New Products

Semiconductor strain gage catheter tip blood pressure transducer consists of a silicon diaphragm approximately 0.001 inch thick, bonded to a 0.090 inch diameter cylindrical sleeve. Deflection of the silicon diaphragm due to blood pressure produces a change in the resistance of four elements of a Wheatstone bridge formed in the surface of the silicon diaphragm by diffusion process, resulting in 1-μ thick p-type elements, atomically bonded to the n-type substrate. The p-type sensitive regions are located such that two are in tension and two in compression, with tension and compression elements connected in adjacent bridge arms, resulting in a circuit that is thermally compensated and strain additive. The resistivities of the strain sensitive regions have on the order of 1000 times lower resistance than the base diaphragm material so that no insulation is necessary between the elements and the diaphragm. The diffused strain sensitive regions are located on the inside face of the diaphragm and are isolated from one another by a masking process during the diffusion. The silicon diaphragm is oriented monocrystalline material that is extremely low in dislocations to provide a nearly perfectly elastic pressure sensing element. The gage elements formed in the material by atomic lattice modifications completely eliminate any possibility of slip between gage and diaphragm and preclude hysteresis effects. A gage now available has a full-scale range of 0 to 5 lb/in.^{2} (250 mm-Hg) and delivers a usable output of 50 mv. Natural frequency of the gage diaphragm is above 5 kcy/sec. Semiconductor strain gages for other applications are also available.—R.L.B. (Electro-Optical Systems, Inc., 125 N. Vinedo Ave., Pasadena, Calif.)

Circle 1 on Readers' Service card

Electrometer (model EL-1) covers the range 10^{-4} to 2×10^{-15} amp with two probes. One of the probes provides preamplification at the signal source to provide measurement of current from 10^{-10} to 2×10^{-15} amp. The second probe covers the range from 10^{-4} to 2×10^{-13} amp. A combination probe holder and shield can be used to mount either probe at the signal source. Interchange of probes when the signal level varies in amplitude is said to be easily accomplished.—J.S. (Vacuum Electronics Corp., Terminal Drive, Plainview, N.Y.)

Circle 2 on Readers' Service card

Close-tolerance thermistor probe for the ultra-sensitive measurement and control of temperatures in the area of 0°C, model 32A135, measures just 0.060 inches maximum diameter by ½ inch long, with 0.008 inch dumet leads measuring 6 inches long for ease of making connections. It is now in full production and is available in large quantities. The resistance of model 32A135 is 2000 ohms at 25°C and 5700 ohms (±5 percent) at 0°C. Temperature coefficient at 25°C is −3.9 percent per degree Centigrade. Dissipation constant at 25°C in still air is 0.6 mw per degree Centigrade. The time constant at 25°C in still air is 6 seconds. In lots of 100 units, the price is $6.35 each. Variations of resistance and operating temperature are available for special applications.—R.L.B. (Victory Engineering Corp., 128–45 Springfield Ave., Springfield, N.J.)

Circle 3 on Readers' Service card

Controller for a-c power is available in six models with capacities ranging from 1.15 to 6.9 kv-amp. The controller proportions the voltage across the load by varying the firing angle, the instant of time during each half cycle when current starts to flow through a silicon controlled rectifier. This regulates power from maximum at zero firing angle to shut off at 180 deg. Input voltage may be 115 or 230 v and output is adjustable from 0 to line voltage. Control may be manual, by means of a graduated knob on the unit, or by a 0- to 1-ma signal. Response to a step signal is said to be within 1/60 second. Control source impedance may be 3000 ohms or higher. Lower source impedance reduces response slightly. Power factor is 1.0. Ambient temperature may be up to 100°F for full rated power. Forced convection cooling base is available for operation at higher ambient temperature. Power line frequency may be 50, 60, or 400 cy/sec. Size of the unit is 5 by 6 by 9.5 inches and weight is 7.5 pounds.—J.S. (Research Incorporated, P.O. Box 6164, Minneapolis 24, Minn.)

Circle 4 on Readers' Service card

Bioamplifier is for the reliable acquisition of such low-level bioelectrical signals as EEG, EKG, EMG and fetal EKG. Featuring a gain of 6000 (differential); input impedance, 0.5 megohm; output impedance, 30,000 ohms; frequency response, 0.4 cy to 5 kcy/sec flat; common mode rejection, 80 db min; noise level, 3 μv peak to peak; power requirements, plus and minus 7 volts at 1 ma.: size, 0.675 in.^{3}; weight, ½ oz.; price, $195.00. Model 120 is one of a family of interchangeable modules for physiological data acquisition.—R.L.B. (Biocom, Inc., 5883 Blackwelder St., Culver City, Calif.)

Circle 5 on Readers' Service card

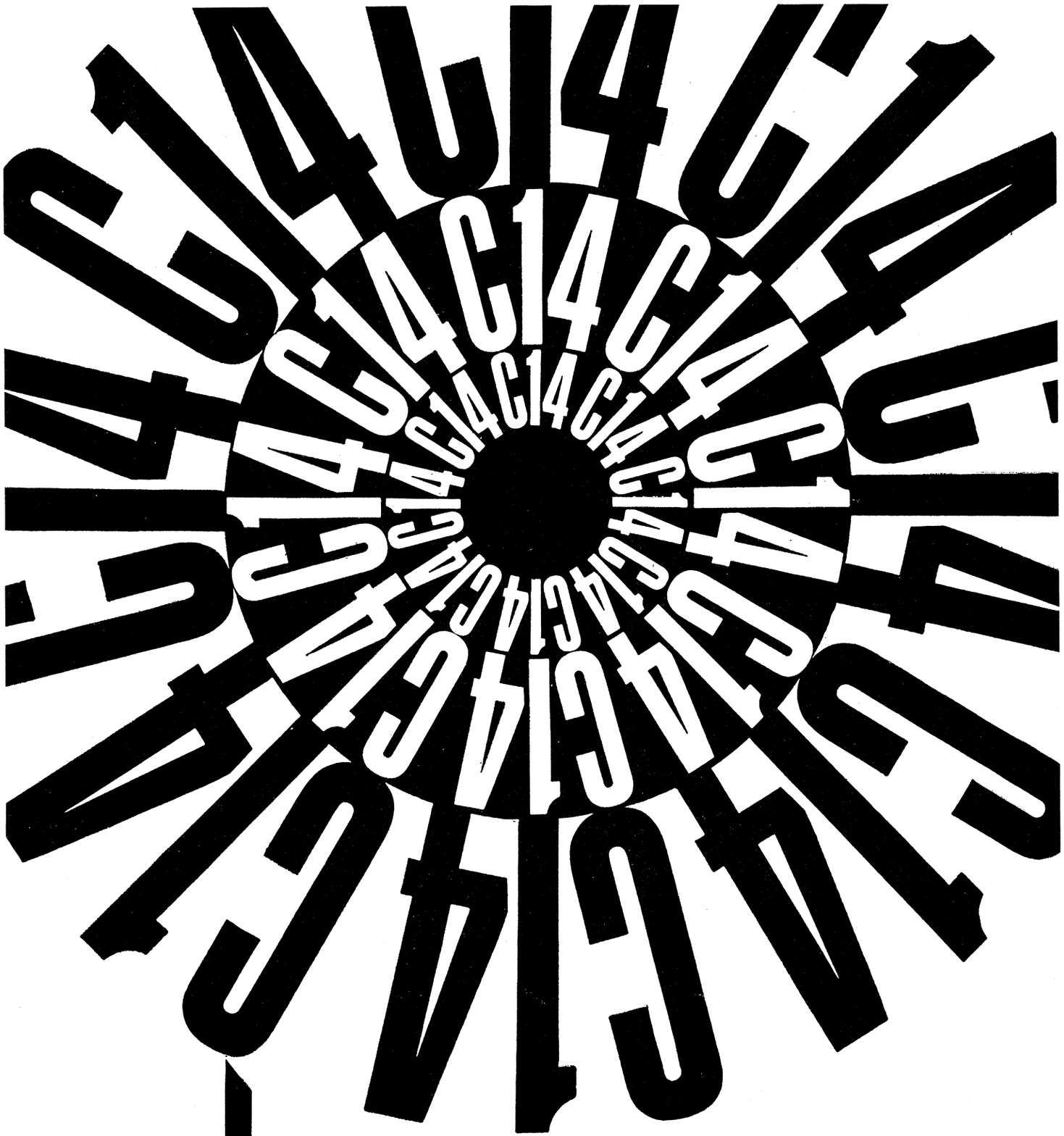
Digital pattern generator is a solid-state magnetic device that produces signals suitable for digital controls. Each of ten separate and simultaneous outputs consists of 64 binary bits. Each of the 640 bits can be individually controlled. Maximum operating speed is greater than 250,000 frames per second; a frame is defined as the ten parallel bits, one from each output. By selective repetition, each output can have as many as 512 serial bits. Six additional output lines are available representing the binary address of the

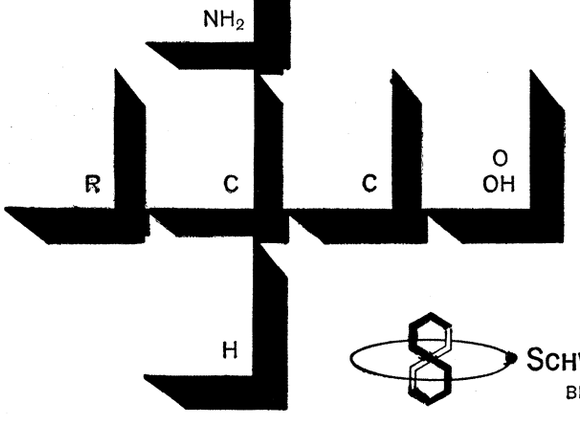
The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

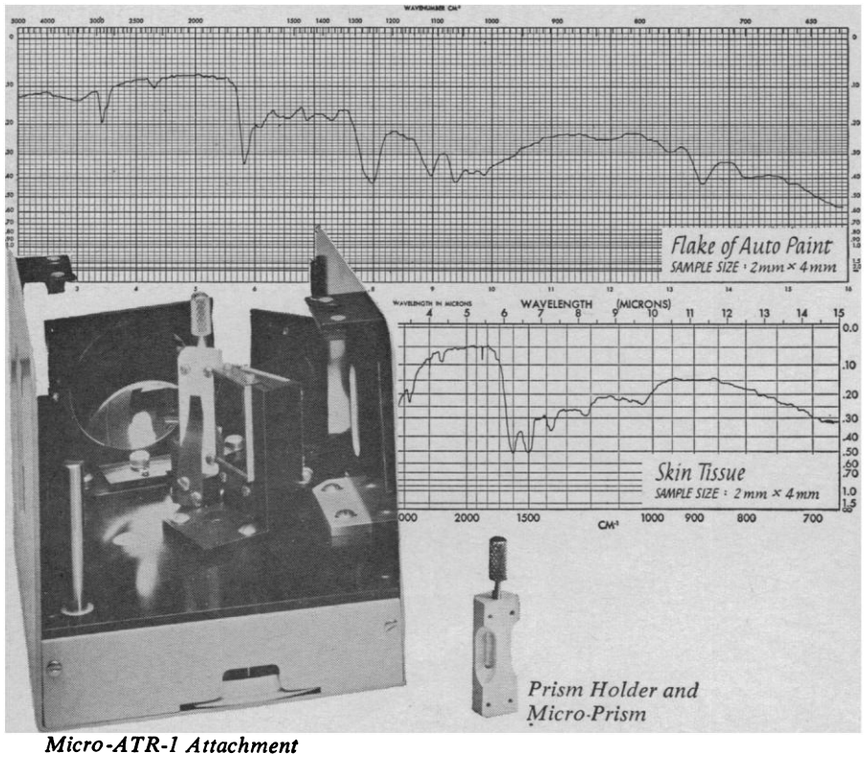
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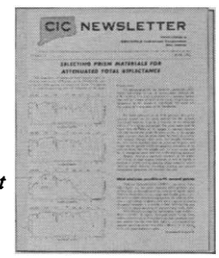


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frame being read. Programming is accomplished by inserting miniature cylindrical magnets in a pegboard. The arrangement of the magnets, each of which determines a single pulse, governs the pulse pattern. The pegboard with its magnets arranged can be stored for future application, or a permanent record of any program can be made on a punched paper template as an overlay on the pegboard. Under the pegboard is a 64×10 coincident-current magnetic-core memory with a single reset driver used instead of digit drivers. The presence of a magnet above a core biases the core so that it is unable to switch to a clockwise or counterclockwise flux pattern. Consequently, no flux change is possible when the core is driven by the X, Y, or reset coding. Output levels are 0 and −5 volts.—J.S. (Cybetronics, Inc., 132 Calvary St., Waltham, Mass.)

Circle 6 on Readers' Service card

Radiochromatogram scanning system features a 4-π detector assembly which measures beta emitting isotopes, such as tritium and carbon-14, on both sides of a chromatogram strip. The system accepts chromatogram strips up to 50 feet in length and from ½ inch to 1½ inches wide. The detector assembly is equipped with thin Micromil removable windows. When operated in the windowless mode, the chromatogram strip is only 0.025 inch from the detectors. With the windows installed on the detectors, gas flow rate is less than 30 cm³/min. The system provides efficiences of 5 to 10 percent for carbon-14 and 1 to 2 percent for tritium. Background is less than 15 counts per minute without additional shielding. A bulletin on the Actigraph system is available from the manufacturer.—R.L.B. (Nuclear-Chicago Corp., 359 E. Howard Ave., Des Plaines, Ill.)

Circle 7 on Readers' Service card

The model 35800 **radio frequency transfer voltmeter** permits measurement of a-c voltages at frequencies ranging from 20 cy to 30 Mcy/sec. Accuracy at frequencies up to 1 Mcy/sec is said to be ±0.05 percent and at 30 Mcy/sec ±0.5 percent. Voltages range from 0.6 to 200 v. The instrument, which operates on the direct-transfer principle, consists of a transfer unit and eight high-frequency thermal converters. It is also available with fewer converters when only a limited range of voltages is required. Features of the instrument noted by the manufacturer include cali-

bration traceable to the National Bureau of Standards, provision for connection of an external galvanometer for high resolution, provision for connection of an external millimeter to simplify a-c frequency response testing, and true r.m.s. response.—J.S. (Engelhard Industries, Inc., 75 Austin St., Newark 14, N.J.)

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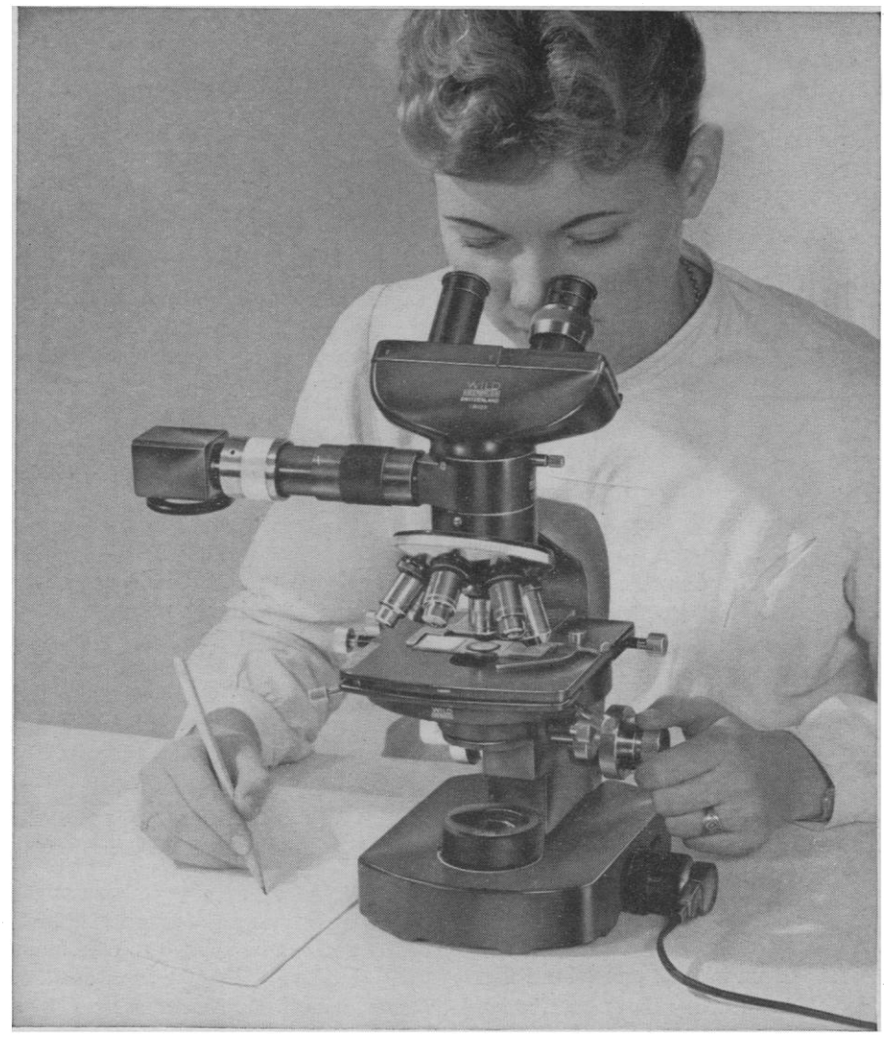
Thermoelectric cooling unit is said to provide a heat pumping capacity up to 400 BTU/hr in a 90°F ambient. Performance with a cold-side to hot-side temperature difference of 64°F is 200 BTU/hr at a cold-plate temperature of 40°F. Under no-load conditions, with ambient temperature 90°F, the lowest temperature attainable is −28°F. The heat exchanger contained in the unit is composed of a finned aluminum plate. The technique used to remove heat from the fins depends on the user's design parameters. The unit measures 4¾ by 9 by 4¼ inches and weighs 4.5 pounds.—J.S. (Ohio Semiconductors, 1205 Chesapeake Ave., Columbus 12, Ohio)

Circle 9 on Readers' Service card

The model AAC-300 miniature precision **angular motion compensator** accepts angular rotational input to its input shaft and differentially advances or retards the output shaft as guided by 18 adjustment cams. Input and output shafts extend from opposite ends of a cylindrical housing of anodized aluminum. Stainless-steel ball bearings and stainless-steel shafts are used throughout. Full-range adjustments up to 7 deg are accomplished at any one of 18 adjustment points with a standard box wrench while the system is in motion. Travel is continuous although stops can be provided. The devices are used in measurement, control, and computing equipment to correct for repeatable angular position errors, design parameter uncertainties, time associated system changes, and potentiometer loading errors.—J.S. (American Aerospace Controls, Inc., 123 Milbar Blvd., Farmingdale, N.Y.)

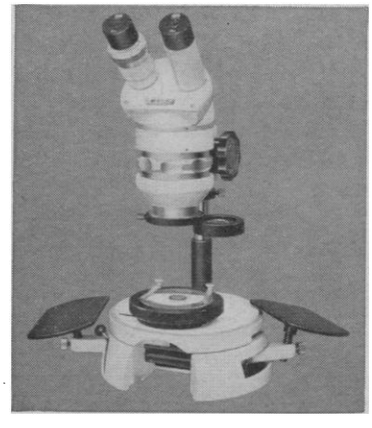
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The model 200 **simultaneous streak and framing camera** will record streak and framing records of the same event. Both records are taken from the same point of view, through the same objective lens, on the same time base. The camera provides a streak record written at speeds up to 6.9 mm/μsec



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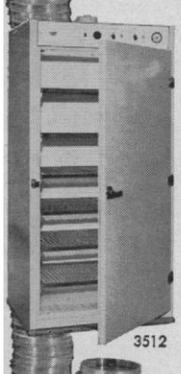
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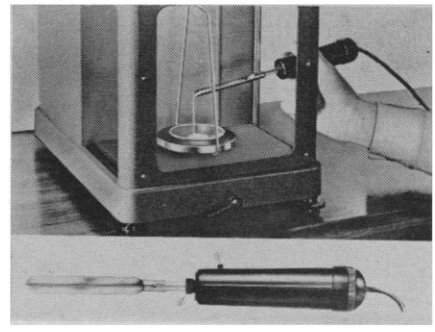
and time resolved to 3.6×10^{-8} second. A sequence of qualitative two-dimensional pictures of the same event is recorded at rates up to 550,000 frames per second. Activity between the two records can be identified with close correlation of time and space so that sources of minute variations in film density can be precisely determined. The camera is modular in configuration and can be used as a streak camera only, or as a simultaneous-writing camera. The streak and framing modules can be purchased and operated separately and the other module added later. Color, black and white, or Polaroid film may be used, and the two records can be recorded on the same or different types of film. The framing module records seven 0.4- by 0.5-inch pictures in sequence on standard 4- by 5-inch film at a maximum aperture ratio of $f/10$ with shutter speeds of 0.43, 0.86 and 1.71 μsec. The streak module places the record on 5⅛ inches of 35-mm film. Recording time is 18 μsec; aperture ratio is $f/6.5$, and linearity is within 0.5 percent.—J.S. (Beckman & Whitley, Inc., San Carlos, Calif.)

