

ELECTRONICS AND COMMUNICATIONS

Design • Manufacture • Engineering • Application

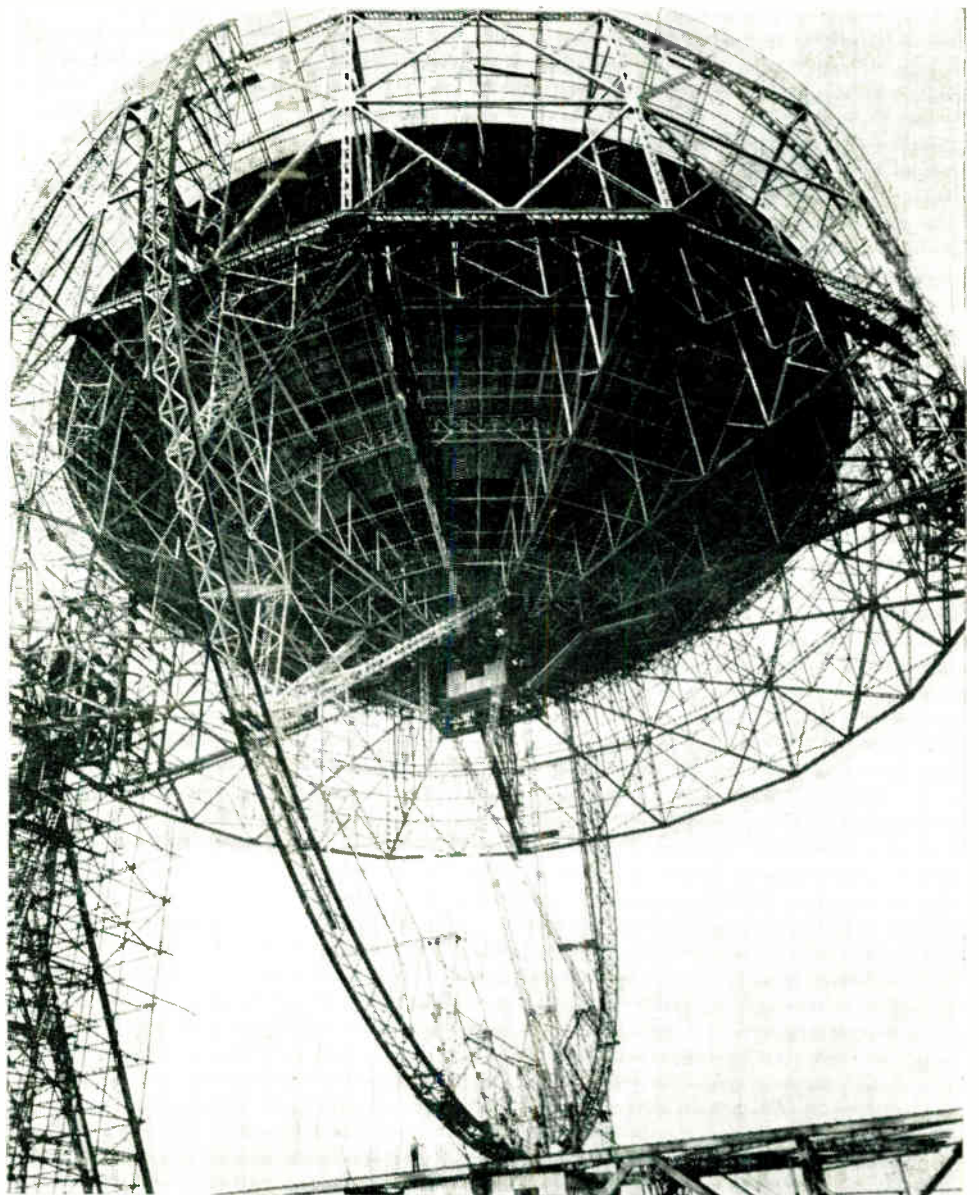
- Characteristics Of An Electron Synchrotron For Atomic Research
- Plating Process Expands Industrial Use Of Gold And Silver
- Cast Resin Insulators In Mass Production
- Automatic Slicers Increase Germanium Wafer Production

JANUARY, 1958

An AGE Publication



Toronto, Canada



*The World's Largest Radio-Telescope Which Has Been Built At Jodrell Bank In Cheshire, Eng.
Courtesy U.K. Information Office*

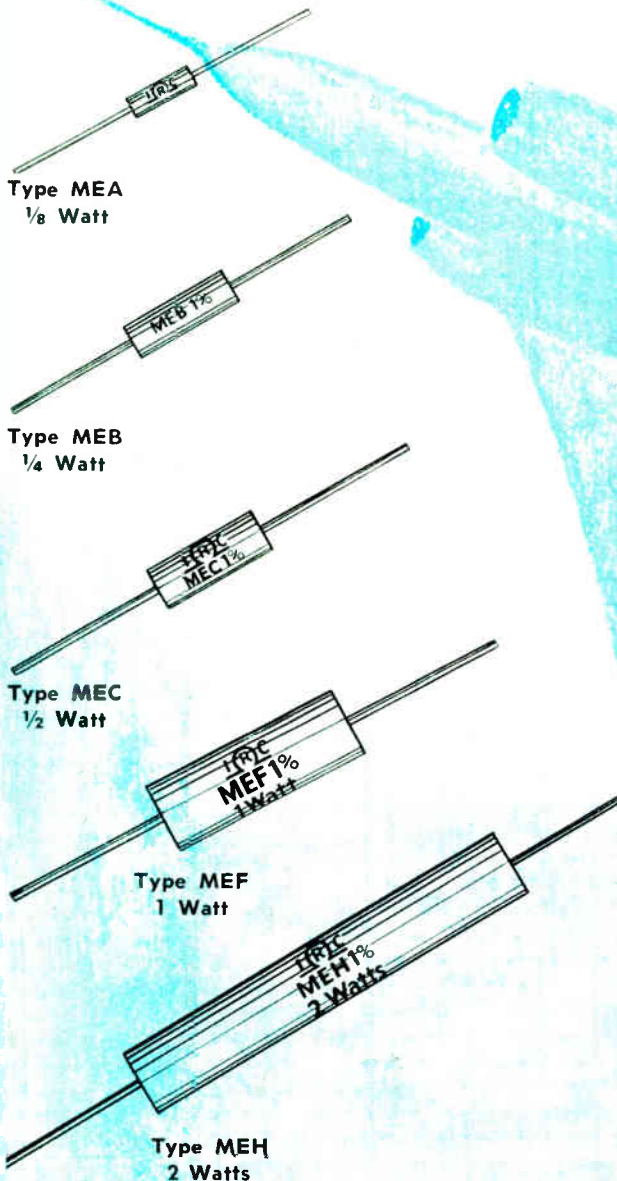
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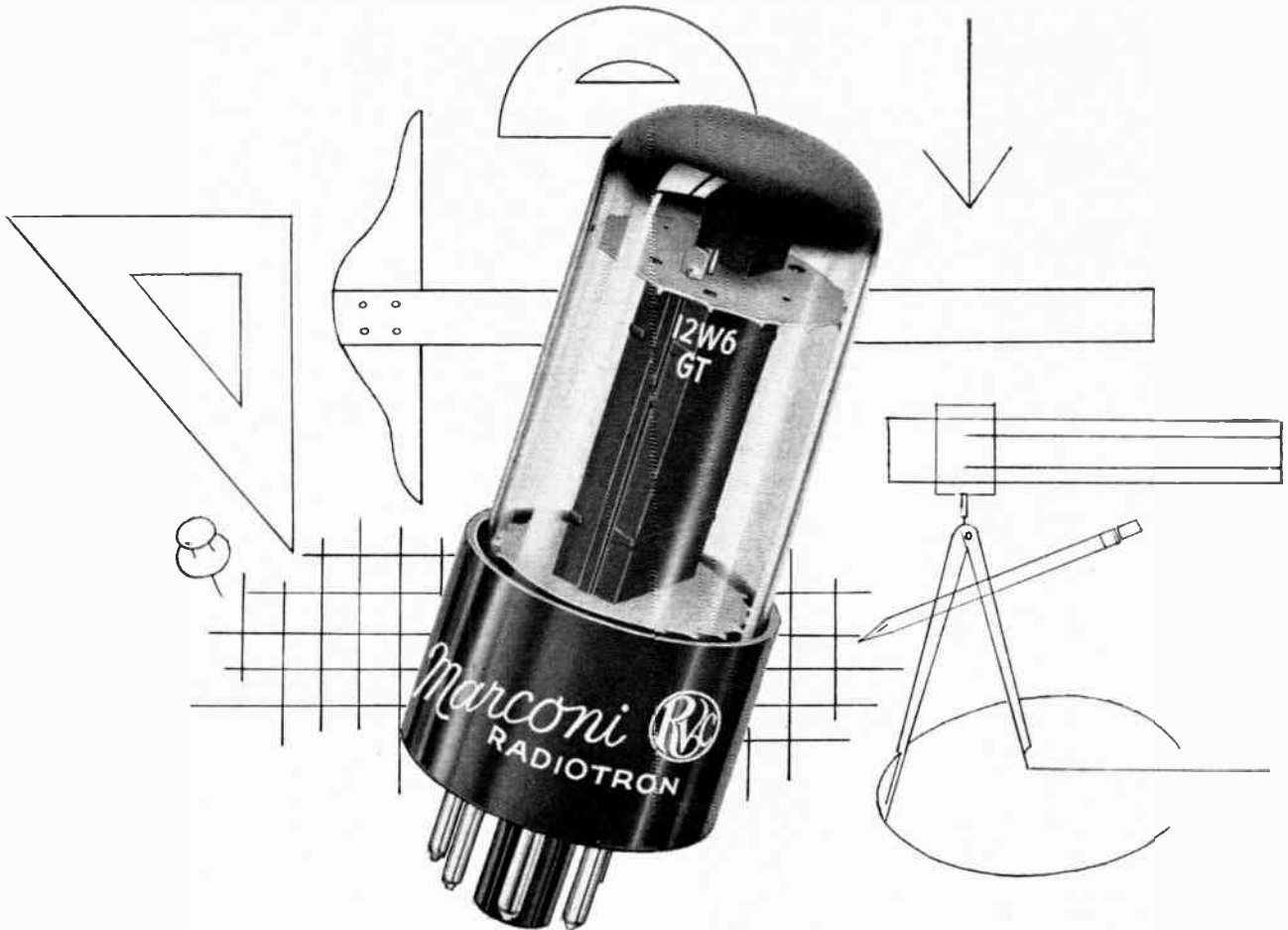
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Electronics And Communications

VOLUME 6

JANUARY, 1958

NUMBER 1

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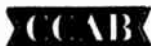
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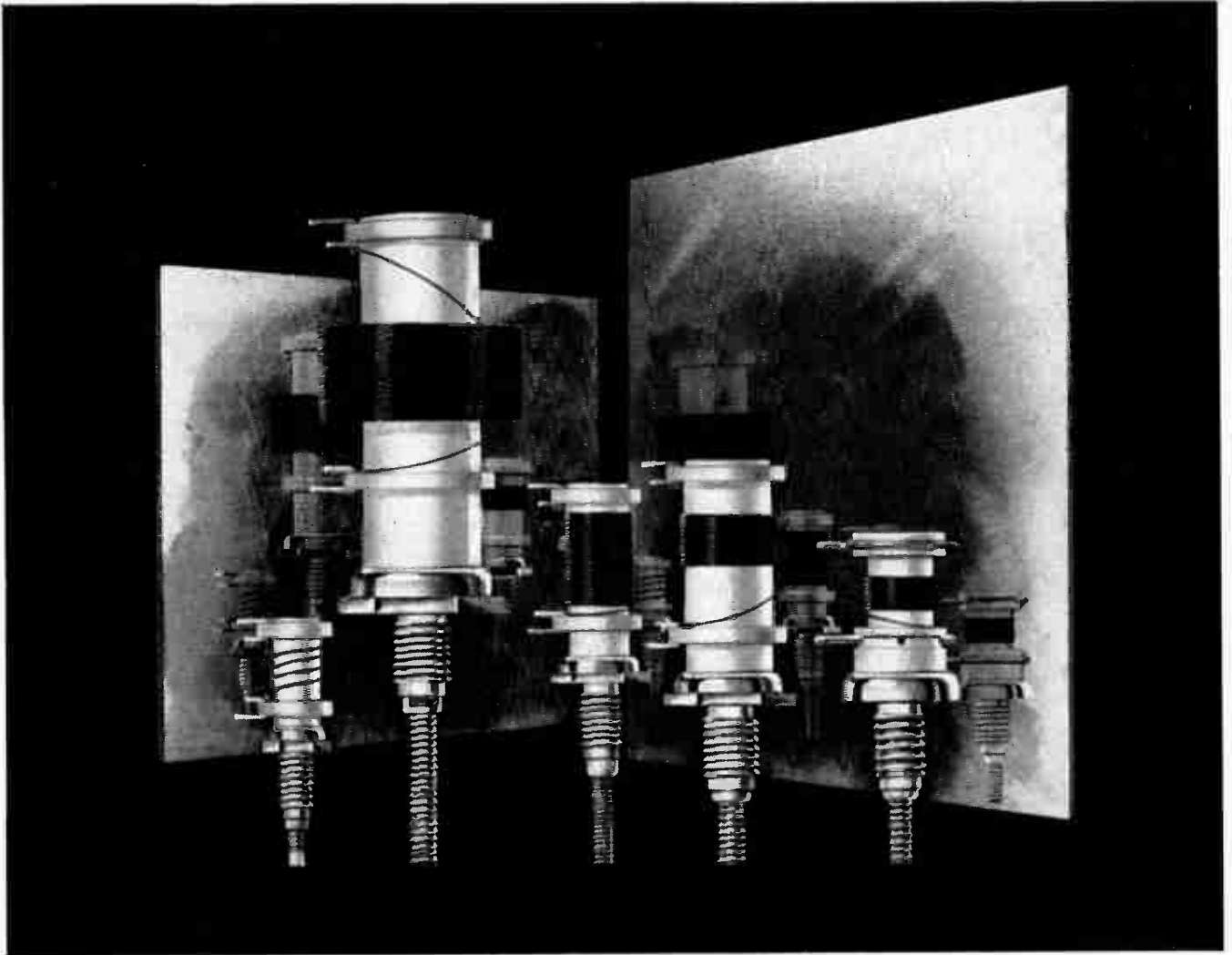
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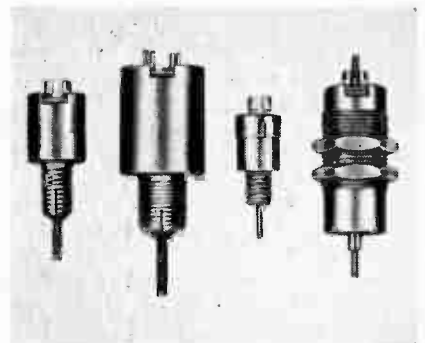
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RETMA Report



By Basil Jackson, A.R.Ae.S., Tech. M.C.A.I.

Active Engineering Committees

The various RETMA engineering committees have been active recently. The Mobile Equipment Engineering Committee of the Electronics Division, met in Toronto on January 14 to discuss the preparation of a specification covering VHF Maritime Mobile Equipment, of vital importance when the St. Lawrence Seaway opens to international shipping in 1959.

On January 16 an inaugural meeting of the RETMA General Communications Committee of the Electronics Division was held, also in Toronto. The first task to be assigned to this new engineering committee is a study of the proposed Department of Transport Specification No. 122 entitled "Specification for AM Single Sideband Radiotelephone Equipment Operating in the 1.6 - 30 mc. Band".

The purpose of such a study would be to form a basis for recommendations to the Canadian Radio Technical Planning Board for placing before the Department of Transport. Any suggested changes in DOT 122 would be compatible with present practices and would form the basis for an industry specification to cover this type of equipment.

On January 22 the Receiver Engineering Committee met in Toronto. Under discussion were the latest Standard Proposals and Standards, reports of the Sub-committee on Safety and CSA and on Spurious Radiation, television channel re-allocation proposals and other relevant engineering business.

A Task Force on Basic Industry Statistics met on January 17 to formulate recommendations for compiling basic statistics of the Canadian electronics industry.

EIA Conference on Automation

Sponsored by the Engineering Department of the Electronic Industries Association of the United States, a conference on "Automation Systems for Business and Industry" was held on January 22, 23 and 24 at Arizona State College. The sessions were broadly divided into subjects dealing with automation within the electronics industry, and outside the electronics industry, and terminated in a panel discussion covering the economic, education and social aspects of automation. A review forum on the final day of the conference wound up the proceedings.

The keynote address was made by Dr. Joseph Harrington Jr. of Arthur D. Little Inc., who said that facts about the real place of automation systems in business and industry were of paramount importance in the critical national security situation which existed in the United States at the present time.

RETMA Career Pamphlet Stock Exhausted

The pamphlet produced by the Industrial Relations Committee entitled "Your Future in Electronics" was so much in demand by schools that the supply has been exhausted. A limited reprint has been ordered to satisfy the requests of some schools, which had ordered them late in 1957. The pamphlet gives guidance to young persons interested in a career in the Canadian Electronics industry. RETMA regrets that no more orders for this pamphlet can be accepted at this time.

Three Million Television Sets Sold

Sometime during January, somewhere in Canada, a television dealer will uncrate the three-millionth television receiver to be manufactured and sold in Canada. This achievement has been accomplished in about nine years, in spite of the fact that Canadian television stations have been operating for only just over five years.

Newsletter

Canadian Radio Technical Planning Board

Recent CRTPB Meetings

The Executive Committee met in Toronto, on January 3, at the CRTPB Office.

On January 15, the Fixed Land and Maritime Mobile Committee, under the chairmanship of W. Ornstein, met in Toronto. The committee discussed the preparation of a motorcycle equipment specification, split channel specification, received comments on DOT Specification 105, discussed tunable receiver in DOT Specification 112, and dealt with correspondence that had accumulated during the period covered by the past two meetings.

New Altitude Indicator Eases Air Traffic Problem

An altitude assignment control that will provide faster and easier handling of air traffic information between Ottawa's Uplands Airport approach control and Montreal Area control centre has been put into operation at Uplands and Montreal by the Department of Transport. It is the first such installation in Canada.

The new equipment provides air traffic controllers at Ottawa with a visual picture, by means of a panel of lights, of the various altitude levels used by aircraft on the Montreal-Ottawa airway and indicating whether or not they are occupied. Prior to the installation of these indicators, constant telephone calls were needed between the two traffic areas to determine the altitude position of aircraft in the approach lanes.

This is the first of six installations of this equipment. Other air traffic control units to receive them are Gander, Goose Bay, Winnipeg, Calgary, and Edmonton. The new installations will be brought into operation early this year.

City Invokes DOT Regulations

Recently the city of Owen Sound, Ontario, applied to the DOT to be designated as an area in which the local building inspector was empowered to enforce regulations, under the Radio Act, requiring that radio and television antennae or aerials be constructed and installed in such a manner as not to endanger the public. The area was designated as such, making it the sixth to be granted this power; the others are Chapleau, Ont., Swift Current, Sask., Drumheller, Alta., Kimberley, B.C., and Vernon, B.C.

New Signals Centre For Atlantic Air-Ground Service

The Aeradio Signals system at Gander, Newfoundland, recently officially opened by the DOT, is now operating on a 24 hour basis.

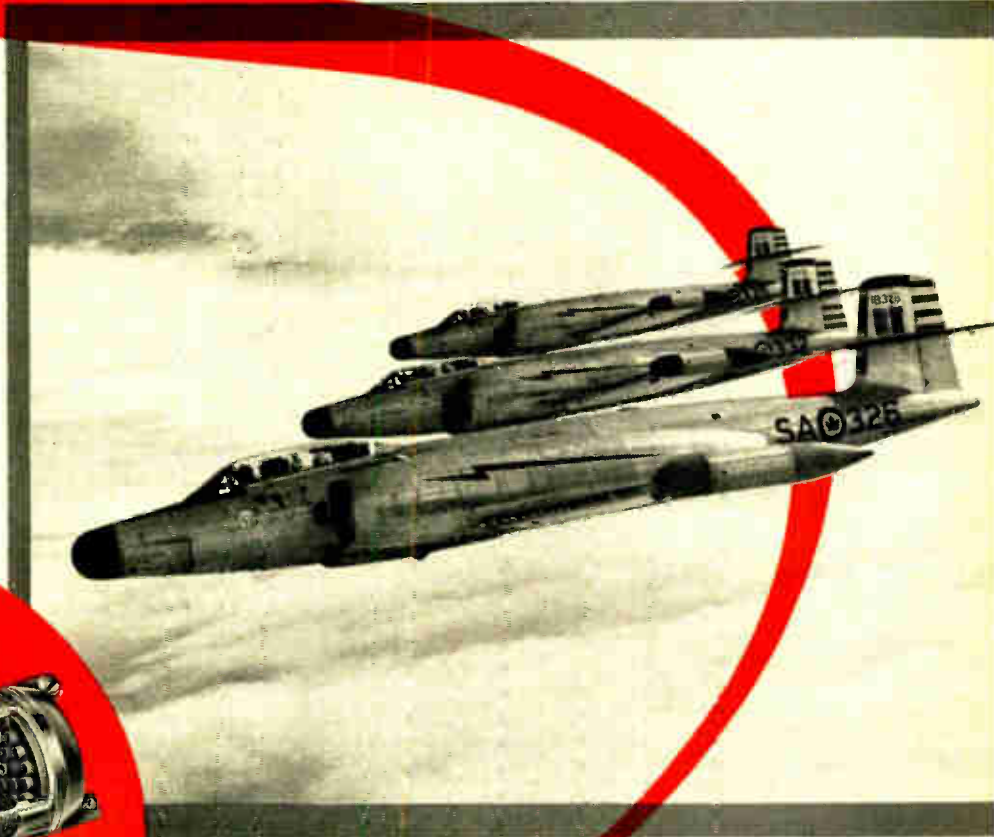
Opening of the Signals Centre marks the final phase of an extensive program of renovation of Gander as a key point in North Atlantic air-ground and point-to-point telecommunications. The air-ground facilities are being used in conjunction with the tape relay centre housed in the same premises, and which was put into use several months ago. Transmissions from the center are broadcast from a new and powerful remote transmitter station.

