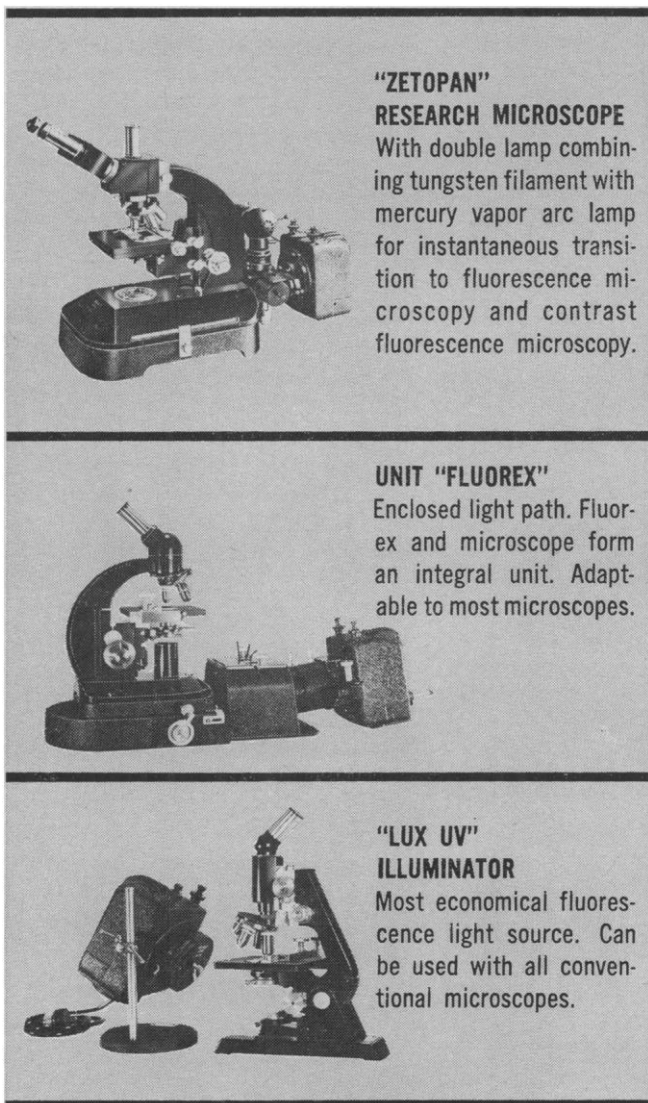


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Rubidium frequency standard uses an optically pumped rubidium-87 cell as the basic frequency reference. Optical pumping to redistribute the atoms among the energy states of rubidium is effected by irradiating the cell with light from a rubidium-85 vapor discharge lamp excited to luminescence by a radio-frequency field supplied by a transistorized oscillator. When the cell is irradiated by microwave energy of proper frequency, the energy levels depleted by optical pumping tend to be replenished by a further redistribution of the atomic energy states. As a result, more pumping energy is absorbed. When the microwave energy is at the precisely correct frequency, the transmission of pumping light is at a minimum. This minimum is detected by a photodetector from which an error signal is derived that is used to maintain the microwave frequency. In the instrument, microwave energy is generated by a crystal oscillator at 6834 Mcy/sec, the resonant frequency of rubidium-87, and is supplied to a resonant cavity containing the gas cell. The stabilized signal from the crystal oscillator is fed to a transistorized frequency synthesizer circuit that provides three output frequencies: 5 Mcy/sec, 1 Mcy/sec, and 100 kcy/sec. Output power is 10 mw into a 50-ohm load. (Space Technology Laboratories, Inc., 8929 Sepulveda Blvd., Los Angeles, Calif.)

Circle 1 on Readers' Service card

Teaching microscopes, series 60, include a selection of models ranging from instruments specifically designed for teaching high school biology and botany to others more elaborately equipped for intermediate and advanced course work. In these microscopes, the

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither Science nor the writer assumes responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 139 and 221. Circle the department number of the items in which you are interested on this card.

traditional rack and pinion focusing system has been eliminated; the nose-piece assembly itself can be focused. Built-in slide protection is afforded by spring-loaded construction of the nose-piece assembly and by a variable autofocus stop. (American Optical Co., Buffalo 15, N.Y.)

Circle 2 on Readers' Service card

High-vacuum laboratory enclosure (Fig. 1) is available in standard units of 4- by 5-ft modules and in special sizes. The units are constructed with 12-in. diameter glass viewing ports mounted in a sloping front, a 15-in. diameter airlock, and a rear access panel measuring 12 by 18 in. Bellows-type neoprene gloves permit manipulation in the interior. The units are fabricated of 1/4-in. stainless steel plate. Glass viewing ports are 1-in. thick polished plate glass. (S. Blickman, Inc., 536 Gregory Ave., Weehawken, N.J.)

