To Larger Quarters

The Charles W. Pointon organization have recently purchased a new building affording them many times the space previously occupied and will enable them to enlarge their facilities considerably. The move has been completed and their new address is 6 Alcina Avenue, Toronto 10, Ontario. The new telephone number is OLiver 7984.

(Turn to page 35)



This name makes ^{TV} news!

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.

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



Telecommunications

Division of Pye
Canada Limited



AJAX, ONTARIO

Memo to-

ENGINEERS DRAFTSMEN TECHNICIANS

EXPERIENCED IN DESIGN AND DEVELOPMENT OF ELECTRONIC AND RELATED ELECTRO-MECHANICAL DEVICES FOR GUIDED MISSILES, TORPEDOES, NAVAL ORDNANCE, AIR-BORNE RADAR AND TELECOMMUNICATIONS EQUIPMENT.

Despite our very successful recruiting Campaign carried out last Spring, our mushrooming expansion leaves us short-handed. There are still a few excellent opportunities to establish yourself permanently with a world-leader in the electronics field, where know-how and initiative determine your advancement. If you fit in one of the following categories, drop us a line and tell us about yourself. Your letter will be kept in strict confidence.

Engineer (1) Electronics, Electrical or Mechanical, 3 to 5 yrs. experience in high pressure aircraft hydraulic systems.

Draftsmen (4) Electronics or Electrical, 3 to 5 yrs. experience in layout on electrical and electronics circuitry.

Engineer (1) Electrical, for basic design of electromagnetic devices such as magnetic amplifiers and electronic transformers. Experience desirable, but design and development interest of paramount importance.

Engineer (1) Electronics or Electrical, 5 yrs. experience in transmitter or multi-channel link design.

Technicians (2) For prototype development of asdic and radar equipment. Familiar with shop routines and capable of working without direct supervision.

Engineers (2) Mechanical (1), Electrical (1). With suitable design and development experience for electronics naval ordnance devices.

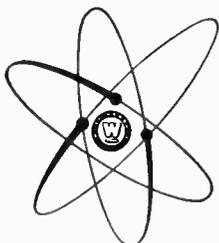
Engineering Writers (1) Electrical or Arts graduate with sound technical background in general electronics equipment. Experience in design, installations or operation desirable. Technical writing ability essential.

Engineer (1) Physics or Electrical, for Electronics Research and development work. Experience desirable.

Engineers (2) Electrical, Electronics or Mechanical, for design and development of guided missiles.

Engineers (2) Mechanical, experienced in the mechanical design and development of telecommunication equipment.

*In your reply, please indicate section for which you feel qualified.
Interview by appointment only.*



Address replies to
SPECIAL PLACEMENT REPRESENTATIVE

electronics
DIVISION

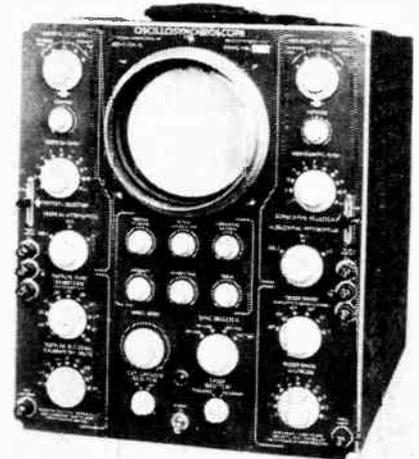
CANADIAN WESTINGHOUSE CO. LIMITED
HAMILTON, ONTARIO

NEW PRODUCTS

(Continued from page 30)

● Oscillosynchroscope Item 423

Announcement has been made by the manufacturers of the availability of a Model OA-16 Oscillosynchroscope, featuring a calibrated buck-out voltage which allows balancing out of DC levels accurately to 10 per cent, so that small superimposed AC signals can be expanded for more minute inspection of both the signal and small changes in DC level. This represents a possible 40:1 expansion of the signal over that observable using conventional DC methods.



Also featured are vertical and horizontal amplifier band-widths from DC to 5 MC and 1 MC, and sensitivities of 50 MV, peak-to-peak, per inch and 120 MV, peak-to-peak, per inch, respectively. Triggered or recurrent sweeps from 0.4 microseconds per centimeter to 10 seconds total sweep time are available. A video delay line permits observation of rising wave fronts of pulses.

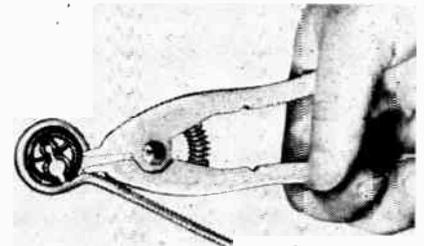
Amplitude measurement may be made through use of a 60 cycle square-wave which adequately covers any deflection range with an accuracy of 5 per cent.

Mechanical features include machined aluminum bezel for use of standard camera clamp, an illuminated ruled screen, and a blower for interior cooling.

The OA-16 operates on 115/230 volts at 440 watts. Dimensions are: Height 15 $\frac{3}{4}$ ", Width 13 $\frac{1}{4}$ ", Depth 22". Weight is approximately 75 lbs.

● Eye-Opener Tool Item 424

With the increasing necessity for using 300-ohm lead-in wire of the round line, oval line and similar non-ribbon types, in connection with the widening UHF field, a well-known tool manufacturer has introduced an improved Stand-Off "Eye-Opener" Tool.



Use of this tool, according to its makers, means that the metal bail on a TV stand-off can be opened up quickly and safely to accommodate the larger lead-in lines and then squeezed to its original position so as to hold the line tight. A pair of pliers or any other standard tool will not do this job satisfactorily, it is claimed.

(Turn to page 37)

NEWS

(Continued from page 33)

**Radio Fall Meeting
R.E.T.M. And I.R.E.**

Among the highlights of the Radio Fall Meeting of members of the R.E.T.M.A. Engineering Department, the R.T.M.A. of Canada and the Institute of Radio Engineers was the presentation of a plaque to Mrs. Martha E. Kinzie for her untiring efforts on behalf of the National Television Systems Committee in its work of formulating a successful compatible standard for colour television. Mrs. Kinzie was Secretary of the National Television Committee responsible for co-ordinating the voluminous reports connected with the committee's work. Another award of prominence made at the gathering was the presentation of a \$100 award to Dr. W. G. R. Baker, Vice-President of American G.E.

**Communications Workers
To Meet In June**

The 1954 convention of the Communications Workers of America will be held in Cleveland. The site for the convention, which will probably be held in mid-June, was selected by the CWA's Executive Board after considering a number of cities which were seeking the annual session, which attracts about 3000 delegates and guests. (Turn to page 47)



● Top Row Left: Mrs. Martha E. Kinzie being presented with award of plaque for her untiring efforts on behalf of the National Television Systems Committee in its work of formulating a successful compatible standard for colour television. Top Row Right: Mr. B. Hunt, President of the RTMA of Canada addressing the banquet gathering of the Radio Fall Meeting of members of the R.E.T.M.A. Engineering Department, The R.T.M.A. of Canada and the Institute of Radio Engineers. Bottom Row Left: Mr. R. Hackbusch, one of the head table guests is shown addressing the Radio Fall Meeting. Bottom Row Right: Dr. W. G. R. Baker, Vice-President of the American General Electric Company being presented with the award for the presentation of the best group of papers delivered at the convention. More photos on page 36.

KULKA Single and Double Pole "Toggle" Handle Type
AIRCRAFT SWITCHES
For Electronic and Communications Use

Made to JAN specs for DC, or AC circuits up to 1600 cycles. Available with screw terminals and with soldering lugs. Switching characteristics provide for changes in electric circuits by use of SPST, SPDT, DPST and DPDT. Has bakelite housing and only one mounting hole.

TERMINAL BLOCKS
Barrier type, made of molded bakelite in varied styles & sizes up to 26 terminals. Send for catalogue.

KULKA ELECTRIC MFG. CO., Inc.
MOUNT VERNON, N. Y.

Represented in Canada by
A. T. R. ARMSTRONG CO. LTD.
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"Helineers"

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Now Available!**

Your copy of the Helipot® Condensed Catalog describing every model of Helipot precision potentiometers and Duodials is now ready for mailing. Please write for it and your copy will be mailed promptly.

**ASK FOR
DATA FILE No. 1232**

Helipot corporation
a division of **BECKMAN INSTRUMENTS, INC.**
SOUTH PASADENA, CALIFORNIA
... first in precision potentiometers

224

B.C. TELEPHONES

(Continued from page 17)

of toll circuits from point-to-point. Direct circuits are constantly ready between any point of the chain and the terminal in Vancouver. When a subscriber, whether he is a fisherman, tugboat operator or land station subscriber, wishes to place a call, he rings the Vancouver operator by flashing his carrier. Of course, he has information concerning the frequency assignments of the stations nearest him, and as a result operates his set on the required frequency. The Vancouver operator then completes his call.

It is this "dropping off" of circuits which accounts for the fact that of the 17 circuits leaving Vancouver, only seven go all the way through to the end of the line.

The second network extends from Vancouver through to the interior of the province to Prince George.

These circuits differ somewhat in their use from the Island chain. The interior circuits will be used primarily as regular long distance circuits between Kamloops and Prince George and Vancouver, with the accent on this type of service as opposed to the ship-to-shore and point-to-point service which is the highlight of the coastal chain.