Circle 11 on Readers' Service card

The model 4000 **static card reader** reads from 1 to 960 circuits simultaneously and can be applied to read an entire standard IBM, Remington-Rand, or similar card. The device will read either 12 rows or 80 columns through individual contact pins without change of card position. In operation, the punched card is inserted through a door in the front of the unit. Operation of a reader handle moves the card and a printed-circuit board into contact with the contact pins. Correct card placement is assured by a position sensing mechanism. Improper card insertion prevents current from being switched to the printed circuit matrix. Indicator lights warn of improper conditions. All circuits can be brought out to connectors of the user's choosing.—J.S. (Industrial Timer Corp., Highway 287, Parsippany, N.J.)

Circle 12 on Readers' Service card

Vibro spatula is a new laboratory device for dispensing powdered substances. Virtually no practice is required to achieve maximum efficiency. Slight pressure on the button starts an electrically driven vibrator located in the plastic handle. Flow speeds are adjustable by turning the knob located on the vibrating shaft. Three interchangeable stainless-steel V-shaped troughs are supplied as well as a brush and electrical plug-in cord. Operation is 115-volt 60-cycle a-c. Unit is priced at $25.—R.L.B. (Mettler Instrument Corp., 20 Nassau St., Princeton, N.J.)



Circle 13 on Readers' Service card

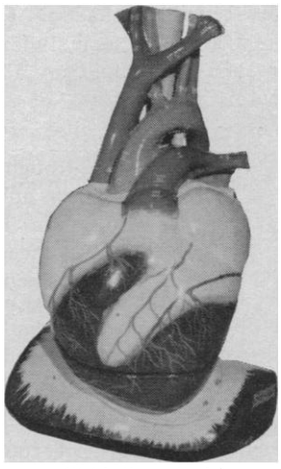
A set of 11 optical-quality **step reflectors for optical maser systems** is available. At the wavelength of ruby radiation, the reflectivities of the mirrors vary in sequential steps from 5 to 99 percent. The optical flats provide the convenience of controlled reflectivity for external mirror systems in ruby experimental programs. The mirrors have applications in gain measurement experiments, as fixed mirrors in high-power ruby systems with Kerr cells, or in high-power systems with high-speed choppers. The step reflectors are fabricated from optical-quality glass and the reflecting front surface of the mirror is a durable multilayer dielectric coating. The front and back surfaces of the mirror are flat within 1/10 wavelength. The reflectors are 1.00 inch in diameter and 0.375 inch thick. Each reflector is identified on its diameter.—J.S. (Perkin-Elmer Corp., Norwalk, Conn.)

Circle 14 on Readers' Service card

Automatic recording wave analyzer (model K-101-A) covers the frequency range 10 cy to 19 kcy/sec in four bands. It is capable of analyzing both steady and non-steady signals and furnishes a permanent record on heat-sensitive paper 2 inches wide. Paper speed is adjustable in steps from 0.0003 mm to 100 mm/sec. Three different bandwidths are available: 26 percent, 5 percent, and 1.5 percent. The 26-percent bandwidth can be used to determine rapidly which parts of the spectrum require further analysis. For analyzing non-steady signals, the analyzer must be supplemented with the manufacturer's K-28-C stepping unit and channel selector, and it is convenient to make the signal to the analyzer repet-

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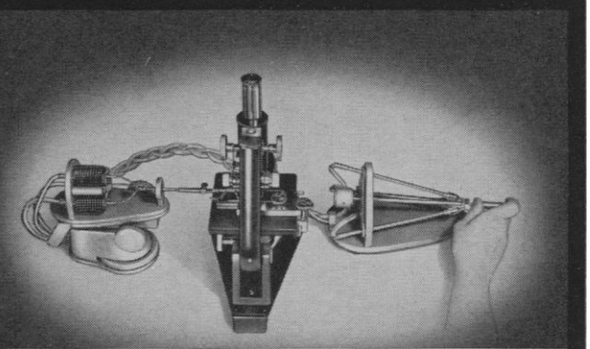
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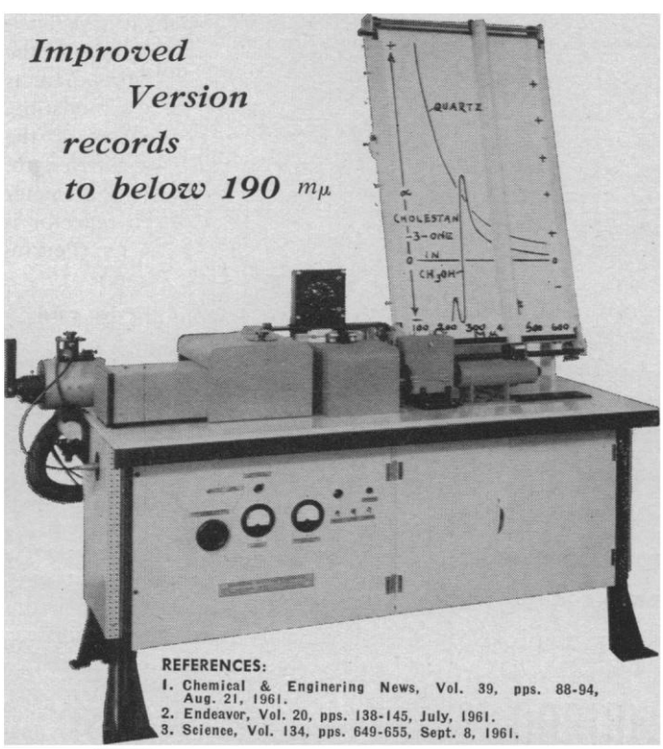
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REFERENCES:

1. Chemical & Enginering News, Vol. 39, pps. 88-94, Aug. 21, 1961.
2. Endeavor, Vol. 20, pps. 138-145, July, 1961.
3. Science, Vol. 134, pps. 649-655, Sept. 8, 1961.

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190-600	±1°, 10° & 100°	500	500

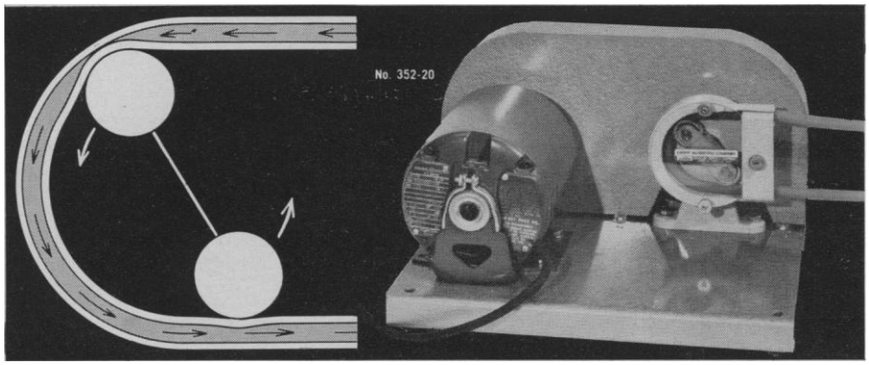
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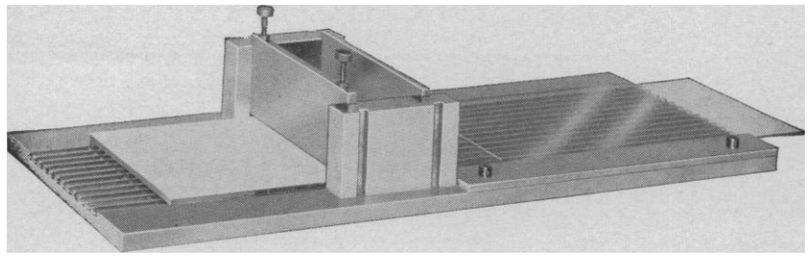
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* Ref. Analytical Chemistry, 33, 1138 (August 1961).

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itive by using a tape recorded signal and joining the ends of the tape. By incorporating a switching signal on the tape, the analyzer controls can be made to step by one bandwidth each time the switching signal passes. A series of amplitude time records for fixed frequency bands are thus obtained enabling a three dimensional graph of amplitude, frequency, and time to be built up. If the input signal is in the form of a multi-channel tape recording, the K-28-C can be used to switch the analyzer automatically from one channel to another. Input signal range is 10 μv to 300 v. Outputs can be recorded in terms of r.m.s., peak, or average. Dynamic range is 44 db. Amplitude accuracy is said to be ± 2 db and frequency accuracy, for 1.5-percent bandwidth and steady frequency signal, ± 1 percent. All controls can be operated manually, and starting and stopping can be remotely controlled.—J.S. (Muirhead Instruments Inc., 441 Lexington Ave., New York 17, N.Y.)

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Rotary-motion vacuum seal permits direct drive up to 200 rev/min while maintaining ultrahigh-vacuum pressures in the range 2×10^{-9} mm-Hg. Isolation of the high-vacuum region is accomplished by means of two chambers built around the shaft, each pumped by a 2-inch diffusion pump. This allows a gradual reduction of pressure from one stage to another, going from 10^{-7} mm-Hg in the first stage to 10^{-8} in the second stage and 10^{-9} mm-Hg in the vacuum chamber itself. Close tolerances of a few ten thousandths of an inch, a liquid nitrogen cold trap to absorb condensible gases, O-ring and labyrinth seals, are used to enhance ultrahigh-vacuum performance. The drives are available with ½- and ¼-inch shafts. Larger sizes can be made.—J.S. (National Research Corp., 70 Memorial Dr., Cambridge 42, Mass.)

Circle 16 on Readers' Service card

Animal surgery apparatus is specifically designed for surgery or dissection of such animals as the rat, hamster, and guinea pig. It consists of a formica-covered board track and a set of adjustable clips and hooks to hold the animal in any desired position. The clips and hooks are attached to short lengths of head chain that can be snapped into clips around the periphery of the board. The clips slide in an aluminum track to allow them to be

positioned anywhere around the board. A drawer in the end of the board provides storage space for the clips and chains.—R.L.B. (Brookline Surgical Specialties, 50 Harris St., Brookline 46, Mass.)

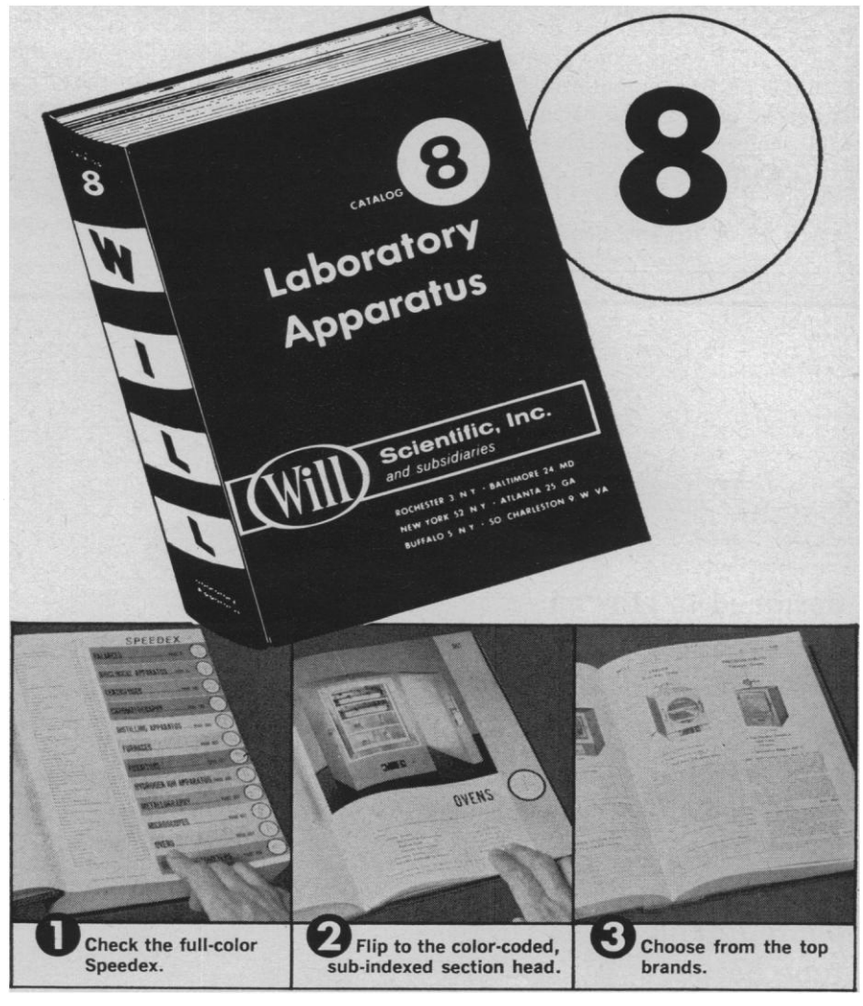
Circle 17 on Readers' Service card

The model EM 9 **electron microscope** features a number of cost-reducing design and construction principles. Adjustment of image brightness is accomplished by virtue of high-frequency oscillation of the electron beam. To decrease image brightness, the operator increases the amplitude of the electron-beam oscillations thereby shortening the time that the beam remains over the opening in the illumination diaphragm. The specimen is brought into the pole-piece gap of the objective by pushing the specimen rod along a connecting link guide. Stereo photographs with 6-degree and 12-degree angles of convergence can be taken by turning the specimen rod. An automatic sheet film camera prints a serial number from 0 to 999 on each photograph. An automatic exposure timer is provided as accessory. Also available as an accessory is an automatic vacuum system that takes over the task of switching from pre-vacuum to high-vacuum. Magnification ranges from 1800 to 35,000 in four calibrated steps as well as in continuous gradations.—J.S. (Carl Zeiss, Inc., 485 Fifth Ave., New York 17, N.Y.)

Circle 18 on Readers' Service card

The model 242 **regulated high-voltage supply** furnishes 0 to 25 ma over a voltage range from 300 to 3500 v. Four in-line dials permit output voltage to be set in 1-v steps within ±0.1 percent. A trim potentiometer permits interpolation between steps with resolution said to be better than 15 mv and with resetability ±0.05 percent. Ripple and jitter level at any output are said to be held to less than 1.0 mv (r.m.s.) and long term drift below 1 part in 10,000 indefinitely. Output is stable under load and line variations to 0.005 percent. Voltage reference is provided by a Zener diode with temperature coefficient 10 parts in 10^6. The instrument uses sampling circuits containing encapsulated wirewound resistors to compare a portion of the output voltage to the Zener diode reference. The error signal generated by a light-modulator comparator is fed from a differential amplifier to a tetrode series regulator tube. The regulator produces the

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output voltage corrected to the needed value. The correction takes place within the recovery time of the supply, less than 1 second from no-load to full-load. Output polarity can be chosen by means of front-panel connectors. The output may be floated up to potential of 1000 volts from ground. At this condition, the output will have a maximum off-ground potential of ±4500 volts.—J.S. (Keithley Instruments, 12415 Euclid Ave., Cleveland 6, Ohio)

Circle 19 on Readers' Service card

The type 241 **quadrate phase meter** is designed for accurate measurement of small phase angles in the vicinity of 90 or 270 deg. The channel for the unknown signal has an input attenuator with accuracy ±1 percent, a signal amplifier with gain stabilized at 100, and a cathode follower for providing low output impedance to the phase detector. Also provided is a voltmeter circuit for measuring the amplitudes of both signals applied to the phase detector. In operation, the unknown signal is used to actuate a gate open from 0 to 180 deg and closed from 180 to 360 deg. When the unknown signal has a 90-deg phase difference from the reference signal, it will pass through the gate from 90 to 270 deg and be stopped from 270 to 450 deg. The resulting average value is zero. If the phase angle is less than 90 deg, the average value of the signal passed is positive and if the phase angle is more than 90 deg, the average value is negative. A mid-scale meter indicates upscale for phase angle above 90 deg and downscale for phase angle below 90 deg. Phase ranges are ±12 deg, ±24 deg, and ±90 deg. Frequency response is 20 cy to 40 kcy/sec without adjustment. Accuracy of phase measurement is said to be ±0.1 deg relative ±¼ deg or ±2 percent absolute. Voltage measurement accuracy is said to be ±2 percent of full scale on any range.—J.S. (Ad-Yu Electronics Lab., Inc., 249–259 Terhune Ave., Passaic, N.J.)

Circle 20 on Readers' Service card



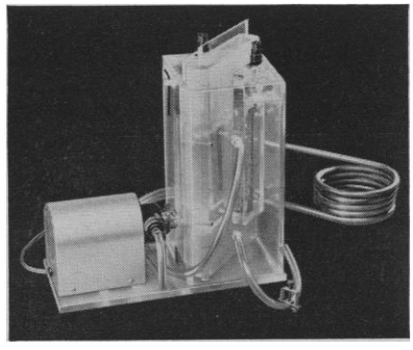
Bulletin on spectrophotometer absorbance cells for ultraviolet, visible, and near-infrared offers the following information for each listed cell: catalog number, number of cells in a set, cell material (silica, near-infrared silica, far ultraviolet silica, Pyrex, Vycor), path length, size, and volume. It also provides the catalog number for the cover, holder, compartment, and compartment cover for each cell. The new brochure also includes illustrations of the various types of cells (rectangular, rectangular gas, cylindrical, cylindrical gas, and demountable), the transmittance characteristics of each cell material, and information on the Beckman line of test tubes. For a copy of the new brochure, write to the Technical Information Department, Beckman Scientific and Process Instruments Division, and request Bulletin 796.—R.L.B. (Beckman Scientific & Process Instruments Division, 2500 Harbor Blvd., Fullerton, Calif.)

Circle 21 on Readers' Service card

Cryogenerator for cooling down to 30°K is a small single-stage machine that operates by compressing and expanding helium gas and passing to and fro between two temperature chambers. Ingenious mechanical design provides a means of separating the heating and cooling phases through the use of harmonic motion of two pistons. A phase displacement permits the change in volume in the expansion chamber

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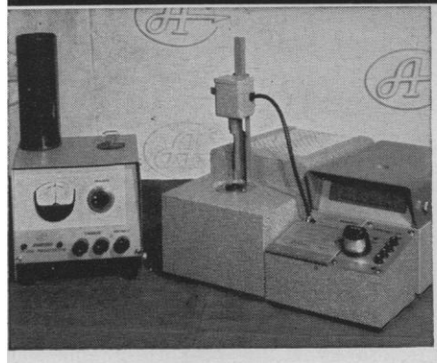
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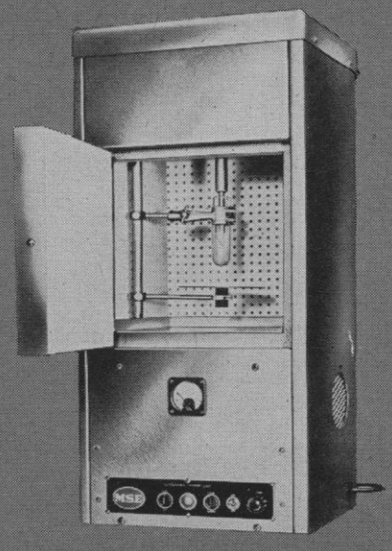
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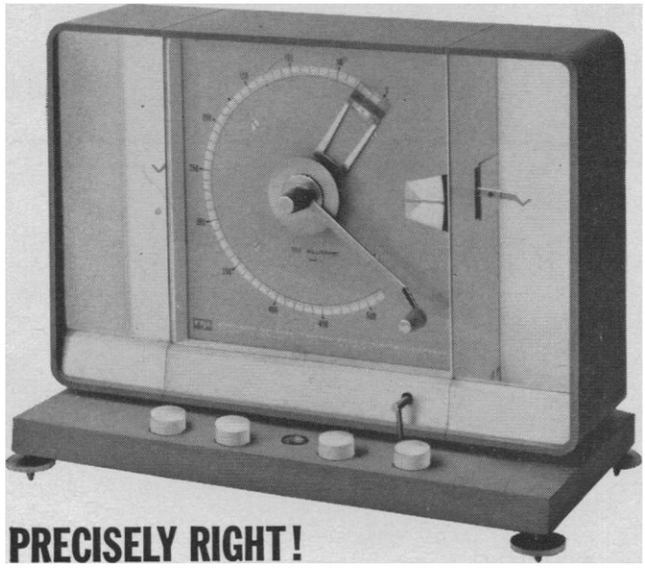
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Circle 22 on Readers' Service card

The model TR601A **temperature controller** is a solid-state instrument that provides proportional control of 20 amp at 115 volts by variation of resistance in any temperature sensing element. The proportional control is accomplished by varying the firing angle of silicon controlled rectifiers. Ninety percent control range can be achieved by an input resistance change of 5 to 50 percent depending on the bandwidth setting. Units are available for input resistance of 50 ohms to 25 kohm. A switching arrangement permits two sensing elements to be connected in series or parallel for a greater control range. By installing a fixed resistance in the sensing circuit in place of the temperature sensor, the instrument can be used as a variable solid-state control for a 2-kw load.—J.S. (Trott Electronics, Inc., 412 Smith St., Rochester 6, N.Y.)