Circle 3 on Readers' Service card

Airborne-particle monitor is modified by the addition of an air-dilution system to cover the range from clean-room atmospheres to the most polluted industrial smogs. The dilution system provides a continuously variable addition of filtered dilution air (from 0 to 200 cm³/min) to a basic sample, giving dilution ratios up to 50:1. The basic facilities of the monitor can be used with or without the dilution system. Fifteen subranges of particle size from 0.32 to 8 μ can be examined and individually indicated on decade registers and recorded by galvanometer, potentiometer, or digital printer. Particle concentrations up to 7340 per minute can be counted with the normal 100-cm³/min sample input. Manual selection or automatic scanning of particle-size ranges can be chosen; in the programmed mode of operation the instrument allows for 0.3, 1, 3, or 10 min of monitoring at each range. (Royco Instruments, Inc., 440 Olive St., Palo Alto, Calif.)

Circle 4 on Readers' Service card

Decade counter tube (Fig. 2) is a cold-cathode, gas-filled tube which provides an output pulse said to be of sufficient magnitude so that an inter-stage coupling amplifier is not needed. The tube operates at counting rates up to 4 kcy/sec. Indication is made by an orange-red glow discharge that is viewed through the dome of the tube envelope at the end of the electrodes. (Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y.)

Circle 5 on Readers' Service card

Residual-gas analyzer for continuous analysis of residual gases in a vacuum system utilizes the mass-spectrometer principle. The instrument is composed of a mass analyzer with a magnet and d-c amplifier and control circuits. Capabilities are said to include resolving power sufficient to separate adjacent peaks up to mass 20 and ability to measure quantities of gas and vapors at mass-to-charge ratios ranging from 2 to 80. Sensitivity is said to be sufficient to permit analysis of gases in the pressure range 10⁻¹ to 10⁻⁹ mm-Hg. Continuous identification of mass un-

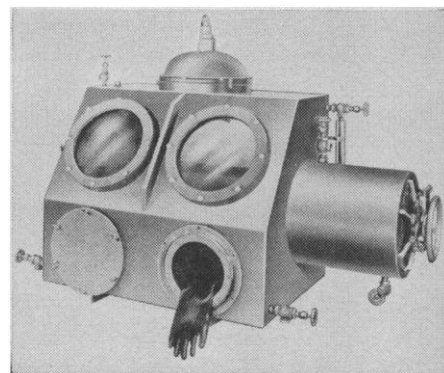


Fig. 1. High-vacuum laboratory enclosure.



Fig. 2. Decade counter tube.

Carboxypeptidase

A:

Twice crystallized.

Carboxypeptidase DFP:

Twice crystallized enzyme treated with diisopropylphosphorofluoridate to eliminate contaminating trypsin and chymotrypsin actively and recrystallized after removal of DFP.

Carboxypeptidase

B:

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der analysis is provided by a self-adjusting central control function that can be manually advanced or turned back for selective analysis of specific peaks. It also permits the instrument to be preset to start or stop at any point on the spectrum. A programmer accessory is available to attenuate and control the scan of a preselected series of masses. Power input requirement is 3 amp, 105 to 125 volts, and 60 cy/sec; variations of 5 volts are tolerated; bake-out temperatures up to 450°C can be used. (Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif.)

Circle 6 on Readers' Service card

Torque meter is a dynamometer that is slipped onto the shaft and held by a hand-tightened collet. Interchangeable collets fit a wide range of shaft sizes. Torque up to 22 in. lb is measured in either direction. Transmitted torque is read from the dynamometer dial by means of a stroboscopic illuminator; rate of rotation is read from the stroboscope dial. Accuracy is said to be ± 0.5 percent. (Micro Pump Corp., Box 392, Danville, Calif.)

Circle 7 on Readers' Service card

Differential current meter measures the current from two transducers separately or differentially. Dynamic range of the instrument is 10^5 ; it will measure current of 10^{-9} amp full scale. Frequency response is 0.5 cy/sec at the lowest range increasing to 30 kcy/sec at the least sensitive range. Preamplifiers with a gain of 10^3 are available for low level measurements. (Eldorado Electronics, 2821 10 St., Berkeley 10, Calif.)

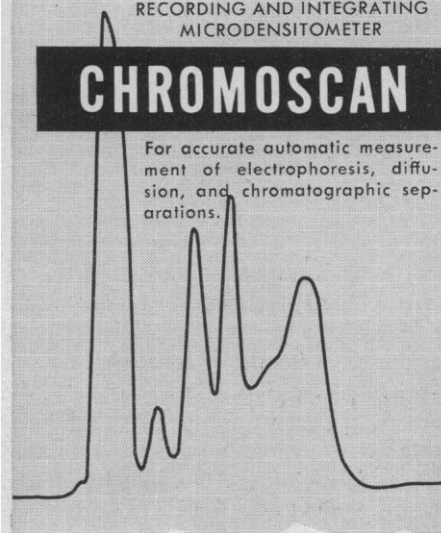
Circle 8 on Readers' Service card

Chromatographic system for closed-loop control of processes delivers control signals of 0 to 4 ma, 0 to 50 volts, proportional to the concentrations of measured components. A current-to-pressure transducer may be used to adapt the instrument to pneumatic-control systems. The system incorporates a sensing unit and a multi-component peak-reading controller. A high-speed pneumatic valve in the sensing unit introduces gas samples into the chromatographic column in less than 1 sec. Carrier gas flow rate and analyzer temperature are controlled. Sensing unit functions are controlled and actuated by a programmer. A memory and transmission unit receives, selects, and stores peak values of the component signals transmitted

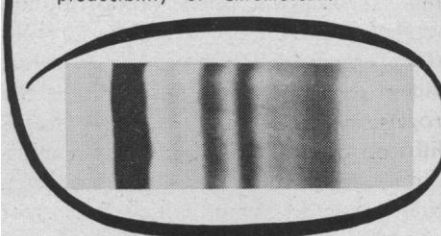
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and later amplifies and transmits segregated peak values according to commands from the programmer. The transmitted signals are available for both control and data-recording purposes. (Perkin-Elmer Corp., Norwalk, Conn.)