Two minor VHF (or FM) systems point up the usefulness of this type of long distance circuit. Circuits have been set up between Nelson and Riondel in the mining district of the Kooten-



● Government officials and industry leaders attending the R.E.T.M.A. Fall Meeting
Top Row, left to right: R. E. Steer, R.C.A.F.; J. W. Webber, Electronic Standards Sub-Committee, Department of National Defence; Lt. Col. J. A. Loutit, Royal Canadian Corps of Signals. *Center Row, left to right:* J. T. Henderson, National Research Council, Ottawa; W. B. Smith, Telecommunications Branch, Department of Transport, Ottawa. *Bottom Row, left to right:* Major J. R. G. Bennett, Department of National Defence; Stan Taylor, Department of National Defence; Ray Anthes, Canadian Westinghouse Co., Ltd.; Walter H. Furneaux, Vice-President, Aerovox Corp., New Bedford, Mass.

nays and a group of circuits is in operation from Victoria to Port Angeles (on the Olympic peninsula) and thence to Seattle.

In the words of one telephone official in Vancouver "These circuits perform all the functions of land lines or un-

dersea cable, without the problems of maintenance in difficult terrain."

And with terrain such as that found throughout the length and breadth of British Columbia, it is small wonder that the future of radiotelephony in B.C. is bright.

FASTER* speeds in the *LOWER **Pressure Ranges with ...** **'SPEEDIVAC' VAPOUR PUMPS** (regd)

OIL VAPOUR PUMPS

MODEL	SPEED Litres sec.		STAGES	BORE SIZE in.
	Unbaffled	Baffled		
102	9-10	7-8	2	1
203	70-80	50-55	3	2
*F203	60-70	50	3	2
403	300-350	170-200	3	4
603	600-650	300-350	3	6
903A	1,500	900	3	9

MERCURY VAPOUR PUMPS

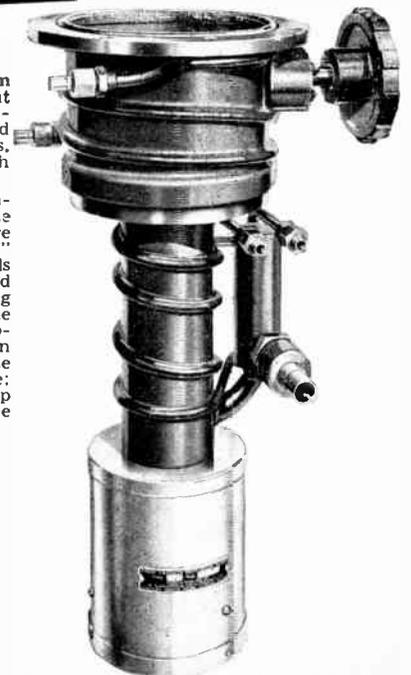
MODEL	SPEED Litres sec.	STAGES	BORE SIZE in.
1M1	2-3	1	1
1M2	9-10	2	2
2M2A	70-80	2	2
6M3	600-650	3	6
†GM2	10-15	2	60 mm.

* A fractionating version of the 203 for highest vacuum duties.
 † A glass vapour pump, alternative connections are available.

From all part of the world vacuum users consult EDWARDS about vapour pumps, because they manufacture a range of standard oil and mercury models, also special types, to cover every application of high vacuum.

Amongst the many unique operational features which has made "SPEEDIVAC" Pumps famous are included: an integral "Booster" type stage which greatly extends the capacity of the pump and economizes on the size of backing pump and pump lines; a Baffle Isolation Valve which cleverly provides for the special manner in which vapour pumps must operate to achieve maximum performance; the Self-Purifying type of oil pump designed for work demanding the highest vacua.

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



CANADIAN ORGANIZATION

SCIEX (CANADA) LTD.

50 YORK STREET

TORONTO 1

NEW PRODUCTS

(Continued from page 34)

● Javabond Liquid Plastic Item 425

Epoxy resins are being widely used and accepted in the electronic field for bonding, coating, potting or encapsulation of all types of components.



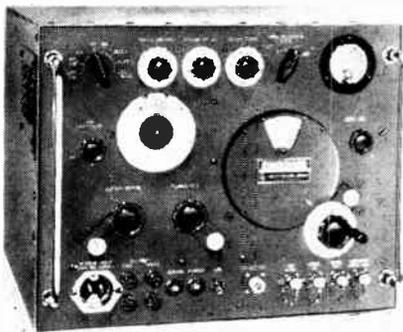
Javabond, the new liquid plastic, possesses excellent electrical properties and practically zero shrinkage. Excellent adhesion to metals, ceramics, and other materials, makes it possible to fulfill the demands of unusual applications. Javabond sets to a hard consistency, and may be extended or coloured with fillers.

● Direct-Reading Signal Generator Item 426

A compact new signal generator offering direct frequency setting and readings from 7 to 11 kmc is now being manufactured.

Known as Model 620A, the new generator is designed to simplify all SHF measurements including sensitivity, selectivity, and rejection, signal-to-noise ratio, conversion gain, SWR, antenna gain and transmission line characteristics. It may also be used for slotted lines, waveguide and filter networks.

Model 620A offers a broad selection of pulsing capabilities. It includes internal or external pulse modulation, internal square wave modulation, frequency modulation and CW output. Pulse output width is variable from 0.5 to 10 microseconds and repetition rate is 40 to 4,000 pps. On internal FM, the instrument provides a saw-tooth sweep variable between 40 and 4,000 cps. For external FM, capacitive coupling is provided to the repeller of the klystron oscillator. Repeller voltage is tracked automatically, and no adjustment is needed to select the correct frequency.

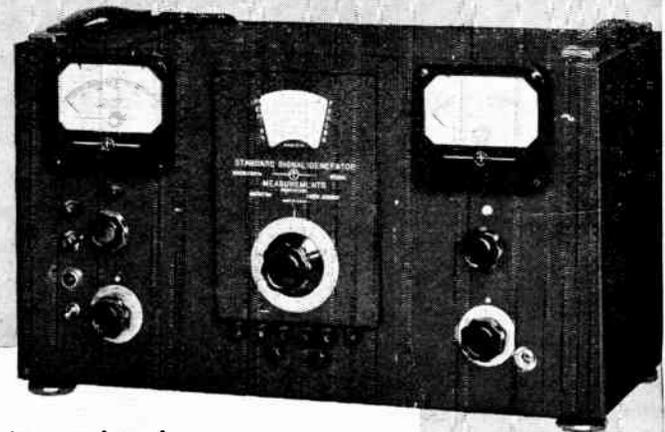


The generator has an output of 0.071 volts to 0.1 microvolts into 50 ohms. Frequency calibration accuracy is better than 1%, and attenuator accuracy is better than plus-or-minus 2 db. In all measuring operations, frequencies are directly set and read, and no charts or interpolation are required.

(Turn to page 40)

STANDARD SIGNAL GENERATOR

**MODEL
65-B**
**RANGE
75 KC
to
30 MC**



Individually Calibrated Scale

OUTPUT: Continuously variable, .1 microvolt to 2.2 volts.
OUTPUT IMPEDANCE: 5 ohms to .2 volt, rising to 15 ohms at 2.2 volts.

MODULATION: From zero to 100%. 400 cycles, 1000 cycles and provision for external modulation. Built-in, low distortion modulating amplifier.

POWER SUPPLY: 117 volts, 50-60 cycles, AC.

DIMENSIONS: 11" high, 20" long, 10 1/4" deep, overall.

WEIGHT: Approximately 50 lbs.

IN CANADA —
H. Roy Gray, Ltd., 46 Danforth Road, Toronto, Canada.

MEASUREMENTS CORPORATION
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MANUFACTURERS OF
Standard Signal Generators
Pulse Generators
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Strength Meters
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Megohm Meters
Phase Sequence Indicators
Television and FM Test
Equipment

STABILITY! ACCURACY! PRECISION!



Silicon
**Miniature
POWER
RESISTORS**



EVERY DESIRABLE CHARACTERISTIC

- Smallest in size.
- Sealed in Silicone.
- 100% impervious to moisture and salt spray.
- Complete welded construction from terminal to terminal.
- Temperature coefficient 0.0002 per degree C.
- Ranges from .05 Ohms to 55,000 Ohms, depending on type.
- Tolerance .1%, .5%, 1%, 3% and 5%.
- RH Types — Silicone sealed in a die-cast, black anodized radiator finned housing and mounts on sub-panel for maximum heat dissipation.
- Prompt delivery. Let us quote on your immediate needs.

Phone, wire or write 1322 23th Avenue, Telephone 2139, Columbus Nebr. for prices and delivery. (We also manufacture deposited carbon resistors.) In Canada Teletronics Corp., Ltd., Toronto and Montreal.

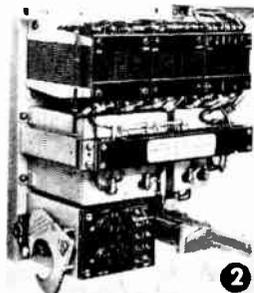
DALE PRODUCTS, INC.