Circle 23 on Readers' Service card

High-voltage charging system is capable of charging capacitor banks to preselected precise voltages as high as 35 kv. The system will charge a 3 μf capacitor bank to voltages from 3.5 to 35 kv at the rate of 60 chargings per second. Accuracy of voltage charged is said to be within $\pm$0.2 percent of the presetting. Power is provided by a built-in 20-kv, 6.5-amp supply operating from three-phase 60 cy/sec power at 480 volt and 2000 amp.—J.S. (Carad Corp., Stanford Industrial Park, Palo Alto, Calif.)

Circle 24 on Readers' Service card

Density gradient fractionator (model D) records the ultraviolet optical density-gradient centrifugation tube as the contents are displaced upward thru a sensing chamber. A test-tube fraction collector catches the effluent and marks

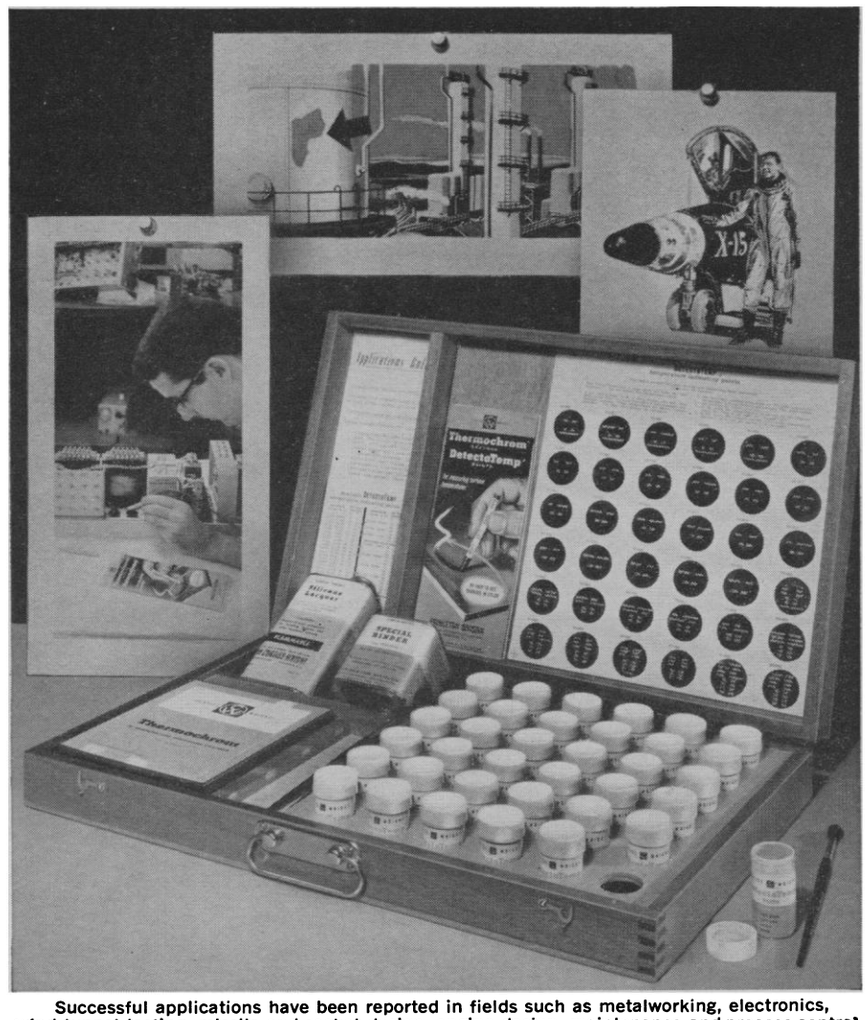
the record for each fraction. A constant speed syringe pump introduces a dense solution from below to minimize disturbance of the gradient as an inverted funnel diverts the upper layer into the absorption flow cell. Fraction collection can be set for a range of specific volumes per tube or programmed to collect each absorbing zone in a separate tube. The recorded analysis is claimed to be about 10 times as sensitive as that obtained with standard optics in an analytical ultracentrifuge. Well-resolved separations of southern bean mosaic virus and tobacco mosaic virus were obtained after density gradient centrifugation in a Spinco model L ultracentrifuge. Automatic safety switches and a convenient light source for visual monitoring of the gradient layers are incorporated in the instrument. — R.L.B. (Instrumentation Specialties Co., Dept. S446, 5624 Seward, Lincoln 7, Nebr.)

Circle 25 on Readers' Service card

Intensity-scale sensitometer produces a standard series of intensity-scale exposures on photographic materials. Exposure intensity is modulated by a series of apertures through which light from an integrating sphere passes before reaching the emulsion plane. Spectral quality of the light is identical for each exposure independent of intensity. A tungsten lamp with stabilized power supply is used as source of light. Reproducibility of exposure is said to be better than ±1 percent. Exposure time is adjustable between 0.1 and 0.002 second in five steps or continuously. Intensity range is 20 steps of 0.15 log F. Exposure area is 1 by 4 inches with two rows of ten each ¼-inch diameter tubular channels. Light intensity is 320 meter candles at 2850°K. The instrument will accept either sheet film or glass plates.—J.S. (Itek Corporation, 10 Maguire Rd., Lexington 73, Mass.)

Circle 26 on Readers' Service card

Instrumentation and control cable (type RC-101) resistant to radiation, humidity, and water is said to be unaffected by 3×10^{-6} r/yr of gamma radiation. The cable is said to provide trouble-free operation in temperatures from 0° to 300°F, relative humidity of 100 percent at 70°F, and under conditions of continuous immersion in water. The copper wire conductors, up to 90 in number, are encased in a silicone-rubber jacket with laminations of inorganic fibers and polyester film,



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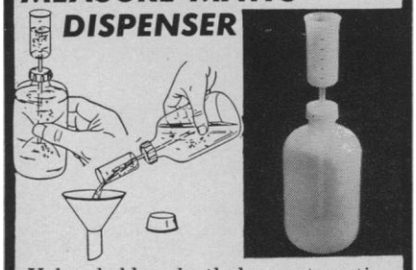
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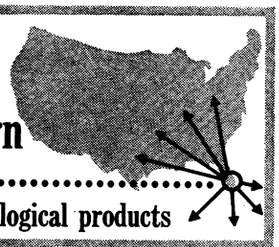
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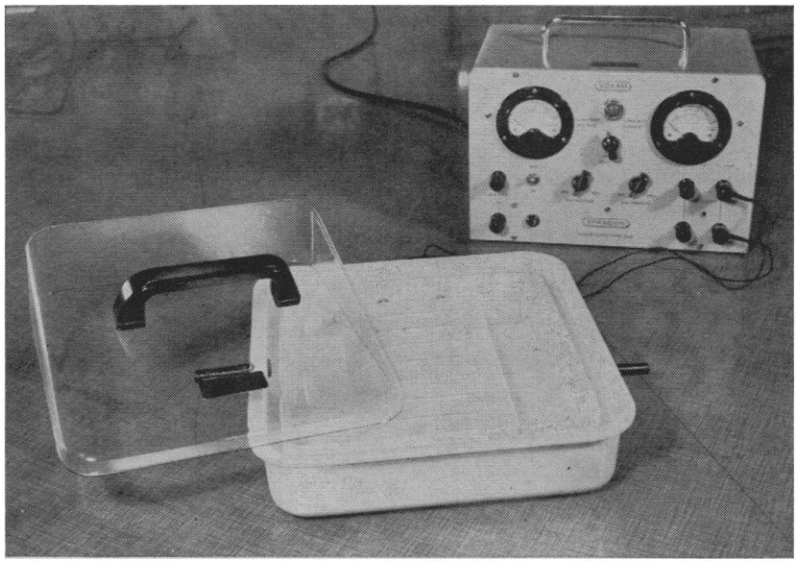
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The model EM 3 **high-speed multiplexer** will switch from 4 to 64 channels with switching time for the full complement of 64 channels less than 50 μsec. The unit is supplied wired for 32 or 64 channels as desired and a plug-in arrangement permits expansion to the wiring limit. Channel selection may be incremental as in a commutator or the channels may be addressed by external signals to flip-flop circuits in the multiplexer. Input and output limits are ± 10 volts with no inversion, and the unit will drive a stable load impedance of 25,000 ohms or greater. Operation is on 116-v, 60-cy/sec power.—J.S. (Packard Bell Electronics, 1906 Armacost Ave., Los Angeles 25, Calif.)

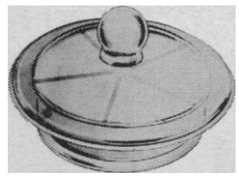
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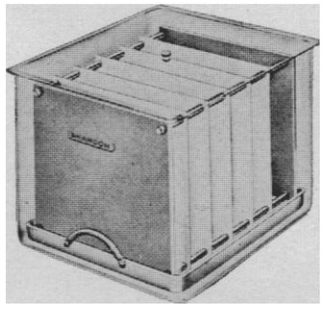
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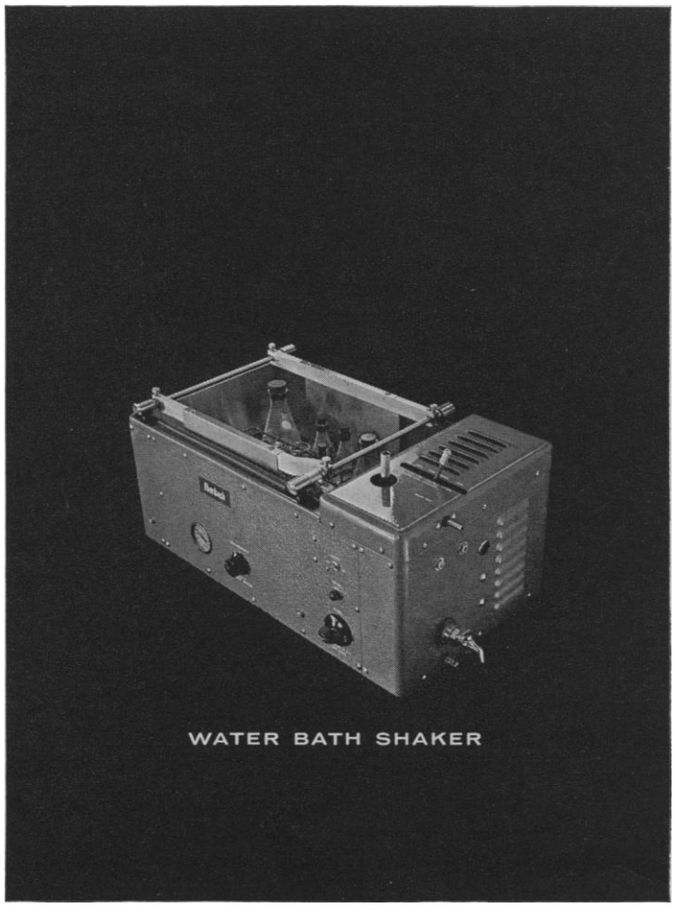


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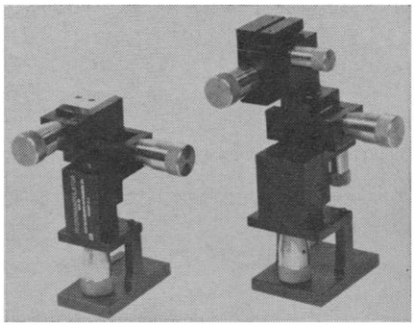
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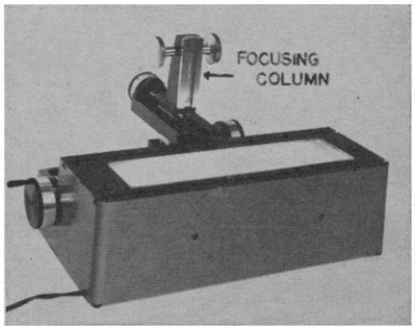
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yield a resonant frequency of 2 cy/sec for isolation from structure-born vibration. The incubator has a thermostatically controlled heat source and filtered circulating air system designed to maintain temperature at any desired value from ambient to 40°C. Special ports permit easy access to microscope controls. The upper desk drawer contains the power supply for the flash unit, the middle drawer holds operating controls, and the bottom drawer is for storage. A new four-page brochure giving specifications in detail is available. —R.L.B. (Sage Instruments, Inc., 2 Spring St., White Plains, N.Y.)

Circle 31 on Readers' Service card

Dual-window pulse-height analyzer comprises a stable linear amplifier, with continuously adjustable gain from 6 to 200, followed by independent ten-turn lower and upper level controls for each of the two windows. The gain control switches are used as multipliers for the range of the lower level selectors. Thus, if the lower level selectors are calibrated to read to 1000 kev when both coarse and fine gain switches are set on 1, the lower level ranges can be set at any point from 250 to 4000 kev by adjusting the gain switches. Upper levels for both ranges selected offer two basic settings: 0 to 100 percent and 0 to 10 percent. One window may be driven remotely for continuous or stepwise spectrum scanning. The following characteristics are cited by the manufacturer: After an overload pulse produced by a 2-Mev photon, the analyzer will correctly handle a 32-kev photon after 10 μsec have elapsed, providing the manufacturer's transistorized detector-amplifier is used. Linearity of the entire system is 1 percent; resolving time is 2 μsec; amplifier stability is better than 1 percent; and integral counting rates up to 120,000 per minute produce negligible distortion.—J.S. (Picker X-Ray Corp., Cleveland, Ohio)

Circle 32 on Readers' Service card

Photoelectric line follower is designed primarily for use with the manufacturer's model 80A strip chart recorder, model 2D *x-y* recorder with roll chart attachments, and model 2D-5 transport delay simulator. According to the manufacturer, the device will follow any black line, including pencil traces, and will track curve slopes up to 80 deg at chart speed to 15 in./min. The instrument includes built-in relays for external circuit control. When used

with the follower, the 2D-5 simulator records in analog form a function representing an experimental operation and then reproduces the function after a selected delay time adjustable from 4 seconds to 7 minutes.—J.S. (F. L. Moseley Co., 409 North Fair Oaks Ave., Pasadena, Calif.)

Circle 33 on Readers' Service card

Ceramic cold trap features an operating temperature range of −360° to +360°C. According to the manufacturer, the ceramic can withstand instantaneous temperature changes over the entire range. Construction of the trap involves a direct glass-to-ceramic seal with no intermediate seals. Coefficient of linear thermal expansion is 5.4×10^{-6} per degree centigrade. Hardness is 7.5 to 8 Moh. The trap is available in sizes from ⅜- to 4-inch diameter in ⅛-inch increments.—J.S. (Glass Products Division of JKM Instrument Co., Durham, Pa.)

Circle 34 on Readers' Service card

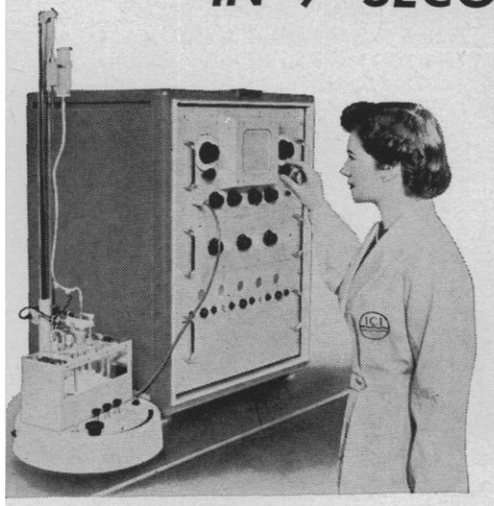
The model 564 **storage oscilloscope** provides both conventional and storage modes of operation. It employs a ceramic cathode-ray tube with a parallel-ground, flat-glass, 8- by 10-cm rectangular face. A bistable memory is employed. Storage time is greater than 1 hour with no appreciable depreciation of the display. Erase time is less than 0.5 second and writing rate is greater than 25,000 cm/sec. Somewhat faster writing rates can be achieved for recurrent signals using sampling plug-in units. More than ten types of plug-in preamplifiers and sweep generators are accommodated by the instrument, including a 0.35-nsec-risetime sampling unit, a four-trace verical amplifier, and a delayed sweep. Automatically stepped vertical positioning places each written trace so that there is no overlap of one stored trace upon another. Traces are automatically spaced evenly on the tube face on any setting of sensitivity. The written trace on storage mode is at a level below conventional traces and is determined by the inherent characteristics of the tube. The written trace has a contrast ratio of better than 4 to 1 against the pale green background characteristic of the storage mode. The conventional recording mode permits trace brightness to be varied as in other oscilloscopes.—J.S. (Tektronix, Inc., P.O. Box 500, Beaverton, Ore.)

Circle 35 on Readers' Service card

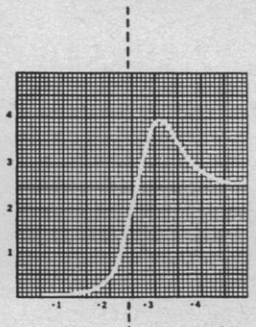
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The entire change of potential is effected during the lifetime of a single mercury drop . . . and the entire polarogram is reproduced on the screen once every 7 seconds, cutting analysis time to a fraction.



Typical reduction wave of Hydroxy-Fluorohydrocortisone in pharmaceutical product.

The Cathode Ray

POLAROTRACE

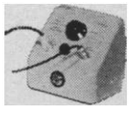
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For determination of trace elements in concentrations OVER A THOUSAND TIMES LOWER than is possible with conventional types of polarographic instruments.

Suitable for research or control operations, this highly-versatile instrument opens up a new world of possibilities in polarographic analysis.

Designed for direct or derivative operations, the ruggedly-designed Polarotrace is faster, easier to operate, more sensitive and has greater resolving power. Its potentialities for scientific progress are immeasurable.

Polarotrace, a product of Southern Analytical Limited, Camberley, Surrey, England, is now available with ANODIC CONVERSION UNIT for reversed sweep operation and measurement of anodic waves. Camera attachments are also available.

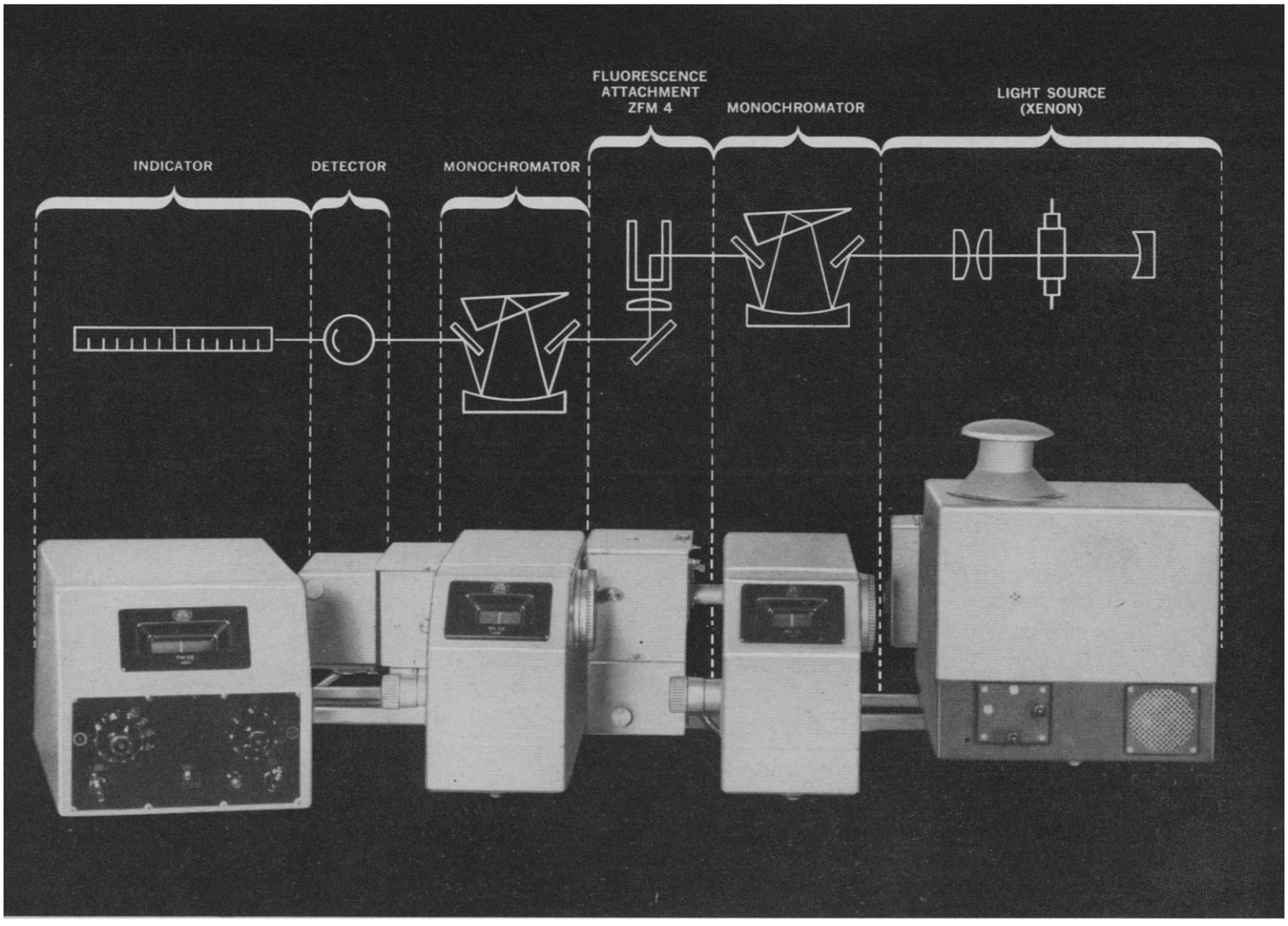


Cat. No. S-83725—POLAROTRACE, with Electrode Stand, which includes thermostatically-controlled tank and built-in gas manifold for simultaneous degassing of the three cells and complete set of glassware. Ready for use (115 volts A.C.) $4500.00

DETAILED INFORMATION AVAILABLE ON REQUEST (Our application laboratory is also at your disposal to run test specimens.)