Canadian Radio Technical Planning Board
200 St. Clair Avenue West, Toronto 7, Ontario

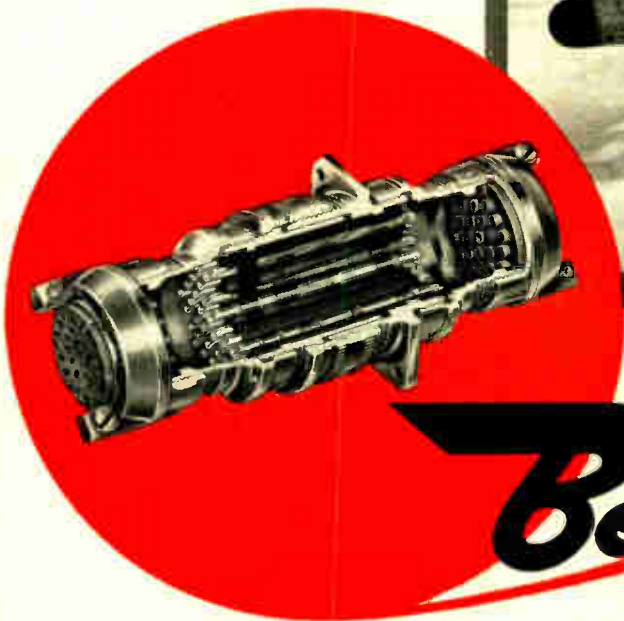
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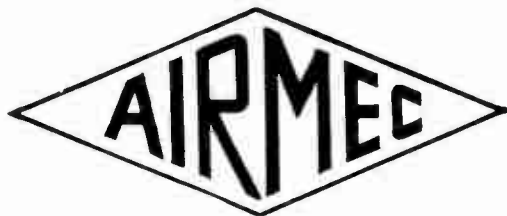
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- Outputs: 100 c s, 1, 10, 100 and 1000 Kc/s. (These outputs available simultaneously in sinusoidal and pulse waveform).
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- Beat detector with loud speaker built-in.



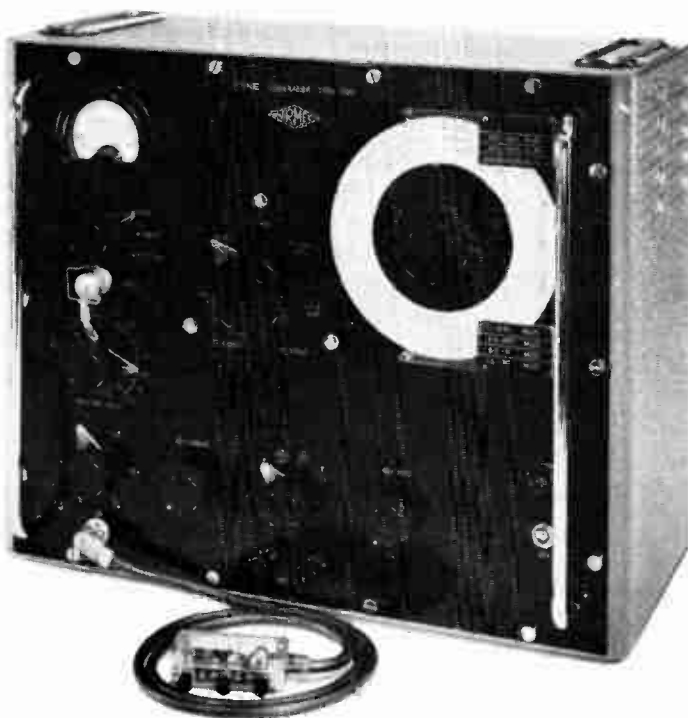
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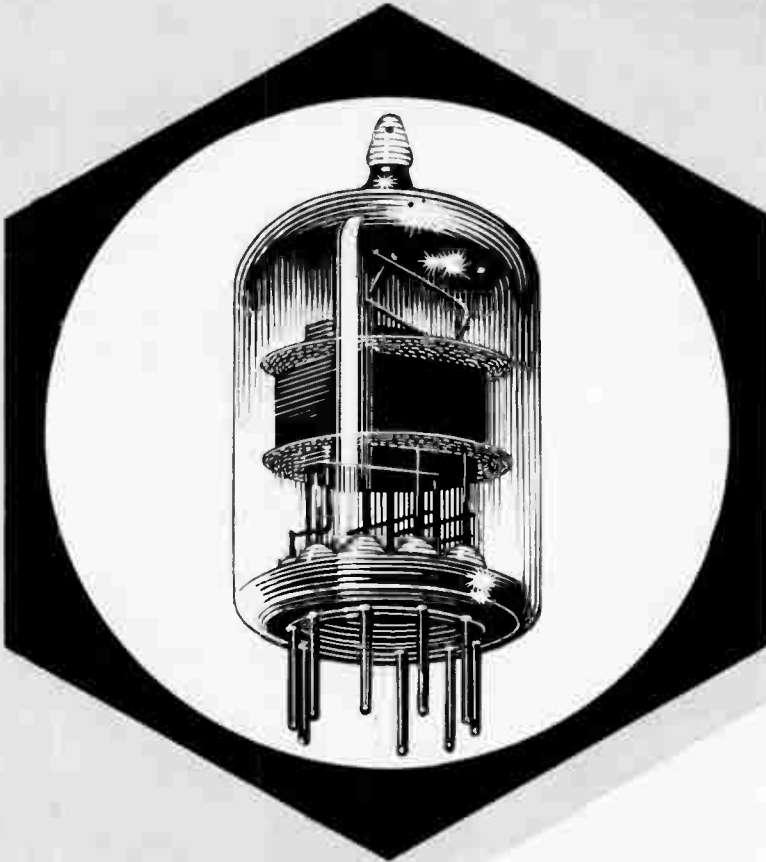


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Alpha Wire Corporation
200 Varick Street, N. Y. 14, N. Y.
ALgonquin 5-5400

TWX: NY-1-1152

Electronics And Communications

Volume 6

January, 1958

Number 1

Subliminal Brainwashing

Subliminal advertising, the latest gimmick devised to sell the public everything from popcorn and cures for baldness to ball-bearing joints for artificial limbs without letting the victim know from whence comes the compulsion to do so looks as though it may be destined for filing away in the limbo of lost causes before it gets a chance to even sell itself.

Subliminal suggestion is the somewhat sophisticated label with which the creators of the technique have chosen to name their new method of advertising. It achieves its effect by projecting advertising messages across television or theatre screens at such low intensities of light that they are perceptible only to the subliminal level of consciousness. All of which means that although one is being subjected to strong influence to buy some product, one is not aware of the source of influence.

Briefly the technique constitutes a form of electronic brainwashing or hypnotic persuasion capable of impelling the unwary to act without benefit of reason and it is largely by reason of this somewhat unethical approach to advertising that the method has been received with anything but open arms. One of Manhattan's largest advertising agencies in a confidential report to its clients had the following to say about subliminal advertising: "A person perceiving subliminally may feel that whatever thought or emotion is triggered off by the subliminal stimulus is within himself, it originates within himself, it is his own idea."

According to recent reports the lid on this box of subliminal tricks was inadvertently lifted before its originators were ready to publicize the technique. The premature leak, however, has afforded those who would be largely concerned with its use to make known their reactions and the major American television networks have so far turned thumbs down on the idea by banning the use of subliminal advertising on their company owned stations, an action, we believe, that is highly commendable and one that will receive the wholehearted support of the general public.

Following are statements of the American television stations with regard to subliminal advertising as reported by Frederick W. Roevekamp in the *Christian Science Monitor*.

"The National Broadcasting Company:

'It is NBC's position that in the light of the present lack of knowledge of the effects and implications of such technique, employing it in broadcasting would be improper.

"This memorandum constitutes a directive that NBC will not accept or use subliminal perception messages for broadcast over our television or radio network or station facilities or in material prepared for broadcast by the NBC or by California National Productions.

'Our position on the matter is in accord with a recent recommendation of the National Association of Radio and Television Broadcasters' code review board that any proposals to use the TV medium in the process called subliminal perception be referred to the board immediately for review and that the experimentation or use of the process should not be permitted on the TV broadcasting medium pending such review and consideration'.

"The Columbia Broadcasting System:

'The legal, social, and ethical implications raised by subliminal perception as we understand it are sufficient to preclude it from use in any form on the CBS television network and our company-owned stations. Furthermore, it has been and will continue to be our policy to insist that all advertising messages transmitted over our facilities are clearly identified as such to the viewers.'

"The American Broadcasting Company issued no special policy statement but a spokesman said: 'We do not accept it.'

"The code review board also has asked its members that 'experimentation and use of the procedure should not be permitted on the television broadcasting medium pending . . . review and consideration.'

"These statements indicate to some observers, however, that neither the television nor the advertising industry has closed the door on subliminal advertising altogether.

"If it turns out to be successful the competitive pressure of the market may well result in a publicity effort to persuade the public to accept the painless persuasiveness of the invisible ad."

It behooves not only authorities in the telecasting industry to steer clear of this perverted use of television but also those in the advertising business if they are concerned with retaining the goodwill of the buying public and confidence both in their products and business ethics.

Misleading To Say The Least

A FULL page advertisement appeared in the December issues of various American aviation periodicals, sponsored by an American aircraft company, which read in part as follows: ". . . . the corporation would like to express its gratitude to and confidence in the *only nation in the world which is truly a government of, by and for the people*". The italics are ours.

Was this most intriguing statement written with "tongue in cheek", or is it possible, in this day of international enlightenment, that the writer could be so naive?

Any informed person knows that many countries have governments fully as democratic — just as truly of, by

and for the people — as the government of the United States of America. And a number of these countries, like Canada, prefer their own version of democratic institutions.

The statement is, to put it mildly, unfortunate. Within the U.S.A. it fosters an extremely erroneous impression of other countries. Outside of the U.S.A. it irritates her allies. No doubt it pleases the Kremlin.

The aviation industry — the bulwark of the free world — is now reaching for strength through international co-operation. We feel strongly that anything which diminishes this co-operation, however slightly, is to be deplored. Therefore, we deplore the wording of the advertisement.

Since early in 1950 an electron synchrotron has been in operation for research in nuclear physics at Queen's University. The machine is one of several built by the General Electric Company according to the design of Elder, Gurewitsch, Langmuir, and Pollock. It is capable of accelerating electrons to an energy of 70 million electron volts and produces X-rays when these high energy electrons are allowed to strike a tungsten target. In this article some basic principles of electron synchrotrons and selected features of the General Electric machine will be presented. A recent modification which has increased the output of this machine by a factor of approximately five will be described in the last part of the article.

Characteristics Of An Electron Synchrotron For Atomic Research

By H. Janzen*

A SYNCHROTRON is a circular charged particle accelerator with two distinguishing features. First, the particles are constrained to move in an orbit which is maintained essentially constant in shape and size by a relatively slowly increasing magnetic field produced by an alternating current magnet. Second, most of the energy is given to the particles by a radio-frequency electric field synchronized with their motion. A small increment of energy is given to the particles as they pass through the electric field on each orbit traversal.

The fundamental equations of motion in a circular accelerator, as they apply to a constant or slowly varying magnetic field, are shown in Fig. 1. In equation (1) the term on the left is the centripetal force necessary to keep a particle of mass m and with velocity v moving in a circular orbit of radius r . The term on the right is the force on the particle of charge e due to the magnetic field component B_z perpendicular to the plane of the orbit. Equation (2) is an expression for the relativistic momentum of a particle where T represents its kinetic energy, E_0 its rest energy, and C is the velocity of light. Combining (1) and (2) gives equation (3) which in the relativistic limit, where T is much greater than E_0 , reduces to equation (4). Equation (4) shows that at high energy, if the orbital radius r remains constant, the particle energy varies very nearly as B_z , and this describes the conditions in a conventional electron synchrotron over most of the acceleration. Equation (4) also shows that the limiting factor on particle energy in a given machine is the

maximum value of magnetic field attainable at the orbit.

In accelerators with constant orbital radius such as betatrons and synchrotrons, the magnetic field which maintains the particle orbit is called the guide field. Besides providing the component B_z this field must also supply radial and axial focussing forces. These are essential to prevent loss of the particles to the accelerator tube walls owing to the mutual repulsive forces between the particles or the effects of scattering by residual gas molecules.

The guide field configuration normally used in conventional betatrons and synchrotrons to supply both radial and axial focussing forces is illustrated in Fig. 2. To derive this, consider a particle moving in a magnetic field in a circular orbit at radius r_0 , and imagine it displaced radially from this orbit by a small amount, without change in energy. The centripetal force necessary to maintain the particle in the new orbit varies as $1/r$. Now, if the magnetic field B is made to vary with radius at a rate less rapid than $1/r$, say $1/r^n$ with $n < 1$, there will be an unbalanced force on the particle directed towards its original orbit at r_0 . For axial focussing imagine the particle displaced vertically from the median plane between the pole pieces. It is clear from the diagram that forces tending to restore the particle to the median plane will result if the field lines are concave inwards, which is characteristic of a field that decreases with radius. This means that if B varies as $1/r^n$, n must be greater than zero for axial focussing forces to exist.

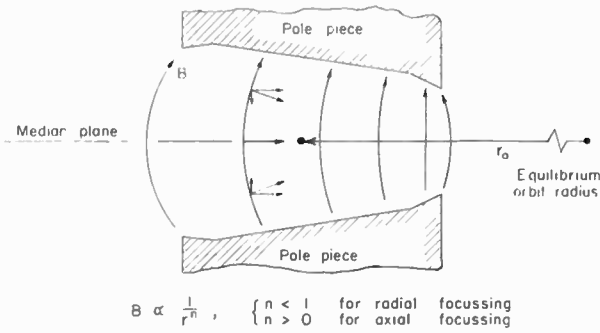
The number n is called the field index. D. W. Kerst (2), after a careful study of all the factors involved, chose a value for n of $3/4$ for his second betatron, and many later machines, including the synchrotron at Queen's were designed with this value of field index.

Synchrotron Acceleration Process

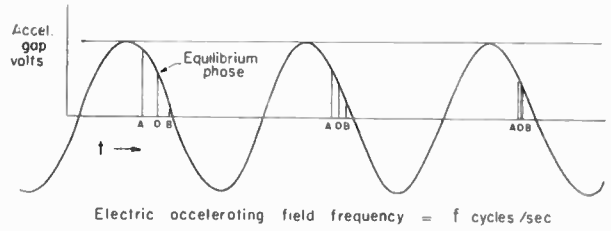
Let us now examine the synchrotron acceleration process in more detail. As mentioned earlier, energy is given to the particles by a radio-frequency electric field. This field appears across the open end of a quarter-wave concentric cavity resonator which forms a section of the accelerator tube. A particle on passing through this electric field will gain or lose energy depending on the direction and magnitude of the field at the time. McMillan (3) first pointed out that according to the phase-stability principle, the particles would synchronize themselves with

$$\begin{aligned} \textcircled{1} \quad \frac{m v^2}{r} &= e v B_z \\ \textcircled{2} \quad m v &= \frac{\sqrt{T(T + 2 E_0)}}{c} \\ \textcircled{3} \quad \sqrt{T(T + 2 E_0)} &= c e r B_z \\ \textcircled{4} \quad T &\approx c e r B_z \quad \text{FOR } T \gg E_0 \end{aligned}$$

● Fig. 1. Equations of Motion.



● Fig. 2. Guide Field Configuration.



Equations:

$$f = \frac{v}{2\pi r_0}$$
 or

$$r_0 = \frac{v}{2\pi f} \approx \text{const. for } f \text{ const. if } v \approx c$$

● Fig. 3. Phase Stability Principle.

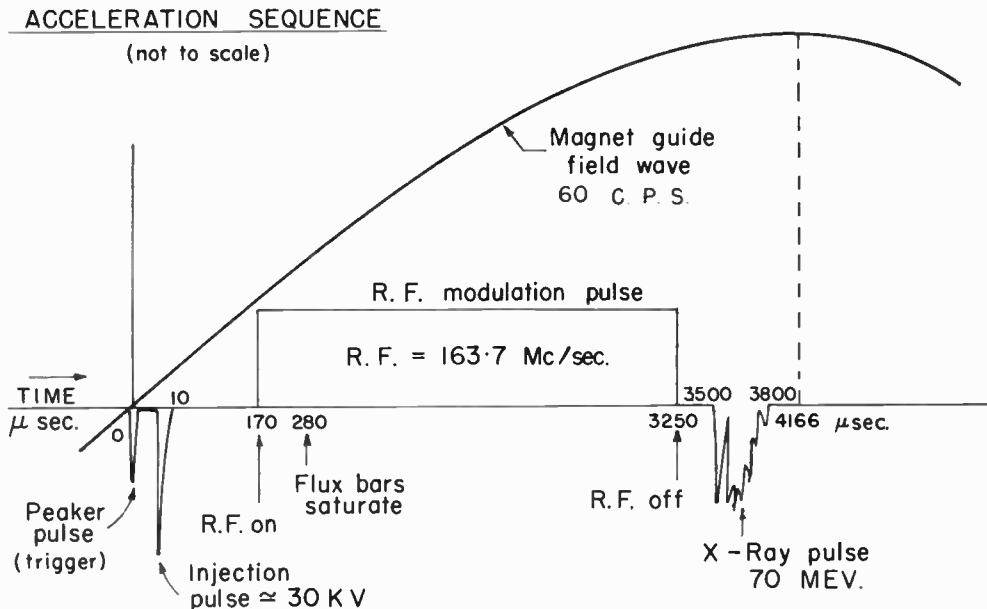
the electric field automatically, as illustrated in Fig. 3. Here several cycles of the high frequency field are shown. A particle moving in the so-called equilibrium orbit crosses the field at phase O and acquires just sufficient energy to complete one orbit circuit and arrive at the gap again at the equilibrium phase on the next cycle. Should a particle arrive at the gap too soon, such as A on the diagram, it will acquire more than the normal energy increment and this will cause it to move in a slightly larger than normal orbit. It will therefore take longer to complete the circuit and it will arrive later, that is nearer to the equilibrium phase, on the next cycle. The reverse occurs for a particle such as B which arrives at the gap late. The motion is said to be phase-stable and in general the phase of a given particle will oscillate relatively slowly about the equilibrium phase. The action of the field is such that the particles become bunched about the equilibrium phase.

Because of the synchronizing action of the electric field, it is the frequency of this field which determines the equilibrium orbit radius in a synchrotron according to the equations as shown in Fig. 3. If the particle velocity v changes appreciably during the acceleration, then f must be frequency modulated in order to keep r_0 constant or nearly so, within the operating region of the magnet guide field. For electrons, appreciable velocity change occurs only for energies below about 2 Mev, for at this energy they are already moving at 98 per cent of the speed of light. Thus, if electrons are injected into a synchrotron at this energy the complication of frequency modulation can be avoided.

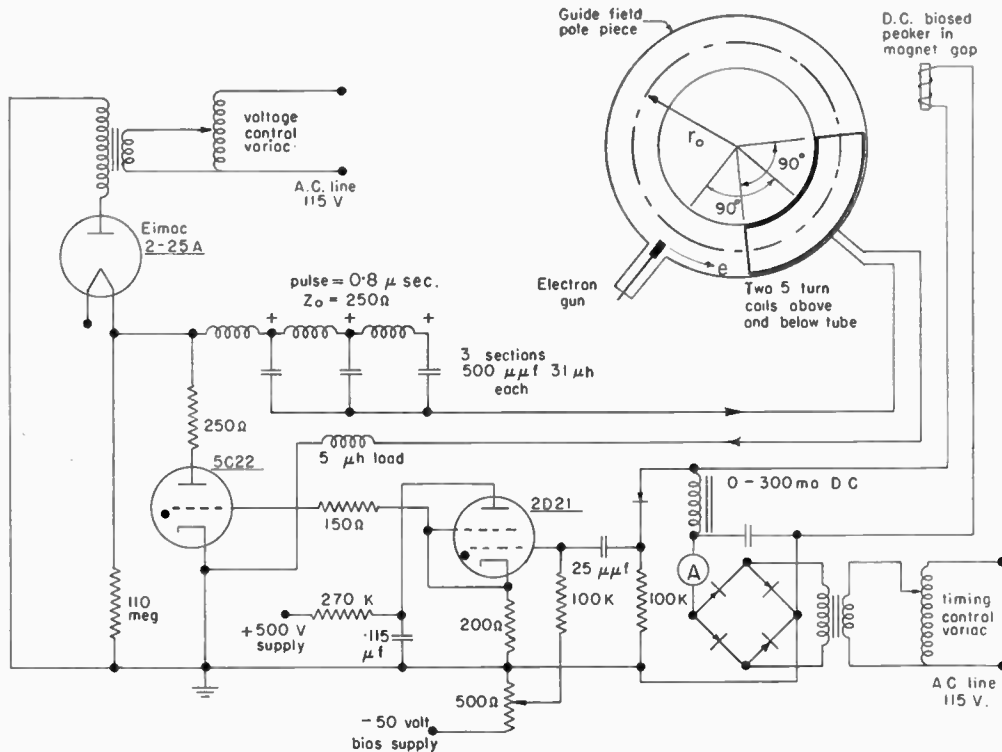
H. C. Pollock (4) first suggested the use of betatron action to accelerate electrons initially to 2 or 3 Mev

in an electron synchrotron. The guide field requirements for both types of acceleration are exactly the same, and with the addition of a small amount of iron in the form of flux bars, a synchrotron magnet is easily converted into a betatron. The purpose of the flux bars is to provide the magnetic flux through the orbit required for acceleration by electromagnetic induction. The flux condition necessary for acceleration by induction at constant orbital radius, as first stated by Wideröe (5), is that the rate of change of mean flux per unit area linking the orbit must be twice the rate of change of magnetic field at the orbit, and this is independent of the velocity of the particle or its mass. In a betatron the Wideröe flux condition must be maintained throughout the acceleration, but in a synchrotron it need only be maintained for relatively short period of time. Once the electron energy has reached the 2 to 3 Mev level, synchrotron acceleration at constant frequency can commence, and the flux bars may be allowed to saturate at this time.