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X-ray diffractometer attachment for the study of powder, wire, or sheet specimens at high temperature in high vacuum, consists of two major parts—a completely removable water-cooled jacket and a base plate with furnace stand and platinum specimen mount. The specimen's position may be adjusted during the run, without disturbing the vacuum or temperature conditions, by two rotational controls and one translational control located outside the instrument. The furnace elements of 40-percent rhodium platinum permit operation in air at elevated temperatures. X-rays enter and leave the attachment through two beryllium windows that permit reflection from 0 to 160 deg. Models are available for the Norelco wide-range diffractometer, the GE spectrogoniometer, and the RCA horizontal diffractometer. (MRC Manufacturing Corp., 47 Buena Vista Ave., Yonkers, N.Y.)

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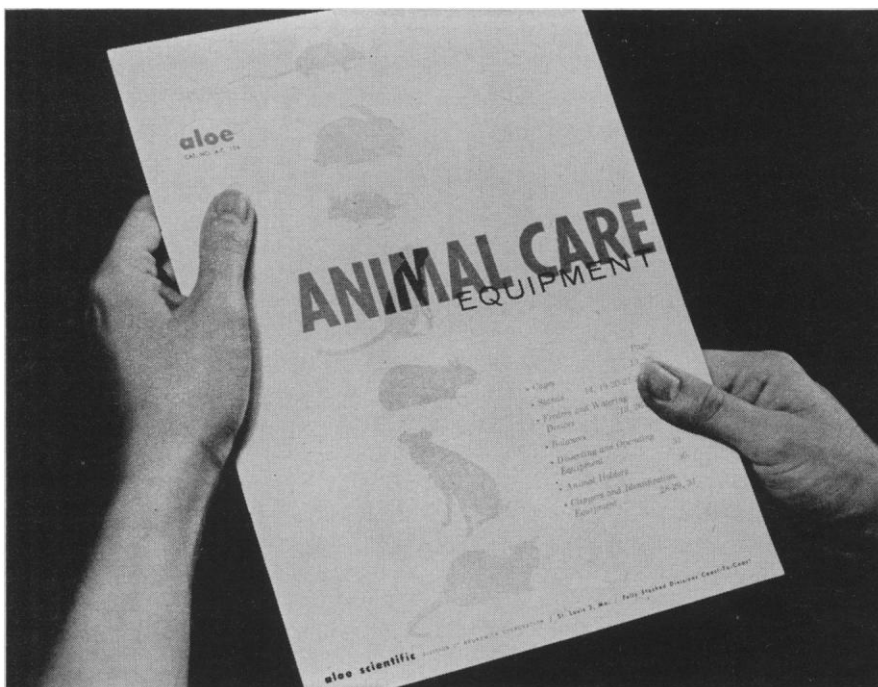
Time delay is continuously variable up to 3 nsec by manual adjustment or by motor with push-button switch. Bandwidth is from d-c to more than 2000 Mc/sec. Specifications quoted by the manufacturer include: accuracy better than ± 1 percent at any point with calibration capability to ± 0.01 percent; resolution time infinitesimal and readability better than 0.05 psec; input voltage greater than 500 peak volts; maximum attenuation 0.017 db at 100 Mc/sec, 0.68 db at 1000 Mc/sec, and 0.85 db at 1500 Mc/sec. The instrument is coaxially constructed and consists of bilateral passive network with no active devices. (Ad-Yu Electronics Laboratory, Inc., 249-259 Terhune Ave., Passaic, N.J.)

Circle 11 on Readers' Service card

512-Channel analyzer, model ND 120, is based on the manufacturer's model ND 102, 256-channel analyzer with various circuit improvements. The unit has 10^6 count capacity and is rack mounted; the circuitry is said to be extremely accessible. (Nuclear Data, Inc., 3833 W. Beltline, Madison, Wis.)

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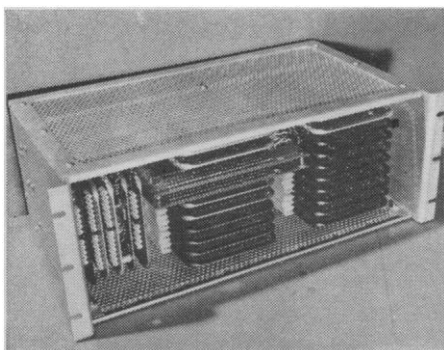


Fig. 3. Magnetic-core memory.

Magnetic-core memory (Fig. 3) operates at 1 Mcy/sec with access time of 0.4 μ sec. Two standard sizes are available, 128 and 512 words, with 24 bits per word. No rewrite circuitry is needed for the nondestructive memory. Loading can be performed at speeds up to 200 kcy/sec, if desired, but the standard input is from paper tape. Ambient temperature range for operation is 0° to 50°C; power consumption is 50 watts for the 512-word memory. (Aeronutronic Division, Ford Motor Co., Ford Rd., Newport Beach, Calif.)