STANDARD SCIENTIFIC Supply Corp. 808 BROADWAY NEW YORK 3, N.Y.

LABORATORY APPARATUS REAGENTS AND CHEMICALS



Spectrofluorometry made simple

With the Carl Zeiss Spectrofluorometer you can measure fluorescence of solutions with high accuracy and operating simplicity. The basic equipment consists of a xenon high-pressure bulb in housing, two quartz monochromators, fluorescence attachment ZFM 4, detector housing and indicator.

The two prism monochromators make it possible to change both the exciter wavelength as well as the wavelength of emitted fluorescent light. Thereby, information is obtained concerning the type and concentration of the substance causing fluorescence.

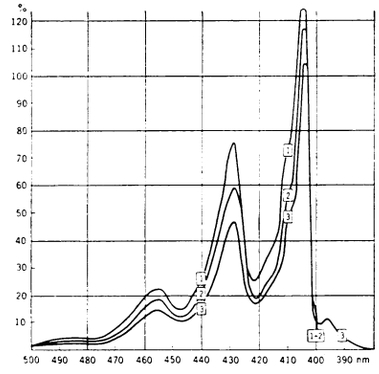
The mode of operation is briefly as follows: the white light emitted from the xenon bulb enters the first monochromator and is dispersed. By means of the wavelength setting device, the proper monochromatic exciter light is selected. This monochromatic light penetrates the sample and the fluorescent light is deflected into the second monochromator where it is again dispersed to determine the maxima of fluorescence. These amounts can be read off on the indicator.

Simplified equipment for spectrofluorometric examination is also available for work of a less critical nature. In this case a high pressure mercury burner is used as the source of light. The exciter light is selected by monochromatic filters (578, 546, 436, 405, 365, and 313 mμ) and the emitted fluorescent light dispersed by the quartz monochromator. This arrangement can also be reversed.

The Spectrofluorometers are also ideally suited for turbidity measurements.

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Complete service facilities available.



Fluorescence spectra of 3, 4-benzopyrene: 1, dissolved in benzene, 2. from a paper chromatogram, 3. benzopyrene on paper.

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WEST GERMANY

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SCIENCE 12 October 1962
Vol. 138, No. 3537
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

GUIDE TO SCIENTIFIC INSTRUMENTS

Compiled by
The editorial staff of *Science* and Earl J. Scherago

On the pages that follow are listed a number of instruments and products used by research scientists in all fields. Under each product heading appears the names of firms which manufacture each product. The firms listed are manufacturers only. No dealers or manufacturers' agents are included except those which actually manufacture the product named. Foreign products are listed only when there is an exclusive agent in the United States; the products are listed under the agent's name.

There are separate sections on chromatography and nuclear instruments in order that instruments and accessories for these fields could be grouped together.

To use the directory look up in alphabetical sequence the product you are seeking. List all manufacturers appearing under the product heading. Then turn to page 321 where you will find a complete alphabetical list of all companies with their names, addresses, and telephone numbers.

In a directory of this type there is always room for improvement. Undoubtedly there are many ways in which this one can be made more useful. Therefore, we welcome any suggestions or comments from both research scientists and manufacturers. Some helpful criticisms might be:

1) Categories omitted
2) Companies not listed
3) Incorrect categories
4) Some categories too general
5) Incorrect spellings

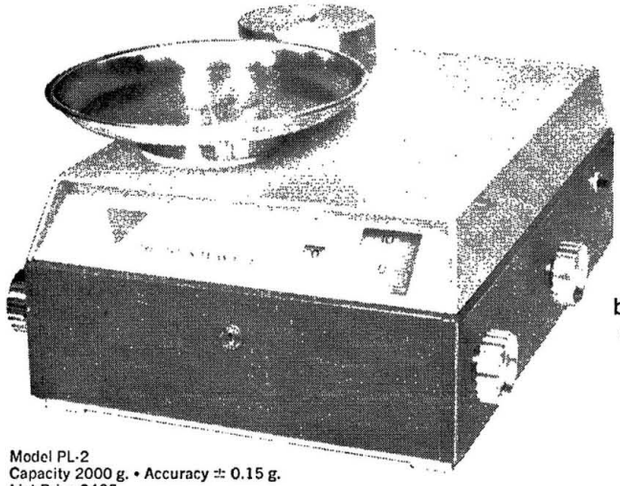
We are also interested in your opinion about the general usefulness of the guide. Address all correspondence to:

Science Guide to Scientific Instruments
11 West 42nd Street
New York 36, New York
PE 6-1858

NO KNIFE EDGES IN NEW

OPTICAL PROJECTION TORSION BALANCE

By eliminating knife edges with Torsion's practically one-piece construction, Model PL-2 is designed to operate even in severely corrosive or dust-laden atmospheres where maintenance costs for ordinary "knife-edge" balances would be prohibitive. ● The long lasting accuracy of this Torsion construction, with Dynavar bands, has been proved by a testing device that made continuous weighings 24 hours a day for six months. Over 1,750,000 operations later the Torsion mechanism still had its original sensitivity and accuracy.



Model PL-2
Capacity 2000 g. • Accuracy ± 0.15 g.
List Price $425

ADDITIONAL FEATURES

True Weight even when out of level

Zero point does not shift even when balance has been moved to a position that is out-of-level.

Weight Loading

Weight loading knobs are conveniently located on both sides of the balance for easy operation by either right or left hand. Weighing by substitution to 1000 grams is used in this New Torsion Laboratory Balance.

Unlimited Tare Range

Taring through a 125 gram range is accomplished with a built-in knob on the side of the balance. By adding weights to the second pan the balance can be made to tare throughout its 2 kilogram capacity.

In addition to these features, Torsion's Model PL-2 offers a sharp image with a high degree of illumination for easy reading and an oil damper to speed up weighing.

Ask your laboratory supply salesman for a demonstration or write us for Bulletin PL-2 which gives complete specifications.

The
Torsion Balance
Company

Main Office and Factory: Clifton, New Jersey
Sales Offices: Chicago, Ill., San Mateo, Cal.

GUIDE TO SCIENTIFIC INSTRUMENTS

1. **Absorption Spectra, Charts**
Central Scientific
Gelman Instrument
Geophysics Corp. of America
Gilford Instrument Labs.
Hughes Aircraft
Sadtler Research Labs.
Wallace & Tiernan

2. **Accelerators, Electron. See 602**

3. **Accelerators, Positive Ion. See 603**

4. **Accelerometers**
Cambridge Instrument
Columbia Research Labs.
Fairchild Controls
Kistler Instrument

5. **Accelerometers, for Oceanography. See 706**

6. **Acid Pumps**
American Instrument
Bel-Art Products
Carrier-Stephens
Clinical Perfusion Associates
Hudson Industries
International Medical Instrument
Laboratory Plasticware Fabricators
LaPine Scientific
Nalge
Pioneer Plastics
Randolph
Sethco
Sigmamotor
United States Stoneware

7. **Adsorbents for Gas Chromatography. See 152**

8. **Air Particle Monitoring Systems. See 604**

9. **Air Pollution Test Equipment**
American Instrument
Barber-Colman
Barnebey-Cheney
Beckman Instruments, Scientific and Process Instruments Div.
Brothers Chemical
Carad
Central Scientific
Coulter Electronics
Coulter Industrial Sales
Devco Engineering
E. I. du Pont de Nemours, Instrument Products Div.
Ercona
Gelman Instrument
E. Vernon Hill
Leeds & Northrup
Mast Development
Measurement Systems
Millipore Filter
Mine Safety Appliances
Pall
Phoenix Precision Instrument
Schmidt Instrument
Technicon Instruments
Tracerlab
G. K. Turner Associates

10. **Air Samplers. See 297**

11. **Alarms, Radiation. See 606**

12. **Amino Acid Analyzers, Automatic**
Beckman Instruments, Spinco Div.
E. I. du Pont de Nemours, Instrument Products Div.
Phoenix Precision Instrument
Research Specialties
Technicon Instruments

13. **Amplifiers, Laboratory**
Amplifier Corp. of America
Applied Dynamics
Argonaut Assoc.
Beckman Instruments
Beckman Instruments, Spinco Div.
BioCom
Brush Instruments Div., Clevite
California Instruments
Cohu Electronics
Communication Measurements Lab.
E & M Instrument
Ealing
Electro Instruments
Electronic Designs Div., Maxson Electronic
Electronic Missiles & Communications
Electronic Tube & Instrument Div., General Atomics
Ensco
Epsco
Franklin Electronics Labs.
Franklin Systems
General Radio
Gulton Industries
Heath
Hewlett-Packard
HRB Singer
Houston Instrument
Industrial Instruments
Instrument & Development Products
Keithly Instruments
Kenelco
Kollmorgen
Leeds & Northrup
Magnetic Instruments
Micro-Tek Instruments
Midwestern Instruments
Minneapolis-Honeywell, Heiland Div.
Mnemotron
Nuclear Enterprises
George A. Philbrick Researches
Photron Instrument
Radionuclide Div., Nuclide
Sanborn
H. H. Scott
Spacelabs
Strand Labs.
Taber Instrument
Technical Associates
Tektronix
Vinco Electronics

14. **Anaerobic Culture Apparatus**
American Sterilizer
Baltimore Biological Lab.
B-D Labs.
Difco Labs.
E. I. du Pont de Nemours, Instrument Products Div.
Hudson Industries
Kontes Glass
Microchemical Specialties
National Instrument
New Brunswick Scientific
Research & Control Instruments
Torsion Balance
VirTis

15. **Analog-to-Digital Converters**
Adage
Applied Dynamics
Beckman Instruments, Systems Div.
Coleman Electronics
CBS Labs. Div., Columbia Broadcasting System
Datex
Dymec Div., Hewlett-Packard
Electronic Associates
Fischer & Porter
Ford Instrument
General Electric, Industrial Sales Operation
General Precision
General Time, Electronic Systems
W. & L. E. Gurley
Interstate Electronics
Kollsman Instrument
Non-Linear Systems
North Atlantic Industries
Radiation Counter Labs.
Radiation Instrument Development Lab.
Starling
Theta Instrument
Wang Labs.

16. **Analyzers, Automatic Chemical. See 148**

17. **Analyzers, Electrolytic. See 306**

18. **Analyzers, Pulse Height. See 607, 608**

Animal Research

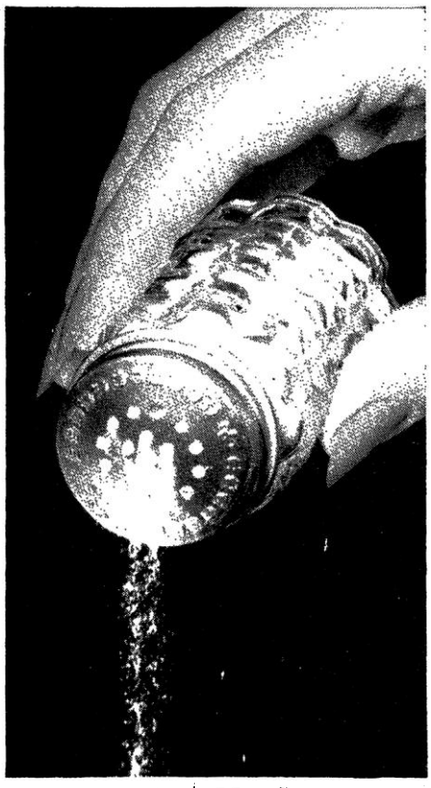
19. **Animal Behavior Research Equipment. See 77**

20. **Animal Cage Bedding Material**
Paxton Processing

21. **Animal Cage Washers**
Alvey Ferguson
Better Built Machinery
Champion Dish Washing Machine
Heinicke Instruments
Hobart
Industrial Systems
Ransohoff
Southern Cross
R. G. Wright

22. **Animal Cages, Glass**
Acme Metal Products
Diablo Labs.
Harford Metal Products
J and J Sheet Metal
E. W. Schultz

23. **Animal Cages, Metabolism Study**
Aloe Scientific
American Lincoln Incubator
Atomic Accessories
S. Blickman
Delmar Scientific Labs.



polyethylene in a salt shaker? Take MICROTHENE® powdered polyethylene ... stir in a little imagination ... chances are you'll come up with a way *you* can use it. A new use, perhaps.

Here's a material that's inert chemically; melts around 200-300° Fahrenheit; has a low specific gravity, a low coefficient of friction and enormous surface area.

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I think I have the germ of an idea. Please send me more information on the properties and present uses of MICROTHENE polyethylene in powdered form.

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Company_____

Address_____

City_____ Zone____ State_____

SC-3

Diablo Labs.
Harford Metal Products
Hoeltge
Kirschner
Porter-Mathews

24. Animal Cages, Metal (Mice, Rats, Guniea Pigs, Hamsters, Rabbits)
Acme Metal Products
American Lab. Equipment
American Lincoln Incubator
J. Amon
Animal Cage Specialties
Armstrong Metal Specialties
Biedling & Olberg Metal Works
Brinkman Mfg. & Fence
Bussey Products
Cameron
Chewalla Sanitary Brooder
Den-Ko
Diablo Labs.
Disposable Lab. Cages
Fenco Cage Products
Ford Kennels
Harford Metal Products
J and J Sheet Metal
Lenderking Metal Products
Norwich Wire Works
Partsco
Porter-Mathews
H. Pratt
Sani-Cage
E. W. Schultz
G. H. Wahmann
Westgate Hills Rabbitry

25. Animal Cages, Metal (Dogs, Cats)
Acme Metal Products
American Lab. Equipment
American Lincoln Incubator
J. Amon
Animal Cage Specialties
Animatic Animal Care Products
Armstrong Metal Specialties
Brinkman Mfg. & Fence
Bussey Products
Cameron
Den-Ko
Dirck
East River Wire Works
Fenco Cage Products
Ford Kennels
Harford Metal Products
Lenderking Metal Products
Norwich Wire Works
Partsco
H. Pratt
Riverside Iron Works
Sani-Cage
E. W. Schultz
G. H. Wahmann

26. Animal Cages, Metal (Primates)
Acme Metal Products
J. Amon
Animal Cage Specialties
Animatic Animal Care Products
Brinkman Mfg. & Fence
Cameron
Fenco Cage Products
Ford Kennels
Harford Metal Products
Lenderking Metal Products
Norwich Wire Works
Partsco
H. Pratt
Sani-Cage
E. W. Schultz
G. H. Wahmann

27. Animal Cages, Metal (Poultry)
Acme Metal Products
American Lab. Equipment
American Lincoln Incubator
J. Amon
Animatic Animal Care Products
Armstrong Metal Specialties
Brinkman Mfg. & Fence
Bussey Products
Cameron
Chewalla Sanitary Brooder
Ford Kennels
Harford Metal Products
Norwich Wire Works
H. Pratt
Sani-Cage
E. W. Schultz
G. H. Wahmann

28. Animal Cages, Plastic, Disposable
Diablo Labs.
Keystone Plastics
Labline
Maryland Plastics

29. Animal Cages, Plastic (Mice, Rats, Guinea Pigs, Hamsters, Rabbits)
Capital Plastics
Consolidated Molded Products
Diablo Labs.
Disposable Lab. Cages
Ford Kennels
Harford Metal Products
Keystone Plastics
Kirschner
Maryland Plastics
Patti-Plastics
Sani-Cage
Vo-Kal

30. Animal Cages, Plastic (Dogs, Cats)
Acme Metal Products
Harford Metal Products
Maryland Plastics
Patti-Plastics
Sani-Cage
Vo-Kal

31. Animal Cages, Plastic (Primates)
Acme Metal Products
Ford Kennels
Harford Metal Products
Patti-Plastics
Vo-Kal

32. Animal Cages, Plastic (Poultry)
Ford Kennels
Harford Metal Products
Sani-Cage

33. Animal Drinking Fountains
Micro-Metric Instrument

34. Animal Foods, Laboratory
Allied Mills
Calbiochem
Diablo Labs.
Foringer
Nutritional Biochemicals
Ralston Purina
A. E. Staley

35. Animal Operating Equipment. See 717

36. Animal Restrainers
Atomic Accessories
F & H Machine
Foringer
Harford Metal Products
Maryland Plastics
Porter-Mathews
G. H. Wahmann

37. Animals, Laboratory
Carolina Biological Supply
Ford Kennel
Taconic Farms

(End of Animal Research)

38. Antibiotic Testing Materials
B-D Labs.
Baltimore Biological Lab.
Consolidated Labs.
Difco Labs.
Millipore Filter
Nutritional Biochemicals
C. Schleicher & Schuell
Scientific Products

39. Aquariums
Metal Frame Aquarium
Taylor
National Instrument Labs.

What's so different about the Vanguard Model 1000 volumatic fraction collector?

A Only the Vanguard Model 1000 Volumatic Fraction Collector is completely transistorized, completely self-contained. Thanks to transistorization, you're assured of absolute reliability in performance. This reliability even extends to cold-room environments where temperature often causes erratic operation or complete instrument failure.

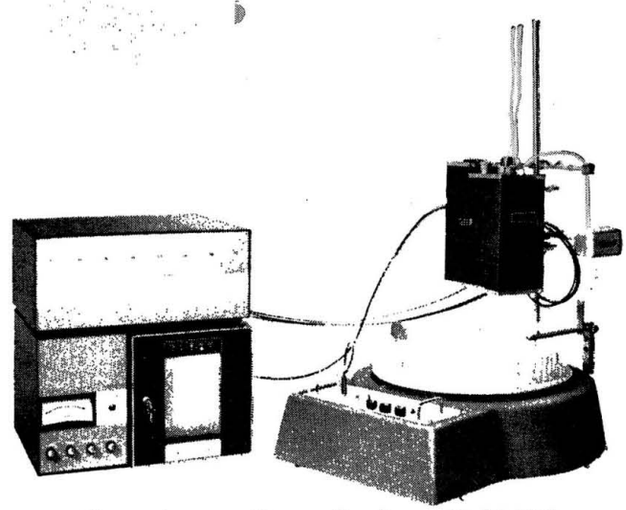
Q. How does the Vanguard Volumatic Fraction Collector affect hold-up and mixing?
A. In volumetrically controlled separations, hold-up and mixing are virtually eliminated between fractions.

Q. How is this reduction possible?
A. The Model 1000 uses a unique system of repetitive cuts for a single sample, in conjunction with a photo-electric sensing device. It actually collects from one to ten times the siphon volume in each test tube. You simply dial the number of times you want the siphon filled and discharged into each test tube.

Q. Is the Model 1000 compact and portable?
A. Vanguard's Model 1000 is highly compact. Specifically: 25″ wide, 30″ long and 6″ high. So, you make maximum use of laboratory and cold-room space. The Volumatic weighs less than 50 lbs. Yet, because the instrument cabinet is cast aluminum, you get the strength and rigidity needed for large columns and ancillary equipment.

Q. Any other facts?
A. Interchangeable turntables for 13mm, 15mm and 18mm test tubes are standard accessories. There's a complete selection of siphons. For increased versatility, a time and drop counting plug-in unit is available.

Q. Where can I get more information?
A. For complete information about the Model 1000, write: Vanguard Instrument Company, Box 244, LaGrange, Illinois.



Shown above are Vanguard's all new Model 1056 Automatic UV Analyzer and Model 1000 Volumatic Fraction Collector.