COLUMBUS, NEBRASKA

Silicon
**MINIATURE PRECISION
RESISTORS**

**MANUFACTURED IN
ACCORDANCE TO
JAN-R-26A Specifications
Characteristic G'**

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



BE SURE
WITH

Telecommunications

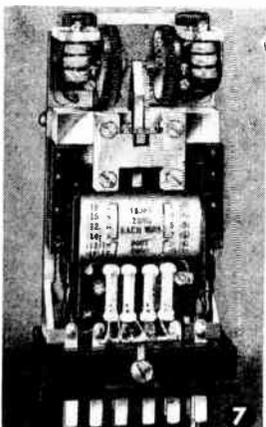
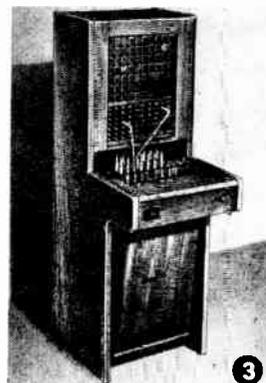
EQUIPMENT

2. "Syncycle" ringing frequency converters.
3. Magneto Telephone Switchboards.
4. Magneto and C. B. Telephones.

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.

7. "Carpenter" high-speed polarized relays . . . repeat signal impulses of varying time duration with utmost accuracy as in telegraph, measurement, protection and tele-control schemes.

Illustrated literature available on request.



TELEPHONE MANUFACTURING COMPANY LIMITED

Canadian Branch Office and Showroom

SAXONY BUILDING - 26 DUNCAN ST.
TORONTO - EM. 6-5314

TRENDS

(Continued from page 32)

★ **WITHIN A YEAR CANADA** will have the second greatest number of television transmitters in use of any country in the world. Seven transmitters are now operating or under construction and fourteen privately owned stations are in operation or under construction. Covered by these 21 stations 75 per cent of Canada's population will be within reach of TV service.

★ **IN 1950 THERE** were 30,000 TV sets in use in Canada, most of them in southern Ontario. It is estimated that by the end of 1953 there will be 450,000 sets in use.

★ **VANCOUVER WILL PROBABLY** be the first city in Canada to have electronically controlled traffic lights. The lights will be installed at the intersection of Boundary Road and Lougheed Highway and will automatically control the traffic according to its volume in any one direction.

★ **CANADA'S DEPARTMENT** of public works now has an electronic engineer as its ministerial head. He is the Honourable R. H. Winters who is a graduate of Mount Allison University and the Massachusetts Institute of Technology.

★ **LOW FLYING PLANES** need no longer hover over crowded cities in preparing to land at adjacent airports. This advance is due to an electronic development known as the DME, (Distance Measuring Equipment). With the DME incoming aircraft can be guided with precise accuracy to the airport.

★ **THE AMALGAMATION OF** Britains Royal Air Force and Royal Navy Fleet Air Arm radar research establishment at Malvern has been effected to coordinate more closely and raise the efficiency of radar research for the armed services.

★ **THE SUN PIPE LINE CO.**, of London, Ontario, and the McKinlay Transport Ltd., of Dixie, Ontario, have recently been granted certificates from the U.S. Federal Communications Commission to operate mobile radio units on the American side of the U.S.-Canadian border. The Sun Pipe Line Co., will operate nine units. Both companies will receive service from the Bell Telephone Company of Canada.

(Turn to page 45)



It whistles whenever I walk by it.

READERS' SERVICE PAGE

We realize that our readers are busy people and may not always have time to write letters of enquiry to manufacturers regarding advertised products that are of interest to them. Therefore, to save you the time of writing a letter, we offer you the use of this Readers' Service Page. It is designed for your convenience in obtaining free and without obligation detailed information on any

advertiser's product or New Product appearing in this issue of *Electronics and Communications*. Check as many New Products or Advertisements as you like on the attached coupons and send to *Electronics and Communications*, 31 Willcocks Street, Toronto 5, Ontario. We will see that detailed information concerning your enquiries is in your hands within a few days.

**Your
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Check Advertiser's Name For Further Information

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<input type="checkbox"/> Canadian Aviation Electronics oscilloscopes	52	<input type="checkbox"/> Industrial Products co-axial connectors	46
<input type="checkbox"/> Canadian General Electric junction transistors	51	<input type="checkbox"/> Kulka electric terminal blocks	28
<input type="checkbox"/> Canadian Marconi radiotrons	3	<input type="checkbox"/> Longstaffe electronic equipment	19
<input type="checkbox"/> Canadian Marconi radio receiver	14	<input type="checkbox"/> Measurements Corporation signal generator	37
<input type="checkbox"/> Canadian Marconi room service	29	<input type="checkbox"/> McCurdy audio equipment	40
<input type="checkbox"/> Canadian Marconi controls and resistors	6	<input type="checkbox"/> McVity electronic equipment	42
<input type="checkbox"/> Canadian Westinghouse electrostatic focus gun	21	<input type="checkbox"/> P.S.C. Applied Research ice detector	30
<input type="checkbox"/> Canadian Westinghouse — help wanted	34	<input type="checkbox"/> Phillips magnetic wire	7
<input type="checkbox"/> Computing Devices technical electronic equipment	31	<input type="checkbox"/> Pye telecommunications	33
<input type="checkbox"/> Consolidated Electronic Equipment custom terminal seals	20	<input type="checkbox"/> Radionic Research technical electronic equipment	48
<input type="checkbox"/> Cossor transmitter	5	<input type="checkbox"/> Sciex "Speedivac" vapor pumps	38
<input type="checkbox"/> Crosby side band receivers	30	<input type="checkbox"/> Stark hermetically sealed meters	23
<input type="checkbox"/> Curta hand calculator	39	<input type="checkbox"/> Telephone Mfg. Co. telephone equipment	34
<input type="checkbox"/> Dale power resistors	37	<input type="checkbox"/> Tektronix tubes	50
<input type="checkbox"/> Electrodesign electronic thermometer	41	<input type="checkbox"/> Universal Wire & Cable enamelled wire	44
<input type="checkbox"/> Erie resistors and capacitors	15	<input type="checkbox"/> U.S. Engineering Co. manual	45
<input type="checkbox"/> Ferranti research consulting	44	<input type="checkbox"/> Webcor tape recorder	48
<input type="checkbox"/> Glendon cartridge	40	<input type="checkbox"/> Western International co-axial and telephone connectors	11
		<input type="checkbox"/> Wiley books	47

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Coupon** 

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<input type="checkbox"/> 414	<input type="checkbox"/> 419	<input type="checkbox"/> 424	<input type="checkbox"/> 429	<input type="checkbox"/> 434	<input type="checkbox"/> 439
<input type="checkbox"/> 415	<input type="checkbox"/> 420	<input type="checkbox"/> 425	<input type="checkbox"/> 430	<input type="checkbox"/> 435	<input type="checkbox"/> 440
<input type="checkbox"/> 416	<input type="checkbox"/> 421	<input type="checkbox"/> 426	<input type="checkbox"/> 431	<input type="checkbox"/> 436	<input type="checkbox"/> 441
<input type="checkbox"/> 417	<input type="checkbox"/> 422	<input type="checkbox"/> 427	<input type="checkbox"/> 432	<input type="checkbox"/> 437	<input type="checkbox"/> 442
<input type="checkbox"/> 418	<input type="checkbox"/> 423	<input type="checkbox"/> 428	<input type="checkbox"/> 433	<input type="checkbox"/> 438	

Company Name

Your Name

Street Address

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NEW PRODUCTS

(Continued from page 37)

● Vacuum Voltage Divider Item 427

This divider features a fully shielded, low voltage probe and a purely capacitive circuit loading as low as 1.5 mmfd. The unit is 9½" long and 2½" in diameter. It can be used with an oscilloscope or voltmeter to measure both low frequency and RF voltages up to 60,000 volts. These units can also be used to measure double voltages in a balanced-to-ground arrangement.

Typical applications include measuring RF tank voltages, viewing the output of high voltage aircraft magnetos or pulse generators, and measuring the high voltage output of small 60 cycle power supplies that require low circuit loading.



The natural voltage division ratio of a divider with 4 mmfd. loading capacitance is about 22 mmfd. to 2.8 mmfd. (or about 8:1); the ratio of a divider with 1.5 mmfd loading capacitance is about 22 mmfd. to 0.4 mmfd. However, for this latter unit to be linear at low frequencies, it is necessary to have either a high impedance voltmeter or a higher voltage division ratio than the natural ratio. Voltage division ratios as high as 10,000:1 and as low as 8:1 can be attained with simple

capacitive shunts across the meter or scope. A shunt of 3000 mmfd. will have the advantage of reducing the reactance of the low voltage half of the divider circuit to the point where it is sufficiently linear down to 60 cycles that it can be calibrated at that frequency. A voltmeter or scope should be used that has 10 megohms or more of shunt resistance.

● Germanium Diodes Item 428

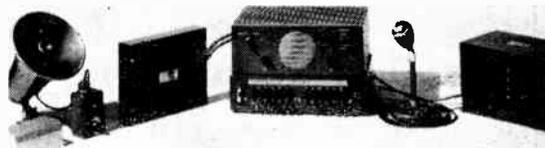
The range of germanium diodes which are of the point-contact glass capsule type has recently been revised and extended by the addition of several interesting new types by one large manufacturer.

Of the existing types, the GEX00 has been discontinued and the GEX44/1 replaced by the GEX34 for all purposes. The GEX34 is intended primarily for use as a television sound detector and sound noise limiter, and as a high level vision detector. It is capable of driving the sound output stage direct, where a sufficiently great R.F. input is available. The GEX35 remains the recommended type for low level vision detection and general purpose use.