To summarize the preceding discussion Fig. 4 shows the acceleration sequence of the General Electric 70 Mev synchrotron at Queen's University. As the guide field passes through zero, a peaker strip mounted near the pole pieces produces a pulse which triggers a series of adjustable timing circuits. These in turn initiate the following pulses. At about 10 microseconds after field zero electrons are injected into the accelerator tube from an electron gun pulsed to about 30 kilovolts. These are then accelerated by betatron action for about 160 microseconds to an energy of about 2 Mev. At this time the R. F. is triggered on, synchrotron acceleration commences and a short time later the betatron flux bars saturate. Acceleration by synchrotron action continues for roughly 3000 micro-



● Fig. 4.



● Fig. 5. Injection Damping Circuit.

seconds, while the guide field increases from a low value to near the maximum value of 8000 gauss. At some time before guide field maximum, the R.F. is turned off, and the electrons, which up to now have been moving in an orbit of constant radius begin to spiral inwards towards the center of the magnet. Shrinking of the orbit after R.F.-off occurs partly because of loss of energy by the electrons through radiation, and partly because the guide field is still increasing slowly. Eventually, the electrons spiral in far enough to strike a tungsten target mounted near the inner wall of the accelerator tube and a pulse of X-rays is produced. The time taken for the electrons to spiral in to the target and the length of the X-ray pulse depend on how rapidly the guide field is rising at the time the R.F. is turned off. The pulse times marked on the diagram apply to the Queen's University synchrotron operating near its maximum energy of 70 Mev. Note also that the complete acceleration takes place in one quarter of the 60 cycle/second guide field wave.

Operational Problems

One of the major problems in the operation of a betatron, and hence in a synchrotron using betatron action initially, is concerned with the injection of electrons at the start of the acceleration. In order to be able to inject electrons into an orbit, the electron gun itself must project some distance into the guide field. It must not however, project in so far that the radial aperture of the accelerator tube is appreciably reduced. This means that the electrons must be injected at a considerable distance radially from their equilibrium betatron orbit. Hence they execute radial oscillations about the equilibrium orbit, with an amplitude equal to or larger than the radial distance of the gun from this orbit. It is clear then that these radial oscillations must be damped out very rapidly if the electrons are to avoid hitting the back of the electron gun on the first few circuits of the orbit. The most satisfactory theory to account for this damping is that advanced by S. E. Barden (6). It is beyond the scope of this paper to discuss this theory in detail and only some of the conclusions will be quoted.

Barden showed that radial oscillation damping rapid enough to account for gun clearance could occur in a betatron with n equal to $\frac{3}{4}$ under the following conditions. First, the guide field index n should be near but not

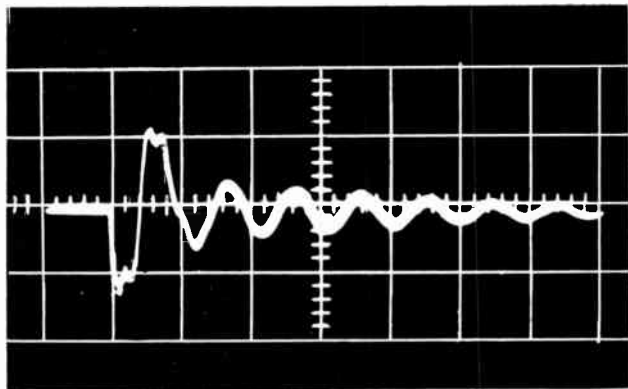
exactly equal to $\frac{3}{4}$. Second, a first harmonic azimuthal asymmetry centered at 90° from the gun-azimuth must be present in the guide field at the time of injection, but not for an appreciable time thereafter. Damping of radial oscillations occurs in the presence of the asymmetry through a resonance transfer of energy from radial oscillations into orbital motion. Resonance transfer of energy is possible because the radial oscillation frequency and the orbital frequency are commensurable in the ratio of 1 to 2 for a field index of $\frac{3}{4}$. Barden further suggested that in a conventional betatron the favorable transient guide field

* About The Author

Mr. Janzen, the author of this article, received his primary schooling in Waterloo, Ont. and his secondary education at the Kitchener-Waterloo Collegiate and Vocational School in Kitchener. He entered Queen's University on scholarships in 1944 and graduated with a B.Sc. degree in physics in 1948. After spending a semester as a demonstrator in physics at Queen's and a summer working for the Defense Research Board in Ottawa, he returned to Queen's in the fall of 1949 for post-graduate work in physics. As a graduate student he became associated with the research program of the 70 Mev. electron synchrotron in the fall of 1950, and received his M.Sc. degree in 1953. Registered as an Electrical Engineer with the Association of Professional Engineers of Ontario, he is at the present time a Research Associate on the staff of the Physics Department at Queen's University.



H. JANZEN



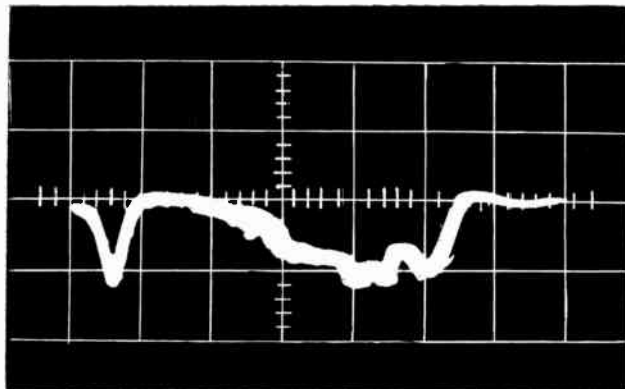
● Fig. 6. Injection Damping Pulse on 2 μ sec./cm. Sweep 10 Volts/cm. Sens.

asymmetry is produced during injection as a result of the large pulsed emission current from the gun being unequally distributed in azimuth.

G. C. Baldwin (7) in a series of experiments with a small betatron verified Barden's conclusions. By introducing a controlled transient guide field asymmetry and with careful adjustments of the betatron he was able to increase the output by a factor of five over that obtainable without the transient asymmetry. Later he achieved a similar increase in output by a factor of five, on the 100 Mev betatron at the G. E. Research Laboratory in Schenectady.

A slightly modified version of Baldwin's original injection damping circuit has been installed on the synchrotron at Queen's. The circuit diagram is shown in Fig. 5. It consists of two 5-turn 90° sector coils placed one above and one below the accelerator tube at 90° azimuth from the gun. The coils are connected in series to an artificial-line pulse-forming network. The network is charged to a high voltage through the 2-25A rectifier and then discharged through the damping coils by the 5C22 thyatron. Timing of the damping pulse is critical and to provide accurate control of this a D.C. biased peaker strip placed near the guide field pole-pieces is used. The pulse from the peaker fires the 2D21 thyatron and this in turn fires the 5C22. By varying the D.C. bias current through the peaker strip coil, the time of the peaker pulse after guide field zero can be controlled over a range of about 30 microseconds.

In initial tests on the Queen's synchrotron Baldwin's injection damping circuit immediately gave an increase in X-ray output. With careful adjustment of the various parameters of the synchrotron and the damping circuit an increase in output by a factor of approximately five has been observed consistently. Fig. 6 is an oscilloscope photograph of the voltage pulse appearing across the



● Fig. 7. X-Ray Pulse at 70 mev. on 50 μ sec./cm. Sweep.

damping coils. Considerable ringing is seen to be present in the pulse and this explains some of the unexpected phenomena observed in the operation of this circuit. It was found for example that except for a slight difference in timing, reversing the damping coil connections had little effect on the X-ray output. Also it was found that good output could be obtained at several regularly spaced settings of the timing control, corresponding to successive negative peaks of the pulse being properly phased in for damping. At timing control settings between these values the output fell to zero, showing that with the positive peaks phased in to occur at the critical time the effect is undamping in nature, as would be expected from Barden's theory.

To conclude, Fig. 7 shows an oscilloscope photograph of a typical high intensity 70 Mev X-ray pulse from the Queen's University synchrotron as seen by a photomultiplier tube placed in the beam. The pulse has a complicated fine structure some of which can be seen in the figure. Although of no great disadvantage in photo-nuclear activation studies or in nuclear plate work, the pulsed nature of the X-ray output makes direct counting experiments very difficult. Counters capable of handling extremely high counting rates and coincidence circuits with short resolving time and short dead time, are essential to cope with the high specific X-ray intensity during the pulse.

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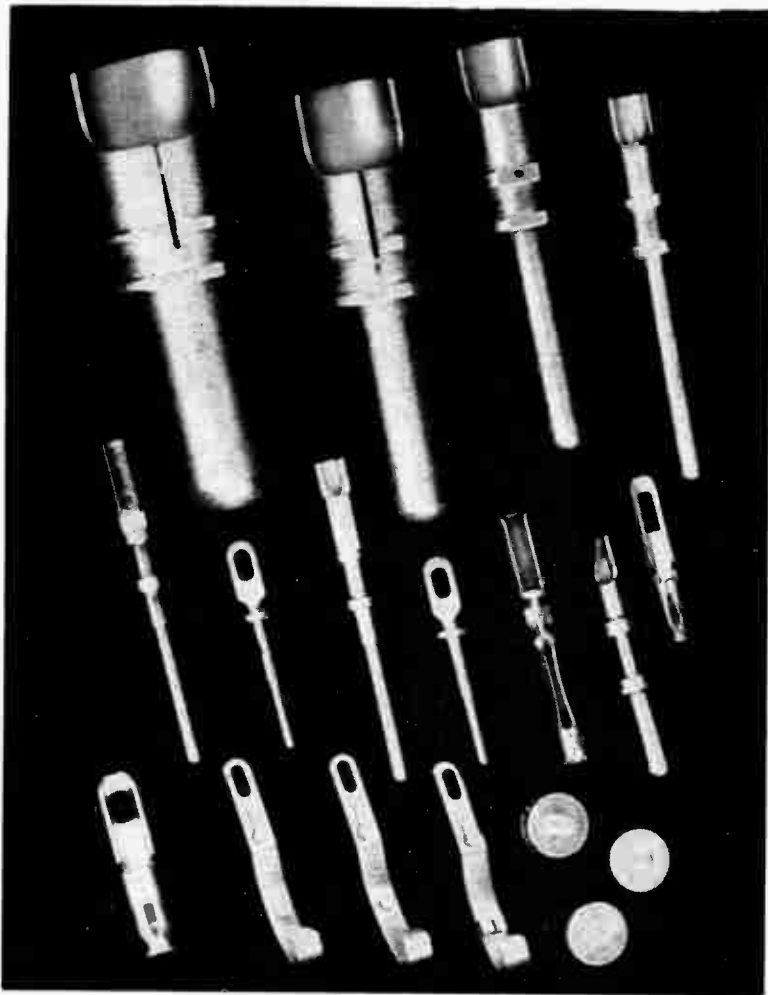
Kicksorter Displays Radioactivity Spectrum

THE kicksorter is to the nuclear industry what the cathode ray oscilloscope is to the electronics industry; it is the basic test and research instrument. It accepts pulses from a detector of radioactivity, and sorts them out according to their amplitude so that the spectrum of the number of pulses at each amplitude can be displayed.

Features of the hundred channel transistorized kicksorter that has been designed and built by Computing Devices of Canada Limited are a device for measuring amplitude of individual pulses, a system of storage of information, and the display of the content of storage.

In the kicksorter, pulses are accepted one at a time from a linear amplifier, and the amplitude measured. When the amplitude has been determined, a count of

one is added to the total already stored in the channel corresponding to the amplitude of the pulse received. The average time taken to store a pulse is 67 μ sec. The system is designed to sort pulses over a 30 volt range in 0.3 volt channel widths, with a resolution 0.03 volts per channel available for restricted parts of the spectrum. During the sorting of pulses, a visual display can be seen on a five inch CRT mounted on the front panel of the kicksorter. This display represents the build-up of the pulse level spectrum during the counting operation. When the counting process is complete, a button on the panel will start a sequential scanning of the channels and display the channel on the horizontal axis and the count on the vertical axis, providing a visual display of the spectrum.



● Contacts in wide variety are Sel-Rex Bright Gold Plated to great advantage. Round pure silver contacts are plated in thicknesses of from .0002" to .0006" with Sel-Rex hard gold. Other parts in thicknesses of from .0002" to .0003".

Cost, quality and durability have made gold-plated and silver-plated surfaces entirely practicable for a wide variety of industrial and consumer products and particularly adaptable to the electronics industry.

Plating Process Expands Industrial Use Of Gold And Silver

By Birger R. Ekblad*

FUNCTIONAL combination of beauty and serviceability has broadened the entire field of gold plating. With a recently developed process, gold plating of many industrial and consumer products is now entirely practicable from the standpoints of cost, quality and durability.

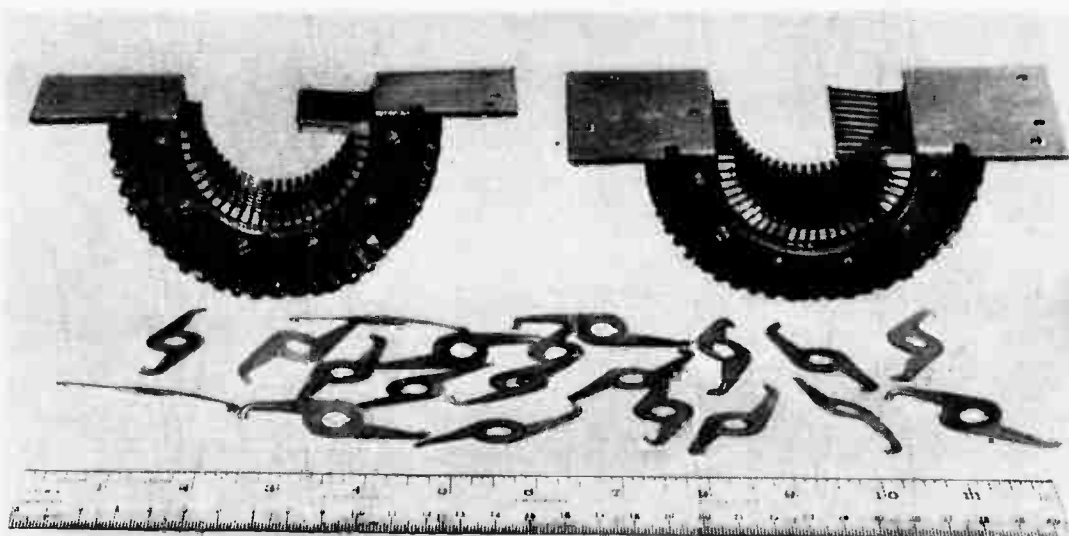
Prior to World War II, there was little demand for deposition of relatively thick coatings of gold. This was due primarily to the wide use of gold in the jewelry and novelty fields where a thin flash of about 0.000001 to 0.000003 in. was sufficient. Because methods and processes of manufacturers were a carefully guarded secret, production was slow and general technology lacking.

Material shortages, increased demands and recognition of this noble metal accounted for growing use of gold during World War II. Now, improved techniques have

broadened the field for use of gold in practically every branch of industry for both protection and decoration.

Gold plate has many merits as a coating. Its low electrical resistivity, resistance to tarnish, oxidation and attack by salt spray and corrosion make it adaptable to a variety of industrial applications. This is particularly true of the electronics field. The biggest single factor in the growing industrial use of gold plating is the sharp reduction in cost effected by development of improved methods and processes. At the present time, gold compares very favorably in cost with other electroplated finishes. Its slightly higher cost is more than offset by the many advantages it offers.

*Managing-Director, The Electric Chain Company of Canada Limited.



● Stepping Switch and Wiper Contacts used in this complex piece of electrical equipment are Sel-Rex Bright Gold Precision Plated. Consisting of a combination of Beryllium copper contactors with a framing of steel and fibre, there are no less than 260 gold plated parts involved.

Radical changes in production methods are responsible for a large share of the savings. Gold plating has evolved through the pint, quart and gallon stages, and completely outgrown the 4-gallon pyrex jar stage. Today, the bulk of gold plating work is processed in 20 to 500-gallon tanks, using both still and barrel plating equipment in mass production methods.

Another important reason for reduced costs is the development of solutions and processes which produce high-quality work. At the same time, they eliminate intermediate operations and drastically reduce rejections.

The latest of significant developments in electroplating is the Bright Gold Process. With this process, costly intermediate scratch brushing and buffing operations are eliminated. Moreover, the deposits have physical characteristics which make it ideal for both industrial and decorative purposes.

Industrial gold plating applications generally require relatively heavy deposits — as much as 0.0001 to 0.005 in. Previously, the only method for plating thick deposits was through the use of a hot cyanide bath. Plated parts, to be densely coated, had to be intermittently scratch brushed or buffed. This operation was costly and deposits were coarse-grained. Specified thicknesses were a hit-and-miss proposition.

New Process

Now, however, a new process eliminates these objectionable features and plates heavy deposits. It completely eliminates scratch brushing or buffing to secure bright, hard, fine-grained, dense and pore-free deposits.

Plating is done from a high-cyanide, low-temperature electrolyte having a gold metal concentration of about one troy ounce of metal per gallon. The solution is mechanically agitated and operates at normal current densities. Cathode efficiency approaches 100 pct. This allows accurate deposition of plate thickness to meet exact specifications. The bath is simple to operate and easy to maintain. While it is a precious metal plating process, production plating is done with conventional equipment.

Hard, bright deposits of 0.001 in and thicker are obtained without difficulty regardless of shape or size of the piece. Tukon hardness converted to Vickers scale is 115 as compared to 65 Vickers for conventional gold plating. This hardness is extremely important in the prevention of galling and abrasion. In the electronics field, gold prevents tarnishing, oxidation and corrosion. It also prevents wear on radar and telephonic parts, including sliding and wiping contacts.

Because the bath operates at room temperature, the process is well suited for protective plating of assembled units, soldered assemblies or delicate precision parts where heat might affect strength, shape or characteristics.

Low-temperature operation is also important to the life and efficiency of a gold plating bath. At low temperature, cyanides in the plating bath do not deteriorate and form injurious compounds which cause roughness. Because they do not deteriorate, the bath has long life.

The deposits, considered uniform and fine-grained, open a broad new field of industrial applications for gold. Gold can now be used even when cost is a primary consideration.

Extensive research has been done to determine metal distribution which is important in any plating application. Thickness measurements on various plated objects show accurate determinations have been made regarding distribution of gold.

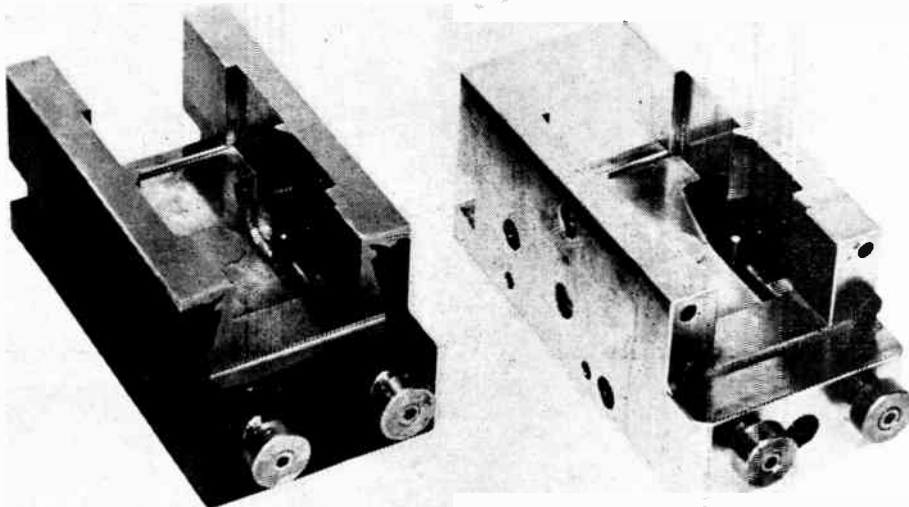
On metal sheets measuring 2 x 3 in. and plated with an average thickness of 0.0004 in., profilometer readings show variation of only 1.5 to 1 ratio over the entire surface compared to 5 to 1 with conventional gold plating. On other surfaces, similar results in uniformity were achieved. Profilometer tests made on highly buffed surfaces showed no alteration of surface contour even after deposition of 0.001 in. or more of gold.

Uniform distribution makes industrial gold plating applications practicable for protective surfaces where close tolerances are a must. The surface can be plated to a specified thickness without changing surface contour. Where plated thickness must be held to a minimum, even distribution affords uniform protection over the entire surface and eliminates thin spots.

Industrial gold plating has definitely entered a new era by its entrance into the earth satellite and guided missile fields. To provide maximum heat reflectivity and emissivity, the United States IGY Earth Satellites have been plated with Sel-Rex Bright Gold Process underneath their final coatings. This patented formulation was also used to plate most internal parts and instrument housings for temperature control.

In the manufacture of guided missiles, Sel-Rex Bright Gold is used to plate miniature contacts and pins used in the intricate systems.

From these latest developments, it is apparent that special gold and silver plating processes have established some considerable superiority wherever the highest functional quality and the maximum protective ability are demanded.



- The nickel electro-formed mould (shown on the left) is suitable for production runs and if the shape is intricate can be considerably cheaper than a steel mould.

Cast Resin Insulators In Mass Production

By A. Marshall*

A perfect resin of low viscosity, long pot life with short curing cycle and low exothermic heat, non-toxic and with low shrinkage, and low price is still a manufacturer's dream. However, the rapidly increasing volume of resins consumed and the many product improvements indicate that the resins have been accepted as a desirable working medium with increasing applications and that steps are being taken by the resin manufacturers in the right direction. In the meantime the user must strive towards the optimum through the skilful use of fillers, thinners and catalysts as well as careful design of the tooling and the manufacturing methods some of which are discussed in the following article.

THE epoxies and polyesters offer to the manufacturer of electrical equipment a new and excellent insulating material. This new plastic, which can be cast into rigid insulators at no pressure and at relatively low temperatures, enables encasement of delicate apparatus, networks and various inserts without disturbing their relative position. Thus it opens a field for new designs or improvement of the existing ones. The greatly simplified tooling required for casting facilitates experimental work and reduces the manufacturing cost of small quantities.

However, in order to mass produce cast resin parts, the manufacturer has to face a series of new problems. The material is relatively expensive and requires a long curing cycle, therefore the tooling though individually inexpensive may be required in large quantities. The resin, which after catalysing has only a limited pot life, must be dispensed within a specific time. The curing process involves evolution of heat and has to be controlled to prevent damage to encased apparatus. Selection of suitable resin, catalyst system, fillers, shrinkage control, full mould utilisation and safe material handling are all a requisite to successful manufacture. These problems and their possible solutions are discussed in this article.