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Designers and Manufacturers of Precision Instrumentation for Research

VANGUARD INSTRUMENT COMPANY

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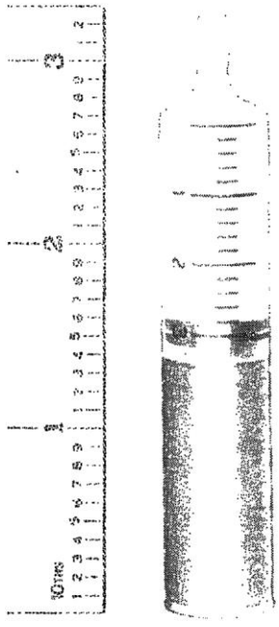
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SAGE
INSTRUMENTS

WORLD'S SMALLEST INFUSION PUMP

Miniature, Lightweight, Portable battery-operated... ideal for continuous infusion into unrestrained animals



Sage Micro-Flow Pump shown actual size

Patent Pending

The new Sage Micro-Flow pump operates by electrolysis. It generates a gas that moves a piston, driving fluid at a generally uniform rate. The unit is just over 3" long – about ⅝" in diameter, and weighs 28 grams. Total capacity is 1 ml.

Flow rates can be varied from 1 ml/half hr to 1 ml/20 hr. The pumping rate is determined by the flow rate capsule selected.

The pump complete and ready for use, with 1 ml/hr flow rate capsule, battery pack and supply of electrolyte... **$55.00**

Flow rate capsule kit with set of 4 capsules: 1 ml/half hr; 1 ml/2 hr; 1 ml/8 hr; 1 ml/20 hr... **$20.00**

Extra battery packs and electrolyte are available.

Send mail orders or requests for catalog data to:

SAGE INSTRUMENTS, INC.

2 SPRING ST., WHITE PLAINS, N.Y.

914 WHITE PLAINS 9-4121

40. **Atmospheric Test Chambers. See 330**

41. **Atomic Absorption Photometers**
Engis Equipment
Jarrell-Ash
Perkin-Elmer

42. **Attenuated Total Reflectance Attachment for Infrared Spectrophotometer**
Beckman Instruments, Scientific and Process Instruments Div.
Connecticut Instrument

43. **Autoclaves, Biological**
Ac-Lab Equipment
American Sterilizer
Barnstead Still and Sterilizer
S. Blickman
Hudson Industries
Precision Scientific
Arthur H. Thomas
Wilmot Castle

44. **Autoclaves, High Pressure**
American Instrument
Autoclave Engineers
Barogenics
Cryo-Sonics
Hudson Industries
Parr Instrument

45. **Automatic Chemical Analyzers. See 148**

46. **Autoradiographic Equipment. See 678**

47. **Bacteriological Charts**
Aloe Scientific
B-D Labs.
Clay-Adams
Consolidated Labs.
Coulter Electronics

48. **Bacteriological Counters. See 193, 218**

Balances

49. **Balance Weights. See 1077**

50. **Balances, Analytical, Digital Readout**
Wm. Ainsworth & Sons
Coleman Electronics
Mettler Instrument
NUMEC Instruments & Controls
Worden Lab.

51. **Balances, Analytical, Double-Pan**
Wm. Ainsworth & Sons
Brinkmann Instruments
Heusser Instrument
Mettler Instrument
Pfaltz & Bauer
August Sauter of America
Seederer Kohlbusch
Torsion Balance
Voland

52. **Balances, Analytical, Micro**
Wm. Ainsworth & Sons
Brinkmann Instruments
Cahn Instrument
Federal Pacific Electric
Heusser Instrument
Mettler Instrument
Microchemical Specialties
Microtech Services
Pfaltz & Bauer
August Sauter of America
Torsion Balance
Worden Labs.

53. **Balances, Analytical, Recording**
Wm. Ainsworth & Sons
Brinkmann Instruments
Cahn Instrument
Mettler Instrument
August Sauter of America
Schuco Scientific Div., Schueler
Torsion Balance

54. **Balances, Analytical, Single-Pan, Direct-Reading**
Wm. Ainsworth & Sons
American Instrument
Brinkmann Instruments
Epic
Exact Weight Scale
Federal Pacific Electric
Heusser Instrument
Labco International
Mettler Instrument
Pfaltz & Bauer
August Sauter of America
Schuco Scientific Div., Schueler
C. H. Stoelting
Torsion Balance

55. **Balances, Analytical, Vacuum**
Wm. Ainsworth & Sons
Brinkmann Instruments
Cahn Instrument
Microchemical Specialties
Schuco Scientific Div., Schueler
Worden Labs.

56. **Balances, Animal**
Exact Weight Scale
Mettler Instrument
Ohaus Scale
Pennsylvania Scale
August Sauter of America
Torsion Balance

57. **Balances, Dispensing**
Magnification Instrument
Mettler Instrument
C. H. Stoelting
Torsion Balance
Henry Troemner
Worden Labs.

58. **Balances, Micro Torque**
Brinkmann Instruments
Cahn Instrument
Franklin Electronics
Heusser Instrument
August Sauter of America
Torsion Balance
Worden Labs.

59. **Balances, Moisture**
C. W. Brabender Instruments
Cahn Instrument
Central Scientific
Federal Pacific Electric
LaPine Scientific
Mettler Instrument
Moore-Milford
Ohaus Scale
August Sauter of America
Torsion Balance

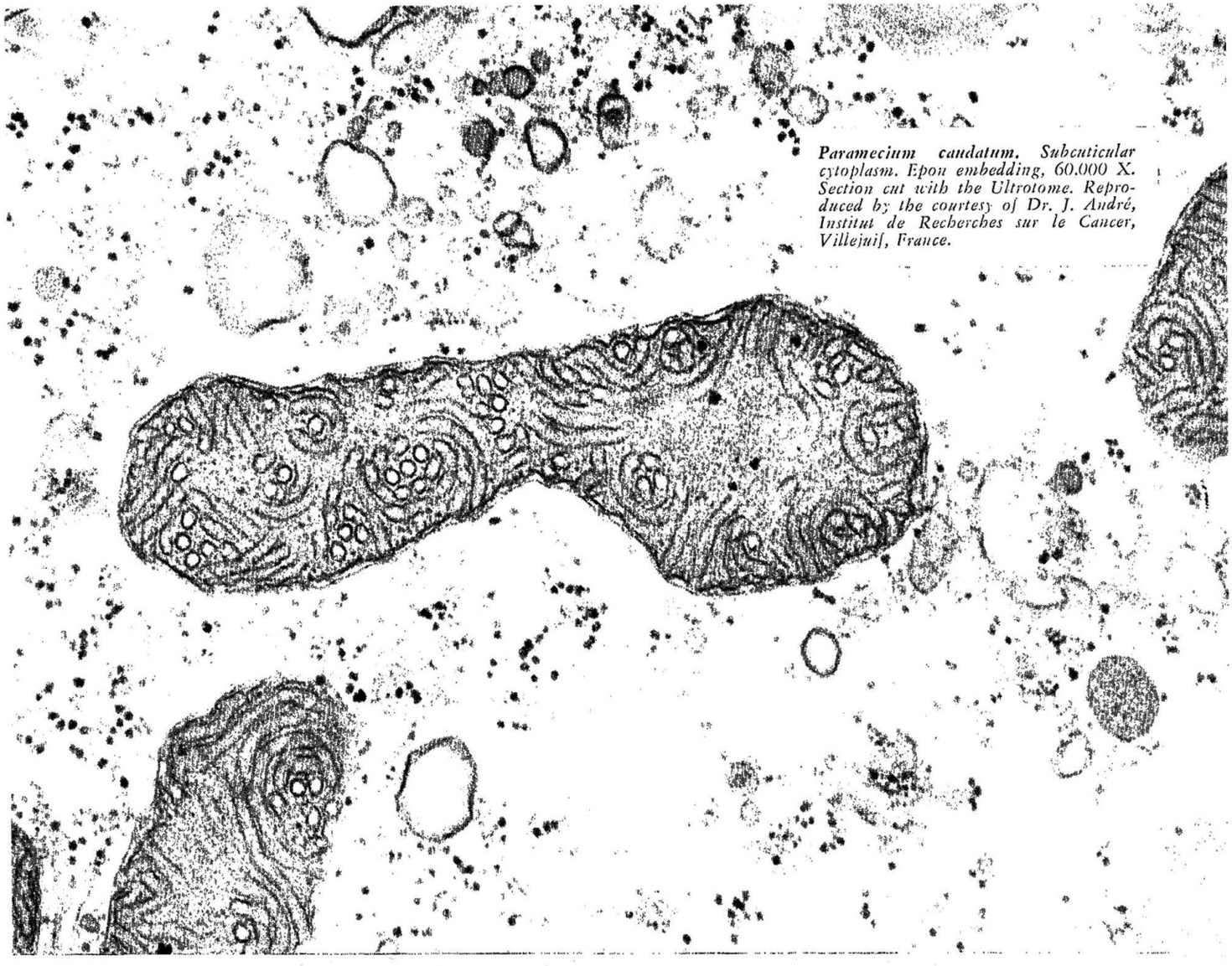
60. **Balances, Platform, Scales**
J. Chatillon & Sons
Detecto Scales
W. C. Dillon & Co.
Exact Weight Scale
Mettler Instrument
Pennsylvania Scale
August Sauter of America
Streeter Amet
Taconic Farms
Torsion Balance

61. **Balances, Prescription**
Schuco Scientific Div., Schueler
Seederer Kohlbusch
Torsion Balance
Harry Troemner

62. **Balances, Remote Control. See 609**

63. **Balances, Solution**
Mettler Instrument
Ohaus Scale
Schuco Scientific Div., Schueler
Torsion Balance
Harry Troemner

64. **Balances, Specific Gravity**
Eberbach
Federal Pacific Electric
Fisher Scientific



Paramecium caudatum. Subcuticular cytoplasm. Epon embedding, 60.000 X. Section cut with the Ultrotome. Reproduced by the courtesy of Dr. J. André, Institut de Recherches sur le Cancer, Villejuif, France.

BIOLOGICAL SECTIONS OF

QUALITY IN QUANTITY

FROM THE ULTROTOME®

Fine results like the reproduction above are already published by many of the 500 Ultrotome users throughout the world. Each of these micrographs is an eloquent demonstration to the specialist.

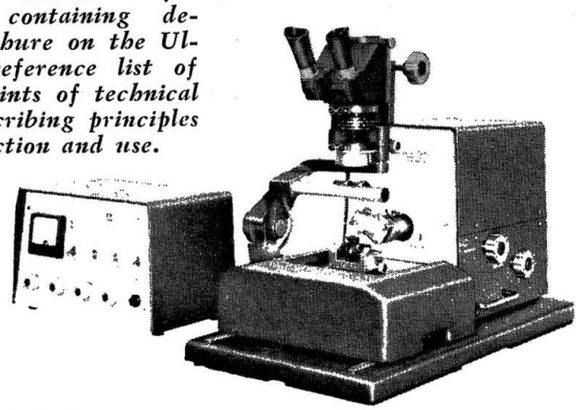
High Quality sections of uniform thickness are produced without chatter from specimens in Epon, Vestopal, Araldite, methacrylate and paraffin. Even hard materials like bone and certain metals are cut excellently.

Unlimited Quantity of ultrathin (100-1000 Å), thin (0.1 μ), or thick (1-10 μ) sections can be cut in long series or short, just as you will at a mere turn of a knob.

A wide range of accessories and supplies has been developed for the Ultrotome to promote efficient microtomy. These include specimen orientation head with vernier scale, plug-in specimen holders in 6 sizes, 26 types of specimen grids, grid storage box, and diamond knives.

Note: Non-profit institutions may now purchase the Ultrotome duty-free. Inquire for details.

Write for literature file 4800S10, containing detailed brochure on the Ultrotome, reference list of users, reprints of technical papers describing principles of construction and use.



LKB **LKB Instruments Inc., 4800 Rugby Ave., Washington 14, D. C.**

International Headquarters: LKB-Produkter AB, P.O.B. 12220, Stockholm 12, Sweden

Mettler Instrument
Ohaus Scale
August Sauter of America
Schuco Scientific Div., Schueler
Seederer Kohlbusch
Torsion Balance
Harry Troemner
Welch Scientific

65. Balances, Student
Wm. Ainsworth & Sons
American Balance
J. Chatillon & Sons
Clay-Adams
Eberbach
Heusser Instrument
LaPine Scientific
Mettler Instrument
Ohaus Scale
August Sauter of America
Schuco Scientific Div., Schueler
Seederer Kohlbusch
Torsion Balance
Voland
Welch Scientific

66. Balances, Thermogravimetric
Wm. Ainsworth & Sons
American Instrument
Brinkmann Instruments
Burrell
Cahn Instrument
Cooke, Troughton & Simms
Schuco Scientific Div., Schueler

67. Balances, Trip
Central Scientific
Ohaus Scale
Harry Troemner
Welch Scientific

68. Balances, Triple Beam
Central Scientific
Ohaus Scale
Welch Scientific

(End of Balances)

69. Barometers, Recording
E. Vernon Hill
Kahl Scientific Instrument
Kollsman Instrument
MKS Instruments

70. Batteries, Dry Cell
Burgess Battery
Marathon Battery

71. Batteries, Mercury
Burgess Battery

72. Batteries, Nickel-Cadmium
Burgess Battery
General Electric, Industrial Sales

73. Battery, Voltage Reference
Ealing
Eppley Lab.
Terriss Consolidated Industries

74. Beakers, Glass. See 417

75. Beakers, Plastic. See 783

76. Beakers, Stainless Steel
LaPine Scientific
Pall
Terriss Consolidated Industries

77. Behavior Research Equipment, Animal
S. Blickman
Davis Scientific Instrument
Foringer
Ralph Gerbrands
Grason Stadler
Harford Metal Products
Kenelco
Labco Div., Partsco
Labline
Lehigh Valley Electronics
Massey Dickinson
Med Science Electronics
Metro Industries
Radionics
E. H. Sheldon Equipment
Spacelabs

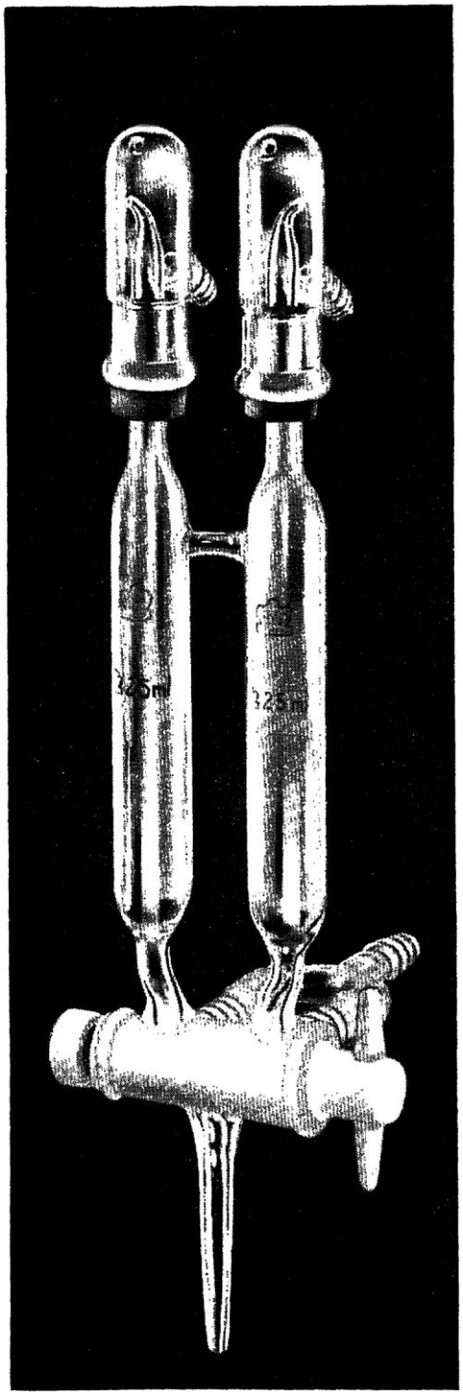
78. Benches, Laboratory. See 388

79. Birefringence Measuring Equipment
Gaertner Scientific
E. Leitz
Process & Instruments
Rao Instrument

80. Blenders, Homogenizing
Blackstone
S. Blickman
Branson Instruments
Bronwill Scientific
Eberbach
Hudson Industries
Instrumentation Associates
Master Appliance
Mixing Equipment
Patterson-Kelley
Ivan Sorvall
Waring Products

81. Blenders, Laboratory, Disintegration
Eberbach
Gifford-Wood
Hudson Industries
Instrumentation Associates
Ivan Sorvall
F. J. Stokes
United States Stoneware

82. Blenders, Laboratory, for Solids
Hudson Industries
Laboratory Plasticware Fabricators
E. Leitz
Patterson-Kelley
Ivan Sorvall
F. J. Stokes
United States Stoneware



NEW DESIGN AUTOMATIC PIPETTE

Works Fast • Costs Less Fills From A Remote Reservoir

One side fills and zeroes while the other side dispenses. The 25 ml size gives four samples per minute; other sizes have comparable rates. One stopcock controls each of the two transfer type pipettes. A "Y" tube connects both pipette sections to your remote reservoir through a single feed line.

. . . ruggedly designed with glass rod bracing the two pipette bodies for strength.

To avoid grease contamination, model K-76333 with Teflon stopcock is the answer. Otherwise, model K-76330 with a glass stopcock plug and even lower prices is recommended.

Size, ml	5	10	25	50	100
Tolerance, ml	±0.02	±0.04	±0.06	±0.10	±0.16
K76330	$18.00	$18.60	$19.05	$20.80	$22.75
K76333	22.95	23.55	24.00	25.75	27.70

Also available with ₹ 10/18 joints connecting pipettes with overflow chambers. For the full story, please write for Bulletin 1061.

KONTES GLASS COMPANY
Vineland, New Jersey

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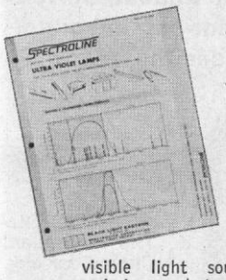
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SPECTROLINE

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ULTRA-VIOLET





★ Sources
★ Lamps
★ Data

New "Spectroline" Bulletin 1462 gives complete list of far and near ultra-violet and monochromatic visible light sources and lamps, their emission and transmission characteristics, and recommended applications for laboratory and industry.





- OVER 25 NEW U-V LAMPS for laboratory and field use . . . hand, bench, other models with self-contained power.
- NEW MINIATURE U-V LAMPS . . . quartz gaseous discharge lamps . . . filters . . . power supplies.

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A DIVISION OF
SPECTRONICS CORPORATION
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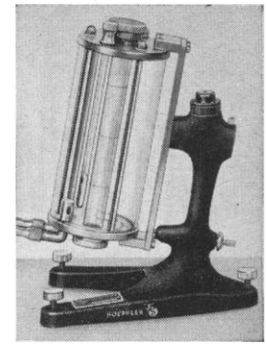
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a factor in your product?

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Save money with the

HOEPPLER



MADE IN U.S.A.

Here's an instrument that pays for itself over and over again! How? By assisting in product development and manufacture—and by eliminating costly errors in viscosity control.

Operating on the falling-ball principle, the Hoeppler Viscosimeter has an accuracy of 0.1% to 0.5%. Even gases as well as liquids, oils, plastics, syrups, viscous tars, etc., can be measured. Only a small sample (30 cc) is required, and the results are consistent and reproducible.

The Hoeppler Viscosimeter is now serving manufacturers in many fields—food, chemical, ceramic, plastic, etc. It belongs in any laboratory where viscosity is a factor in the manufacture or sale of a product. Price $350.

Interchangeable spare parts available.

Write for Bulletin HV-303, which gives full details.

Manufactured by FISH-SCHURMAN CORP.
74 Portman Road, New Rochelle, N. Y.

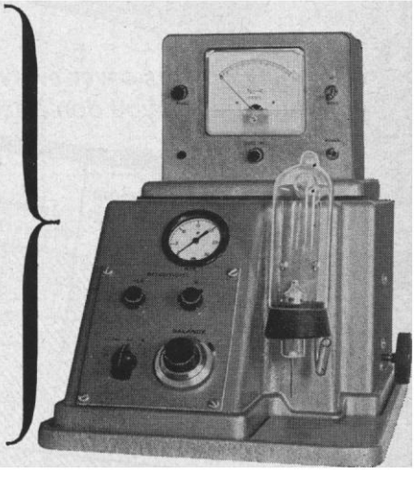
Fish-Schurman

Not just holding our lead...
but adding to it, with the
new N.I.L. FLAME PHOTOMETER! *

If you now use older models of the N.I.L.-Patwin Flame Photometer, you still have the best instrument in the field. But if you need a new or another flame photometer, get a Model C and relax for years to come—with higher reliable sensitivity and greater output with less effort.