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Timing modules may be used as completely self-contained, sold-state, time-delay devices offering single-pole normally open output, or they may be used to operate a separate magnetic relay. In operation negative d-c appears at load terminals after continuous energization for specified delay intervals and remains until supply is interrupted. Operating voltage range is 24 to 30 v d-c; operating temperature range is -55° to +100°C; time tolerance over the specified operating range is said to be ± 10 percent. Delay ranges are factory set between 0.1 and 30 sec in two models and between 30 and 60 sec in a third model. Reset to 90-percent recovery is achieved in 0.2 or 1 sec depending on the model. (G-V Controls Inc., Okner Parkway, Livingston, N.J.)

Circle 14 on Readers' Service card

Scanning monitor oversees as many as 200 inputs that can be represented by a d-c voltage as low as 10 mv full scale. Display lights indicate out-of-limits conditions; also, a warning horn, which can be silenced by an acknowledgment button, sounds. Scanning rate is five points per second; limits are in-

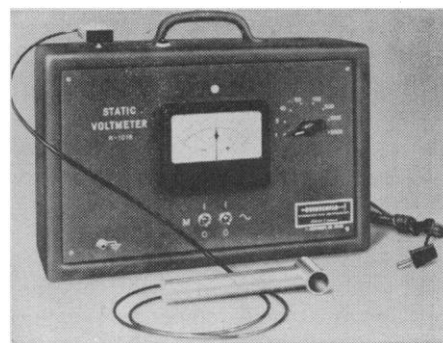


Fig. 4. Static voltmeter.

dividually set by inserting pins in a pinboard. Accuracy is said to be ± 0.1 percent of full scale. Manual readout of any point with ± 1 -percent accuracy is available continuously. At 2-sec intervals the system selects the point addressed for manual readout and applies its signal to the readout meter. The reading is held by the meter for 2 sec during which the normal scanning of the monitor continues. Point identification is continuously displayed in lighted numbers. Self-checking devices are incorporated to verify operation of the detecting amplifier, alarm circuit, and indicating lights and continuity of input circuits and input selection relays. Each check requires 30 sec and may be repeated as frequently as desired. (Hagan Chemicals and Controls, Inc., Hagan Center, Pittsburgh 30, Pa.)

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Static voltmeter (Fig. 4), manufactured by Rothschild of Zurich, measures static charges from 0 to 5000 volts in eight ranges. A probe electrode permits direct measurement of potential on the surface of material. A synchronous motor discharges the static voltage to ground every 5 sec to permit the slope of the charge to be determined independently of the equilibrium voltage. Surface conductivity up to 10^{15} ohms is measured by a special electrode that measures the half value of an input voltage. (Fabrionics Corp., P.O. Box 521, Huntington, N.Y.)

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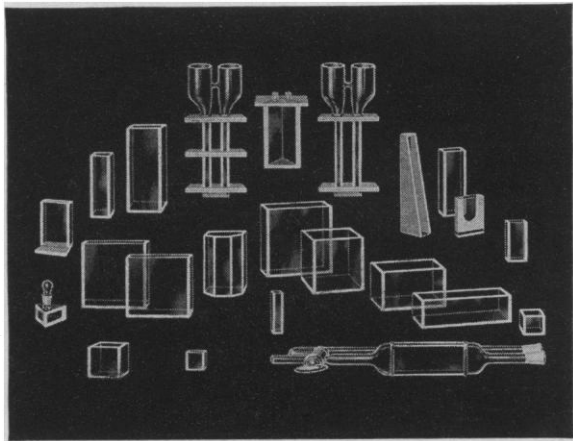


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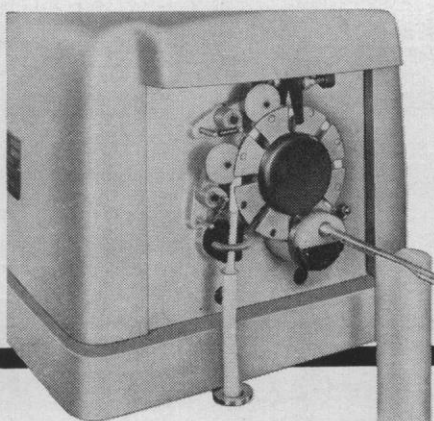
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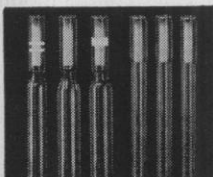
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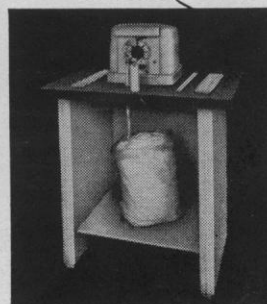