Out of the casting resins family, polyesters and epoxies

emerge as the most versatile resins for a whole range of applications, including that of electrical insulators. This does not substantially limit the choice, since each of these two resins comes in a wide variety of properties, and the final selection has to be made with the consideration of the end product required and proposed manufacturing methods. In choosing a casting resin, the following points should be considered:

- (a) Viscosity
- (b) Pot life
- (c) Curing temperature

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He was discharged in 1945 in Great Britain with the rank of Lieutenant, Signals Corps.

He was educated in Poland and subsequent to World War II, at the University of Leeds, where he graduated with a degree of B.Sc. (Electrical Engineering).

Mr. Marshall served his apprenticeship with Joseph Lucas Ltd. and came to Canada with Joseph Lucas (Canada) Ltd. in 1951. He joined this company in April, 1952 as a manufacturing methods engineer with the communications equipment division.

Since October 1944, he has been casting resins development engineer.

Mr. Marshall is a member of the Corporation of Professional Engineers of Quebec and of the Engineering Institute of Canada.

Between 1949 and 1950, he was assistant lecturer in mathematics at Ashton Technical College, Birmingham, England.

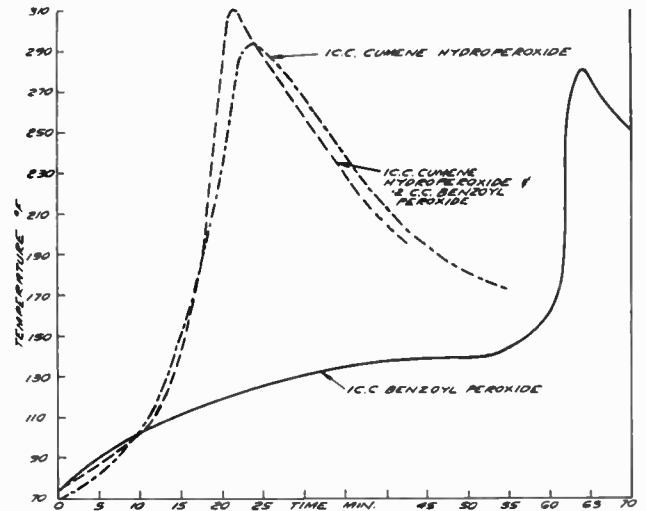
- (d) Curing time
- (e) Shrinkage
- (f) Adhesion
- (g) Heat distortion point
- (h) Thermal co-efficient of expansion
- (i) Mechanical strength
- (j) Electrical characteristics
- (k) Material cost.

It is very doubtful that a resin will be found to meet all the desired requirements. On the whole, the epoxies will be found superior to polyesters, but the substantially higher material cost and their toxicity make them a second choice. Since most of the properties of a basic resin can be improved by the use of suitable fillers, polyesters may often be used to full advantage with the benefit of a lower cost.

There is a very wide choice of fillers from which to select, but silica appears at present to be the best all-rounder. Depending on the amount incorporated (which will be regulated by the viscosity of the resin and the desired pourability of the compound) the ground silica will improve the resistance to temperature variation, mechanical strength, electrical insulation and heat distortion point. However, the grade has to be chosen carefully to avoid settling out of too coarse particles or thixotropic effect given by too fine a grade. The addition of a coloring agent, apart from lamp black, not only enhances the appearance of the casting but improves its weathering properties. The amount of filler used may be increased by reducing the viscosity of the resin with reactive and non-reactive fillers, preferably the former. In general, the thinner will reduce the mechanical strength and electrical resistance, but this reduction may be offset to advantage by the benefits derived from the additional amount of filler. Even so, the thinner should be added with restraint, as it has a critical point past which there is a rapid deterioration of mechanical properties and it may adversely affect the curing.

The improvement in pot life, curing temperature and time as well as shrinkage, will increase with the addition of fillers, and can be further regulated by the use of suitable catalysts. The choice here is very wide in spite of the fact that for production purposes the catalysts or hardeners selected will be those suitable for oven curing. The aim here is to select a system which will give a pot life not shorter than a half-hour, curing heat not higher than 200 F, and the shortest possible curing time — in no case longer than two hours. It will be often found that a combination of two different agents rather than

EXOTHERMIC CURVES OF POLYESTER RESIN COMPOUND (SILICA FILLED) WITH DIFFERENT CATALYSTS, 100 GMS. SAMPLES AT 150°F OVEN TEMPERATURE



- Curing cycle can be modified by combining two catalysts of different properties.

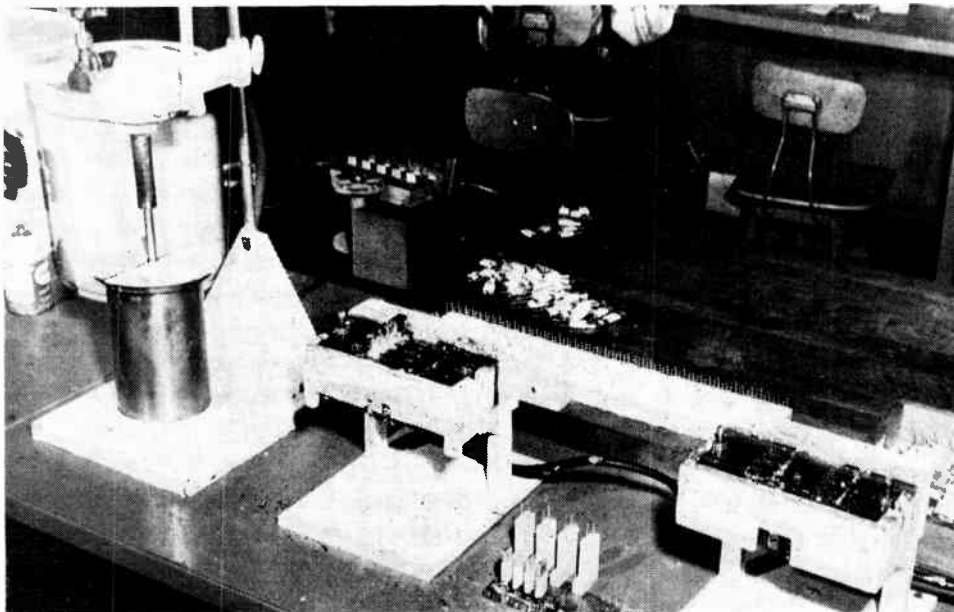
any single one will give improved polymerisation (see fig. 2).

With the polyesters, the use of an accelerator and catalyst combination often gives satisfactory results, but as the two chemicals react violently in direct contact with one another, their storage and handling present a safety hazard.

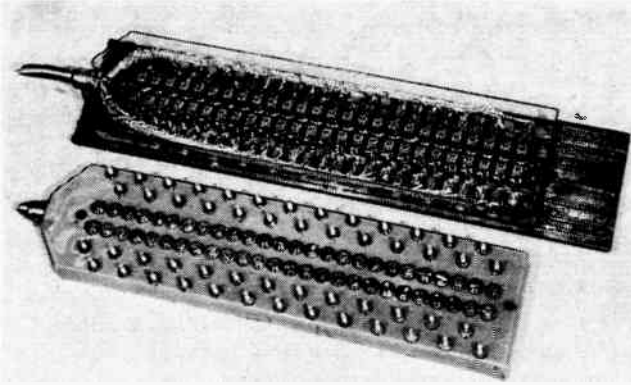
Where adhesion of the casting to metal, glass etc. is of importance, epoxy resin will be an obvious choice. Some increase in adhesion of polyester resin to metals may be obtained by additions to it of, say, maleic anhydride. This is useful as an undercoat only, since it inhibits air curing.

Tooling

The comparatively long curing cycle required for casting resins necessitates provision of a number of casting moulds, therefore the final selection of the type of moulds used will affect to a large extent the cost of the product to be manufactured. The choice of tooling will depend on —



- The use of heated moulds proves convenient on small parts or comparatively small requirements. They occupy little space and dispense with need of oven.

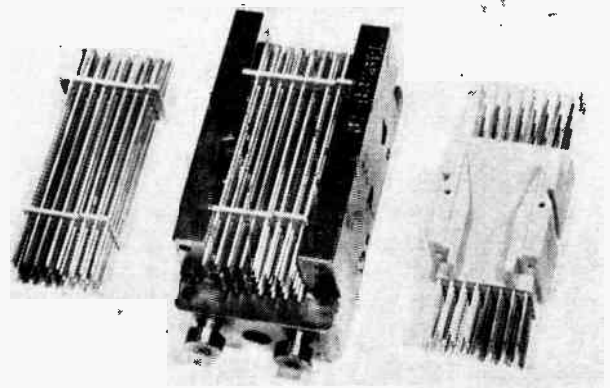


● Fig. 4. The use of polystyrene shell, which becomes part of the casting, eliminates the necessity for a complicated casting mould.

- (a) Type of resin used,
- (b) Temperature and time required to cure,
- (c) Dimensional requirements of the casting,
- (d) Quantity of the castings to be produced.

Both polyesters and epoxies exhibit varying degrees of adhesion and therefore even with the use of an efficient parting agent, they will be subjected to rough handling associated with ejection of the casting. On the other hand, an excellent adhesion of polyester to polystyrene enables the use of injection moulded sections for different phases of the casting, simplifying the construction of the moulds. In some instances, a polystyrene shell can be used as a dispensable mould, provided dimensional tolerances are not too close. Where the dimensions have to be closely controlled, the choice of moulds is limited to nickel-electro-formed or steel moulds. The nickel electro-formed moulds (see fig. 1) consist of a shell of hard nickel (one-eighth to $\frac{1}{4}$ inch thick), backed up with Kirkside, Cero-metrix or silica filled epoxy. They are suitable for most production castings and are considerably cheaper than steel moulds, particularly in the case of the more intricate shapes.

Where small size or quantities or both do not warrant provision of a curing oven, the heated moulds may be used to advantage (see fig. 3). The hot water heating method is preferred to the electrical element heating, since it enables fast, closely controlled heating of the



● Fig. 5. The tooling for terminal strips has been simplified by the use of polystyrene face plates, which become part of the casting.

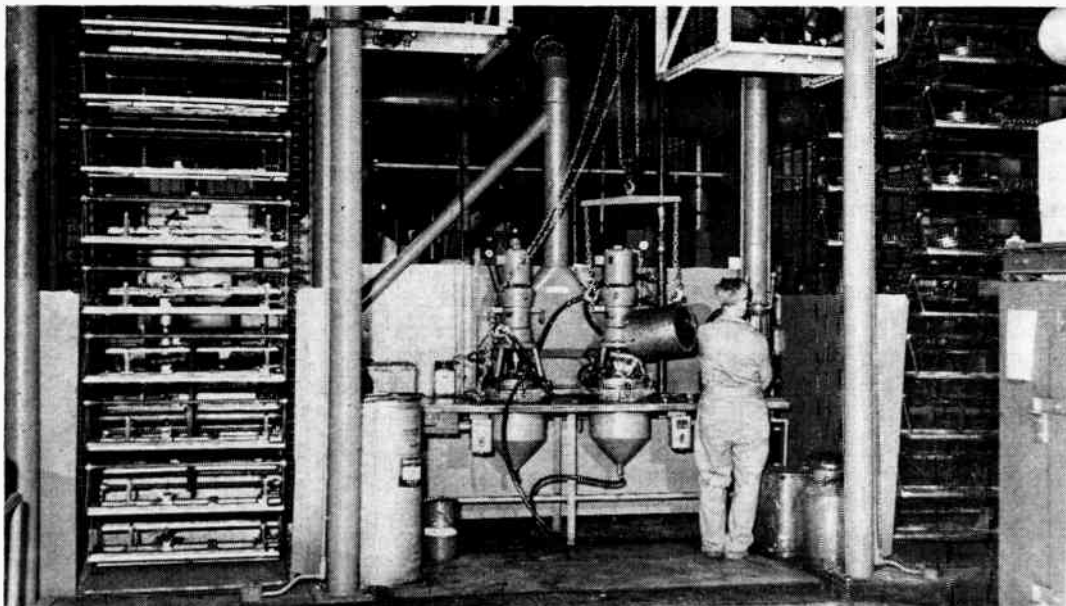
mould, as well as cooling on completion of the cycle.

The following two examples of tooling may serve to illustrate possible choice of tools in the production casting of rigid insulators:

- (a) a cable terminal consisting of a number of terminals wired to a cable, is encased in a compound requiring two hours' cure with maximum curing temperature of 200°F. Since the dimensional tolerances are not too rigid, it was possible to use a polystyrene shell into which the terminals are assembled and then wired (see fig. 4). The shell is then filled with the compound and upon curing becomes an integral part of the casting.
- (b) A terminal strip, the sections of which have close dimensional tolerances, is cast in a steel mould, but the cost of tooling has been greatly reduced by the introduction of polystyrene plates into which the terminals are assembled, and which upon curing of the compound becomes a part of the casting (see fig. 5).

Mixing, Metering And Dispensing

A natural tendency in the selection of a mixing metering and dispensing system is to integrate these operations through the use of an automatic machine. This, in addition to simplifying and speeding the operation, reduces the direct contact between the material, and the operator. The latter is of no small importance when handling



● Fig. 6. Up to 80 lbs. of polyester compound, which is too abrasive for automatic dispensing, is catalysed under vacuum in the mixers. Strict schedule must be maintained to allow for cleaning of mixers before gelation occurs.

epoxies and their hardeners, which are toxic. However, the use of an automatic mixing and dispensing machine may not be applicable due to the large volume to be dispensed per casting. Abrasiveness of the filler or a straight matter of economics. Where alternative methods are used, a strict adherence to a fixed cycle must be maintained, with ample allowance for the disposal of catalysed compound and cleansing of vessels before gelation occurs. In the author's plant, where the filler is too abrasive to allow accurate automatic metering for any period of time, quantities of up to 80 lbs. of polyester resin are catalysed and dispensed successfully under nitrogen pressure through a 12-foot hose, (see figs. 6 and 7). At the other extremity, small quantities of an epoxy resin with a comparatively short pot life, required for filling relay coils, are dispensed with a caulking gun arrangement under air pressure (see fig. 8).

Mould Utilisation And Curing

The casting moulds are of comparatively simple construction but the long curing cycle necessitates provision of a number of moulds, representing a major financial outlay. Their full utilisation is therefore an essential basis for an economical production. For this reason an attempt should be made to limit to an absolute minimum the period the moulds are out of the oven. This, in addition to the gain in time, will maintain the moulds warm, speeding up the heating of the compound and aiding in the release of entrapped air. The pre-assembly of the inserts away from the moulds can reduce the time considerably. Here the use of plastic face plates or assembly jigs pays handsome dividends.

The assembly line itself should be laid out in such a way as to keep the ejecting position, mould cleaning and parting agent application in close proximity to the mould assembly and casting area. Cleaning the moulds with a jet of compressed air and the use of liquid parting agents suitable for spraying with an air gun or in an aerosol container are further steps in reducing idle periods of the moulds. Moulds cleaned with compressed air require a thorough cleaning periodically. Blasting with chopped corn cobs gives very satisfactory results without danger of damaging the moulds.

In the selection of a curing oven, one has a choice between the conveyerised and the batch oven. The author's preference is for a batch oven with cam regulated temperature control, as it gives greater flexibility of curing temperature adjustments, curing period, layout of the casting shop, and requires less space and lower financial outlay. The ability to change the temperature and curing cycle will be particularly appreciated in the areas subject to humid summers. These have a definite effect on the curing of the resin, and occasional adjustments to the curing cycle are required to keep the process under control. Whichever oven is selected, it should be heated by forced air circulation which keeps the temperature uniform throughout the oven, and conducts away the fumes generated during the curing.

Safety

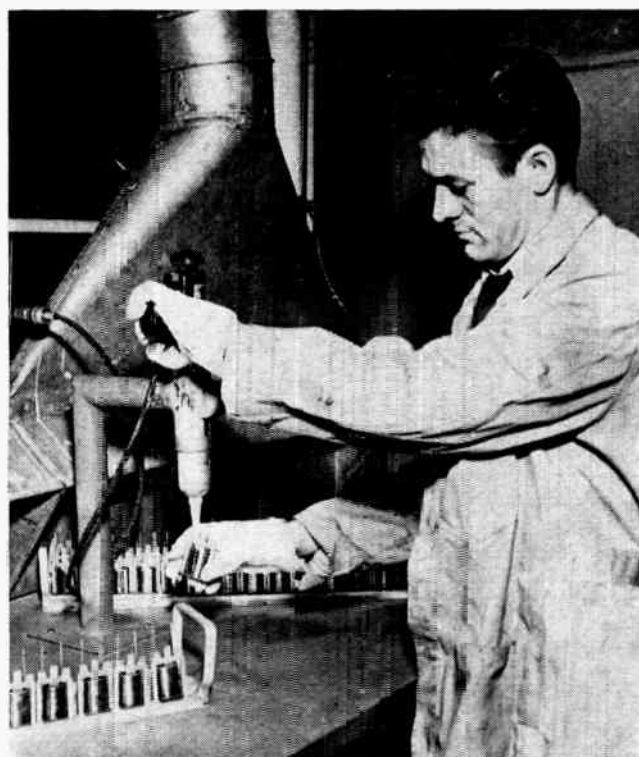
The fire and health hazards associated with the handling of the resins, catalysts, and fillers, require the provision of various safety measures. Their extent depends on the volume of material handled, operations involved and individual approach. The following precautions as provided in the author's plant may serve as an illustration:

- (a) All storage bins for silica and glass fibre, mixing pouring and disposal positions, are provided with exhaust outlets.
- (b) Inflammable catalysts are stored in refrigerated units.
- (c) Cleanliness of the working areas is a must.
- (d) Operators must use a protective cream on hands and are provided with washing facilities in the proximity of their work.
- (e) The working areas are well ventilated through circulating fans.

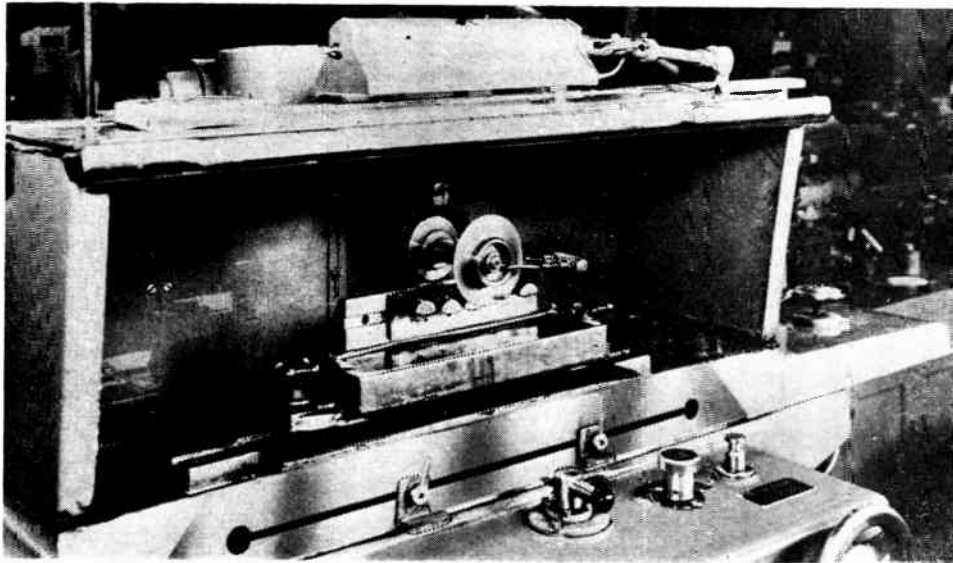
These precautions have ensured the company accident free work over the past few years.



● Fig. 7. Compound catalysed in the mixer is dispensed under nitrogen pressure through a hose with pinch-off valve.



● Fig. 8. Relay coils are filled with an epoxy compound through a caulking gun arrangement under air pressure.



● Wafer production is increased by slicing a number of germanium bars in a single pass shown in above illustration.

Automatic Slicers Increase Germanium Wafer Production

A NEW type of slicing machine has made it possible for one leading manufacturer of electronic components to increase production of germanium transistor crystals.

Brittle, shock-sensitive, hard-to-machine germanium has posed difficult problems to transistor manufacturers. The time and spoilage involved in cutting extremely thin, smooth wafers from bars of this crystalline material has contributed to the high cost of transistors. With surface finish critical to the ultimate electrical qualities of the transistor, the slightest shift in tool speed or stock feed fractures the crystals.

Sylvania, the firm involved, has overcome these problems with a battery of slicing machines designed specifically for hard, brittle, friable materials. Called "Microtom-atic" these unique machines quietly slice germanium bars into usable crystal wafers, uniform and accurate in thickness and parallelism. The finish, approaching a lapped surface is adequate for transistor applications as it comes from the Microtom-atic. The machines are virtually unattended once they have been loaded and the automatic cycle started!

Microtom-atics are designed and built by The DoALL Company, with all the facilities for precise parting and dicing of brittle, friable materials and for the rapid interchange of the necessary fixtures. Other materials for which these machines are used are silicon, quartz, ceramics, ferrites and carbides. They are widely used also for the preparation of metallographic test sections.

Production Increased

Wafer production is increased by slicing a number of germanium bars in a single pass. These are cemented to a steel plate provided with a key to locate it on a slot on an angle plate fixture. (See above) This plate is exactly parallel to the plane of the diamond cutting wheel. For proper electrical characteristics in the ultimate tran-

sistor, the "cuts" must be made perpendicular to a certain crystallographic axis of the bar. This axis does not normally conform to the physical axis and varies with each bar — hence, the difference in the angles of the bars on the fixture as illustrated. Cutter is a diamond wheel 4" in diameter and .021" thick revolving at 5000 r.p.m. Smooth, fracture-free cuts are the result of steady chatter-free table movement at speeds as low as 1/16" per minute and up to 50 feet per minute. In this application the table moves the bars at 1.0 to 1.5 inches per minute into the cutter on the cutting stroke and returns at full speed before cross index of the saddle. Slices .012" and thinner are produced, thickness being held to within .001". Parallelism is held to .0002". The excellent finish obviates subsequent lapping.