New Model C Features..... *plus*.....Old Patwin Virtues

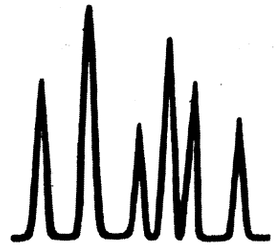
- Electronic galvanometer designed by N.I.L. means faster response, better control, smaller samples.
- Photo-resistive cells give 10-fold increase in sensitivity over old photoelectric cells, 0.001 mEq/L of Na, 0.002 mEq/L of K.
- Switch to direct reading of mEq/L.
- Single dilution for both elements.
- Simple switchover from Na to K without changing sensitivity measurements.
- Less bench space, total area 10½" x 20".
- No change in price.
- Internal standard double-beam principle.
- Thermally stable for round-the-clock use.
- Cells individually replaceable.
- For connection to propane or natural and city gas.
- Built-in gas and air regulators.
- Readings unaffected by smoke, fumes, and other contaminants.
- External atomizer easily removed and cleaned.
- Cast aluminum housing.



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National Instrument Laboratories
828 EVARTS STREET, N.E., WASHINGTON, D. C.
Telephone NOrth 7-7582

* Send for Bulletin 4-7000

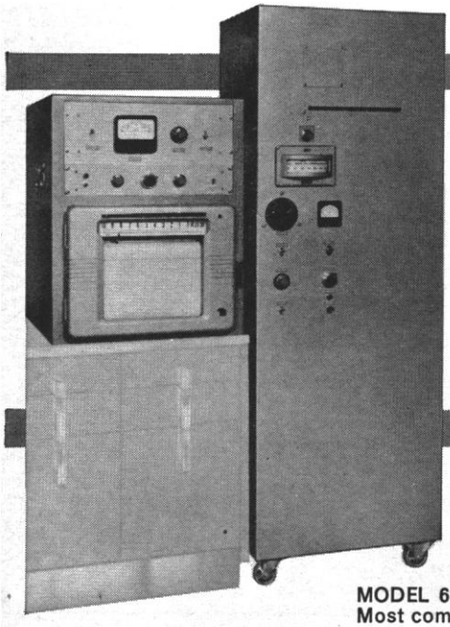


The Chromatogram is the Proof

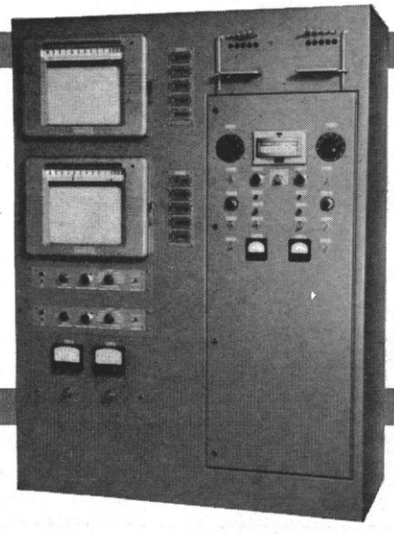
BARBER COLMAN

Gas Chromatographs

You choose options which best advance your work. In Argon ionization systems, the 1 cm diode detector is offered with a Ra 226 source, the tritium triode, flame ionization and thermal conductivity are available too. Options include table, floor, and table-floor models, with recorders or without, universal or special models, disc integrators or electronic read-out/print-out integrators. A Barber-Colman engineer will be glad to help you choose — see the Yellow Pages.



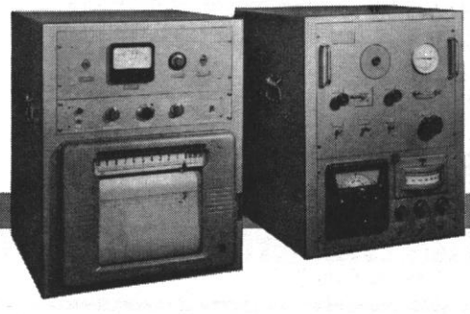
MODEL 15
With the same operating abilities as Model 10, Model 15 is convenient for crowded labs in single column work for biochemical, bio-medical areas. Electronics cabinet is semi-portable, column cabinet is wheeled.



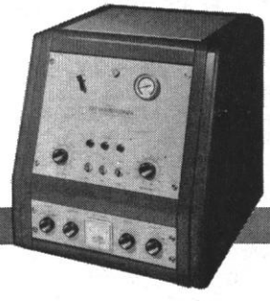
MODEL 10 DUAL
The 'Instrument of Choice' for biochemical U-shaped or coiled-glass packed-column analyses. Superbly instrumented for utmost sensitivity and control of sample input, column, detector. Also available as a single column unit.



MODEL 61C
Most compact—21x15x13 inches—and universal of instruments. Fine instrumentation with convenient controls make it the most versatile table model.



MODEL 20
Semi-portable separate table units for electronics and columns offer great sensitivity and accuracy in general chemical analyses. Operating characteristics are similar to Model 10 but has linear sample splitter.



MODEL 23C
A compact, accurate table model, Model 23C is a low-cost, high quality unit. Widely useful for chemical analyses within the sensitivity range of thermal conductivity detection. Ideal for quality control laboratories.

The many options cover every need . . . you buy nothing you don't need

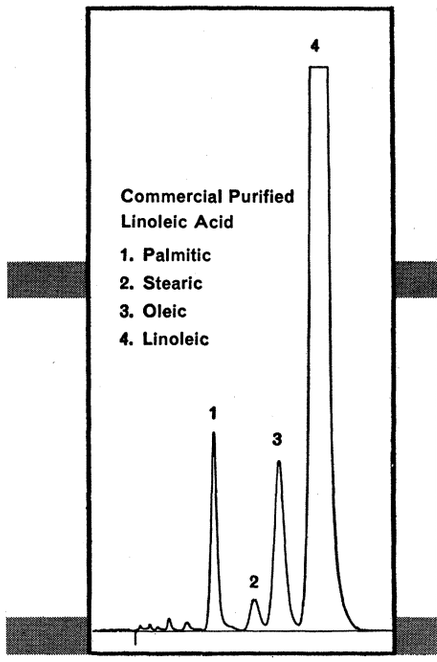
Model	Max. Column Temp.	Thermal Conductivity	Ionization Flame	Ionization Argon	Features
61C	380°C	▨			linear splitter
23C	300°C	▨			heated filament or thermistor detector
15	400°C	▨	▨	▨	for biochemical studies
*10	400°C	▨	▨	▨	single column } Single or dual packed or capillary **columns
10	400°C	▨	▨	▨	dual column } Single or dual packed or capillary **columns
20	400°C	▨	▨	▨	linear splitter

*Convertible to dual column in field. **Licensed under Golay Patent 2920478.

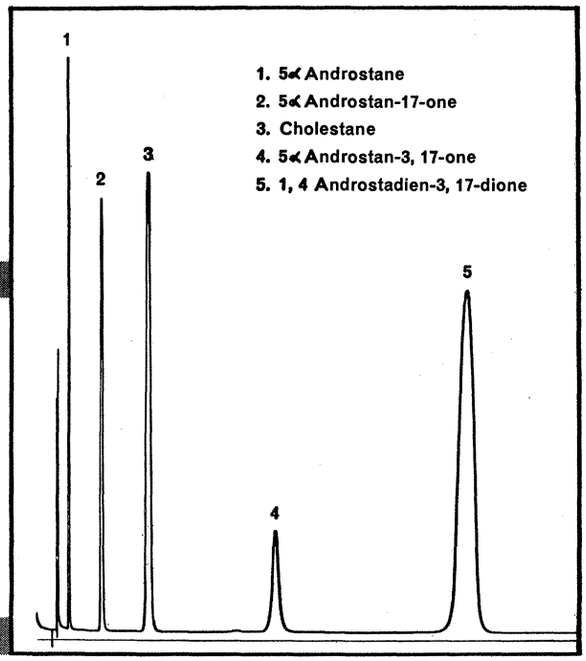
Temperature programming available on most models.

A complete line for Gas Chromatography. Nation-wide network of Sales and Service Factory Branches.

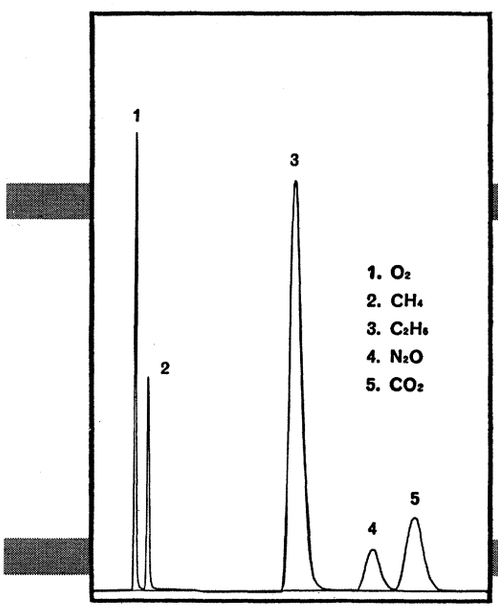
. . the "Instruments of Choice"



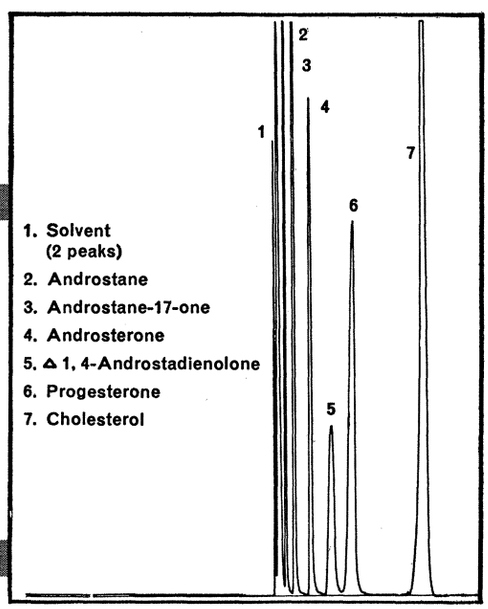
Model 10 — .05 ul Fatty acids
Chart IPM 1/3 Carrier gas Ar. 30 psi
Detector Sr-90, Range 30, Volt 600
Liq. phase H_3PO_4, treated EGS
Column 4 ft. glass, OD 6mm, ID 4+mm
Temp. °C. Col. 220, FH 300, Dtr. 240



Model 10 — 0.1 ul Steroids
Chart IPM 1/3 Carrier Ar. 30 psi
Detector Sr-90, Range 10, Volt 500
Liq. phase Igepal
Column 6 ft. glass, OD 1/4", ID 5mm
Temp. °C. Col. 240, FH 320, Detr. 240



Model 23C — .5 ml gases
Chart IPM 1/3 Carrier gas Helium 15 psi
Detector thermal cond., Range 5, Amp. .190
Column packing Silica gel
Column 6 ft. copper, OD 1/4"
Temp. °C. Col. 28, FH 80, Detr. 28
Col. flow in ml/min 110



Model 15 — 0.2 ul Steroids
Chart IPM 1/3 Carrier gas Ar. 15 psi
Detector Sr-90, Range 10, Volt. 900
Liq. phase S.E. 30 (Anakrom ABS)
Column 6 ft. glass, OD 1/4", ID 5mm
Temp. °C. Col. 242, FH 320, Detr. 260

Please send me the literature marked:

Fact File of chromatograms for

- ☐ biochemical
- ☐ medical
- ☐ petrochemical
- ☐ chemical
- ☐ Model 10, Bul. F-9214-1, for Argon ionization detector cells with Ra, Sr^{90}, H_3 or hydrogen flame.
- ☐ Model 20, Bul. F-9226-1, for Argon ionization detector cells with Ra, Sr^{90}, H_3, hydrogen flame or thermal conductivity.
- ☐ Model 15, Bul. F-10373, for Argon ionization detector cells with Ra, Sr^{90}, H_3, or hydrogen flame.
- ☐ Model 23C, Bul. F-10500-1, Thermal Conductivity Detection.
- ☐ Model 61C, Bul. F-10433, Compact, all detectors.
- ☐ Model 34P, F-11069, Programmer
- ☐ Accessories to all models.
- ☐ Argon Ionization Detector, Bul. F-10195.
- ☐ Hydrogen Flame Detector, Bul. F-10197.
- ☐ Linear Sample Splitter, Bul. F-10189.
- ☐ Attenuators for Model 10 and 20, Bul. F-10196.
- ☐ CRS-1 Electronic High Speed Integrator Bulletin.
- ☐ Gas Control Accessories, Bul. F-10413.

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BARBER-COLMAN COMPANY

Dept J, 15131 Rock Street, Rockford, Illinois, U.S.A.
BARBER-COLMAN of CANADA, Ltd., Dept. J, Toronto & Montreal • Export Agent: Ad. Auriema, Inc., N.Y.

Blood

83. Blood Cell Counters, Electronic
Cooke, Troughton & Simms
Coulter Electronics
Fisher Scientific
Haemoscope
International Telephone & Telegraph, Federal Labs. Div.
Sanborn
Scientific Products

84. Blood Cell Counters, Mechanical
American Optical, Instrument Div.
Burton Medicquipment
Clay-Adams
Veeder Root

85. Blood Chloride Meters. See 151

86. Blood Flow Meters
Avionics Research Products
Carolina Medical Electronics
C-Mar Instrument
E & M Instrument
Ensco
Fischer & Porter
Gilford Instrument Labs.
Medicon Div., Quality Precision Products

87. Blood Gas Analyzers, Micro
Beckman Instruments
Beckman Instruments, Spinco Div.
Cambridge Instrument
F & M Scientific
R. L. Faley & Assoc.
Fisher Scientific
Instrumentation Associates
London
Micro-Metric Instrument
Micro-Tek Instruments
Perkin-Elmer
Precision Scientific
Scientific Industries
Starling
Yellow Springs Instrument

88. Blood Gas Analyzers, Recording
Beckman Instruments
Beckman Instruments, Spinco Div.
Epsco
F & M Scientific
R. L. Faley & Assoc.
Instrumentation Lab.
London
Minneapolis-Honeywell, Heiland Div.
Precision Scientific
Sanborn
Waters

89. Blood Gas Analyzers, Van Slyke
Central Scientific
Fisher Scientific
Keyes Scientific
Macalaster Scientific
Precision Scientific
E. H. Sargent
Arthur H. Thomas

90. Blood Oxygen Analyzers, Dissolved Oxygen. See 735

91. Blood pH Analyzers, Recording
Beckman Instruments, Scientific and Process Instruments Div.
Beckman Instruments, Spinco Div.
Brinkmann Instruments
Cambridge Instrument
Epsco
Foxboro
Instrumentation Associates
Instrumentation Lab.
London
Sanborn
Terriss Consolidated Industries

92. Blood pH Electrodes
Beckman Instruments, Scientific and Process Instruments Div.
Brinkmann Instruments
Cambridge Instrument
Instrumentation Associates
Instrumentation Lab.
Leeds & Northrup
London
L. G. Nester
Photovolt

93. Blood PO_2 Measuring Instruments
Beckman Instruments, Scientific and Process Instruments Div.
Beckman Instruments, Spinco Div.
Cambridge Instrument
Electro Medical Lab.
International Medical Instrument
London
Minneapolis-Honeywell, Heiland Div.
Starling
Yellow Springs Instrument

94. Blood Pressure Monitors
Beckman Instruments, Spinco Div.
Decker
Cambridge Instrument
E & M Instrument
Ensco
Gilford Instrument Labs.
Gulton Industries
Instrumentation Associates
Kenelco
Metro Industries
Minneapolis-Honeywell, Heiland Div.
Sanborn
Spacelabs
Starling

95. Blood Viscometers
Atomium
Automation Products
Bendix, Cincinnati Div.
Brookfield Engineering Labs.
Cannon Instrument
Haemoscope
National Instrument
S and A Products

96. Blood Volume Analyzers
Atomium
Delta Instrument
Industrial Instruments
Nuclear Industries

(End of Blood)

97. Boiling Point Determination Equipment
Hallikainen Instruments
Scientific Glass Apparatus

98. Bombs, Combustion
Parr Instrument
Schuco Scientific Div., Schueler

99. Borers, Cork. See 216

100. Bottles, Plastic. See 784

101. Brain Probes, Radiation Detecting. See 610

102. Brain Tumor Localization Systems. See 611

103. Burettes, Automatic
Ace Glass
American Instrument
Brinkmann Instruments
Fischer & Porter
Fisher Scientific
Kahl Scientific Instrument
Kimble Glass
Kontes Glass
London
National Instrument
E. H. Sargent
Scientific Glass Apparatus
Tech Glass

104. Burettes, Micro
Ace Glass
American Instrument
Fischer & Porter
Fisher Scientific
Roger Gilmont Instruments
Kimble Glass
London
Metro Industries
Microchemical Specialties
Micro-Metric Instrument
E. H. Sargent
Scientific Glass Apparatus
Tech Glass
Arthur H. Thomas

105. Calorimeters, Bomb Type
Parr Instrument
Schuco Scientific Div., Schueler

Cameras

106. Cameras, High Speed, Framing
Abrams Instrument
Abtronics
Fairchild Camera & Instrument, Defense Products Div.
Nikon

107. Cameras, High Speed, Movie
Abrams Instrument
Adage
Beckman & Whitley
Burke & James
Camera Equipment
Chadwick Helmuth
Fairchild Camera & Instrument, Industrial Products Div.
Flight Research
Kahl Scientific Instrument
Lafayette Instrument
Mitchell Camera
Northridge Research
Optomechanisms
Wollensak Div., Revere Camera

108. Cameras, Oscilloscopic. See 722, 723

109. Cameras, Underwater. See 708

(End of Cameras)

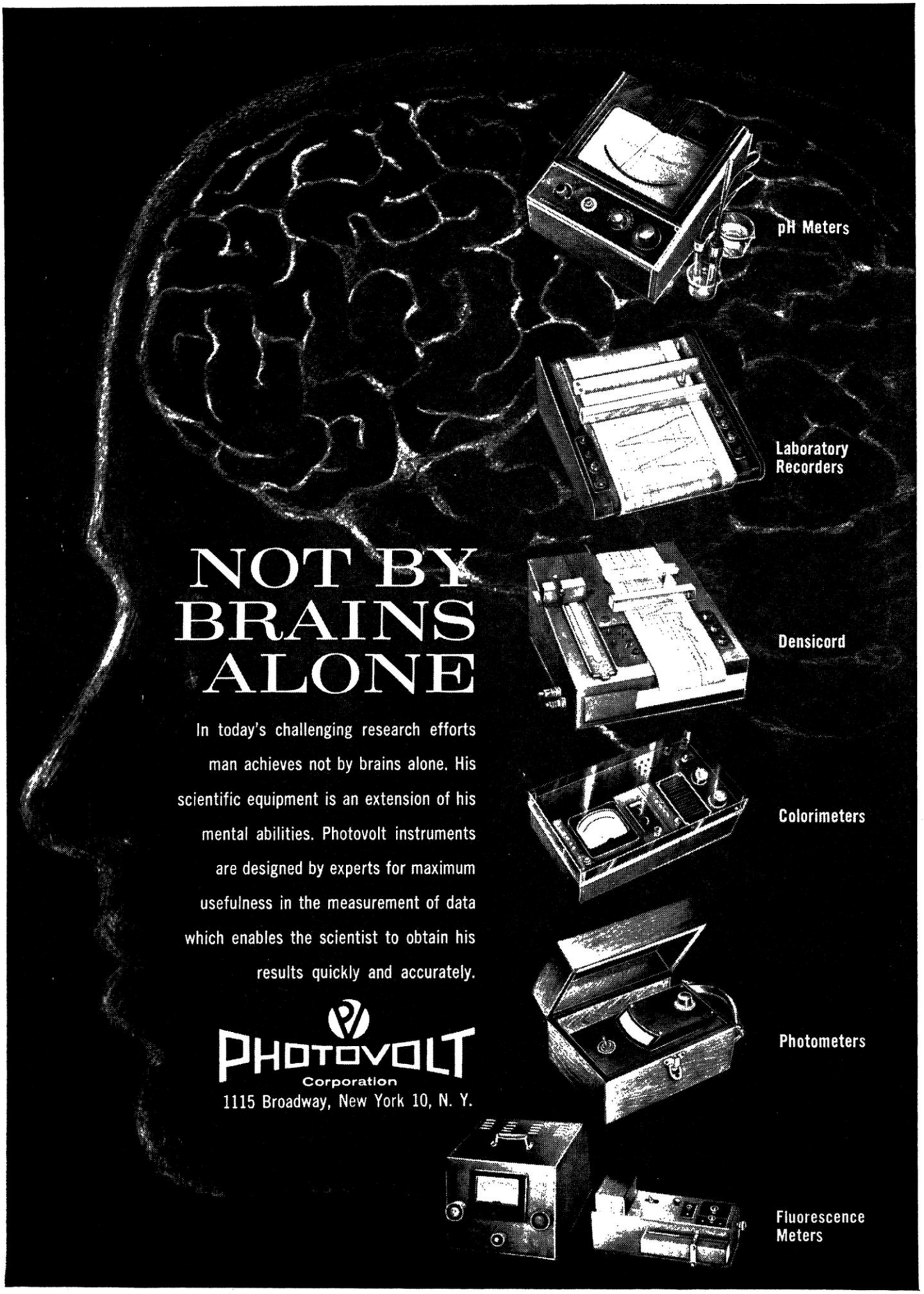
110. Cans, Specimen Type for Biological Samples
Ellisco