The GEX45/1 and GEX55/1 high back resistance general purpose diodes are continued unchanged as is the GEX66 low-resistance V.H.F. mixer which will operate efficiently up to 1,000 Mc/s and give a useful response at frequencies as high as 10,000 Mc/s.

The GEX64 low resistance mixer is now supplied in groups matched for 5 mA forward current in the voltage range 0.2 to 0.3 volts, for use in telephony modulators and similar bridge circuits where matched rectifiers are necessary for optimum operation.

The new types include the GEX36, a mixer diode and telephony modulator for use at higher voltage than the GEX64; it is available in groups matched for forward current at 5mA in the voltage range 0.675 to 0.875 volts.



● Tailor-Made Communications Item 429

As a result of the proper engineering and application of mechanical and electrical components, this system of industrial inter-communication produces highly intelligible voice communication to overcome the high ambient noise levels usually encountered in manufacturing operations. Typical of this are installations now in operation in rubber industries, steel mills, machine shops, foundries, and commercial printing and metal stamping plants.

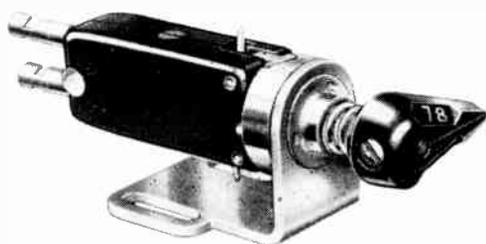
This system is not an ordinary inter-communication system. Ten years of continual use in major industries has proved its ability to perform on the production line.

● Germanium Triode GET1 Item 430

A germanium triode of the point contact type is now in pilot plant production and is available to equipment makers in sufficient quantities for experimental work and prototype equipment. The triode uses single crystal germanium, and the unit is hermetically sealed in a metal can insulated from all electrodes. Flexible leads are provided for the connections.

The triode is suitable for use in amplifiers, oscillators and for electronic switching applications. Its low power consumption and electrical characteristics make it ideal for digital computer work.

(Turn to page 44)



ACOS Hi-g

The ACOS HGP33-1 Hi-g Cartridge incorporates new developments giving the following advantages:

- Improved tracking at highest modulation levels.
- High compliance.
- Low mass of moving system.
- Mounting suitable for North American arms.
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BOOK REVIEW

PRINCIPLES OF TRANSISTOR CIRCUITS, edited by Richard F. Shea and co-authored by members of the engineering staff of the Electronics Laboratories of the General Electric Company gathers for the first time in book form a large portion of the existing research material on transistor circuits. The book provides basic theory plus an elaboration of various techniques in the field. It presents a firm background in this rapidly progressing field which will permit utilization of new forms of transistors as they appear.

In order to make the book applicable to as many of these devices as possible, the authors use a general treatment, built around generalized equivalent circuits which can be used to conveniently represent the great majority of transistors. After a brief introduction, the book is divided into three parts covering low-frequency, high-frequency and large signal non-linear applications. In each section the same general organization is followed: presentation and analysis of equivalent circuits, analysis of the mathematical relationships, and development of applicable circuits. The subject matter is liberally illustrated. Problems and bibliography are included.

Each chapter is as self-explanatory as possible. Special chapters on duality, matrix methods, and on the application of feedback are included. Resemblances to vacuum tube circuits are pointed out, and the book uses current network theory modified to fit transistor circuits. It elaborates in detail on the fundamental equivalent circuits for various configurations and for different frequency ranges. It includes material relative to D-C, audio and ultrasonic amplifiers in their various forms and combinations, and includes circuits for utilization of transistors in oscillators, intermediate frequency amplifiers and radio frequency amplifiers. Analysis is applicable to both n-p-n and p-n-p units.

PRINCIPLES OF TRANSISTOR CIRCUITS, published by John Wiley and Sons Inc., contains 535 pages. Price \$11.00.

UHF TELEVISION ANTENNAS AND CONVERTERS, by Allen Lytel, a recent publication by John F. Rider, Inc., New York, contains all the latest and up-to-the-minute information on ultra high frequency televi-

sion antennas, transmission lines, converters and tuners are included.

Numerous diagrams, performance charts and photographs of all types of uhf television antennas now on the market, facilitate the technician's job of selection. What transmission lines to use, when to use them and how they operate both as an antenna lead-in and circuit element, are completely explained.

All types of uhf television converter circuits are broken down stage by stage with schematic diagrams. The purpose, function and layout of each stage is discussed. Complete coverage is given to all commercially used uhf converters including single-channel and full band types. Match-box units and uhf conversion strips are fully treated in the section on single-channel converters.

Uhf all-channel tuners are discussed by the various types now commercially available. Circuit diagrams materially aid in the explanations.

This is a valuable reference source for the technician now engaged in installing receivers in uhf areas, as well as the technician who is looking forward to future operations in this field. Students will find the subject completely covered in an easy to understand manner.

UHF TELEVISION ANTENNAS AND CONVERTERS contains approximately 128 pages in a paper binding.

The entire field of power system engineering, including the basic tools of analysis developed during the past two decades, is examined in **AN INTRODUCTION TO POWER SYSTEM ANALYSIS**, written by Frederick S. Rothe. Published in September by John Wiley & Sons, the book is one of a series written by General Electric authors for the advancement of engineering practice.

Rothe considers the characteristics of each building block in the modern power system, and analyzes the components of the generator, transformer, transmission line, and the load. While his scrutiny of synchronous machine theory, transformer theory, transmission line theory, symmetrical components, and stability is confined to the problems associated with the fundamental operating frequency, he also investigates the transient behaviour of the components during disturbances.

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INSTRUMENTS/CONTROLS

The author's wide experience in the field has enabled him to select the fundamentals and explain them succinctly, as well as to advance the information necessary to solve the majority of problems that arise in practice. Mr. Rothe is currently Manager of control systems in the analytical engineering section of the General Electric Company in Schenectady.

AN INTRODUCTION TO POWER SYSTEM ANALYSIS contains 137 pages and is priced at \$5.00.

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PL-259 Plug (NT 49190)

Mates with UHF female. Two-piece construction. For use with Cable RG- U: 8, 9, 10, 11, 12, 13, 63, 65. \$3.00 ea.

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UG-176 U for RG- U: 59, 62, 7110 ea.



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UG-260 U	0.52	UG-447 U	1.15
UG-261 U	0.84	UG-492A U	3.50
UG-262 U	0.90	UG-604 U	1.15
		UG-625 U	0.95



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INC., Chicago, Ill.**

Custom moulding and fabricating of TV
Picture Tube Masks and other plastic
products.

RADIO MATERIALS CORPORATION,
Chicago, Ill.

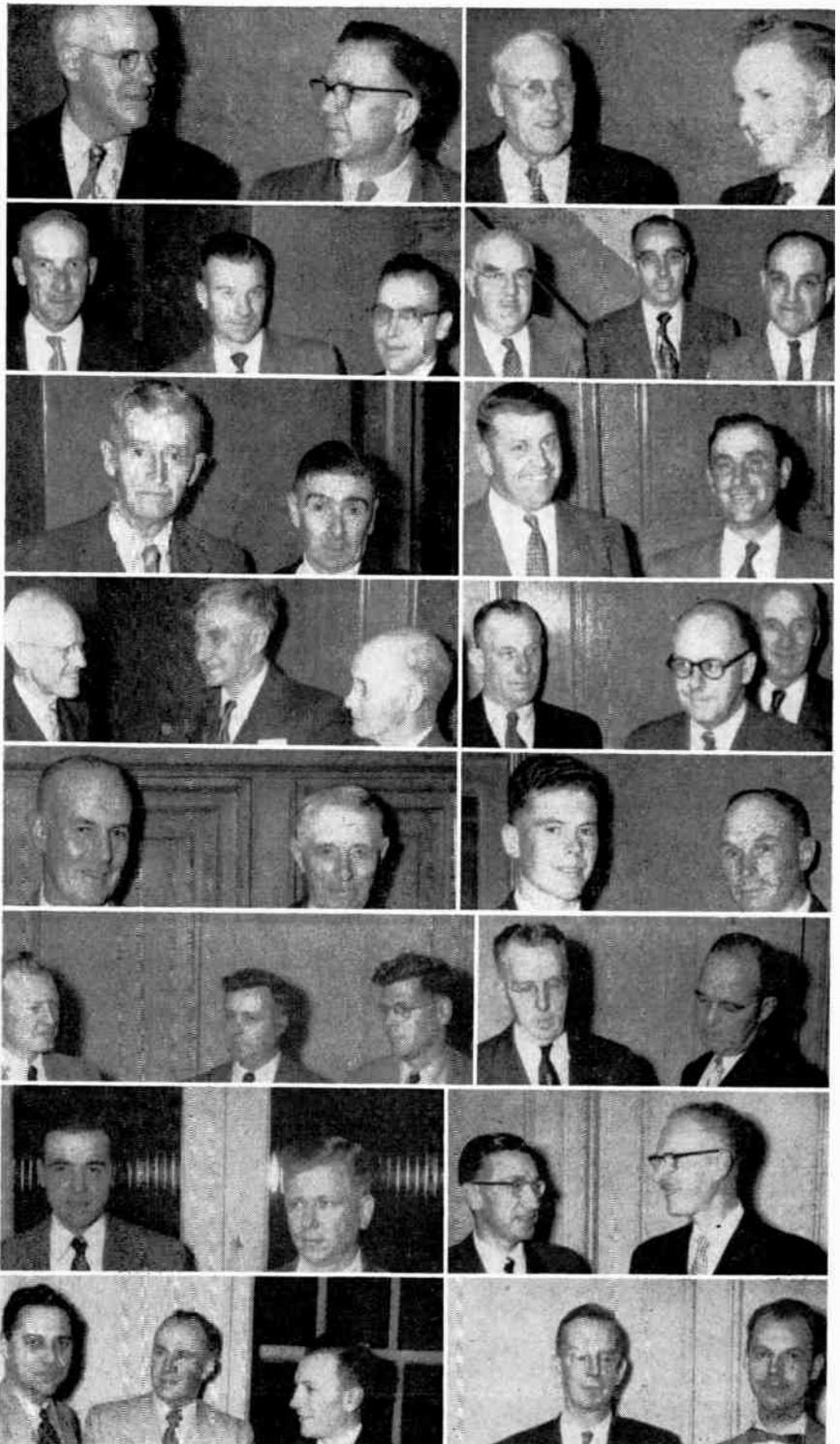
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• • •
WRITE FOR LATEST LITERATURE