Helpful Hint: Cut wafers fall into a coolant filled pan seen below the germanium bars. This cushions the fall of the cut wafer and prevents wafers breaking against each other. A screen basket in the pan facilitates removal and draining of wafers. Coolant is water with a detergent — *no lubricant!*

Operation

One man easily tends four Microtom-atics. Once loaded and started, the machines index automatically and accurately until the entire bar has been reduced to usable wafers. The work area is completely enclosed in plexiglas and steel assuring return of used coolant to the reservoir through a microscopically fine filter. Generous capacity of the 20 gallon coolant reservoir assures supply of cool, fresh, uncontaminated coolant to the work. Controls for establishing crossfeed increment (thickness of wafers) and setting automatic operation, are immediately accessible to the operator. Note sensitive crossfeed dial indicator (circle) for setting small increments with great accuracy. Automatic hydraulic control provides positive crossfeed index to $\pm .0005$ giving accurate wafer production to exactly the same thickness.

LET "THE DEMODULATOR"

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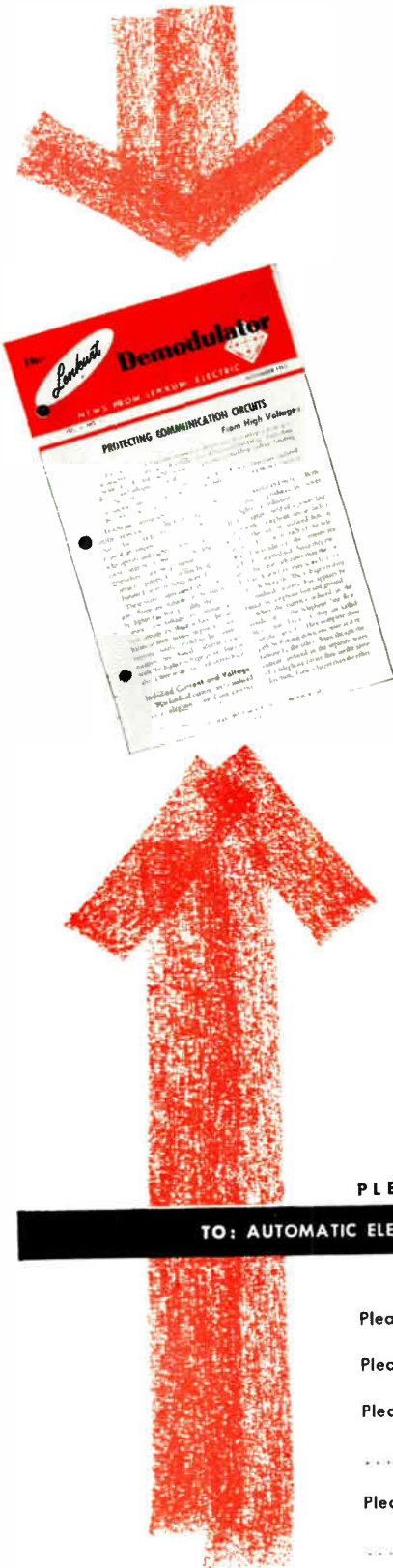
as it has thousands of others in both Canada and the U.S.A. with timely and important articles

ON CARRIER COMMUNICATIONS

and developments connected with this field. For example, articles have appeared on: Factors affecting the propagation of Micro-waves; Transmission of Dial and Teletypewriter signals; Cable Transmission characteristics; Amplitude modulation, etc., etc. It is circulated

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Automatic's new coloured paystations

Your customers will really take to the new "80-series" paystations in colour. Bright, cheerful colours make these paystations easier to see, help dress up their surroundings, make new installations easier to "sell" to merchants, mean more paystation revenue rolling in each month.

New "80-series" paystations offer a choice of ten colours. They also offer all these famous Type 80 Monophone features:

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- Durable, moistureproof Koiled Kord
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Automatic Electric (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

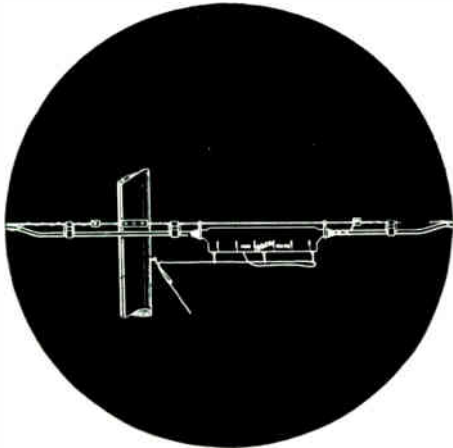
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AUTOMATIC  **ELECTRIC**

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**“Reliable”
ready-access
cable
terminal**



for plastic insulated and jacketed conductors in aerial cable.

- Easy to install—does not require the services of a cable splicer and helper.
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- May be used on any size of cable up to 1.2 inches overall diameter.
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- Available without terminal blocks or with one, two, three, or four 6-pair blocks.
- Installer—serviceman can readily add up to four 6-pair unprotected terminal blocks.
- Loading coils or other units may be installed in place of terminal blocks.

Each unit contains all parts ready for immediate installation. For complete information and literature on Ready-Access terminals, write or phone

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AUTOMATIC ELECTRIC

SALES (CANADA) LIMITED

5812

business briefs and trends

★ As a part of its expansion program Neptune Meters Ltd., of Long Branch, Ontario, has acquired an English firm, Cleveland Meters Ltd. Neptune Meters Ltd. is the Canadian subsidiary of the Neptune Meter Co.

* * *

★ New radar equipment is planned for installation at fifteen major Canadian airports in the next few months. This equipment, which is known as the Decca MR-75 short range surveillance radar, increases the efficiency of airport control tower operations. By its means the position of all aircraft within a radius of 40 miles of the airport may be determined.

* * *

★ The total number of telephones in the B.C. Telephone Company system continues to grow apace, according to the company's quarterly report issued November 1, 1957. At that date it was estimated that the total telephones in service at the year-end would be over 452,000.

* * *

★ Speaking in Vancouver, Arnold J. Groleau, of Montreal, chairman of the engineering committee of The Trans-Canada Telephone System, had this to say about the transcontinental microwave radio relay system which will be completed this year: "Its planning and construction have involved a wide range of skills and it is a matter of pride to the industry that the engineering and construction work have been done by Canadians and that the electronic gear is being manufactured in Canada."

* * *

★ Cannon Electric Canada Limited have recently found it necessary to increase the prices of their "P" and "UA" Plugs, due to rising production costs. Adjustments are based on cost studies of each individual item.

* * *

★ Cossor (Canada) Ltd. of Halifax, Nova Scotia, which works in the field of radar, communications, instruments and industrial electronics, is planning expansion of facilities within the next six months. From its inception in 1948 with but six employees, the company has advanced to the point where it now employs 250 persons. With the expanded plant it is anticipated that there will be a gradual increase in personnel to cope with the company's progress in business.

* * *

★ With more and more emphasis being placed on the importance of stimulating interest in research programs and creating an incentive for the youth of the nation to engage in engineering vocations, it is expected that there will be many opportunities for important new electronics assignments for Canadian firms resulting from United States-Canada joint projects. P. J. Casella, president, RCA Victor Co., Ltd., Montreal, declares that the industry is ready and willing to handle such assignments.

* * *

★ From CJON-TV, Newfoundland, comes the report that, since October last, daily TV transmissions have been received from England on a Pye Commercial Television Receiver. The chief engineer of the Newfoundland TV station claims that best reception results when a quarter-wave vertical antenna, connected to a set by six feet of co-axial cable, has been used.

* * *

★ In the annual report of the Technical Service Council, Toronto, published in 1957, Dr. Robert A. Bryce, chairman, stated that more than 3,000 engineers left Canada in the five-year period, 1952 to 1956 inclusive. Dr. Bryce made this significant comment on the situation: "The largest missile center in the western world could be set up with the Canadian scientists who have emigrated to the United States recently."

* * *

business briefs and trends

★ For the fifth year in succession, Canada has exceeded all other countries in the number of telephone conversations per person, showing an average of 481 per capita. Sweden, with an average of 455 calls per person has ousted the United States from second place. Canada remains in third place in the number of telephones per 100 population. Of the 4½ million telephones in use in Canada at the beginning of 1957, more than 77 per cent were dial-operated.

* * *

★ The future of the hi-fi industry promises to be bright, says George Silber, president of Rek-O-Cut Co., Inc., who have recently completed a new plant in Corona, N.Y., which will double production capacity. According to present indications it is felt the hi-fi industry may exceed the \$250 million mark during 1958.

* * *

★ The TV radio servicing industry today is larger in dollar volume than factory sales of TV and radio sets, according to Frank W. Mansfield, marketing research director of Sylvania Electric Products Inc. Repair parts and servicing volume rose from over \$400 million in 1948 to \$2.554 billion in 1957 and is expected to reach almost \$4 billion by 1966. Service technicians are expected to increase by 50 per cent within the next decade.

* * *

★ To compensate for recent changes in foreign exchange rates, and to keep the domestic price of nickel in accord with the basic export price, The International Nickel Company of Canada, Limited recently announced an increase of 2½ cents per pound in its price of electrolytically refined nickel, for consumption in Canada. The change, which was effective January 1, 1958, increased the price from 69 cents (Canadian currency) to 71½ cents per pound. No change has been made in the company's price of nickel for the United States or any other markets.

* * *

★ The General Electric Company has developed a silicon-controlled rectifier to replace relays and certain power industrial tubes. They are still in the laboratory development stage and will not be ready for commercial production until the Fall of this year.

* * *

★ The British electronics industry is now taking a much greater part in the manufacture of guided weapons than the aircraft industry, according to Aubrey Jones, Minister of Supply in Great Britain. This comment was made at a recent exhibition of the Society of British Aircraft Constructors. Some 400 firms have become engaged in the development of guided weapons.

* * *

★ It is reported that Communist China is making strides in the field of electronics and that it may become a strong competitor in the world market for electronic equipment and components.

* * *

★ Mail sorting by means of electronic equipment is being studied by groups in Canada, the United States and the United Kingdom. Brigadier Holmes, spokesman for a delegation from the GPO in Great Britain, which has made a visit to post office departments in the United States and Canada, made the comment: "We saw nothing to indicate that more advanced techniques are being used in those countries."

* * *

★ While the general trend appears to be toward fully-transistorized radios in future new car models, manufacturers are not entirely in agreement on the importance of the advantages to be gained from the use of transistors. Some contend that all-transistor radios will be a major factor in helping increase the tendency toward miniaturization. Others feel that the re-designing of the complete radio circuitry, which would be necessitated by the use of transistors, would present a serious hazard to the industry which manufacturers might not feel prepared to risk at the present time.

* * *

New Products

New Product specifications published in Electronics and Communications have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our Readers' Service, Page 45. Just mark the products you are interested in on the coupon on Page 45 and the information will be in your hands within a few days.

Mylar Metallized Capacitor — Type RQL

Item 1834

Astron Corporation, E. Newark, N.J., leading manufacturer of Capacitors and RF Filters, announces a new Mylar metallized capacitor, Type RQL.

This miniature unit in a hermetically sealed case is extremely reliable at temperatures up to 125° without derating.



Astron's type RQL is available in a wide range of case styles and constructional variations similar to those from type CPO 4 thru CPO 11 in Mil C 25A. Electrical specifications of Mil-C-18312, the military specification recently issued by the U.S. Navy for metallized capacitors, are met.

Complete technical information is available by writing to Astron Corporation, E. Newark, N.J. or Charles W. Pointon Ltd., 6 Alcina Avenue, Toronto 10, Ontario, Canada.

Microwave Absorbing Material Absorbs Radar Pulses

Item 1835

A new microwave absorbing material operating over a higher frequency range, has been added to its product line, it was announced recently by Gulton Industries, Inc., of Metuchen, N.J.

Known as AF20, it is an alternative material to AF10 and AF11 previously announced. AF20 is a light rigid material having a frequency range of 2,500 to 70,000 megacycles with improved performance at high angles of incidence. Types AF10 and AF11 are primarily intended for operation over the frequency range of 2,500 to 50,000 megacycles.

Designed for permanent radar darkrooms for use in precise radar measurements and as temporary test bays, AF20 is a highly expanded polystyrene treated to give a specific attenuation. The material is supplied in rigid blocks, 15 inches square and four inches thick. The wide band performance of AF20 enables Q, S and X band measurements to be carried out in the same darkroom.

Recently, Plessey Co., of Ilford, Essex, England, developer of the microwave absorbing materials, claimed that the "... materials absorb radar pulses instead of reflecting them. A structure covered with the material becomes invisible to a radar beam." According to the British press, the announcement "... offers the first possibility that radar warning defenses can be defeated." To date, there has been no means of jamming or bending radar.

The British newspaper continued: "... these radar absorbing materials are claimed to provide new standards of navigation safety for aircraft and shipping by eliminating unwanted radar reflections from the structure ... and by eliminating permanent echoes from certain airfield and harbour installations."

Further information available from the Canadian representative, Lake Engineering Co. Ltd., 767 Warden Avenue, Scarborough, Ontario.

Thread Speed Indicator

Item 1836

A new speed indicator has been introduced by Jaquet, manufacturer of industry's most popular make of speed measuring instruments. The latest addition to the family is designed to measure the feed velocity of threads and thin wire.

Basically, it is the well-known Speed Indicator, but is equipped with a light measuring roll that has a V-shaped groove around the circumference, similar to the familiar V-pulley. A guide roller ensures that enough tension is applied to the thread to prevent slippage, but not enough to retard the free run of the thread. The tension created efficiently handles the smoothest threads or wires. The circumference of the measuring wheel at the point of the V-shaped groove is 1/10 yard, and final readings are provided in yards per minute. Operation is similar to the Jaquet Speed Indicators in that speeds are measured for 6 or 3 seconds, according to the model used. Comes complete with carrying case.

Also available for the standard Speed Indicators and hand tachometers are two new rolls for linear measurements. One has a circumference of 12 inches for direct feet-per-minute measurement, and the other has a perimeter of 0.6 feet for speeds in feet per second.

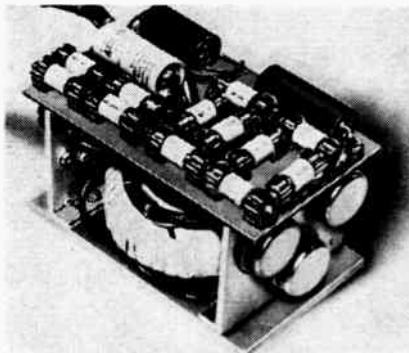
For further details, contact R. H. Nichols Limited, 2781 Dufferin Street, Toronto, Ontario, Canada.

Transistorized Static Converters

Item 1837

A complete range of transistorized static DC to DC converters for use where reliability and size are important is now available from the UAC Electronics Division of Universal Transistor Products Corp., 36 Sylvester Street, Westbury, New York.

These compact, lightweight units are specifically designed to convert battery voltage DC to high voltage DC in two-way radios, public address amplifiers, or wherever conventional power supplies are used. They are fully rectified and filtered, and have a transistor reliability of 95% in 10,000 hours of use.



A typical receiver supply produces 250 VDC @ 130 MA or 290 VDC @ 130 MA from either 12 or 13.6 VDC input and is packaged in a 3 3/8" x 1 7/8" x 3 3/4" package.

A typical transceiver supply (pictured) produces three outputs — 500 VDC @ 165 MA, 270 VDC @ 150 MA, and —55 VDC @ 10 MA — from a 12 VDC input, and comes in a 3 1/2" x 5" x 3" package.

Represented in Canada by Electronic Enterprises Regd., 551 Oakwood Avenue, Toronto 10, Ontario.

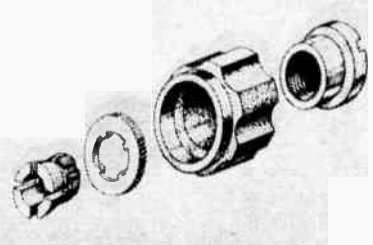
Collet-Type Radio Knob

Item 1838

The illustration shows a simplified collet-type radio knob developed by R. H. Panther, Canadian Army Signals Engineering Establishment, Ottawa. The use of a split collet as the means of attachment enables the knob to be fixed to any standard 1/4" dia. shaft without any pre-preparation of the shaft, such as flats or tapped holes, and the way in which the collet principle has been applied has made it possible to be used with a knob less than 1" dia.

So, for the first time a collet-type knob suitable for use with miniature apparatus has been created; despite its small size it has all the desirable features of the larger knobs of this type, notably the ability to transmit torque in excess of 100 in./oz., and consists only of four component parts.

Unlike some of the larger knobs, it permits no free movement between the molded portion and the collet once locked on to the shaft, so that a pointer knob attached to this collet will continue to provide accurate reference to its associated scale.



A series of four knob bodies for production in high-impact plastic has been designed for use with this collet, ranging from 15/16" dia. through 2 3/8" dia., and provision has been made to use them with or without an indicating skirt at the base.

For further reference to this device, contact Colonel D. A. Kellough, Superintendent, CASEE, Department of National Defence, Ottawa, Ontario.

Teflon Dielectric And Fibre Glass Jacketed Cable

Item 1839

Amphenol Canada Limited announce the availability of a new semi-solid Teflon Dielectric & Fibre Glass Jacketed Cable electrically equivalent to RG-63/U providing a greater temperature range.

This new cable identified as 421-125 is satisfactory for any application requiring a low capacity, high temperature cable primarily for RF reception purposes.

It features (a) Greatly increased temperature range provided by Teflon Core and Fibre Glass Jacket. (b) Low capacity due to special semi-solid Teflon Core construction. (c) Retains all other desirable features with standard Polyethylene RG-63/U. Standard connectors for the Polyethylene RG-63/U fit this Teflon version where impedance matching is not critical. Where constant impedance matching is required, new connectors have been developed. These are: 82-884 plug and 82-885 jack.

Temperature range is from -73°C to +200°C, impedance is 125 ± 6 ohms, dielectric test is 3000 VRMS, and the capacity is 10 MFD/FT. nominal.

For further information write: Amphenol Canada Ltd., 300 Campbell Ave., Toronto 9, Ontario.

New Products

Tetrode Amplifier

Item 1840

A new Tetrode amplifier, for use in broadband amplifiers from audio frequencies up to about 300 Mc/s has been developed by L M Ericsson, Sweden, and will be available in Canada through Ericsson Telephone Sales of Canada Limited, 130 Bates Road, Montreal 8, P.Q.

Provisionally named the A-1600, the new tube has a low output capacitance which gives it a very high figure of merit at intermediate frequencies. Three cathode leads reduce the cathode lead inductance. The close-spaced structure results in small transit time loading. At a frequency of 70 Mc/s the input conductance is approximately 1100 umhos. The special plate design gives the A-1600 pentode-like characteristics, making it suitable in input stages.

Detailed technical information available on request from Ericsson Telephone Sales of Canada Limited, 130 Bates Road, Montreal 8, P.Q.

Transistorized Power Supply For Two-Way Radio Equipment

Item 1841

A 25 watt "piggy back" transistorized power supply for existing two-way radio equipment, which guarantees over 80 per cent efficiency, has been developed by Allen B. Du Mont Laboratories, Inc.

According to Joseph A. Ricca, manager of Du Mont's Mobile Communications Department, the transistorized power supply furnishes total standby receiver high voltage, thereby decreasing the standby drain of the mobile unit's receiver section. This results in a much longer life for the vibrator power supply, which now will be limited to furnishing transmitter power only.



Although packaged specifically for existing Du Mont equipment, the new unit has electrical characteristics which make it useable with other manufacturers' equipment, Mr. Ricca points out. Input voltage is 13.8 volts d-c nominal with a ± 20 per cent variation. Output voltage is 250 volts d-c ± 10 volts at a 90 milliampere load.

Measuring 6" long by 2 $\frac{3}{8}$ " high by 1 $\frac{1}{2}$ " deep, the transistorized package is secured easily to the front cover of the Du Mont mobile case, such as furnished with the Du Mont MCA-101, 301, and 401 series. By placing the receiver high voltage supply in the open, component temperature within the case is reduced considerably, Mr. Ricca says. The ambient temperature rating of the unit is -30 degrees C. to +75 degrees C.

Other important specifications are a five per cent half to full load voltage regulation and a peak-to-peak ripple that does not exceed 0.1 per cent.

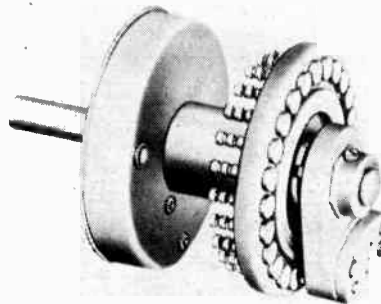
For further information contact the Mobile Sales Department, Allen B. Du Mont Laboratories, Inc., 760 Bloomfield Avenue, Clifton, New Jersey, U.S.A.

Rotary Switch With Adjustable Stop

Item 1842

The Daven Co., Livingston, N.J., announces the availability, directly and through selected distributors, of a new rotary switch with adjustable stop.

For flexibility in all types of circuit experimentation, laboratory work, bread-board setups, and in circuitry where the exact number of switch positions might be changed at a later date, the new Daven Rotary Switch with an adjustable stop is ideal. This unit will have a maximum of either 24 positions with 15° spacing or 32 positions with 11 $\frac{1}{4}$ ° spacing. One, two, three, and four pole units are available in this design.



In common with all other Daven Rotary Switches, the Adjustable Stop Switch features: sturdy, dependable construction; large silver alloy contacts and slip rings; tamper-proof, knee action silver alloy rotor blades; high grade, accurately machined dielectric; and gold flashed turret-type terminals for ease of soldering.

The switches are constructed to meet and exceed applicable military specifications on humidity, moisture, environment, temperature cycling, contact resistance, life, vibration and shock. These switches will meet and exceed applicable paragraphs of MIL-S-3786, MIL-E-5272, and MIL-T-945A.

Continuous current carrying capacity (not make or break) is 15 amperes. Switches are smooth operating, positive action, rotary selector type. Switch contact resistance remains extremely uniform and is on the order of .003 ohms. The capacitance between switch contacts, and between switch contacts and return slip rings, varies from 0.4 mmf to 2.5 mmf depending on the switch. Breakdown voltage between contacts and slip ring is 3000 V.

For complete information on the new Daven Adjustable Stop Switch, write to The Daven Co., Livingston, N.J., U.S.A.