111. Capacitance Measuring Equipment
Decker Aviation
Electro Instruments
Electro Scientific Industries
Electronic Designs Div., Maxson Electronic
Foxboro
General Radio
Industrial Instruments
Keithley Instruments
Leeds & Northrup
London
Muirhead Instruments
Philips Electronic Instruments
Siemens New York
Spacelabs
Tektronix
Texas Instruments
Trimount Instrument Div., General Controls

112. Capacitors, High Voltage Storage
Atomic Laboratories
General Electric, Capacitor Div.
Jennings Radio

113. Carbon Analyzers, Combustion Type
Barber-Colman
Burrell
Coleman Instruments
F & M Scientific
Fisher Scientific
Laboratory Equipment
Arthur H. Thomas

114. Carbon Analyzers, Organic Carbon
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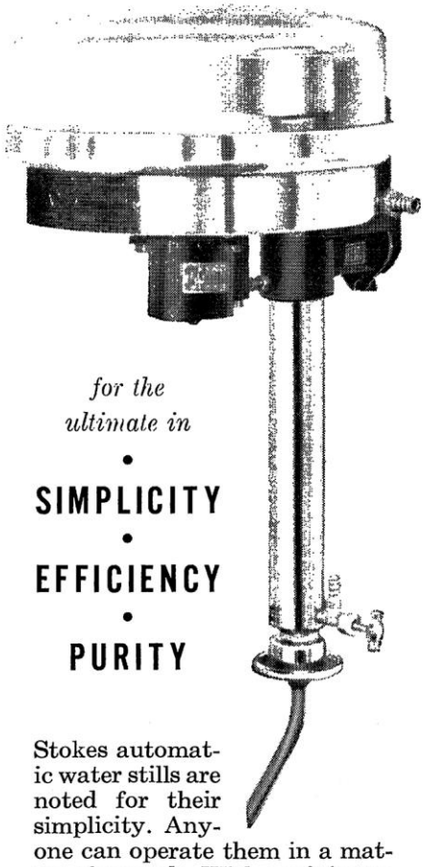


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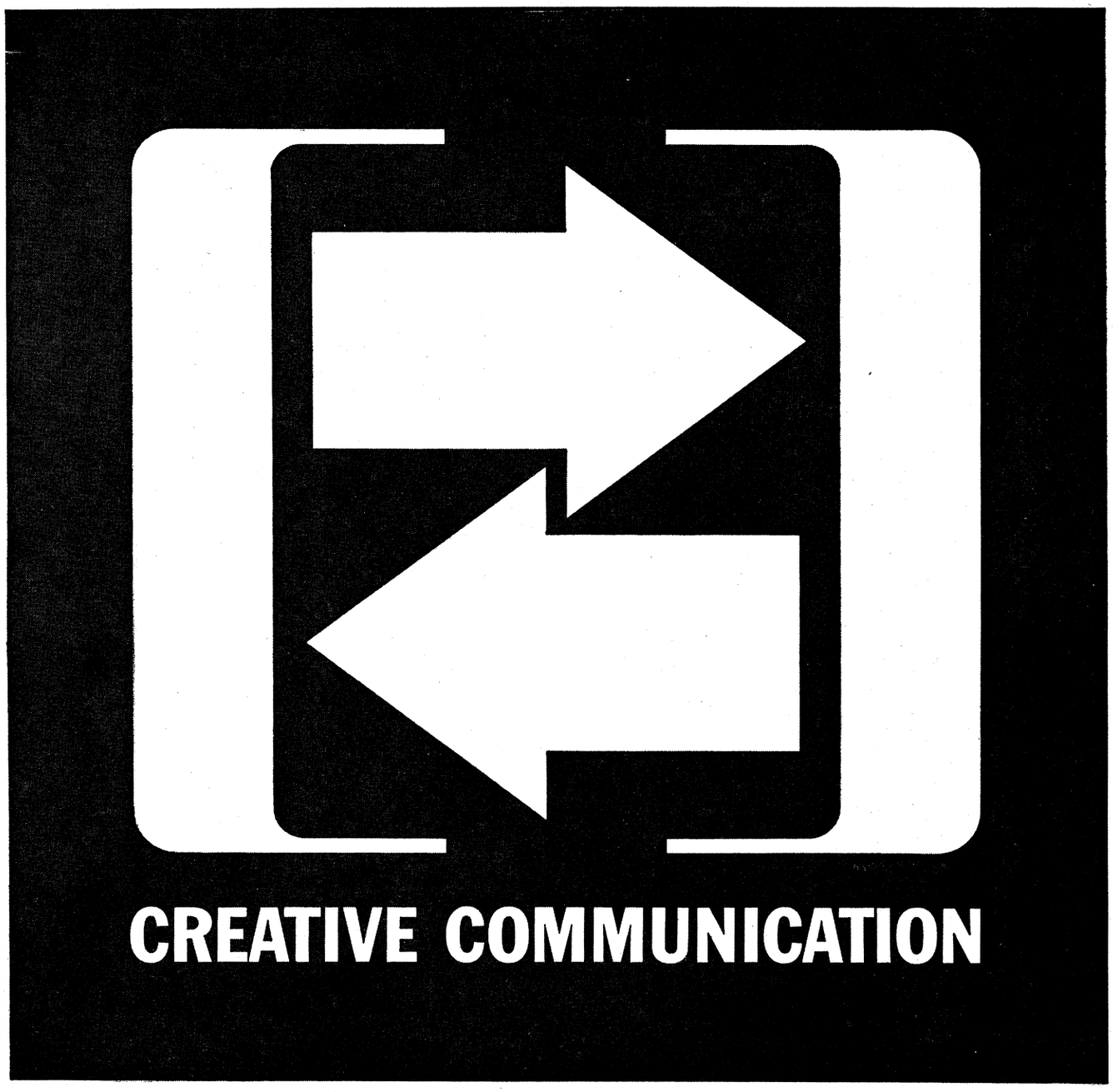
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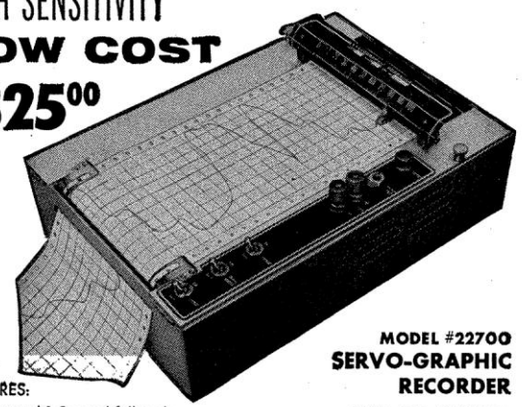
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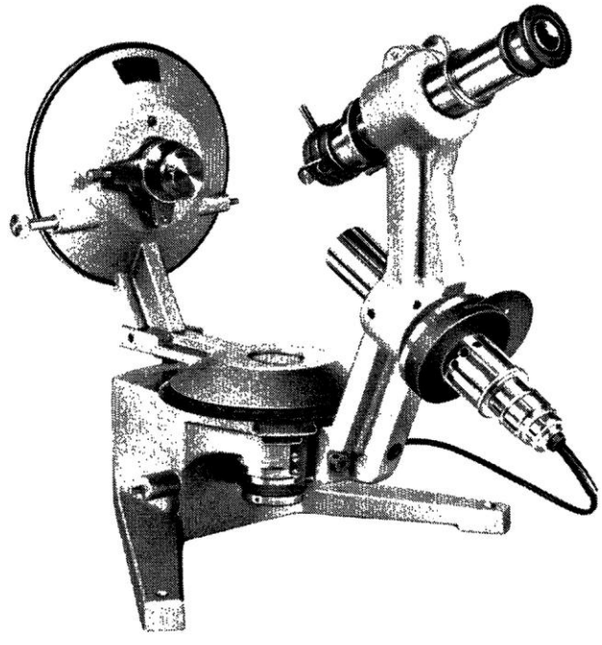
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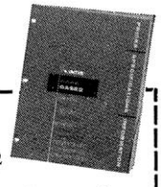
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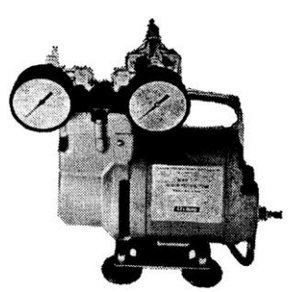
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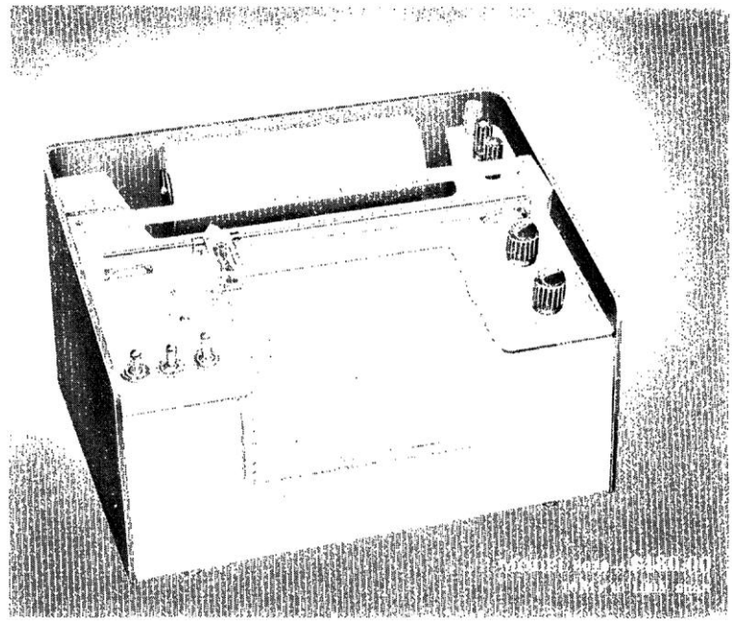
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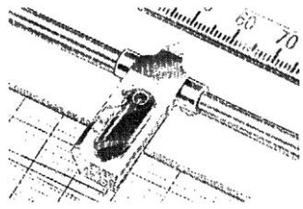
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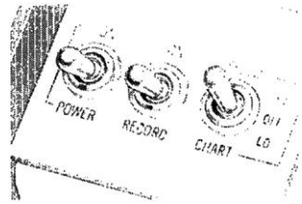
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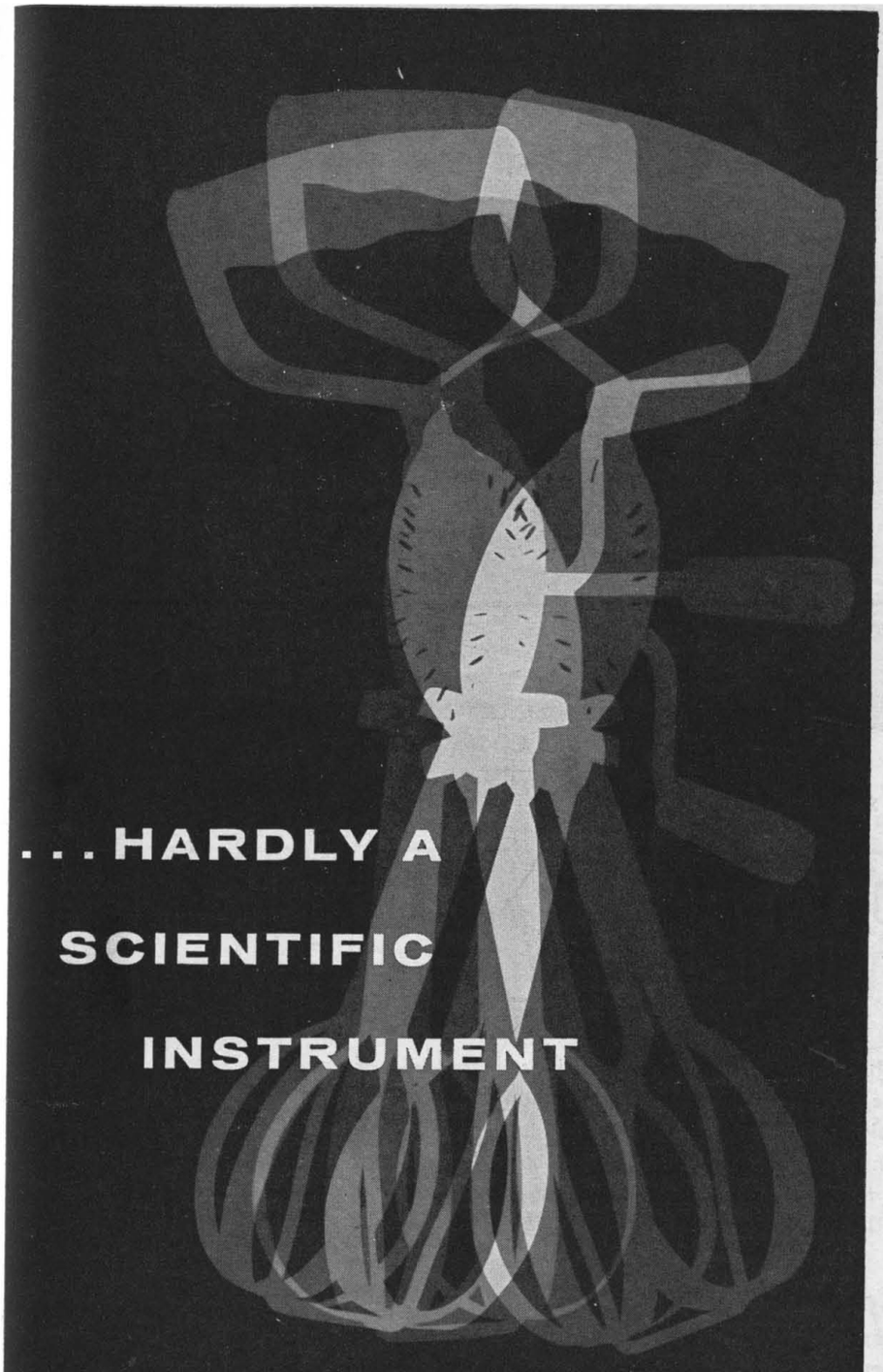
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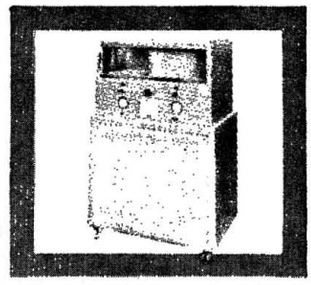
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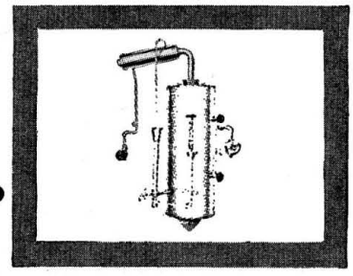
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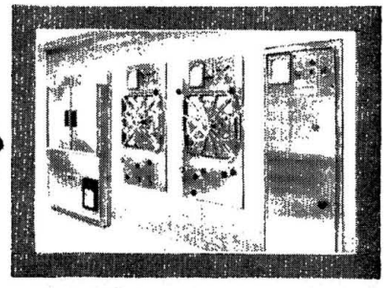
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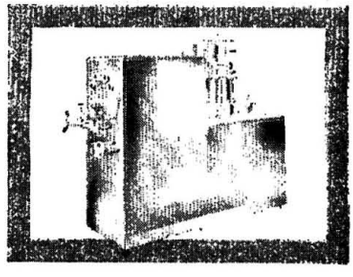


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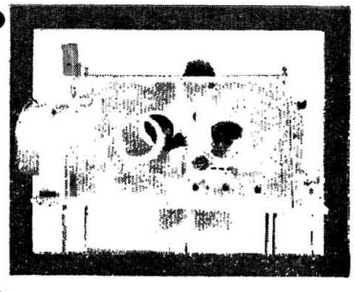


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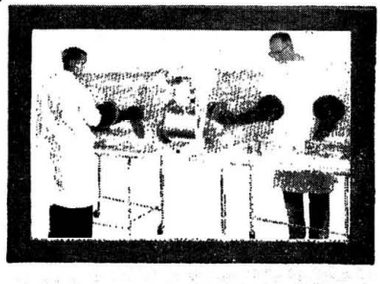
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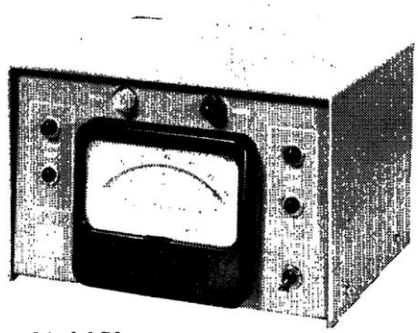
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Chromatography, Liquid

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Chromatography, Paper

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178. Carboys, Plastic. See 785

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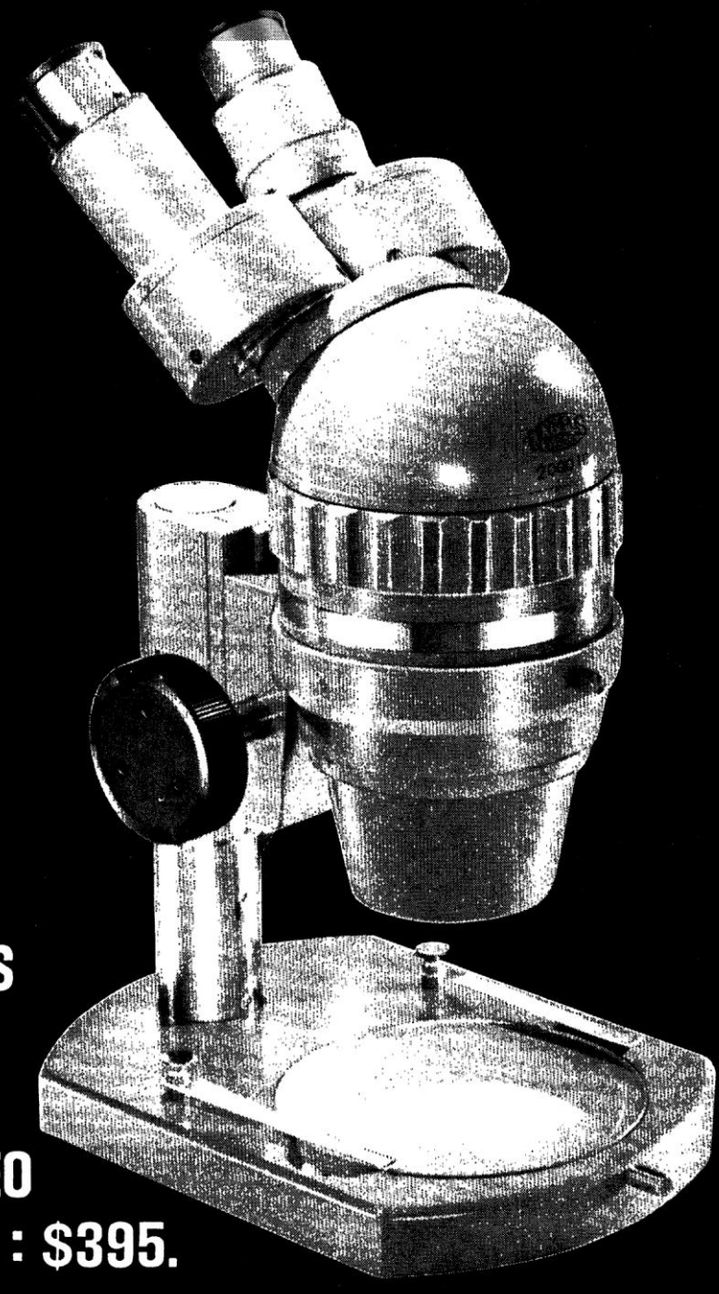
180. Densitometers
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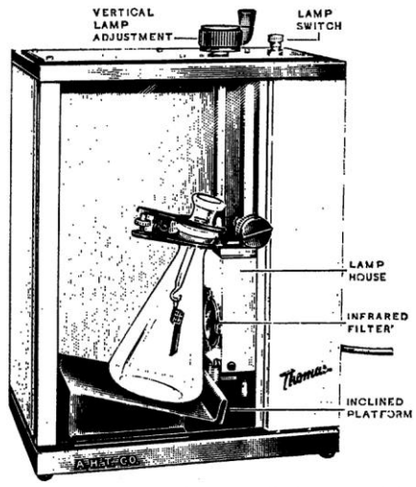
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for oxygen flask combustions



6472-B. *(Flask not included).*

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Cabinet is of metal, 12¼ × 8 × 16 inches high overall, with transparent acrylic plastic door with full-length hinge, baffled vents and spring-loaded latch. Lamp is mounted in housing with screw crank elevating device; fixed focusing reflector is sealed within lamp envelope.