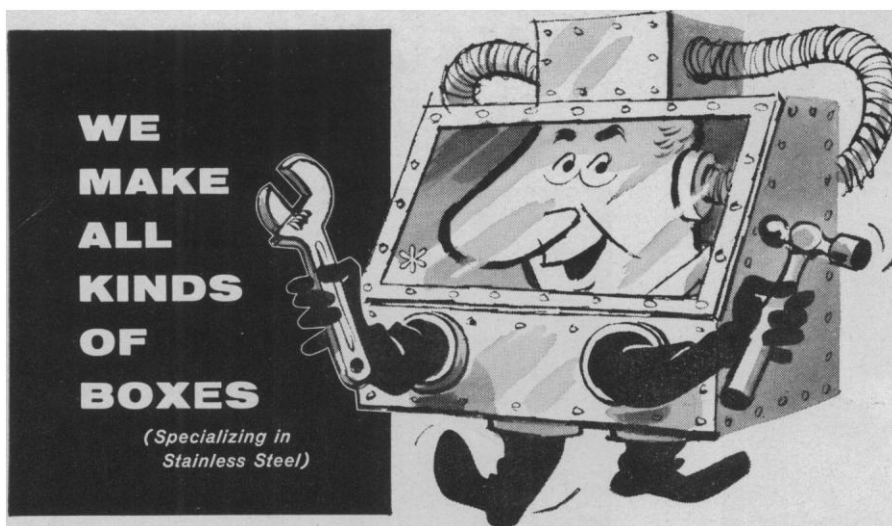
The Harrison Pipette Plugger eliminates the slow, tedious job of hand stuffing cotton in pipettes. An experienced operator can plug pipettes up to 2400 per hour, with each cotton plug absolutely uniform in size. Cotton plugging speeds adjustable to 22, 30 or 40 pipettes per minute. The Harrison Pipette Plugger can be used over a full range of standardized cotton plugging type pipettes *without adjustment*, including the following pipettes: Bellco V.I.P. 12-334, Corning 7086, and Kimble 37034A. Other pipettes having identical top dimensions and tolerances as these will also be satisfactory. However, conventional pipettes can be reworked and shaped to the cotton plugging top dimensions . . . if they are of borosilicate glass.

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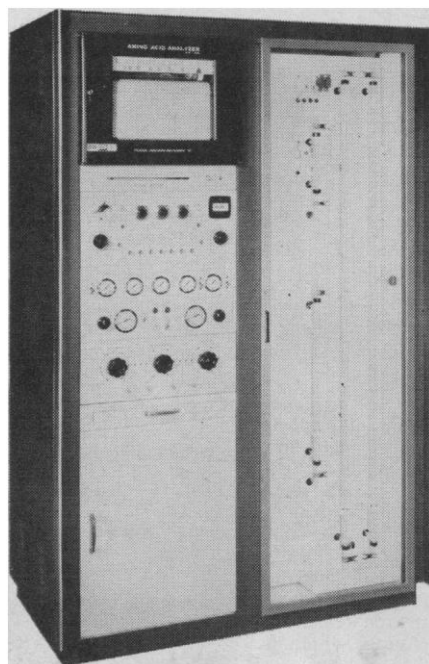
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$\frac{3}{4}$ -in. diameter, semicircular ingot form and weigh about 20 g/in. Mobility and resistivity data are supplied with all single-crystal material. Measurements are made on an ultrasonically formed Hall sample from material immediately adjacent to that supplied. (Micro State Electronics Corp., 152 Floral Ave., Murray Hill, N.J.)

Circle 17 on Readers' Service card

Rubber tubing lined with polytetrafluoroethylene plastic combines the advantages of chemical inertness of the liner with desirable mechanical properties of the rubber tubing. The liner is available with internal diameters from $\frac{1}{8}$ to 1 in. covered with $\frac{1}{8}$ -in. neoprene rubber or other elastomer. (Pennsylvania Fluorocarbon Co., 1115 N. 38 St., Philadelphia 4, Pa.)

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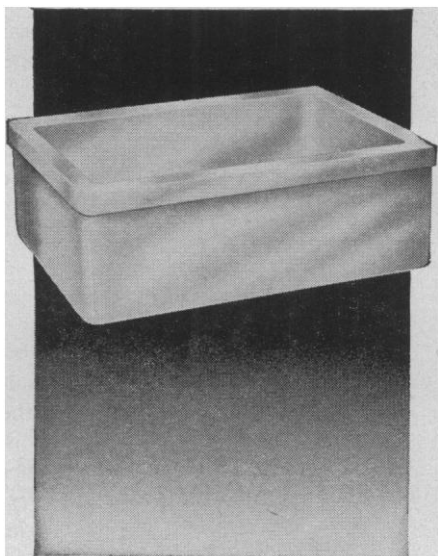
Pulverizer for preparation of samples for spectrochemical analysis achieves uniformity of particle size by the use of screens and an air stream to remove particles from the grinding chamber as soon as they reach a predetermined size, while grinding is going on. Coarse material, up to $\frac{3}{16}$ in. in diameter, is fed into a grinding chamber that is shaken by an eccentric mechanism. An air stream directed through the chamber is reversed in direction 200 times per minute. The reversal of the air path cleans the screens while removing the particles to a collector. Screens as fine as 450 mesh are available. (Pitchford Scientific Instruments Corp., 501 Castle Shannon Blvd., Pittsburgh 34, Pa.)