Automatic Fog Detector

Item 1843

An important new application of electronics has appeared in the form of an automatic fog detector. This equipment is manufactured by Stone-Chance Limited of London, England and marketed in Canada by Decca Radar (Canada) Limited of Toronto.

This automatic fog detector emits a concentrated beam of light which is slowly revolved and measures the amount of light returned by reflection from water droplets in the atmosphere. It not only detects fog or mist, even at night, but also accurately measures the visibility in terms of distance.

Entirely automatic in its operation, the fog detector gives a continual graphic record of the visibility distance, operates fog signals and other alarms when the visibility falls below a pre-set level, and switches those signals off when it rises above another level. At regular intervals the equipment gives itself a complete systems check during which it automatically compensates any changes in its characteristics, such as dirt on the lenses, or if a fault has occurred, switches itself off and operates a fault alarm signal.

Decca Radar (Canada) Limited, 23 Six Points Road, Toronto 18, Ontario.

Alphlex Zipper Tubing

Item 1844

A new harnessing and cabling technique, Alphlex Zipper Tubing, just announced by the Alphlex Tubing Division of Alpha Wire Corporation, 200 Varick St., New York 14, New York, reduces to just the slide of a zipper the time and labor needed to group, mark, protect, harness and custom-cable.

Constructed of polyvinylchloride plastic, Alphlex Zipper Tubing is strong, flexible, durable and low-cost. In addition to speed and ease of application, it exhibits advantages impossible with conventional tubing. Because it is supplied flat and open (the user zips it to close) no minimum orders nor expensive "extrusion" set-up charges are necessary. Its ease of accessibility for wire changes, and its high versatility make it unexcelled for prototype work. It is a labor saving device for production applications.

General purpose type ZIP-31 meets MIL-I-631C specifications. Type ZIP-44 (Air Force approved) meets MIL-I-7444A (Amendment I) specifications. Standard wall thickness is .020" \pm .001". Alphlex Zipper Tubing can be sealed permanently with a liquid sealer. Available in all put-ups from 10 feet to 1000 feet in clear or black, in sizes from 1/2" I.D. to 4" I.D.

Other factors available to special order include special thicknesses, sizes of 1/4" increments and lengths in excess of 1000 feet. Also special exact footage lengths, colors (red, yellow, orange, blue, green, brown) contrasting color combinations of zipper and body for additional color coding, perforations in body of zipper tubing, and fungus proofing are available.

Write for Alphlex Zipper Tubing Catalog Z-1 to Alpha Wire Corporation, 200 Varick St., New York 14, N.Y., U.S.A.

1000 Watt Ceramic Tetrode

Item 1845

Eitel-McCullough, Inc., San Bruno, California, manufacturers of Eimac electron power tubes, has announced a new high-current, low-voltage radial beam tetrode having high power gain and a plate dissipation of 1000 watts.

Designated the 4CX1000A, this new tube type incorporates all the advantages of Eimac ceramic-metal construction and high temperature processing. Specifically designed for single side band operation, the 4CX1000A is a low-voltage, high-current Class AB₁ RF or AF linear amplifier tube,



exhibiting high power gain and exceptionally low distortion characteristics. The 4CX1000A achieves its maximum rated output power with zero grid drive, thus minimizing driver stage design problems and eliminating one source of distortion.

For further information contact R. D. B. Sheppard, 2036 Prince Charles Road, Ottawa 3, Ontario, Canada.

New Products

Precision Potentiometers

Item 1846

Series 5000 are new $\frac{1}{2}$ " high-temperature, single-turn Helipot® precision potentiometers, now in production at the Newport Beach, California plant of Helipot Corporation, a division of Beckman Instruments, Inc.

The stainless steel potentiometer features a temperature range of -55° to $+150^{\circ}\text{C}$. Power rating above 5,000 ohms is 2.5 watts at 60°C , derating to 1 watt at 150°C below 5,000 ohms, 1.5 watts at 60°C , derating to zero at 150°C .



Standard resistance range is 500 to 70,000 ohms with a linearity tolerance of $\pm 0.50\%$. Best practical linearity tolerance is $\pm 0.25\%$.

Three models are available, each weighing 0.3 oz. Model 5001 features bushing mount . . . 5002, servo mount. For trimming applications the 5001 may be equipped with a shaft lock. The model 5016 high-torque trimmer with slotted bushing mount is available only in production orders. Mechanical stops are standard on the 5001 and 5016.

Series 5000 are available in linear and non-linear versions.

Sales representative for Canada: R-O-R Associates, Ltd., 1470 Don Mills Road, Don Mills, Ontario.

Telemetry Dual Mixer-Monitor

Item 1847

Each half of this dual mixer-monitor provides facilities for mixing as many as four independent input channels of data or timing signals onto one composite output for recording on a single track of a magnetic tape. Frequencies from 300 cps to 100 kc can be accommodated on each channel.

Equally versatile is the monitoring feature that permits independent monitoring of any of the four inputs, the composite output, or any of three auxiliary signals. A large, easy-to-read, zero-center meter provides direct readings in db. Front-panel calibration of the meter for each channel is made possible by jacks and individual controls. The two halves of each dual mixer-monitor are interchangeable plug-in units, housed with a power supply for both units in a single package suitable for rack mounting.

Dual mixer-monitors are available as units or as complete packaged systems. An auxiliary Selector-Scan Switch Panel permits pushbutton choice of any of the eight monitoring channels on each half of each dual mixer-monitor. A typical system consists of four dual mixer-monitors, together with the Selector-Scan Switch Panel, mounted in a seven-foot cabinet. The cabinet includes a convenient writing shelf and provisions for the installation of a magnetic tape recorder remote control panel.

Cooled by blowers and protected by interlocks, the system can be operated only when the blowers are forcing filtered air through the cabinet. All controls are on the front panel, providing instant selection of as many as 32 independent channels and simultaneous monitoring of eight channels.

Represented in Canada by Radionics Limited, 8230 Mayrand St., Montreal 9, P.Q.

Speed Clip With Two Locking Steps

Item 1848

A new Speed Clip, designed to accommodate and retain any of the popular single or multiple wire cord sizes for use on appliances and other products, was announced recently by Dominion Fasteners Limited, Canadian licensee and manufacturer of the famous Tinnerman Speed Nut brand spring tension fasteners.

Designed with two locking steps, the clip is merely slipped over a wire and pre-latched, or compressed to the first locking position. Locking tabs on the underside of the clip locate and center the latching leg over the hole in the panel. On compression to the second locking position the latching leg is forced rearward by the locking tabs to catch the underside of the panel, thus securing the wire in the clip and the clip to the panel. Any simple tool pressed against the latching leg will release the spring steel clip for service of the unit.

The new Tinnerman Speed Clip provides exceptionally fast assembly for either strain relief or plain clamping action and can be mounted anywhere and at any time before, during or after assembly.

For additional information contact Dominion Fasteners Limited, 686 Parkdale Avenue North, Hamilton, Ontario, Canada.

Airborne Electrograph

Item 1849

Electromechanical Products, as Canadian sales representatives for Century Electronics and Instruments of Tulsa, Oklahoma, advise that they now have an Airborne Electrograph Model 422 E available.

Heretofore the Electrograph has been primarily used in laboratory applications for direct recording. With the introduction of the Model 422 E direct recording equipment is now available for airborne applications.

Complete details on this equipment are available from Electromechanical Products, Markham Road, Agincourt, Ontario.

Dual Probe Ice Detector

Item 1850

Wright Air Development Centre at Dayton, Ohio, after qualification testing, has placed on its qualified products list the now-famous Dual Probe Ice Detector, engineered and manufactured by Canadian Applied Research Limited of Toronto, Canada.

The detector automatically warns the pilot of ice formation long before he can see it or feel it through his controls. It can be linked to an automatic ice shedding controller and in turn to de-icing boots to form a completely automatic de-icing system.

The word from Wright is just one more indication of the success of the unique instrument. Meeting stringent specifications, it has been chosen for installation on the Avro Arrow, the new Canadian designed delta-wing, all-weather fighter.

A similar choice has been made by Lockheed engineers for that firm's new turbo-prop Electra airliner, soon to make its appearance on the airlines.

Evaluations on the Ice Detector are currently being carried on by TCA, BOAC (for the Comet), the Royal Swedish Air Force for its Saab aircraft, and by several large aircraft manufacturers in the U.K. and Europe. TCA and BOAC are critically weighing the instrument's potential for their aircraft's turbo-prop engines.

For further information, contact: Canadian Applied Research Limited, 1500 O'Connor Drive, Toronto, Ont. PLYmouth 5-3371.

1 Kw. VHF Transmitter

Item 1851

Pye Canada Limited will shortly market a medium power transmitter designed primarily for airport ground-to-air operations and also for teleprinter and VHF point-to-point links. It is basically a two-unit transmitter; the RF and modulator sections are assembled in self-contained cubicles which are combined into a composite equipment for R T service.

The frequency range from 118 to 136 mc. is continuously covered. The drive unit consists of a crystal oscillator followed by three harmonic generator stages, providing a total frequency multiplication of twelve times the crystal frequency. These stages are followed by two push-pull stages which drive the amplifier. A feature of the transmitter is the ease and rapidity with which it is possible to set it up on any frequency in the range. All coupling circuits up to carrier frequency are fully screened and double tuned.

The transmitter may be remotely controlled and is fully protected against damage due to overloads or maladjustments. All tubes are accessible from the front of the unit; doors are provided at the rear to facilitate inspection and maintenance. The safety of operating personnel is ensured by interlocking gate switches which remove all dangerous voltages when the doors are opened or the detachable panels are removed.

All tubes and components have been chosen and rated to achieve a high standard of reliability and as a result, the transmitter may be operated unattended in tropical climates. Forced-air cooled tetrodes are used in the RF output stage and radiation-cooled triodes are used in the modulator.

Further enquiries to: Pye Canada Limited, 82 Northline Road, Toronto 16, Ontario.

Video Termination

Item 1852

The Daven Company, Livingston, New Jersey, announces the development of a new Video Termination for 75 ohm coaxial transmission lines.



Designated Daven type RF-300, the termination has the following characteristics:

(1) A turret type lug at the rear of the termination provides a connection point for an oscilloscope. (2) Negligible reactance (less than two degree phase shift) up to 250 MC. (3) Deposited carbon resistor rated at $\frac{1}{2}$ Watt. Accuracy 1%. (4) Nominal resistance 75 ohms. Other values available on special order. (5) RF resistance at 100 MC is within -1% of the DC value. (6) Terminations are housed in standard UHF type connectors. (7) Dimensions: Length—2 inches, diameter— $\frac{3}{4}$ inch.

For further information on this new Video Termination, write to The Daven Company, Livingston, N.J., U.S.A.

News Report

A monthly roundup of news and personnel changes in the Canadian electronics industry

CAE Appoints J. W. Bell

James F. Tooley, managing director of Canadian Aviation Electronics, Ltd. of Montreal, has recently announced the appointment of John W. Bell as vice-president in charge of engineering.

Mr. Bell, a graduate in electrical engineering from the University of Toronto, was Chief Scientific Officer of the Radio Section of the National Research Council, Ottawa, during the Second World War, and was responsible for radar and all technical work.

Prior to joining CAE, Mr. Bell was general manager of Smith and Stone, Limited.

Philips Co-Ordinates Activities In One Company

Manufacturing and commercial activities of Philips companies in Canada, and their auxiliary services, are now incorporated in one firm, Philips Electronics Industries Ltd., formerly Canadian Radio Manufacturing Corporation Ltd., R. Messier, board chairman, announced recently. The change in name became effective January 1.

Philips Industries Limited, Rogers Electronic Tubes and Components Division and the Industrial and Medical Equipment Division, are the company's three marketing divisions.

The first division will handle sales of Philips and Rogers Majestic radio, television and high-fidelity products and sales of Philips lighting equipment, Philishave electric shavers and Philips tape recorders. The second will market Rogers radio and television receiver tubes, Rogers television picture tubes, Philips transmitting and special purpose tubes and Philips radio, television and electronic components, and other electronic components. Medical and industrial X-ray equipment, control and research instruments, and electronic products used by the aviation and other industries will be marketed by the third division.

Mr. Messier also announced the appointment of D. C. F. van Eendenburg as president of Philips Electronics Industries Ltd. Mr. van Eendenburg joined Philips in England in 1935 and came to Canada last year after managing Philips' operations in the Philippines. He has held other positions with

Philips in Holland, Norway, France and Finland.

In addition to Mr. Messier and Mr. van Eendenburg, the directors of Philips Electronics Industries Ltd., are: T. van Dyk, vice-president; P. Bakker, treasurer; and O. W. Rodomar, president of the Philips Industries Limited Division. F. H. Hamer is secretary of the company.

Filtors, Inc. Appoints Sales Representatives

C. G. Barker, sales manager of Filtors, Inc., of Port Washington, N.Y., manufacturers of hermetically sealed subminiature relays, announces that his company has added Consolidated Electronic Equipment Co. Ltd. to its manufacturer's representative list.

Consolidated Electronic Equipment Co. Ltd., which is located at 94 Sheppard Avenue West, Willowdale, Toronto, will cover Canada with the exception of British Columbia.

In addition to their other territories, The Burt C. Porter Co. of 4310 Roosevelt Way, Seattle, Washington, will cover British Columbia.

David

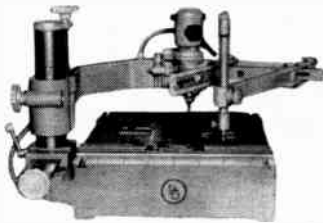
Dowling

ENGRAVING EQUIPMENT

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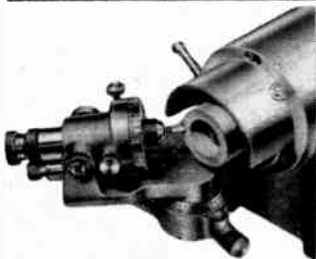
Model 713
Engraving Machine

Reduction range 1:2 to 1:8, with engraving at near writing speeds. Balanced pantograph has ball pivots and adjustable tension. Area for 1:2 reduction, 15 in. by 10 in., for 1:8 reduction, 15 in. by 4 in.



Model 858
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● Attending the 13th Annual Meeting of the Canadian Radio Technical Planning Board in December were the following: (Seated, left to right) C. M. Brant, Controller, Radio Regulations Divn., DOT; F. W. Radcliffe, General Manager, RETMA of Canada, Secretary-treasurer, CRTPB; F. G. Nixon, Controller of Telecommunications, DOT; C. J. Bridgland, General Radio Engineer, Canadian National Telegraphs, Vice-President, CRTPB; F. H. R. Pounsett, Asst. General Manager, Canadian Radio Corporation Ltd., President, CRTPB; R. A. Hackbusch, President, Hackbusch Electronics Ltd., General Co-ordinator, CRTPB; R. C. Poulter, Director of Education, Radio College of Canada, Director of Public Relations, CRTPB; W. Ornstein, Chairman of Fixed Land and Maritime Mobile Committee, CRTPB. (Standing, left to right) R. G. Long, Assn. of Municipal Electrical Utilities of Ontario; R. B. Lanskaill, Tropospheric Scatter Committee, CRTPB; G. H. Stewart, DOT; J. C. Cline, Hydro-Electric Power Commission of Ontario; W. B. Smith, Telecommunications Dept., DOT; C. J. Acton, Telecommunications Dept., DOT; S. Murchie, Assn. of Municipal Electrical Utilities of Ontario; R. E. Santo, CBC; J. C. R. Puchard, RETMA of Canada; A. P. H. Barclay, Chairman of Microwave Committee, CRTPB; S. Bonneville, Telephone Assn. of Canada; T. S. Dutton, Canadian Electrical Assn.; C. E. Tremblay, Chairman, Aeronautical Committee, CRTPB; A. Runciman, Canadian Electrical Assn.; E. L. Palin, Canadian Education Assn.; G. H. Long, Canadian Assn. of Chiefs of Police; N. Wright, American Radio Relay League (Canadian Section); L. G. Buck, Telephone Assn. of Canada; R. Barron, Canadian Electrical Assn.; F. J. Kee, Canadian Electrical Assn.; A. Reid, American Radio Relay League (Canadian Section).

Stark Electronics Reorganize Plant

Stark Electronic Instruments Ltd. of Ajax, Ontario, has made a number of improvements in the operation of its plant during the past few months. Production lines have been brought into co-ordination in the main plant, resulting in economies of space and material handling.

Stark Electronic Instruments Ltd. claims to be the largest manufacturer of test equipment in Canada. Supplying not only government and the armed services, educational institutions, and industry, Stark Instruments

enjoy an extensive export business to countries around the world.

Milton J. Stark is president of this organization.

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ON PAGE 45

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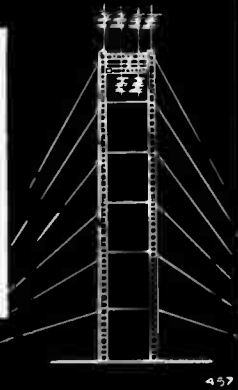
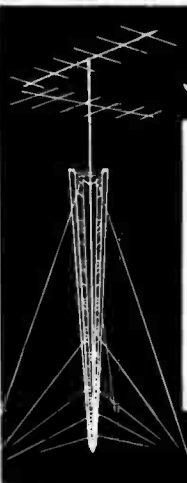
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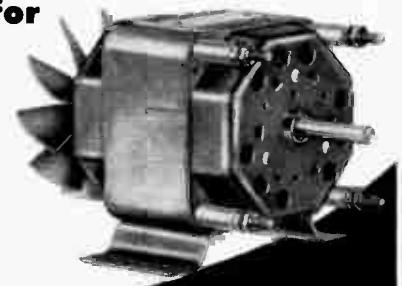


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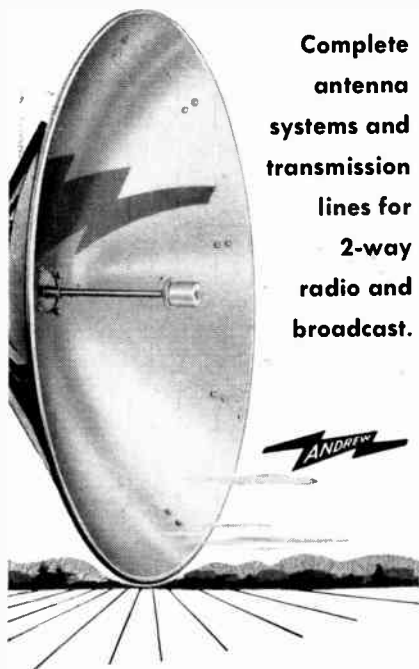
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News Report

CGE Appoints I. F. McRae Board Chairman

Following a recent meeting of the board of directors of Canadian General Electric Company Limited, it was announced that Ian F. McRae had been elected chairman of the board, effective January 1st.



I. F. McRAE

H. M. TURNER

Mr. McRae succeeds Harold M. Turner, who has relinquished his responsibilities as board chairman. Mr. Turner, however, will remain on the directorate and will continue in an active capacity to make available to the company his wide experience in the electrical manufacturing industry.

Mr. McRae, a native of Vancouver, joined Canadian General Electric in 1925 at the Peterborough plant, where he remained to become plant manager in 1941. He was elected a vice president in 1952, and in 1955 became general manager of the Civilian Atomic Power Department, which latter position he will retain in addition to his duties as board chairman. Mr. McRae, who was elected a company director earlier this year, has a long-standing interest in industrial organization work and is at present serving as first vice-president of the Canadian Manufacturers Association.

Mr. Turner was president of Canadian General Electric until undertaking his responsibilities as board chairman in 1955.

New Transmitter For Montreal's CKAC

A modern air-conditioned building is currently under construction to house a new 50,000 watt transmitter for CKAC, Montreal. Equipment is being installed to improve CKAC's coverage in the Montreal metropolitan area, and to extend its coverage in French Canada.

Equipment being installed here includes a new 50,000 watt transmitter designed and manufactured in Canada by the Canadian General Electric Co. Ltd.

Germanium rectifiers are used throughout for the supply of d.c., and light-weight air-cooled tubes are used in place of tubes weighing over 250 pounds each used in earlier designs.



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1/16" to 1 1/8" tips
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News Report

Mel Sales Represent Weldmatic Precision Welders

Weldmatic Division of Unitek Corporation, Pasadena, Calif., announces the appointment of Mel Sales, Ltd., Arnprior, Ontario, as sales engineering representatives in Eastern Canada, west to and including Manitoba.

Besides its main offices in Arnprior, the sales organization maintains branches in Don Mills, Ontario and Montreal, Quebec.

TMC (Canada) Ltd. Exports To Afghanistan

TMC (Canada) Limited of Ottawa, Ontario, manufacturers of telecommunications equipment, have recently completed the design and engineering of a radio communications system for export to Afghanistan. The project is under the auspices of the International Co-operation Administration and the Civil Aeronautics Administration of the U.S. Department of Commerce in Washington.

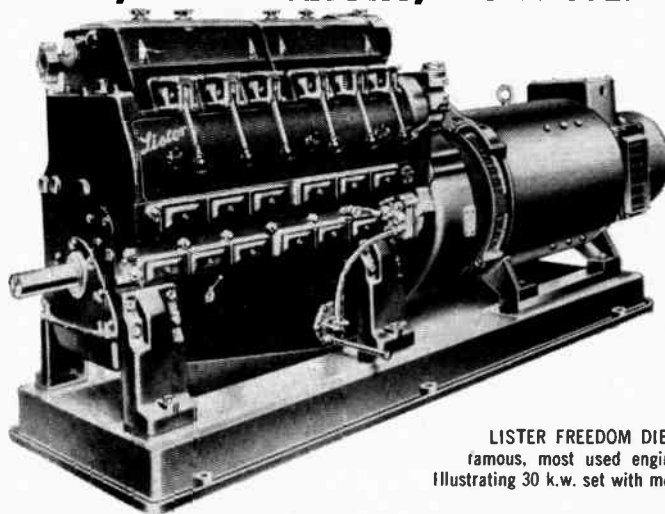
The equipment consists of radio transmitting, receiving, and remote control units and is designed for installation in a number of airports in Afghanistan to provide up-to-date radio communications. This equipment is being purchased as part of a world-wide program for airport modernization.