C.I.T.A. 48th ANNUAL CONVENTION



● A few of the more than 175 delegates who attended the 48th Annual Convention of the Canadian Independent Telephone Association in Toronto were caught by *Electronics and Communications'* candid camera. Shown above are: Norman King, Churchill, Ontario; Eban Sawyer; Harry Todd; Edgar Sturgeon, Churchill, Ontario; Harvey Ralston, Innesville Telephone Company; V. Flynn, Stayner, Ontario; E. B. Palmer, North Norich Municipal Telephone System; W. J. Watt, East Luther Telephone System; Ivan Bruce, Eath Luther Telephone System; Walter Boyd, St. Vincent Municipal Telephone System; Don MacKenzie, Maidstone Municipal Telephone System; Ray Sweetman, Maidstone Municipal Telephone System; W. J. Martin, Harriston, Ontario; G. E. Maldrett, Tweed Representative for the Rural Telephone Committee; W. Chapman, Dresden, Ontario; W. A. Mackay, Rosseau, Ontario; V. Jabbins, Port Carling; Paul Vatchner, Ajax, Ontario; W. E. Campbell, Emsdale; H. Budarich, Emsdale; J. W. Thomson, Eastern Township Telephone Association; G. C. Dance, Western Counties Telephone Association; L. Hopkins and J. Hammett, Mount Albert Telephone Company; Graydon Daines, Moore Municipal Telephone Association; J. A. McDonald, Ontario Municipal Board, Superintendent of Telephone Systems; W. Tummonds and A. Dixon, Manila Telephone Company.

7V Aerials --- RUST TEST

Television dealers and antenna installers are using a simple new test to check the corrosion resistance of various mast materials. The test is a fast, reliable tool for anybody who wants to make sure for himself which masts can take it and which will rust away.

The only equipment needed is an 8-ounce jar, 4 ounces of tap water and a teaspoonful of salt. First the jar is half filled with water (4 ounces); then one level teaspoonful of table salt is added. This gives a salt solution of about 3.3 per cent by weight, or the equivalent of sea water concentration.

This sea water concentration, incidentally is more severe than 20 per cent salt would be, because it tests both corrosion resistance of any coating to the penetration of water through the film. Tenth per cent salt actually helps the coating to stop the migration of water. The 3.3 per cent solution allows water to penetrate some coatings.

Next, pieces of mast tubing about four inches long are immersed in the solution. The test pieces are allowed to stand in the solution for one month or more. That's all the time it takes for the salt to do its damage. Water lost by evaporation is replaced

by adding tap water to bring the water to its original level.

Jones & Laughlin Steel Corporation, Pittsburgh, had this test designed recently for dealers and distributors, to demonstrate the corrosion resistance qualities of a plastic coated electric welded steel tubing.

At the end of a month in the salt water, the plastic coated tubing comes out looking like new.

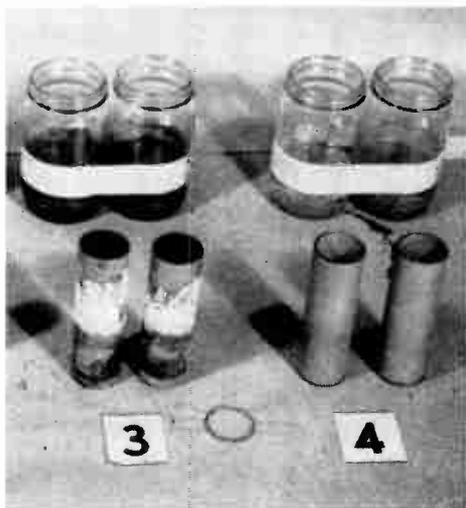
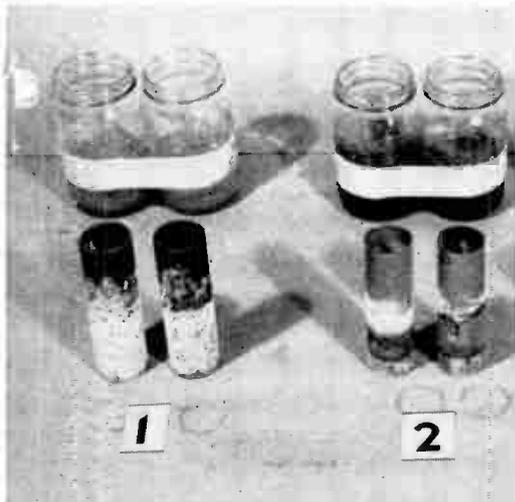
Secret of the new tube's success in resisting the corrosive effects of salt water, is the double coating, inside and out: (1) Vinsynite undercoating, a wash primer which phosphates the steel and at the same time puts on a primer film. (2) The finish coat which is a baked aluminum pigmented vinyl resin coating. The 16 and 18-gauge electricweld tubing is coated inside and out by a special dipping process.

Specialty Coating Inc., a division of Thompson & Co., Oakmont, Pa., developed the Vinsynite-vinyl coating system.

Test samples after 40-day corrosion test. Samples No. 1 and No. 2 are mechanical tubing, electrogalvanized and painted; No. 3 is a plain galvanized mechanical tubing. No. 4 is Perma-Tube, electricwelded steel tubing, coated inside and out with plastic. All these samples were immersed for 40 days in 3.3 per cent salt solution in the jars.

On the painted samples No. 1 and No. 2, note the heavy white zinc corrosion products and the pitting corrosion. General rusting of the steel shows up in sample No. 2.

On No. 3 the zinc is completely gone and the underlying steel severely attacked. On Perma-Tube, No. 4 there is slight staining from the rusty salt water. Rust in the water originated from the cut edges only. There is literally no creepage of corrosion from the cut edge. The coating is intact down to the bare steel.



ULTRA LOW LOSS DESIGNED FOR HIGHEST UHF GAIN

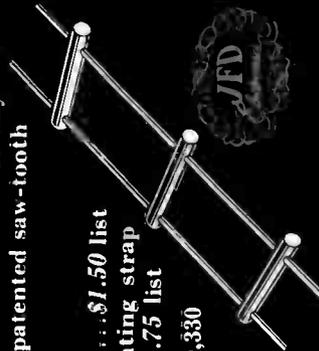
DON'T RUIN your installation with a lightning arrester of high insertion loss. Install the arrester that's an asset instead of a liability to your UHF or VHF installation — the JFD "3-IN-1" with the ultra low loss compensating coil circuit. Thousands of installations prove the "3-IN-1" gives the lowest insertion loss of any arrester in use today. Patented strain-relief lips and patented saw-tooth washers are exclusive JFD extras at no extra cost.

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No. AT110 with hardware for wall or window sill.....\$1.50 list

No. AT110S with UL approved stainless steel mounting strap.....\$1.75 list

U. S. Patent Nos. 2,654,857; D-159,330



3 For UHF-VHF open wire

2 For VHF flat twin leads



1 For all UHF or VHF tubular twin leads

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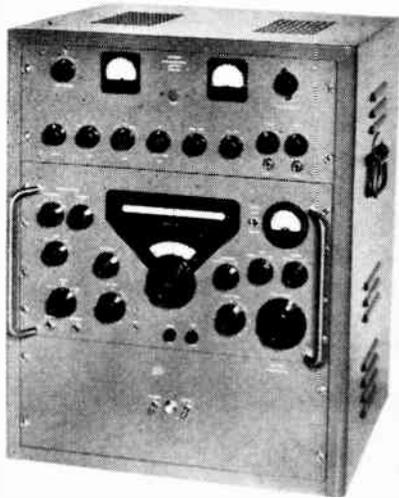
(Continued from page 40)

● Long Range Communication Unit

Item 431

Type 76 Single-Sideband Adapter incorporates the new toroidal coil filters in place of the crystal filters used in the Type 51 Adapters.

One of the outstanding advantages of the toroidal coil filter (Adapter) is the substantial reduction in cost as compared to the



present crystal filter units, a factor that will accelerate the trend to the much superior single-sideband type of communication systems.

This type filter is considerably smaller in

size than the crystal filter, resulting in a saving in weight and chassis space. The unit is more suitable for field use where equipment may be subject to operation under shock and vibration conditions.

Moreover, since the Type 76 Adapter has none of the multiple crystals and L-C network circuits, alignment procedures are substantially eliminated.