Circle 19 on Readers' Service card

Air monitor is designed to detect radiation in airborne iodine vapor. It detects and records specific gamma activity in the energy range 0.33 to 0.55 Mev and warns of alarm conditions. The unit can also be set for other energy ranges. In operation, vapors are deposited on an activated carbon filter, and iodine activity in the deposit is recorded. (Nuclear Measurements Corp., 2460 N. Arlington Ave., Indianapolis 18, Ind.)

Circle 20 on Readers' Service card

Pulse generating equipment features high repetition rates and fast rise and fall times. Available are two clock-pulse generators and a programmed pulse generator. The clock-pulse generators include a 3- to 25-Mcy/sec unit and a 25- to 100-Mcy/sec unit



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with appropriate overlap. Rise and fall time of the clock pulses is less than 4 nsec; pulse width is less than 8 nsec at half pulse height; amplitude is continuously variable from 0 to 4 volts; output impedance is 93 ohms. The programmed pulse generator features internal pulse repetition rate, 3 to 25 Mcy/sec; rise and fall time, less than 6 nsec; amplitude, 0 to 5 volts; output impedance, 93 ohms. Ten pulse times are provided, with front-panel control for selecting any combination of these pulse times individually for each output. Up to four independent outputs can be provided. (Texas Instruments Inc., P.O. Box 6027, Houston 6, Tex.)

Circle 21 on Readers' Service card

O-ring slide chart for metal O-rings covers ring diameters of 0.25 to 50 in. and includes specifications for plain, plated, and coated rings. When the slide rule is set at the nominal outside diameter of a standard ring, the proper installation dimensions are found. For nonstandard rings, the chart gives data for the calculation of installation dimensions. Charts can be obtained by request on company letterhead. (Advanced Products Co., 59 Broadway, North Haven, Conn.)

Circle 22 on Readers' Service card

Level recorder is a high-speed graphic recording voltmeter for measuring r.m.s., average, or peak level of a-c signals from 10 to 200 kcy/sec or, through an internal chopper, d-c to 10 cy/sec. The recorder operates as a null-balancing electromechanical servo with six linear or logarithmic recording ranges from 10 to 75 db. (B & K Instruments, Inc., 3044 W. 106 St., Cleveland 11, Ohio)

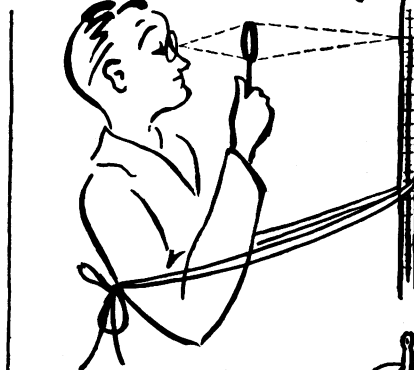
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Vacuum gage of the cold-cathode ionization type measures over the range 10^{-1} to 10^{-6} mm-Hg. The gage is designed for convenient disposal and replacement of dirty or contaminated anode and cathode. The control circuit includes a rectified high-voltage supply and a potentiometer for compensation of line voltage variations. Indication is provided by a 4-in. meter. (Temperature Engineering Corp., Riverton, N.J.)

Circle 24 on Readers' Service card

Temperature transducer covers the temperature range -320° to $+280^{\circ}$ F. The transducer functions as one arm of a four-arm bridge. Excitation current is

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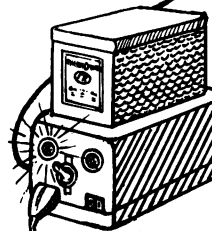
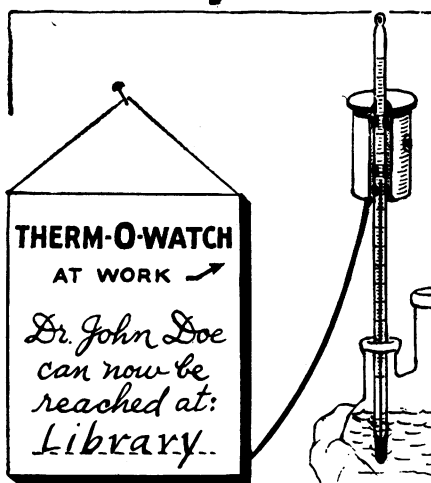
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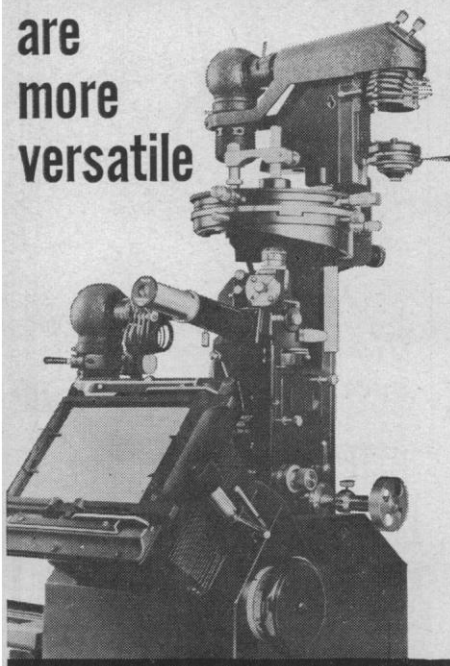


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about 2 ma. Time constant for 63.2 percent of temperature span is said to be less than 0.7 sec and time response of 99 percent of a step temperature change, less than 5 sec. The transducer is approximately 1 in. square and less than 0.04 in. thick and weighs less than 1 g. (Crescent Engineering & Research Co., 5440 N. Peck Rd., El Monte, Calif.)