The radio communications system for Afghanistan will establish air traffic control facilities, point-to-point radio teletype and telegraph communication, ground-to-air and air-to-ground control of aircraft, as well as providing a means of relaying meteorological reports. The latter facility is similar to that currently in use in Canada by the Department of Transport's Meteorological Forecast Office.



● D. V. Carroll (left above), president and managing director of TMC (Canada) Limited is shown with E. Givens (seated) of the Civil Aeronautics Administration of the U.S. Department of Commerce, Washington, D.C. The equipment being examined is a transmit-recvie console for airport radio facilities designed and manufactured by TMC (Canada) Ltd. for Afghanistan.

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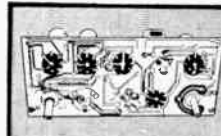
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PROVINCE

News Report

A.P.E.O. Elects Officers For 1958

The Association of Professional Engineers of Ontario recently elected Charles Terry Carson of Windsor, Ont., as its 1958 president. He succeeds John H. Fox of Toronto as head of the largest professional organization of its kind in Canada. The A.P.E.O. is the licensing body for the engineering profession in Ontario.

In business life, Mr. Carson is vice-president and production manager of Hiram Walker & Sons Ltd., Walkerville, Ont. He is also chairman of the committee on engineering education at Assumption University, Windsor.

Mr. Carson, a member of the Association since 1946, has served on the Executive Council for five years, and last year was the Association's 1st vice-president.

Elected 1st vice-president for 1958 is Andrew F. McQueen, Niagara Falls, Ont., who is president of H. G. Acres & Co. Ltd. The 2nd vice-president is Gordon M. McHenry, London, who is Consumer Service Engineer for the Ontario Hydro, London Region.

General Tire & Rubber Co. Changes Name

In keeping with its products and service expansion, The General Tire & Rubber Company, of Canada, Ltd., with headquarters in Welland, Ontario, recently officially changed its name to Industrial Products division.

Known as the Stokes division since 1950 when the Stokes Rubber Company was acquired by The General Tire & Rubber Company, the Welland operations have been expanded into a major supplier of the automotive, refrigeration, appliance and communications industries of Canada.

In recognition of the growth of its Industrial Products division, the



O. G. VINNEDGE

parent company recently named Oliver G. Vinnedge as vice-president in charge of both sales and manufacturing. His responsibility includes the division's plants at Wabash, Logansport and Marion,

in Indiana, as well as the Welland plants. Mr. Vinnedge, prominent for many years in the rubber industry, joined The General Tire & Rubber Company on November 1 after serving in executive capacities for 33 years with the Dryden Rubber division of the Sheller Corp., in Chicago.

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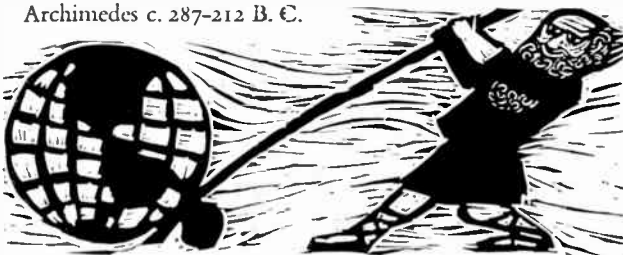
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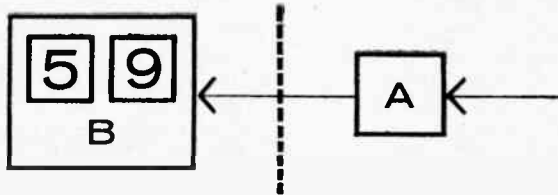
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2C26A	805	4.00	6C6	.45
2C33	813	8.50	6D6	.45
2C40	814	2.50	6F8G	.25
2C43	833A	36.80	6G6G	.60
2C46	836	1.25	6H6	.30
2E22	837	1.00	6J5GT	.35
2E24	838	.35	6J6	.45
2K26	849	35.00	6K7GT	.25
2K28	851	6.00	6K8G	.65
3B24	860	3.75	6L6GAY	.85
3BP1	869B	35.00	6SG7	.50
3C37	872A	1.00	6SH7	.25
3E29	874	.55	6SH7GT	.20
3JP7	876	.75	6SJ7	.59
KC4	891	75.00	6SL7GT	.65
4-125A	955	.25	6SS7	.60
4-250A	K1001 dumont	50.00	7A6	.35
4B22	1624	1.25	7A8	.45
4B25	1625	.22	7AG7	.65
4J25	1632	.20	7E5	.15
4J51	5636-SL	1.25	7F7	.55
4PR60A	5650	50.00	7H7	.25
5AP1	5651	1.00	7S7	.50
5B21	5654	1.35	12A6	.36
5CP1	5718-SL	1.00	12C8	.29
5D21	5719-SL	1.00	12L8GT	.25
5R4WGY	5803	2.75	12SC7	.25
5Y3WGT	5825	6.25	12SF7	.25
6AC7W	5828	3.50	12SK7	.55
6AJ5	5840-SL	1.75	12SL7GT	.45
6AR6	5896-SL	1.50	12SR7	.36
6BM6A	5899-SL	1.75	13-4	.10
6SL7WGT	5902-SL	2.50	14A4	.42
6SN7WGT	5933	1.65	14A5	.39
7ACP19	6021-SL	1.45	14B8	.50
7BP7	6035	10.00	14C5	.45
7MP7	6038	5.00	14C7	.55
9GP7	6046	1.00	14E7	.45
12DP7A	6080WA	6.00	14F8	.75
28D7	6090	1.00	14H7	.45
FG32	6090	1.00	14J7	.50
RK65 5D23	8013	2.90	14N7	.45
101D	9002	.29	14R7	.59
114B			14W7	.50
F-127A			14X7	.50
FG154			17-3	.10
203A			24A	.45
212E			25L6GT	.50
217C			25Z6GT	.50
250R			36	.20
253A W.E.			37	.10
259A W.E.			38	.07
267B W.E.			39/44	.07
332A			46	.29
337A W.E.			50	.35
356B W.E.			50C5	.50
394A			70L7GT	1.05
404A W.E.			71A	.20
417A W.E.			76	.35
450TL			77	.15
H500			78	.15
704A			81	.45
			83V	.45
			89Y	.12

Partial list; many additional types in stock not listed here. WRITE TO DEPT. C FOR PRICE LIST.

CALVERT ELECTRONICS, Inc.

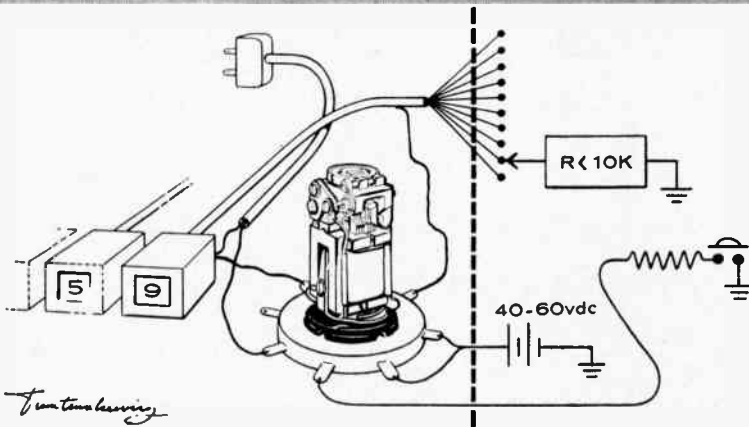
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Cable Address: Calverton, N.Y. Tel. CA. 6-7400



fast switch ON THE NUMBERS

Taking coded information, translating it into decimal form (A) and displaying it on the wall (B) seems to be a matter of concern to a fair number of people these days. Part "B"—making the right number come up—offers an opportunity to demonstrate the virtues of a Sigma Series 72 polar relay. As explained below, halting of display devices can be accomplished in a variety of ways. But because of the 72's combination of high speed, precision and sensitivity, the problem of consistently keeping up with a high speed number drive on very little signal power is solved all at once.



The breadboard diagram to the left of the dashed line has been drawn by our artist, who feels that schematic symbols can never do justice to a Sigma Type 72AOZ-1000-TS High Speed Polar Relay. Of course this may be an expensive way to run a cycledec, but if you are in a hurry you don't want to have to dish up nine separate pulses from the info department (right of the dashed line). Besides, what if it missed counting one of them? To be sure, the relay could be eliminated and the cycledec run directly through its own internal switch contacts. But then AC

supply voltage would have to be put on all switch points except the designated one. This would make it rough for any little solid state peanut you tried to put in that box marked $R < 10K$.

As it is, the 72 will remove the supply from the cycledec .0005 seconds after it lands on the right number, and restore the supply .0008 seconds after you move the ground to another switch point and "push" the reset button. Incidentally, completion of selection puts power on the other contact of the 72, which can then run lights, bells or some other success signal.

Some of the virtues of a Type 72AOZ-1000-TS TCP* SPDT polar relay are:

Contacts rated 500,000,000 operations 60 ma. 120VDC

Coils, two, 1000 ohms each

Either-side stable, operate 0.56 ma. either way either coil

*Armature tungsten, fixed contacts copper-palladium

You can get one such 72 relay with removable dust cover for \$30.00, or for less money in quantity. Samples are available on order, or a bulletin simply on request.

SIGMA INSTRUMENTS, INC.

85 Pearl Street, So. Braintree 85, Mass.

Canadian Representatives:

SAMUEL C. HOOKER (CANADA) LTD., Montreal and Toronto; ARVA, Vancouver, B.C.

News Report

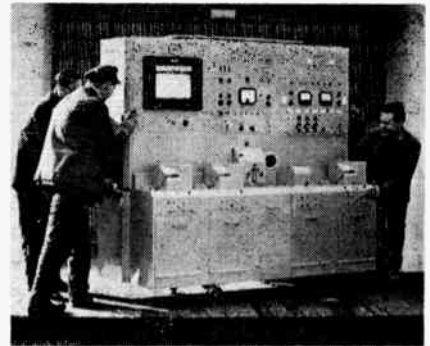
Aviation Electric Adds New Wing To Plant

Aviation Electric Limited of Montreal has announced the completion of an addition of 35,000 square feet to their Montreal plant. The new area houses an air-conditioned manufacturing machine shop and special test facilities for jet fuel controls, fuel flowmeters, and hydraulic and other equipment associated with high inflammable liquids.

The entire new section, which has been added to the existing plant in the form of a wing, has been equipped with air filtering, humidity and temperature control. Temperature will be maintained at a standard 72°F., with tolerance of $\pm 1^\circ$. This will permit the manufacturing of precision instruments, accessories and components for the aircraft and other industries requiring extremely close tolerances. The addition of this new wing brings the total floor area of the Montreal plant to 150,000 square feet.

Radio Physistry Lab Installs Film Analyzer

Recently imported into Canada from Southern Instruments Computer Division, Camberley, Surrey, England, is a Model E1001 Film Analyzer. This equipment was supplied to the Defense Research Board, Radio Physistry Laboratory in Ottawa.



The primary purpose of this equipment is to compute auto- or cross-correlation functions of data supplied in the form of continuous line records on film or paper.

It has, however, been so designed that many other computing functions may be performed, making use of the computing units built into the equipment, either alone or in conjunction with external apparatus.

Automatic recording, sequencing and control circuits are incorporated, which make it possible for the equipment to work entirely unattended when producing correlation functions.

The Canadian representative for Southern Instruments is Electrodesign, 736 Notre Dame St. West, Montreal, Que.

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

ACCESSORIES AVAILABLE:

- 1140-A Null Detector, 1210-A Null Detector — V.T.V.M.,
- 1170 D.C. Supply and 1380 A.C. Supply.

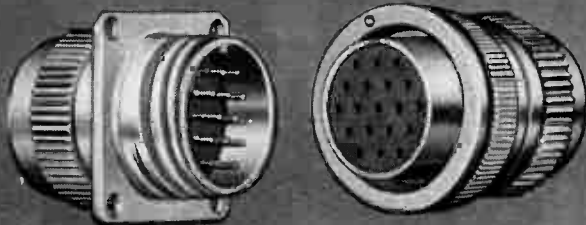
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BIG NEWS ABOUT A LITTLE PRODUCT

(ACTUAL SIZE)



Bendix "PYGMY" Electrical Connectors

- | | |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Gold Plated Contacts | Can be pressurized to current MIL-C-5015 specification |
| Closed Entry Sockets | |
| Resilient Scinflex Insert | High Strength Aluminum Shells |
| Alumilite or Cadmium Plate Finish | Variety of Styles Available—General Duty, Environmental Resisting, Potting Types, Jam Nut Receptacles, Hermetically Sealed Receptacles |
| Two Quick Disconnect Couplings—Double Stub Quick Action Thread or Three-Point Bayonet Lock | Wide Choice of Insert Patterns (1 to 55 contacts) |
| Light Weight | Designed especially for miniaturized Electronic Equipment |
| Small Envelope Size | |
| Maximum Serviceability | |

New "PYGMY" Connectors for Miniaturized Electronic Equipment Installations

Although the newly developed "Pygmy" line of miniature electrical connectors is approximately one third smaller in size and weight than the standard Bendix* AN connector, they provide the same outstanding qualities of serviceability, ruggedness, reliability and resistance to vibration, moisture and corrosion for which all Bendix connectors have become world famous.

If you have an application for miniaturized electronic equipment requiring lighter and smaller connectors than standard AN types, you'll find Bendix "Pygmy" connectors the best possible solution. Write for complete detailed information. SCINTILLA DIVISION OF BENDIX AVIATION CORP., SIDNEY, N. Y.

*REG. U.S. PAT. OFF.



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Scintilla Division

SIDNEY, NEW YORK



BUYERS' GUIDE TO **MUIRHEAD** SYNCHROS

*For Synchros and Servomotors
Consult Muirhead the Specialists with the widest range
and largest stock of Grade 1 Synchros in Canada*

SYNCHROS in current production :

Designation	Size	Volts	Frequency	Function
26V08CX4(B)	08	26V	400c/s	Control Transmitter
26V08CT4(B)	08	26V	400c/s	Control Transformer
11CX4b	11	115V	400c/s	Control Transmitter
11CT4b	11	115V	400c/s	Control Transformer
11CDX4a	11	115V	400c/s	Control Differential Transmitter
11TR4a	11	115V	400c/s	Torque Receiver
11TX4a	11	115V	400c/s	Torque Transmitter
F11M-16-A/1	11	115V	400c/s	Linear Variometer
11R54	11	26V	400c/s	Resolver
26V11CX4a	11	26V	400c/s	Control Transmitter
26V11CT4b	11	26V	400c/s	Control Transformer
26V11CDX4a	11	26V	400c/s	Control Differential Transmitter
26V11TR4a	11	26V	400c/s	Torque Receiver
26V11TX4a	11	26V	400c/s	Torque Transmitter
F11M-16-A/2	11	26V	400c/s	Linear Variometer
15CX4a	15	115V	400c/s	Control Transmitter
15CT4a	15	115V	400c/s	Control Transformer
15CDX4a	15	115V	400c/s	Control Differential Transmitter
15TR4a	15	115V	400c/s	Torque Receiver
15TX4a	15	115V	400c/s	Torque Transmitter
15TX4b	15	115V	400c/s	Torque Transmitter
15TDX4a	15	115V	400c/s	Torque Differential Transmitter
15TDR4a	15	115V	400c/s	Torque Differential Receiver
15R54	15	40V	400c/s	Resolver
15CT6a	15	115V	60c/s	Control Transformer
18CX4a	18	115V	400c/s	Control Transmitter
18CT4a	18	115V	400c/s	Control Transformer
18CDX4a	18	115V	400c/s	Control Differential Transmitter
18TR4a	18	115V	400c/s	Torque Receiver
18TX4a	18	115V	400c/s	Torque Transmitter
18TDX4a	18	115V	400c/s	Torque Differential Transmitter
18TDR4a	18	115V	400c/s	Torque Differential Receiver
18CX6a	18	115V	60c/s	Control Transmitter
18CT6a	18	115V	60c/s	Control Transformer
18CDX6a	18	115V	60c/s	Control Differential Transmitter
18TR6a	18	115V	60c/s	Torque Receiver
18TX6a	18	115V	60c/s	Torque Transmitter
F18M-6-A/1	18	25V	1000c/s nominal	Resolver
23CX4a	23	115V	400c/s	Control Transmitter
23CT4a	23	115V	400c/s	Control Transformer
23CDX4a	23	115V	400c/s	Control Differential Transmitter
23TR4a	23	115V	400c/s	Torque Receiver
23TX4a	23	115V	400c/s	Torque Transmitter
23TDX4a	23	115V	400c/s	Torque Differential Transmitter
23TDR4a	23	115V	400c/s	Torque Differential Receiver
23CX6a	23	115V	60c/s	Control Transmitter
23CT6a	23	115V	60c/s	Control Transformer
23CDX6a	23	115V	60c/s	Control Differential Transmitter
23TR6a	23	115V	60c/s	Torque Receiver
23TX6a	23	115V	60c/s	Torque Transmitter

317/3Ca

SERVOMOTORS in current production :

Designation	Size	Reference Phase Volts	Reference Phase Frequency	Control Phase Volts	Control Phase Frequency
Mk. 14 Mod. 2	11	115V	400c/s	115V (57.5+57.5)	400c/s
Mk. 14 Mod. 3	11	115V	400c/s	180V (90+90)	400c/s
*Mk. 14	11	115V	400c/s		
Mk. 7 Mod. 1	15	115V	400c/s	115V (57.5+57.5)	400c/s
Mk. 7	15	115V	400c/s	20V (10+10)	400c/s
*Mk. 7	15	115V	400c/s		
†Mk. 12 Mod. 0	15	115V	400c/s	115V (57.5+57.5)	400c/s
†Mk. 12	15	115V	400c/s		
Mk. 8 Mod. 0	18	115V	400c/s	115V (57.5+57.5)	400c/s
Mk. 8 Mod. 1	18	115V	400c/s	115V (57.5+57.5)	400c/s
‡Mk. 8	18	115V	400c/s	20V (10+10)	400c/s
‡Mk. 8	18	115V	400c/s		
‡Mk. 8	18	115V	400c/s		
‡Mk. 16 Mod. 0	18	115V	400c/s	115V (57.5+57.5)	400c/s
‡Mk. 16	18	115V	400c/s		
TACHOGENERATOR	Mk. 1 Mod. 1	Size 15	Energyisation 115V	400c/s	Output 3-1V/1000 r.p.m.

*Low impedance control windings †With Tachogenerator ‡Mod. 0 or Mod. 1 shafts

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News Report

Canadian Marconi Appointments

Stuart M. Finlayson, president of Canadian Marconi Company, Montreal, has announced division changes and new appointments in his organization.

A merger of the former Commercial Products Division and Marine Division into the "Engineering Products Division" has resulted in promotions for F. T. Winter and R. E. Foreman, who are now manager and assistant manager respectively of the new division.

C. P. McNamara, who was formerly manager of the Commercial Products Division, now holds the position of Manager of Technical and Commercial Development.

General Controls Names Sales Manager

A. Briggs Crichton has been named sales manager of General Controls Co. (Canadian) Ltd., of Guleph, Ontario.

According to George Crothers, general manager of the automatic controls company.

Mr. Crichton's recent affiliations include the Robertshaw-Fulton Company and Canada Metal Company. He is well known in the

business and trade community for such activities as a member of the Sales Promotion Committee of the Canadian Gas Association, and vice-president of the Supplier's Section of the Canadian Institute of Stove and Furnace Manufacturers.

In his new post Mr. Crichton will be headquartered at General Controls general offices at 171 Surrey Street East, Guelph, Ontario, with jurisdiction over branch offices at Montreal, Toronto, Winnipeg and Vancouver.

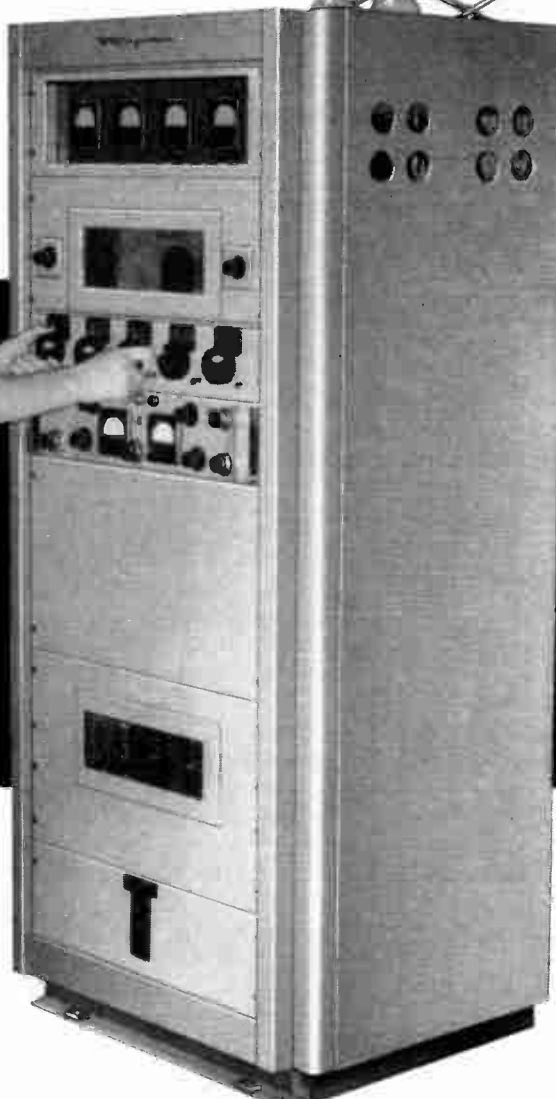
New Directors For Inglis-English Electric

John Inglis Co. Limited and English Electric Company of Canada Limited have appointed the following new directors and officers. H. G. Nelson, Managing Director of the English Electric Company Limited, England, J. G. Notman, President of Canadair Ltd. and Charles Emille Belanger, Partner of Belanger, Saint-Jacques, Sirois & Cie, public accountants of Sherbrooke, have been appointed to the Board of Directors.

W. A. Montgomery has been appointed a Director and Executive Vice-President and W. M. Hurton, Executive Director.



A. B. CRICHTON



**Canadian Westinghouse
1000 watt transmitters
now in operation
by Royal Canadian Navy**

New Canadian Westinghouse HA type transmitters now provide communications for the Royal Canadian Navy between Moncton, New Brunswick and other stations such as Gander, Newfoundland. This 1000 watt equipment designed to withstand temperature and humidity extremes meets the critical specifications of the RCN.