● Metal-Can Cased Capacitors

Item 432

BTY and WY Series "Fixfil" impregnated, high-temperature capacitors are paper and foil units, cased in hermetically-sealed, drawn metal containers and are now available in a choice of terminals of either molded bakelite and silicone rubber or ceramic solder-seal. "Fixfil" capacitors are designed for dependable operation over an extended temperature range from -55°C . through $+130^{\circ}\text{C}$. Both the cases and the terminals will meet the dimensional requirements of JAN-C-25 for style CP53 (bathtubs) and style CP61.

"Fixfil" is a specially developed solid impregnant, thermosetting in nature, that cannot soften, crack, or leak even at the maximum operating temperature. Use of the "Fixfil" impregnant permits the capacitor to be operated at full rated voltage over the entire temperature range of -55°C . to $+130^{\circ}\text{C}$. without derating at any temperature. In addition, the capacitance change from nominal over this same span of temperatures will not be in excess of ± 10 per cent. Temperature characteristics of "Fixfil"-impregnated, paper and foil capacitors will surpass the requirements for Characteristic "E" of JAN-C-25.

Values of capacitance and voltage listed in this bulletin cover up to 1 mfd. 400 VDC. Other ratings are available on special order.

● Marking Tape

Item 433

A new tape which is true white and precision printed to users' specifications by a special process has recently been placed on the market. The tape features high tensile strength, an adhesive which sticks firmly to any clean, smooth surface yet strips off cleanly without leaving a mark, and an excellent printing surface that can also be written on with pen or pencil.



A wide variety of applications include sealing, holding, bundling, marking (unprinted), instructing, identifying, warning and inspecting. Combinations of printed and written data increase its usefulness many times.

(Turn to page 46)

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TRENDS

(Continued from page 38)

★ **THE UNITED STATES DEFENCE DEPARTMENT** is reported to be considering cutting federal appropriations for assisting basic research if and when proposed economies are approved by the department. Some idea of what this will mean can be realized from the fact that in 1951 nearly 60 per cent of the research in electronics was financed by various federal agencies.

★ **WIRE MILEAGE OF TELEGRAPH** and cable companies in Canada totalled 437,581 miles in 1952.

★ **WILLY'S MOTORS LIMITED A SUBSIDIARY OF Kaiser Motors Inc.**, has announced plans to get into the TV manufacturing field. The firm will produce a complete "TV package" for the use of stations operated in areas where high powered television signals are not received. The proposed "TV packages" will consist of a 1000 watt transmitter, camera, projector, consoles panels and other equipment necessary for the operation of a station.

★ **CANADIANS SENT OR** received 1,934,433 cablegrams during 1952.

★ **A SEPARATE ELECTRONIC EQUIPMENT DEPARTMENT** with its own manufacturing and engineering facilities is planned by the Canadian General Electric Company. The company has also announced plans for a stepped up telecommunications equipment manufacturing program.

★ **THERE WERE 5,248 OFFICES** in Canada receiving and forwarding telegrams or cablegrams in 1952.

★ **THE 20TH BRITISH NATIONAL RADIO SHOW**, held in London from September 1st to 12th, attracted just short of 300,000 visitors, including 2,505 from 104 overseas countries, 633 of the latter being buyers.

Among the countries most strongly represented on the overseas register were India with 350 visitors, Australia 149, South Africa 136, Pakistan 108, U.S.A. 81, Sweden 79, France 77, Holland 74, Canada 66, New Zealand 60, Norway 56, Switzerland 46, Germany 45, Denmark 37, and Belgium 33.

★ **CANADIAN TELEGRAPH COMPANIES** handled 21,614,196 telegrams during 1952, of which 19,513,250 were sent through their offices and 2,100,946 were received from the United States.

★ **THE BRITISH ELECTRONIC INDUSTRY** is tending to become a supplier of capital goods to users of industrial electronic equipment rather than a supplier to the smaller consumer goods market of domestic radio and TV users. In the competitive field of electronics where the cost of labour in a finished product is high compared to material costs the U.K. is in the advantageous position of having one of the world's finest labour forces. British authorities, therefore, are placing considerable importance on the export of electronic equipment to countries where skilled workmen are at a premium and the cost of labour correspondingly high.

★ **ANOTHER LARGE EUROPEAN** company has made its appearance on the Canadian electrical scene. The company is Pirelli Holdings S.A. of Basle, Switzerland, with extensive holdings on the continent. This company has acquired control of Cables, Conduits and Fitting Limited of St. Johns, Quebec.

The St. Johns company, makers of wire and cable, will continue to operate under its present management with V. N. Longtin as President. There will still be some Canadian interest in the company.

Although Pirelli has not been active on the Canadian scene previous to assuming control of the St. Johns company, it has already been awarded a "prestige" order for the manufacture of 300,000-volt cable for the Aluminum Co., of Canada's power project in British Columbia. Pirelli is sharing the Aluminum Company order with Canada Wire and Cable.



OSCILLOSCOPE

Type 723



- Vertical cathode ray tube with 4 in. flat screen viewed through a surface-aluminized mirror
- Flat response ± 2 db from D.C. to 5 Mc/s
- Variable E.H.T. voltages of 1, 2, and 4kV
- Automatic Brilliance Control Circuit
- Time-base range from 0.5 seconds to 1 microsecond for full screen deflection
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- Immediate delivery

The above instrument is but one of the Airmec range of electronic equipment which includes everything from V.T. Voltmeters to Electronic Induction Heaters.

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Please send me, free of charge and without obligation, full catalogue information regarding Airmec Electronic Equipment.

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PRODUCTS

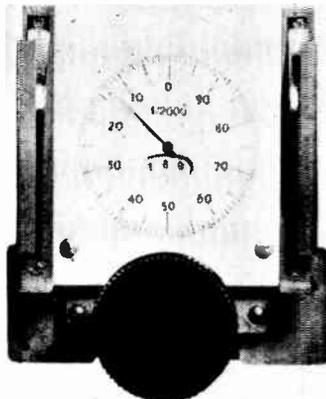
(Continued from page 44)

● **Multi-turn Microdual Precision Drive**

Item 434

For multi-turn control applications an outstanding special instrument. Microdual Type 57-360 is now available.

Basically, this is a special purpose version of standard Type 57. In addition to retaining all the essential features of the original No. 57 model, Type 57-360 enables an unlimited number of 360 degree rotations. Up to 20 revolutions of the operating shaft are marked on the inset turn-counting dial.



The main dial shows 200 divisions. This, in combination with the turn-counting dial enables positioning to 1 in 4,000 divisions. The effective scale length is 78 inches. Each small division represents 5.4 minutes of arc. Resetting accuracy is therefore better than 2.7 minutes of arc.

● **Toroidal Coils And Filters**

Item 435

As large-volume users of filters in high quality telephone and telegraph carrier equipment, the maker of these coils has the necessary background of filter engineering and production techniques to produce filters to the most exacting needs. Filters can be designed, developed and manufactured for specific applications in low-pass, high-pass, band-pass and band elimination types. And, associated components such as delay lines and equalizer networks for the audio or carrier frequencies can also be supplied. Special equipment is used to test each completed filter, to see that it is tuned and adjusted for optimum operating characteristics.

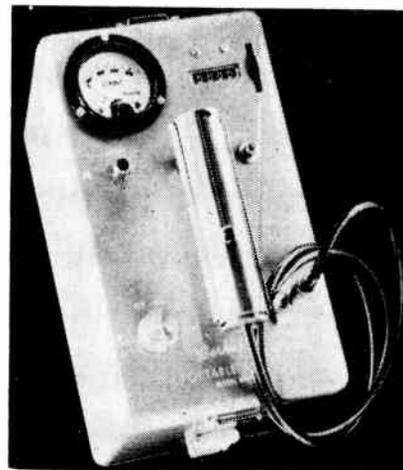
Toroidal Coils manufactured for use in such diverse fields as guided missile development and ultra-fidelity recordings are available in a wide range of sizes, down to the so-called wedding ring size — 0.800 in. O.D. The windings in the coils can be in balanced halves, tapped at any desired point and with closely-coupled secondary or tertiary windings. They are available cased or uncased, either hermetically sealed or mounted in an aluminum case with a bakelite terminal board. And, the cased types come in several standard styles.

● **Portable Scaler**

Item 436

A battery operated portable scaler is now available which provides a field instrument for accurate measurement of very low beta or gamma radiation levels where the source-to-background ratio is small. With the Model 2080 Portable Scaler, it is possible to obtain high accuracy in field measurements where conventional rate meter survey instruments are entirely useless because their statistical accuracy is limited.

The instrument contains an electronic scale-of-eight and a four digit resettable register. The electronic scaling binaries use subminiature tubes and are designed for low battery drain and maximum reliability. A



meter is used for interpolation of the binary count.

The high voltage supply is of the vibrator type and is regulated at 900 volts by a corona discharge tube. A selection of Geiger tubes and probes is available for use with the instrument.

Particular attention has been given to ease of battery replacement and servicing. Hand operated cabinet latches are used so that batteries can be replaced without tools. The instrument weighs 16 pounds and is 11" x 6 1/4" x 8" in overall size. Maximum counting rate is 100 counts per second and battery life is 60 hours in intermittent use.