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Vacuum recorder is a miniature instrument measuring $3\frac{3}{8}$ in. by $5\frac{3}{8}$ in. high. Two ranges. 0 to 1000 μ -Hg and 0 to 20 mm-Hg, are available. The instrument uses compensated vacuum thermopile circuitry. Recording is accomplished by clamping bar action on pressure-sensitive chart paper. Scales are calibrated directly in absolute pressure units. One roll of chart paper is used during 15 days of operation. (Hastings-Raydist Inc., Hampton, Va.)

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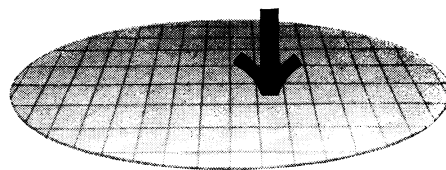
Voltage-reference source is a four-decade, direct-reading device with full-scale output of ± 111.11 volts which can be selected in 10-mv increments. Resolution is 1 part in 10,000 plus vernier, and accuracy is said to be ± 0.025 percent at 25°C with temperature coefficient 0.002 percent per degree centigrade. Output impedance is less than 0.1 ohm. The instrument is not harmed by short circuit. (Electronic Development Corp., 423 W. Broadway, Boston 27, Mass.)

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Bernhardt, H., Young, J. M., and Gourley, R. D.
Cancer Vol. 13, No. 3, May-June 1960

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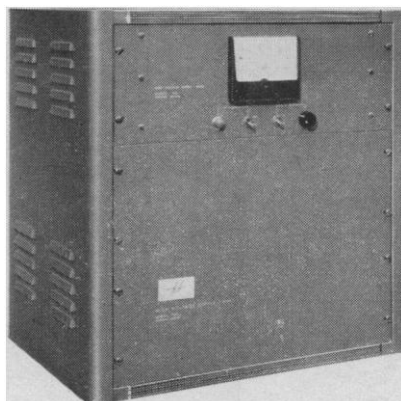
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INDEX OF ADVERTISERS—21 July 1961

Ace Glass Inc.	215	Kewaunee Scientific Equipment	232
Ainsworth, Wm., & Sons, Inc.	217	Kimble Glass Co.	239
Aloe Scientific	229	Kirschner Manufacturing Co.	219
American Edelstaal Inc.	202	Klett Manufacturing Co.	231
American Optical Co.	153, 240	Kontes Glass Co.	214
Baird-Atomic, Inc.	124, 144	LaPine Scientific Co.	222
Beckman Instruments, Inc.	127	Leitz, E., Inc.	122
Bellco Glass, Inc.	231	Lionel Electronic Laboratories	207
Bio-Rad Laboratories	238	Matheson Coleman & Bell	200
Brinkmann Instruments, Inc.	211	Mettler Instrument Corp.	152
Bronwill Scientific, Div. of Will Corp.	224	Mikros, Inc.	236
Buchler Instruments, Inc.	219	Millipore Filter Corp.	234
Canner's, Inc.	238	Minneapolis-Honeywell, Heiland Div.	149
Central Scientific Co.	212	Nalge Co., Inc.	218
Charles River Breeding Laboratories	238	National Instrument Laboratories, Inc.	228
ChemTrac Corp.	204	Nester/Faust	210
Clay-Adams	157	Nikon Inc., Instrument Div.	150
Coleman Instruments, Inc.	135	Nutritional Biochemicals Corp.	123
Colorado Serum Co.	238	Packard Instrument Co., Inc.	160
Coors Porcelain Co.	216	Parr Instrument Co.	216
Corning Glass Works	145	Phoenix Precision Instrument Co.	232
Curtiss Wright, Princeton Div.	205	Photovolt Corp.	205
Difco Laboratories	219	Picker X-Ray Corp.	154
Dimco-Gray Co.	238	Precision Scientific Co.	151
Du Pont, E. I. de Nemours & Co., Inc.	208	Radiochemical Centre	212
Eaton-Dikeman Co.	131	Radio Corporation of America	146
Edmund Scientific Co.	201	Raytheon Co.	133, 221
Elgeet Scientific Instrument Div.	138	Reeve Angel	147
Esterline Angus Instrument Co., Inc.	210	RePP Industries, Inc.	134
Exact Weight Scale Co.	223	Riverton Laboratories, Inc.	238
Fisher Scientific Co.	156	Sargent, E. H., & Co.	142
F & M Scientific Corp.	130	Schwarz BioResearch, Inc.	235
General Biochemicals	141	Sigma Chemical Co.	211
Gow-Mac Instrument Co.	202	Sorvall, Ivan, Inc.	148
Graphic Systems	202	Standard Scientific Supply Corp.	230
Greiner, Emil, Co.	140	Stokes, F. J., Corp.	206
Hacker, William J., & Co., Inc.	226, 234	Taconic Farms	238
Hamilton Co., Inc.	205	Technical Measurement Corp.	158
Harvard Apparatus Co., Inc.	209	Technicon Chromatography Corp.	226
Heller, Gerald K., Co.	209	Temperature Engineering Corp.	214
Hitachi, Ltd.	132	Texas Instruments Inc.	155
Hormone Assay Laboratories, Inc.	238	Thermolyne Corp.	220
Hospital Supply Co.	238	Torsion Balance Co.	143
Houston Instrument Corp.	206	U.S. Stoneware	233
Hughes Aircraft Co.	224	Unitron Instrument Co.	216
Hyland Laboratories	225	Vanguard Instrument Co.	136
Institute for Scientific Information	220	Wild Heerbrugg Instruments, Inc.	203
Instruments for Research and Industry	233	Wilkens Instrument & Research Inc.	238
JKM Instrument Co.	137	Will Corp.	231
Kensington Scientific Corp.	209	Wilmot Castle Co.	126
		Worthington Biochemical Corp.	228