The same Canadian Westinghouse transmitters selected by the Navy for important communications

networks are also available for commercial application. The versatile HA series comes in four models—three CW and one phone. CW types can be readily converted to phone with an easily installed modulator.

Canadian Westinghouse engineers have specified in the tube complement of the conservatively rated HA series transmitters a pair of Eimac 4-400A radial-beam power tetrodes in each of the final amplifier and modulator—CW HT swamping stages.



EITEL-McCULLOUGH, INC.

SAN BRUNO CALIFORNIA

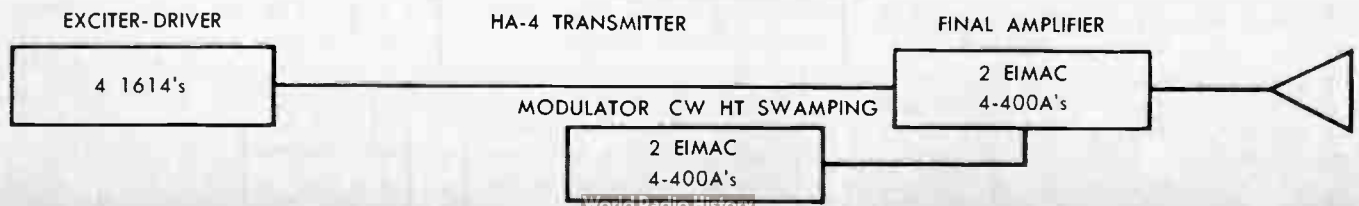
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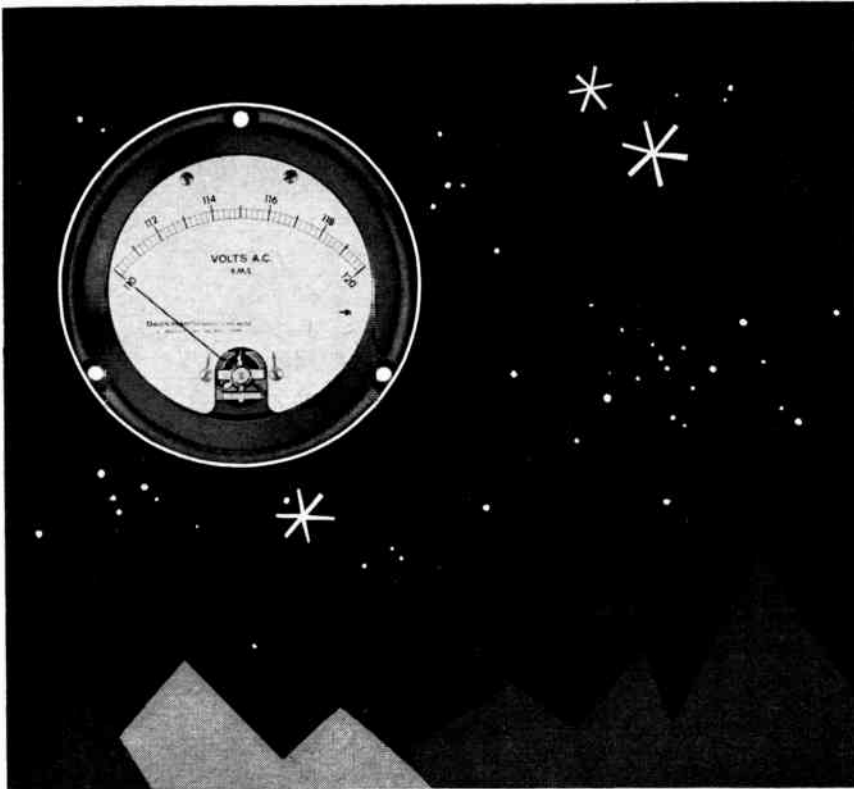
Canadian Representative:

R. D. B. SHEPPARD

2036 Prince Charles Road, Ottawa 3, Canada

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APPLICATIONS? Whether aground or aloft, there's a Beckman Expanded Scale AC or DC Voltmeter to meet your voltage measuring requirements. Eight basic models in 126 shapes, sizes and ranges for panel installations in ground systems, aircraft and test equipment.

MORE INFORMATION? Yours for the asking... write for data file 14E.



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Sales Representative:
R-O-R Associates, Ltd.
1470 Don Mills Road, Don Mills, Ont.

News Report

Atlas Radio Corp. Announces New Subsidiary

D. Lou Harris, president of Atlas Radio Corporation Ltd., has announced the formation of a new subsidiary company to carry on the instrumentation sales activities now being handled by the instrumentation division of the present company.

The new company will be known as Atlas Instrument Corporation Ltd. and will continue to operate at the same address, 50 Wingold Ave., Toronto 19, Ontario.

This change is designed to provide more complete and specialized sales service to the Canadian electronics industry. The new company will be the exclusive Canadian sales and service representative of the following well known U.S. manufacturers of electronic measurement equipment: Electro Products Inc., Gertsch Products Inc., Hewlett-Packard Co., KinTel, Eric Lindgren & Associates, Sierra, Tel Instruments Corporation.

Officers of the new company are: D. L. Harris, president; F. Harris, vice-president; S. Heiber, secretary; A. L. Rosenthal, general manager.

Adalia Limited Represents W. S. Electronics

An item mentioned in "Business Briefs and Trends" on page 39 of the November, 1957 issue of *ELECTRONICS AND COMMUNICATIONS*, relating to a transistor test set produced by a British electronic engineering firm, has elicited the information that enquiries concerning this equipment may be addressed to Adalia Limited, 810 Castle Building, 1410 Stanley St., Montreal 2, Que.

The transistor test set referred to, which indicates noise level and is expected to be of particular value in the manufacture of hearing aids, is the product of Messrs. Bonochord Limited of High Wycombe, Bucks., England. This firm has now been absorbed by W. S. Electronics (Production) Limited of Brunel Road, East Acton, London, W. 3, England.

Adalia Limited, who are the technical representatives of W. S. Electronics in Canada and the United States, announce that they hope shortly to have in Canada some demonstration models of the transistor test set.

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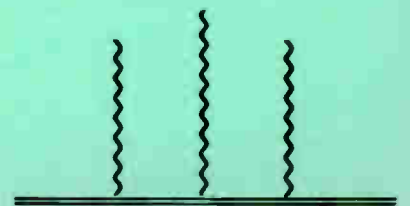
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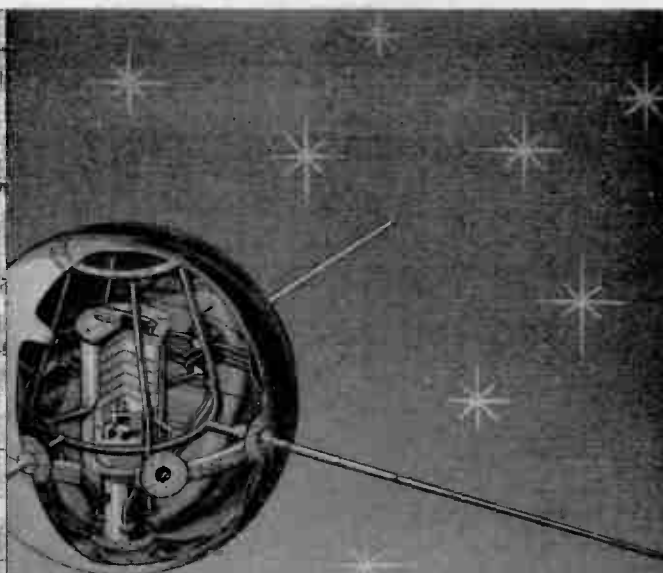
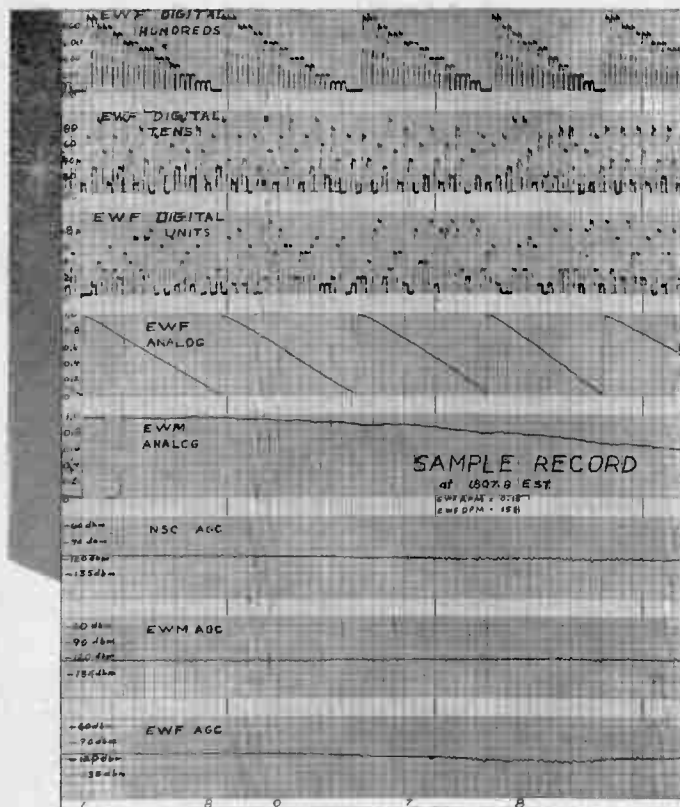
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Radio tracking of IGY earth satellites poses some of the most difficult problems—and is one of the more elaborate phases—of the entire satellite program. The Minitrack tracking system, developed by the U. S. Naval Research Laboratory, receives the satellite's signals and converts them for recording on 8-channel Sanborn oscillographic recording systems.

At each of ten stations in the Minitrack chain, two 8-channel Model 158-5475 Sanborn systems with 150-2900 VA Dual Channel DC Amplifiers record the data. Of the 16 Minitrack variables fed to the Sanborn systems, five are timing information and tracking system performance data, the remaining 11 relating to the satellite's position. Voltage analogs developed from phase angles of 5 signals will determine position. Since the analogs vary from 0-60 volts at rates up to 120 volts per second, with flyback from full scale to zero in less than 1 millisecond, the high linearity of the Sanborn recording systems becomes extremely important. Six more "position" channels will be used for digital recording—three for an "east-west" antenna pair, three for a "north-south" antenna pair. Because these recordings must be clearly readable to 1 part in 1000, each of the three channels will record tenths, hundredths and thousandths individually as shown in the actual digital recording of signals of the satellite transmitter carried in an airplane. To insure clean, easily read records, the Sanborn systems must record signals varying from 0 to 0.9 of full scale in a few milliseconds and recover from the transient in less than 15 milliseconds. The trace in the margin of the recording is serial coded timing information.

Ask Sanborn for specific recommendations on your oscillographic recording problems. Start from folder, or complete 16 page catalog, available on request.

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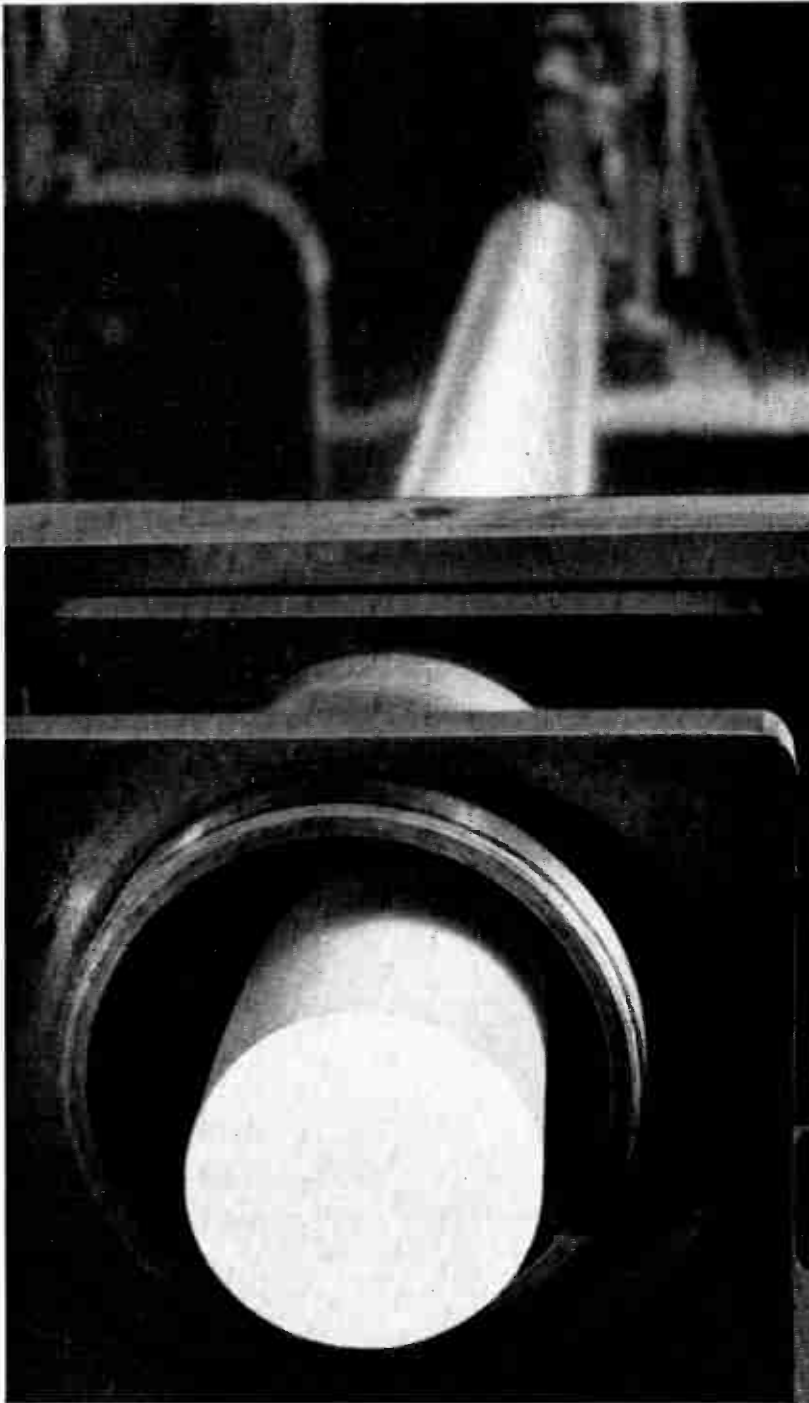


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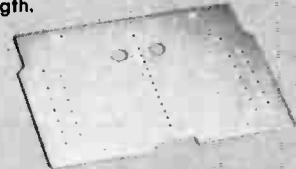
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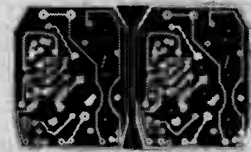
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631



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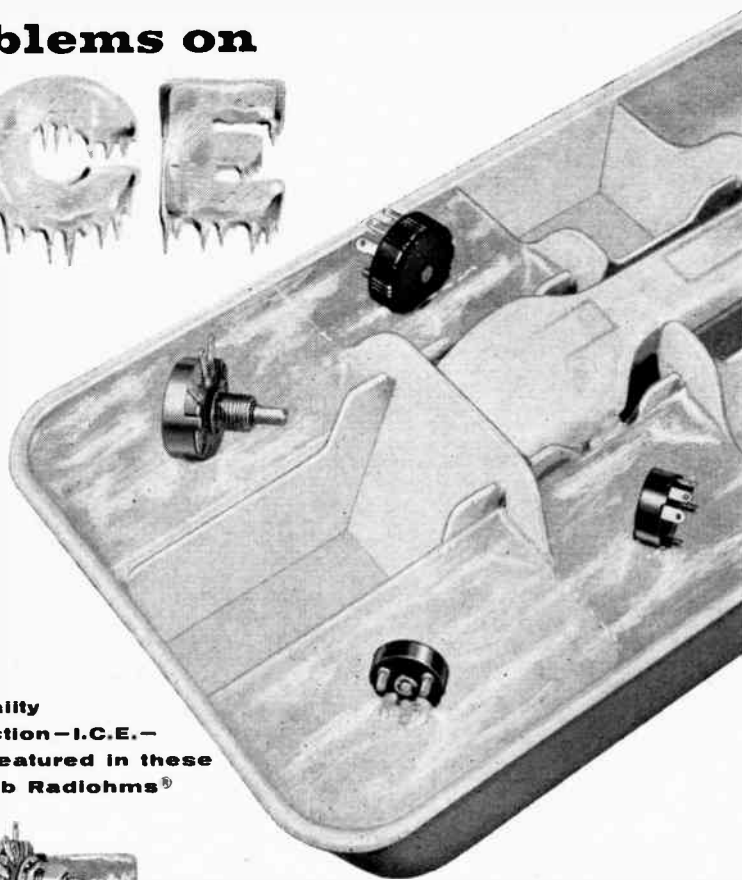
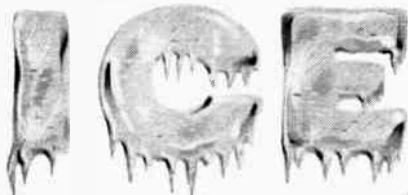


625-NA

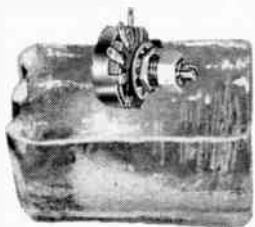


666-R

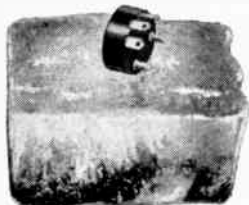
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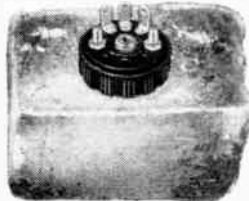
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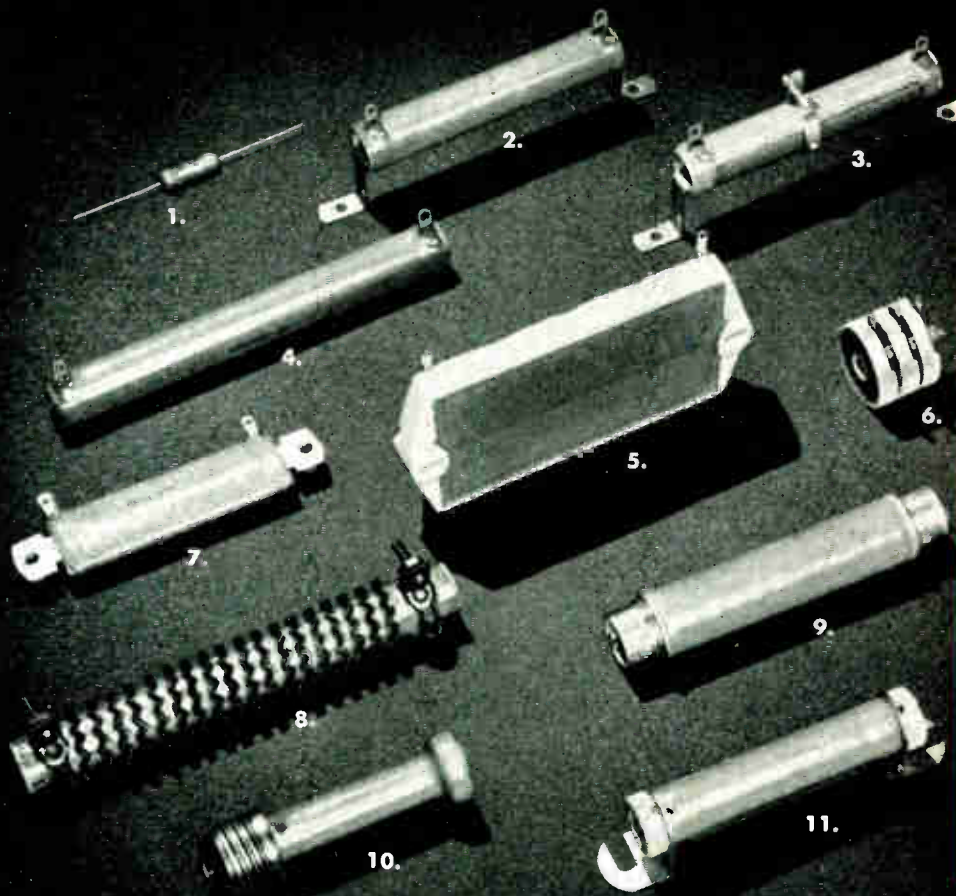
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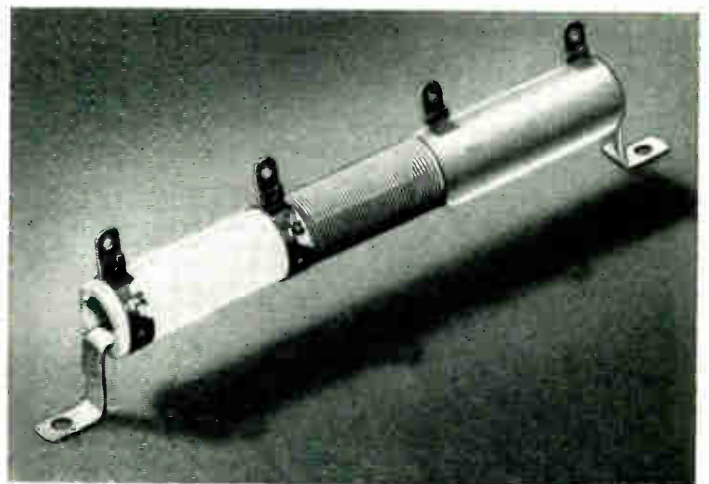
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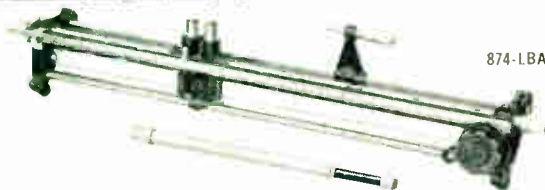
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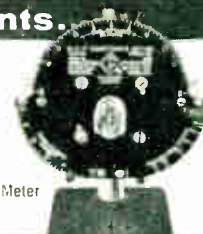
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