(Turn to page 48)

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NEWS

*(Continued from page 35)***J. W. MacDiarmid Joins Pointon Sales Staff**

John W. MacDiarmid has joined the sales staff of the Charles W. Pointon organization at their new location, 6 Alcina Avenue, Toronto.

Mr. MacDiarmid has been connected with the radio business in various parts of the world since 1940 having served in the communications branch



of the Royal Navy. From 1946 Mr. MacDiarmid represented companies in London, England, pioneering the distribution of plastic equipment to the trade in Britain.

Coming to Canada early in 1952 he supplemented and refreshed his technical knowledge with a special course at the Radio College of Canada. This combined technical and sales knowledge will now be devoted to the efficient representation of the products handled by the Pointon organization.

T. A. Moore Director of R.C.A.

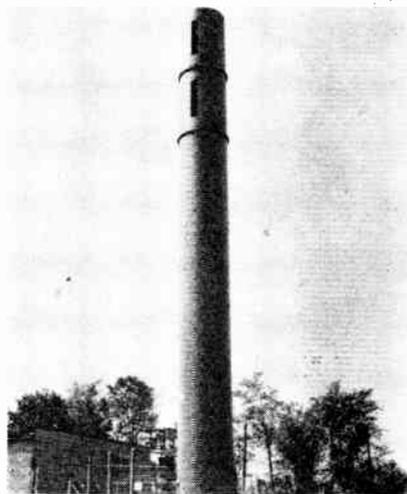
The appointment of Thomson A. Moore as a Director of the RCA Victor Company, Ltd., Montreal, has just been announced by F. R. Deakins, President of the company.



In April of this year, Mr. Moore was appointed Executive Vice-President of the company. Prior to joining RCA Victor in Canada in 1951, he was Sales Manager of the Ford Motor Co., Export Operations, in the U.S.A. He joined the Ford Company after serving as Export Manager of Montgomery Ward and Company, Chicago.

Wavestack of Canadian Design

The Wavestack, a unique type of television antenna, conceived, engineered and built entirely in Canada has now been "proved in" under the operational test of time in its first installation anywhere in the world at CBOT, the CBC's Ottawa network station. The Wavestack, a development of



● Two slot Wavestack television antenna currently in operation at CBOT, Ottawa.

the RCA Victor Company, Ltd., is a simple hollow tower of cylindrical steel requiring no structural support. The Ottawa installation was erected in time for the Coronation telecasts last June, and subsequent reports indicate that antenna performance has been completely satisfactory, without any of the complications which might be encountered in technical innovations of this kind.

I.R.E. Presents Annual Awards

Three of the highest awards presented annually by the Institute of Radio Engineers were announced recently.

The Morris Liebmann Memorial Prize, one of the highest awards in the field of radio engineering went to Dr. Robert R. Warnecke, Technical Director of the French Compagnie Generale de Telegraphie Sans Fil, for his work in the field of electron tubes and especially the magnetron class of travelling wave tubes.

Dr. Harold A. Zahl, Director of Aesearch at the Fort Monmouth, N.J. Signal Corps Engineering Laboratories, was awarded the Harry Diamond Memorial Award presented annually to persons in government employ for outstanding work in the sphere of electronic research.

RCA's Alda V. Bedford, was the recipient of the Vladimar K. Zworykin Television Prize Award, given in recognition to the engineers who have made the greatest contribution to television electronics. Mr. Bedford's award was presented for his contributions to the study of mixed highs and its application to colour television.

(Turn to page 50)

*Keep up-to-date
on new developments
with these important*

WILEY BOOKS!**Principles of
TRANSISTOR CIRCUITS**

Edited by RICHARD F. SHEA, *General Electric Company.* Written by nine G.E. authorities, this is the first full-length treatment of transistors. The book gives you basic theory and details on applicable techniques. It integrates the most useful information scattered through the literature and provides new material published for the first time. 1953. 535 pages. \$11.00.

**ULTRA HIGH FREQUENCY
PROPAGATION**

By HENRY R. REED, *University of Maryland,* and CARL M. RUSSELL, *U.S. Naval Air Test Center.* Based on recent research, this book covers important new developments in the U.H.F. field. The work provides a fuller understanding of such factors as reflection, divergence, and directivity. 1953. 562 pages. \$9.50.

**FIELDS AND WAVES
IN MODERN RADIO
Second Edition**

By SIMON RAMO, *Hughes Aircraft Co.,* and JOHN R. WHINNERY, *University of California.* A new and greatly expanded edition of this famous review of essential electromagnetic theory in modern radio. The work provides thorough coverage of principles and practical applications. There is a full discussion of low- and high-frequency field concepts. 1953. 576 pages. \$8.75.

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PRODUCTS

(Continued from page 46)

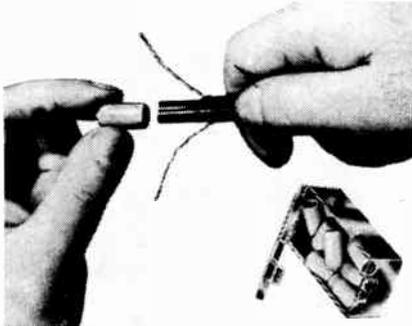
or the world's largest fractional horsepower electrical motor manufacturers.

Labels printed on the new tape provide blank spaces for inspector's rejection notations as well as "remarks" regarding friction, concentricity, and play, etc. The labels are applied to motor housings and notations made when the motors reach final inspection point. When the labels have served their purpose, they are easily and quickly removed.

● UHF Line Caps

Item 437

With the growth of tubular 300-ohm lead-in lines as a means of overcoming UHF signal attenuation due to moisture, television servicemen will be glad to know one company has come up with a quick and easy means of sealing permanently the exposed line ends. The UHF Line Caps are of polyethylene materials and flexible enough to conform with both the round and oval hollow line types.



Heretofore, a serviceman on the job has had to seal off the hollow opening on a rooftop or other precarious location with a match, lighter or soldering iron. Now all he has to do is slip one of these handy caps right over the end of the lead-in, and the job is completed without hazard.

● 1-Inch Magnetic Microphones

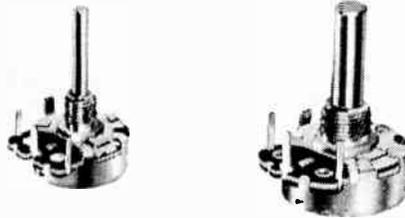
Item 438

A well-known manufacturer of microphones and acoustic devices announces the MC Series of Magnetic Microphones, diameter only 1-inch (25.4 mm.) — small, rugged microphones which are immune to varying conditions of heat and humidity. These controlled reluctance microphones were specifically designed for use with transistor circuits; but they're applicable to other devices — such as small, compact amplifiers and transmitters; dictating equipment; etc. Models MC10 and MC11 are similar, but MC11 has a Mu-Metal shield-ring for reducing hum pickup. Both models are identical in size: diameter 1", thickness $\frac{3}{8}$ ".

● Controls For Printed Circuit Applications

Item 439

In response to demands for controls for use in printed circuit applications, two new variable composition resistors have been announced by the makers. There are three unique design features: 1. Protection against bending during handling is achieved by recessing each blade-type terminal in a notch



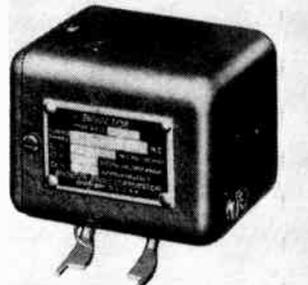
in the bakelite base of the control. 2. Valuable mounting space is conserved on the printed circuit panel by placing terminals close in to the mounting bushing. 3. Adequate clearance for circuit paths is provided by ample spacing between terminals.

The two new controls are available in both $\frac{3}{4}$ " diameter (Type U70) and in $\frac{1}{2}$ " diameter (Type U45). The $\frac{1}{2}$ " diameter control is also available with SPST and DPST 3 amp. 125v. switch. (Type GC-U45 and Type WF-U45 respectively).

● Inductors

Item 440

A new line of inductors, Type 590-A, designed for use in the Q circuit of the maker's Q Meters Type 170-A and Type 190-A. The new inductors, which are now available in six types, are useful for measuring the radio frequency characteristics of condensers, resistors, and insulating materials over a frequency range of 20 mc. to 230 mc. They also have general usefulness as reference coils and can be used to periodically check and indicate any considerable change in the performance of the Q Meters.



Each inductor Type 590-A consists of a high Q coil mounted in a shield and is provided with spade lugs for connection to the coil terminals of the Q Meters. The shield is connected to the lugs which connect to the Low Coil terminal in order to minimize

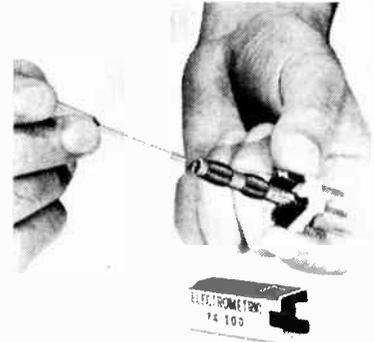
any changes in characteristics caused by stray coupling to elements or to ground.

● Miniature I.F. Transformer

Item 441

Tuning both coils from the same end is one important feature of a new miniature I.F. Transformer Type TX100, now available. Both coils can be tuned either from the top or from the bottom. This permits faster set alignment, reducing radio set production costs. Another result is a greater freedom of radio chassis design.