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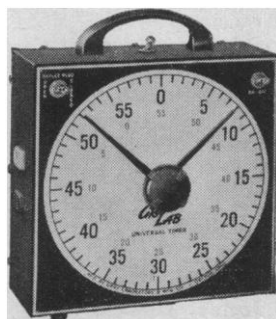
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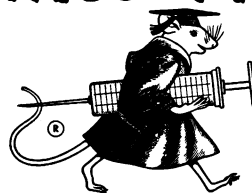
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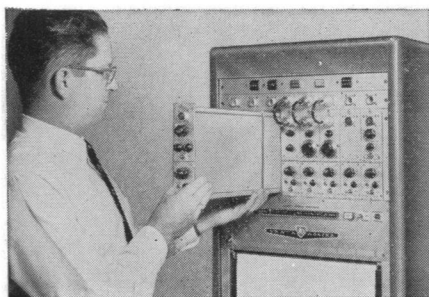
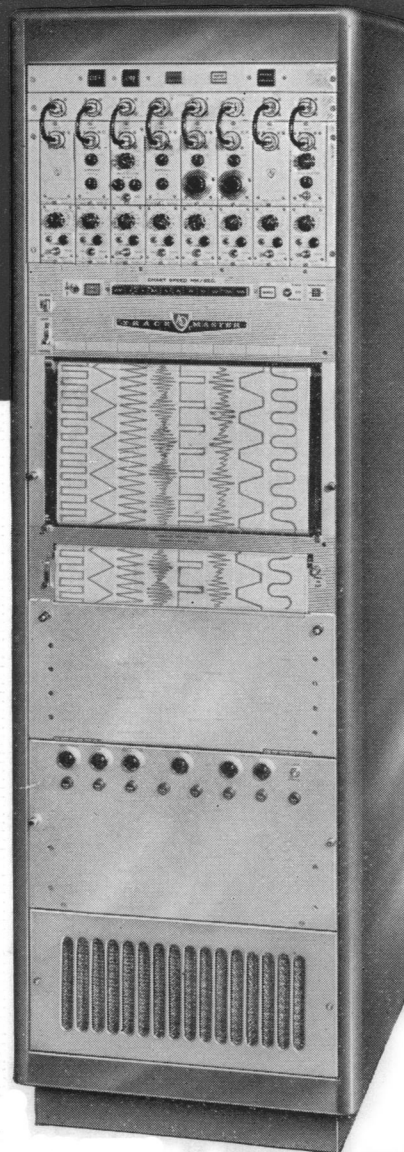
push-button selection. Take-up reel automatically stores full 1000 ft. record. Writing table tilts for easy chart annotations. Guide rails permit quick, easy paper-roll changes. Low cost chart paper makes practical protracted recording at high speeds.

Finest Resolution, Linearity, Stability

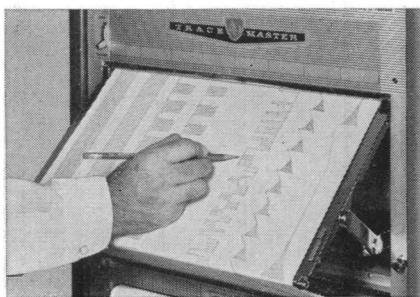
Thin carbon trace (thinner by 4 to 1 over most recorders) and high Band Amplitude Product (higher by 6 to 1 over other recorders) provide up to 24 times the resolving power or ability to detect short, sharp variations in the record. The superior linearity ($\pm 1\%$) and stability in rectilinear presentation permit full use of this unexcelled resolution.

Finest Systems Oriented Compatibility

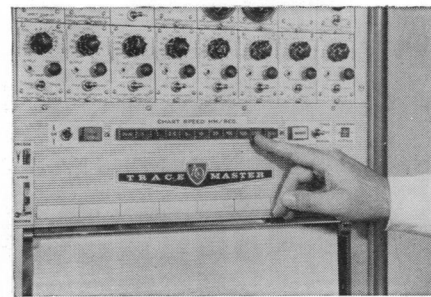
Fully transistorized circuitry...application of combined dc level and signal multiple feedback...complete interchangeability of modular signal-conditioning elements... are some of the features that make the AO TRACE-MASTER the world's finest 8-channel direct writing recorder.



Entire channel easily accessible and completely interchangeable as single unit.



Platen tilts to convenient writing angle.



Widest range chart speed... push-button selection through 0.1 mm/sec to 500 mm/sec.

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