Field trouble is minimized because all connections are soldered. Terminals are permanently soldered directly to the capacitors so cannot come loose. Injury during soldering operation is avoided by using a ceramic base. Coil leads are not subject to breakage because they are soldered directly to the tops of the terminals. Higher Q is the result of a unique delay line type winding. Because Type TX100 is temperature compensated for low drift, it delivers constant high performance over a wide temperature range.



Type TX100 can be used for any application requiring a $\frac{3}{4}$ " I.F. transformer. It is available in a wide range of inductances and Q's for AM, FM, TV and military applications.

● Vacuum Tube Voltmeter

Item 442

Manufacturers of sound equipment, radio and electronic devices, telephonic apparatus and allied lines, and also schools, universities and research laboratories will be interested in the extremely wide range Model E-5151 Vacuum Tube Voltmeter just announced. This precision laboratory voltmeter has twelve well overlapping ranges from 0.001 volt full scale to 300 volts and readings may be made as low as 20 microvolts per division. It is also direct reading in dbm. (decibels referred to 0.001 watt in 600 ohms) from - 72 to + 52. This astonishing width of range is usable from 10 cycles to 2 megacycles per second, and has an accuracy of ± 3 per cent or better from 20 cps. to 200 kc! The voltage scales are linear, and calibrated to read the RMS value of a sine wave. The input impedance is equivalent to 10 megohms shunted by about 20 picofarad.

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● High-Resolution N-M-R Spectrometer

Item 443

New data bulletin illustrates and describes the Varian Model V-4300 High Resolution n-m-r (nuclear magnetic resonance) Spectrometer. Following an introduction characterizing the new instrument as a basic laboratory research unit for rapid non-destructive analysis of chemical bonding situations leading to identification and measurement of components in a mixture and assignment of structural formulas; the publication includes further specific data on the spectrometer and suitable magnet system. Data is included on basic operating characteristics; general arrangement of sub-units encompassing the probe, the radio-frequency transmitter and receiver, sweep device, power supply, and oscillograph.

● Coil Catalogue

Item 444

Burnell & Company is very pleased to announce that it now has available a 12 page catalogue which includes valuable and complete information on toroids, high quality coils, and various audio filter networks.

The catalogue includes complete descriptions, attenuation and Q curves that will prove valuable for equipment design engineers.

● Quinterra-Quinorgo

Item 445

"Quinterra-Quinorgo," is the title of a new 32-page publication just issued. It gives complete information about these electrical insulations made of purified asbestos . . . why they were developed, what their characteristics are, where they may be used to advantage.

This publication is both a manual of facts and a descriptive brochure. For the designer of electrical equipment there are tables giving test data on physical and electrical properties. Test methods are fully explained and there is a separate table for each of the several types of Quinterra and Quinorgo.

For the production man there is advice on application techniques and equipment including step-by-step photographic coverage of methods now in use. These picture stories also illustrate improvements in finished products . . . space savings, lower weight, economy of materials and longer service life. The subjects for the picture stories range from heavy duty lifting magnets to hair curlers.

In addition to photographs, many of the picture stories have sectional diagrams showing how, in a single piece of equipment, Quinterra and Quinorgo are used in many different places . . . for core tubes, layer insulation, wire wrapping, interlaminar insulation, end washers and the final wrapper insulation.

The book concludes with a description of allied products such as Quinterrabond, Quinorgobond, Quinterra-glass and composites or laminates that utilize Quinterra and Quinorgo but are manufactured by others.

● Thermocouple Calibration Data

Item 446

A large manufacturer has announced the publication of their new issue of "Pyrometer Thermocouple Calibration Data". These new tables are based on data recently released by The National Bureau of Standards. Adopted by the Scientific Apparatus Makers Association and the Instrument Society of America, the new tables are corrected to the absolute volt and to the International Temperature Scale of 1948. The Iron-Constantan table has also been corrected to a new curve which has been adopted by S.A.M.A.

Television HOT SPOTS

EVER hear of a TV set's "hot spots?" They're something like baseball's "hot corner" — or third base, where pressure is great during a ball game.

TV "hot spots" are those five places — strain areas — where ordinary tubes fail before their time. They are the low- and high-voltage rectifiers, horizontal and vertical deflection amplifiers, and damper diode. Larger screen sets aggravate the problem.

Recognizing the need for huskier tubes for these sockets, engineers have now taken the heat off the trouble areas by pioneering new "extra punishment" tubes.

They are called CTS-Rated tubes. That means, rated for Continuous Television Service. Engineers tackled the problem of TV's "hot spots" about eight months ago, and have come up with the new tube as their answer.

So far, there are two such tubes: The 5AW4, which came first and replaces the 5U4G; and the brand-new 6CU6, which replaces the 6BQ6GT. More are on the way.

Completely New Design

These tubes are not merely modifications of the older type tubes they replace, but are completely new in design. They will live under strains where the older tubes have a shorter life. They're "work-horse" tubes.

The new 6CU6, for example, with its wide margins of safety for plate dissipation, plate current, high-voltage insulation and high-line protection, has been estimated to cut service call-backs resulting from trouble with the older-type tube by at least 40 per cent.

The tube it replaces was recognized as a good tube, but it was originally designed for 10- and 12-inch TV sets.

Today, the older 6BQ6GT carries the load in 21-inch sets, and it combats accumulated dissipation caused by line-voltage variations, faulty receiver adjustments, and shifting values of components due to age and overload.

The CTS-Rated 5AW4 is a full-wave, high-vacuum rectifier designed for use as a low-voltage rectifier in TV receivers. It was specifically designed to eliminate rectifier failure due to the increased power requirements of large-screen sets.

Development of the new tubes is a natural sequel to TV's rapid development, for with TV's growth, television sets have come to require from four to five times as many tubes and eight times as much power as radio sets. Chances for tube failure have increased tremendously.

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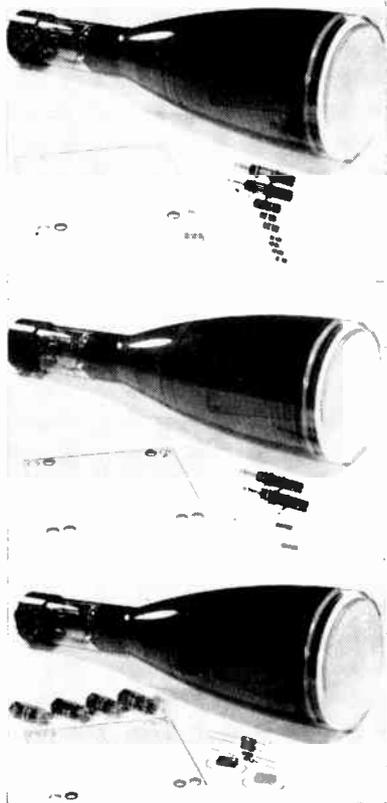
MODIFICATION NOTES

TO USERS OF TYPE 511A, TYPE 512, and TYPE 514 OSCILLOSCOPES

Tektronix now uses RCA's new 5ABP Cathode Ray Tube in these oscilloscopes. This new CR Tube is better in many ways than the old 5CP. It has about twice the vertical sensitivity, 20% more horizontal sensitivity, lower deflection plate capacitance, less pattern distortion, and a flat face. It is directly interchangeable with the old 5CP; so if you wish you can use this new tube in your old scope simply by plugging it in.

You can do better, though, by replacing

a few parts and making some adjustments so that front-panel dials and calibrations will still read right. Because this new tube greatly improves the performance of your scope, we think you'll want to make use of it. To make it as easy as we can for you, we have put up kits of all the parts you will need. The kits, including the new CR Tube, graticule, all necessary components, and easy-to-follow instructions, will help you bring your old scope right up to date. We pay the shipping cost.



K511AB—for Type 511A Oscilloscopes:

Doubles the vertical sensitivity, doubles the linear vertical deflection, reduces errors due to parallax. Kit contains 5ABP1 cathode-ray tube, 6 cm graticule, all other components required to effect the change.

Modification Kit K511AB (P1) . . \$36.00
(with P7 or P11 phosphor 40.00)

K512AB—for Type 512 Oscilloscopes:

Doubles the linear vertical deflection, decreases errors due to parallax. Kit contains 5ABP7 cathode-ray tube, 8 cm graticule, all other components required to effect the change.

Modification Kit K512AB (P7) . . \$39.50
(with P1 phosphor 35.50)

K514AB—for Type 514 Oscilloscopes:

Doubles the linear vertical deflection, decreases errors due to parallax, reduces dc-shift. Kit contains 5ABP1 cathode-ray tube, 6 cm graticule, four 6AU6's, all other components required to effect the change.

Modification Kit K514AB (P1) . . \$37.50
(with P7 or P11 phosphor 41.50)

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Three Canadians Win Highest I.R.E. Award

Among the seventy-six radio engineers and scientists who have been named Fellows of the Institute of Radio Engineers are three Canadians well known in the field of electronic engineering.

The awards will be presented by the President of the Institute at the Annual Banquet to be held at the Waldorf Astoria Hotel on March 24th during the I.R.E. Convention.

Canadian recipients of the award are: B. R. Tupper, Manager and Chief Engineer of the Northwest Telephone Company, Vancouver, B.C.; George Sinclair, Associate Professor, University of Toronto, President of the Sinclair Radio Laboratories Limited, Toronto, and J. E. Hayes, Chief Engineer, Canadian Broadcasting Corporation, Montreal.



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