6472-B. Safety Igniter, Thomas-Ogg, as described, with flask platform, infrared filter, 100 black paper sample wrappers, extra lamp bulb, 3-wire cord, 3-prong plug with adapter and directions for use, but without combustion flask. For 115 volts..... **155.00**

6471-P10. Oxygen Combustion Flask,* Thomas-Ogg, of borosilicate glass, conical, 500 ml capacity. With ball-and-socket stopper held securely by Thomas Pinch Clamp. Stopper can be tilted to permit easy release of vacuum after combustion. With clamp and platinum sample carrier..... **41.70**

*Patent applied for. Based on developments by Clyde L. Ogg and associates, East. Util. Res. & Dev. Div., A.R.S., U.S.D.A., Phila., Pa.

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Fischer & Porter
Fisher Scientific
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188. Cleaners, Glassware, Detergents
Allied Chemical, General Chemical Div.
Aloe Scientific
Fisher Scientific
General Electric, X-ray Dept.
Linbro Chemical
Meinecke
Monarch Chemicals
National Ultrasonic
Scientific Products
Southern Cross
Arthur H. Thomas
VirTis

189. Cleaners, Ultrasonic. See 424

190. Closed Circuit TV. See 979

191. Cloud Chambers. See 615

192. Cobalt Sources. See 617

193. Colony Counters, Bacteriological
American Optical, Instrument Div.
Clay-Adams
Consolidated Labs.
New Brunswick Scientific

194. Colorimeter Cells
American Instrument
Coleman Instruments
E. I. du Pont de Nemours, Instrument Products Div.
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Precision Glass Products
Hayes G. Shimp
Carl Zeiss

195. Colorimeters, Photoelectric Absorption
Bausch & Lomb
Beckman Instruments, Spinco Div.
Bio Metrics
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E. I. du Pont de Nemours, Instrument Products Div.
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Schoeffel Instrument
Carl Zeiss

196. Colorimeters, Reflectance
Bausch & Lomb
Hurletron
Instrument Development Labs.
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Phoenix Precision Instrument
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Martin Sweets
Carl Zeiss

197. Column Packing. See 159

198. Combustion Boats
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Fischer & Porter
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199. Combustion Furnace, High Frequency Induction
Fisher Scientific
General Electric, Industrial Sales Operation
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200. Combustion Furnace, Tube Type
B.T.U. Engineering
Burrell
Custom Scientific Instruments
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203. Combustion Units, Schoeniger Type
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Microchemical Specialties
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204. Comparators, Optical. See 719

205. Computer Data Converters, Analog-to-Digital. See 15

206. Computer Data Converters, Digital-to-Analog. See 282

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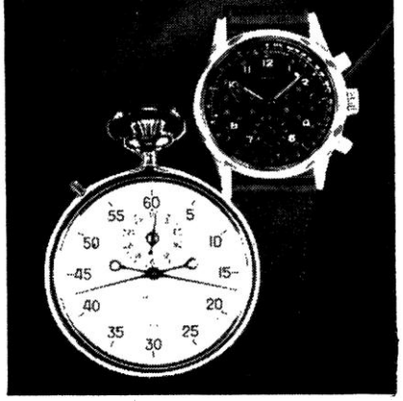
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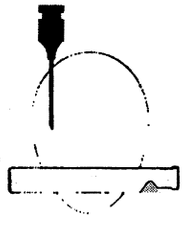
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213. Connectors, Metal (for Small Tubing)
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214. Connectors, Plastic (for Tubing). See 787

215. Containers, Lead Shielded. See 618

216. Cork Borers
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Falcon Plastics Div., B-D Labs.
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219. Counters, Beta. See 624

220. Counters, Blood Cell. See 83, 84

221. Counters, Colony. See 193

222. Counters, Drop. See 293

223. Counters, Flow. See 626

224. Counters, Gamma. See 627

225. Counters, Geiger. See 629

226. Counters, Liquid Scintillation. See 663, 664

227. Counters, Low-level. See 665

228. Counters, Particle, Macroscopic
Amperex Electronic
Cooke Troughton and Simms
Coulter Electronics
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E. Vernon Hill
Phoenix Precision Instrument
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229. Counters, Printing
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Chadwick Helmuth
Durant
Foringer
Presin
Radiation Instrument Development Lab.
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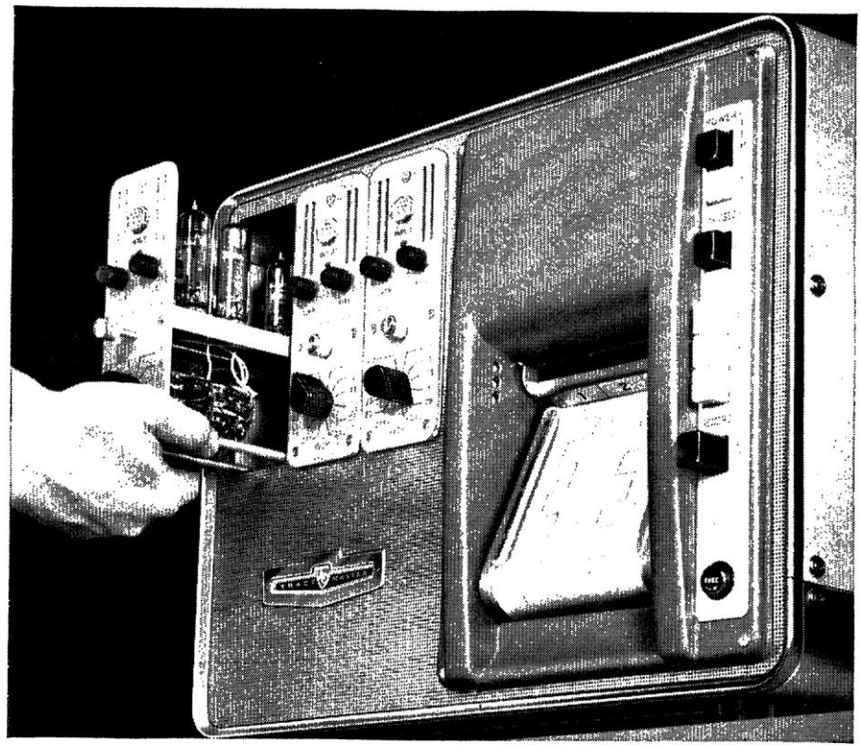
230. Counters, Proportional. See 632

231. Counters, Scintillation, See. 633

232. Counters, Whole Body. See 705

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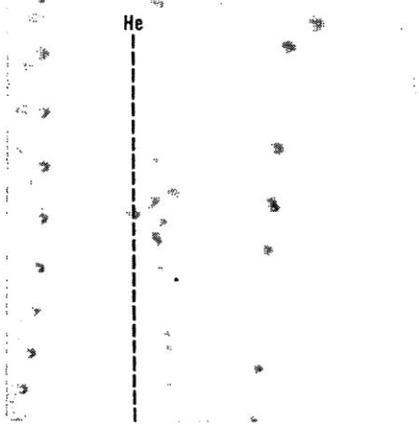
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234. Crucibles, Zirconium
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235. Crushers, Laboratory
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Sturtevant Mill
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236. Cryogenic Containers for Liquid Gases
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Andonian Associates
S. Blickman
Cryogenerators
Cryogenic Engineering
Hofman Labs.
Linde Div., Union Carbide
Ronan & Kunzl
Sulfrian Cryogenics
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237. Cryogenic Gas Liquifiers
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Linde Div., Union Carbide

238. Cryogenic Storage Refrigerators
Canal Industrial
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Cryogenic Engineering
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Sulfrian Cryogenics
VirTis

239. Cryoscopes
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Andonian Associates
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Intercontinental Scientific
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240. Cryostats
Air Products & Chemicals
Andonian Associates
Cryo-Sonics
Cryogenic Engineering
Wm. J. Hacker
Hofman Labs.
International Equipment
National Instrument Labs.
Sulfrian Cryogenics

241. Crystal Lattice Models. See 581

Crystals

242. Crystals, Infrared Transmitting
Applied Instruments
Beckman Instruments
Block Associates
Connecticut Instrument
Eastman Kodak
Geoscience Instruments
Isotopes
Materials Research
National Lead
Norton
Texas Instruments

243. Crystals, Laser. See 484

244. Crystals, Maser. See 516

245. Crystals, Scintillation. See 688

246. Crystals, Ultraviolet Transmitting
Applied Instruments
Geoscience Instruments
Isotopes

(End of Crystals)

247. Culture Apparatus, Bacteriological
American Sterilizer
Baltimore Biological Lab.
B-D Labs.
Bellco Glass
Falcon Plastics Div., B-D Labs.
Fischer & Porter
Hudson Industries
Kontes Glass
Microchemical Specialties
National Instrument
New Brunswick Scientific
Scientific Glass Apparatus
Scientific Products
Thermolyne

248. Culture Flasks
Bellco Glass
Clay-Adams
Falcon Plastics Div., B-D Labs.
Fischer & Porter
Hudson Industries
Kimble Glass
Kontes Glass
Macalaster Scientific
Microchemical Specialties
Scientific Glass Apparatus
VirTis

249. Culture Media
Baltimore Biological Lab.
B-D Labs.
Carolina Biological Supply
Colorado Serum
Consolidated Labs.
Difco Labs.
Hyland Labs.
Millipore Filter

250. Culture Tube Closures. See 992–994

251. Current Integrators
Elcor
Massey Dickinson
Micro-Tek Instruments

252. Cuvettes. See 194, 211, 316, 593, 934, 935

253. Defibrillators
American Optical, Instrument Div.
Biocom
Cambridge Instrument
E & M Instrument
Electrodyne
Ensco
Mikros

254. Demineralizers
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255. Demonstration Equipment. See 887

256. Density Gradient Column Fractionators
Instrumentation Specialties

Densitometers

257. Densitometers, Electrophoresis. See 317

258. Densitometers, Micro
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259. Densitometers, Paper Chromatography. See 180

260. Densitometers, Spectrographic. See 922

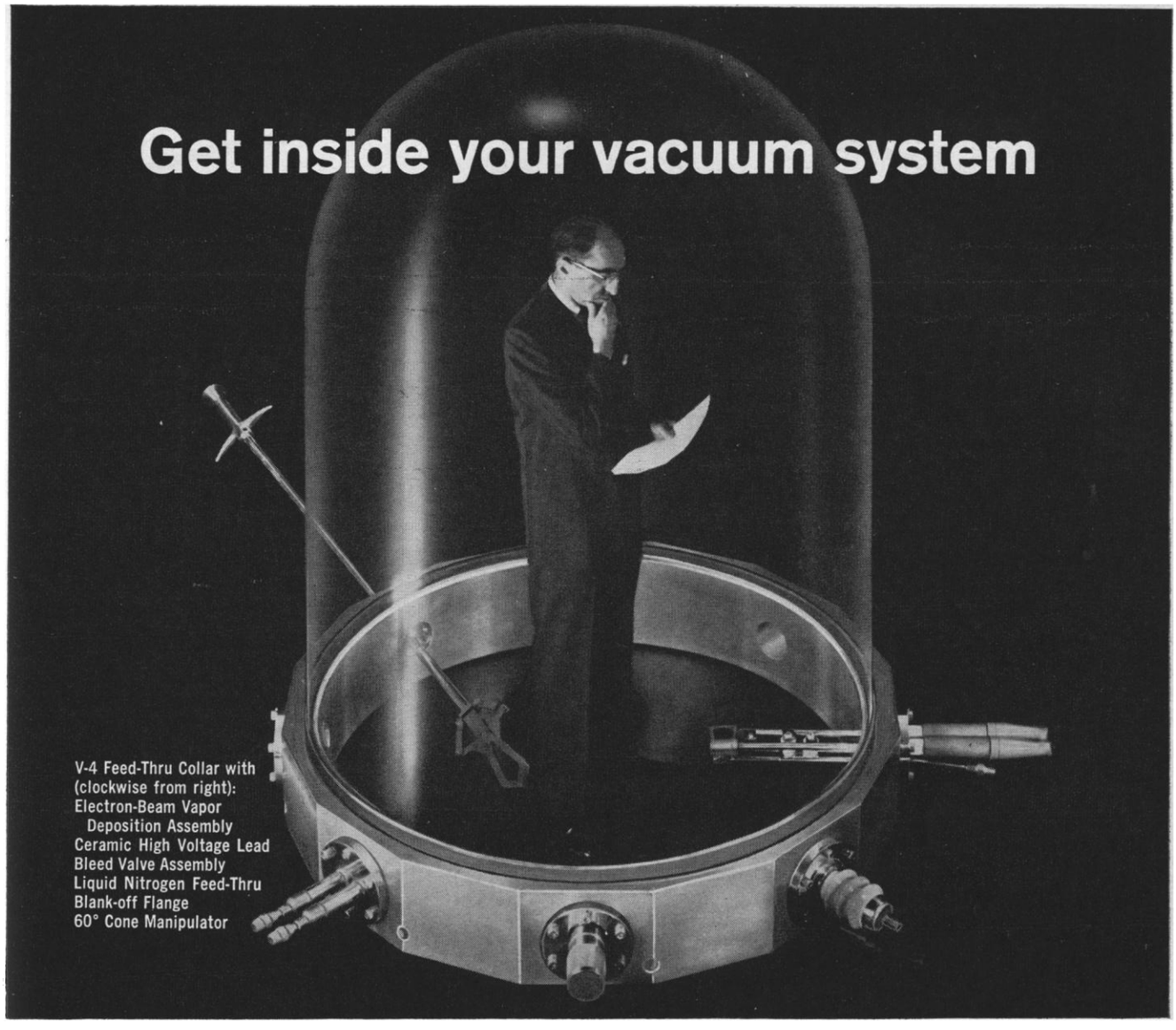
(End of Densitometers)

261. Depth Recorders, Oceanographic. See 710

262. Dermometers. See 912

263. Desalters. See 181

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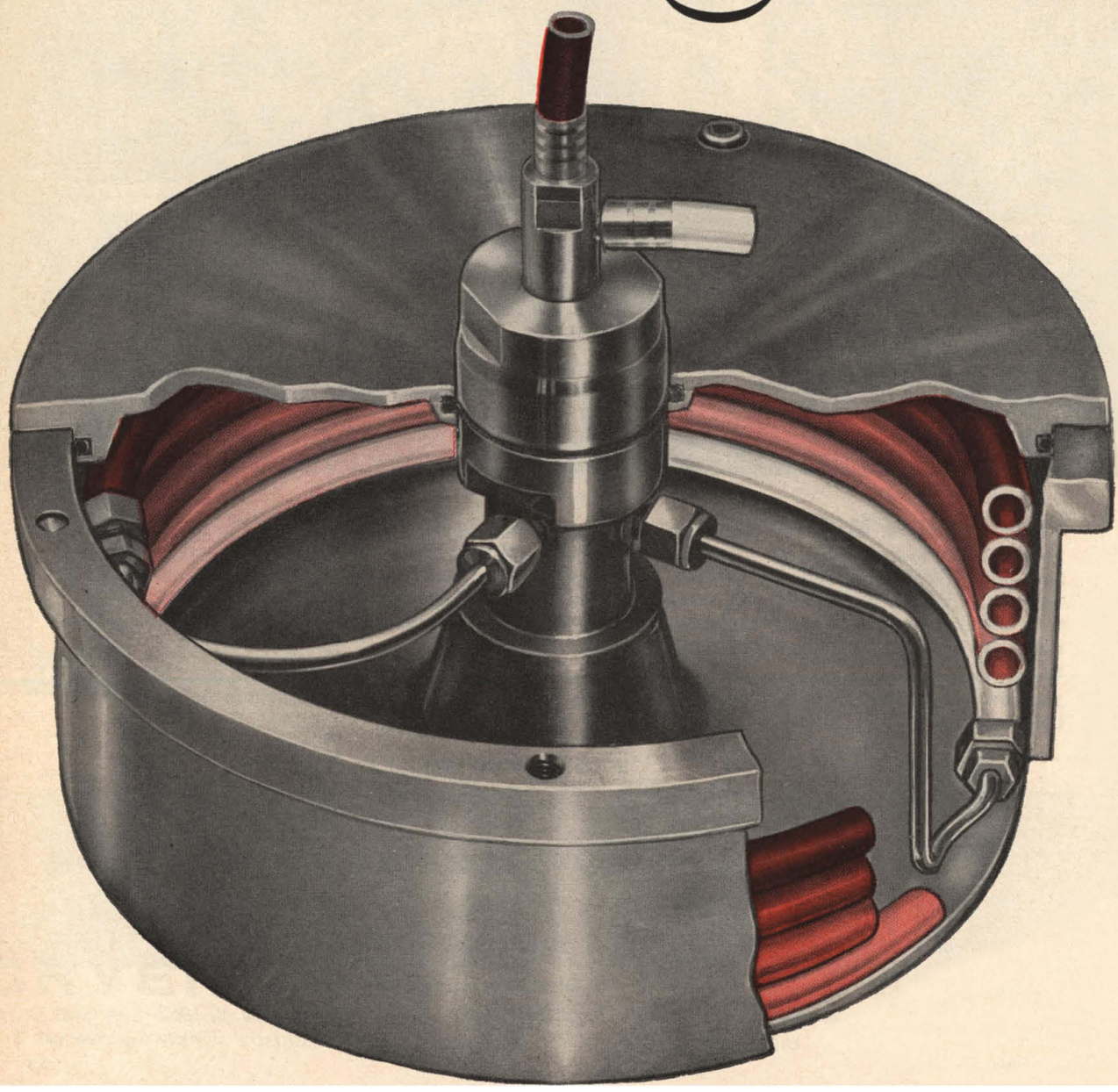
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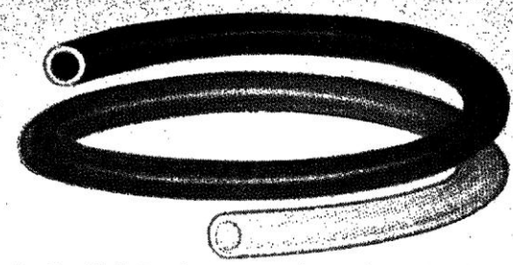
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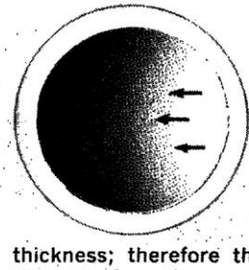
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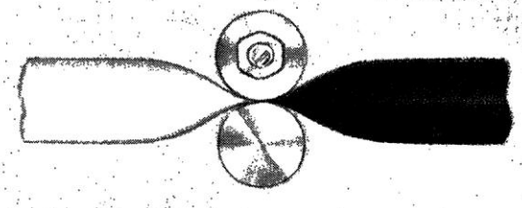
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Kimble Glass
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266. Desiccators, Plastic
Ace Glass
Labline Instruments
Pioneer Plastics
VirTis

Detectors

267. Detectors, Gas Density
Automation Products
Devco Engineering
General Electric, Industrial Sales
Gow-Mac Instrument
Greenbrier Instruments
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MKS Instruments
Newark Controls

268. Detectors, Infrared
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Block Associates
Eastman Kodak
Eppley Lab.
Electro Mechanical Research
General Electric, Industrial Sales
Geophysics Corp. of America
International Telephone & Telegraph, Industrial Labs. Div.
Lehigh Valley Electronics
Measurements Systems
Minneapolis-Honeywell Regulator, Industrial Products Group
Networks Electronic
Philco, Lansdale Div.
Raytheon, Microwave & Power Tube Div.
Servo Corp. of America
Texas Instruments

269. Detectors, Photoelectric. See 762

270. Detectors, Radiation. See 624–635

271. Detectors, Thermal Conductivity
Atkins Technical
Custom Scientific Instruments
Devco Engineering
Elion Instruments
F & M Scientific
Foxboro
General Electric, Industrial Sales
Gow-Mac Instrument
Greenbrier Instruments
Industrial Instruments
Instrumentation Associates
LOENCO
Mine Safety Appliances
Podbielniak
United Control
Victory Engineering
Wilkens Instrument & Research

272. Detectors, Vacuum, Leak
Acme Industrial
Canal Industrial
Consolidated Electrodynamics
Devco Engineering
Elion Instruments
General Electric, Instrument Dept.
Geophysics Corp. of America
Industrial Instruments
MKS Instruments
NRC Equipment
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Varian Associates

(End of Detectors)

273. Deuterium Light Source. See 492

274. Dew Point Determinators
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American Instrument
Atkins Technical
Barber-Colman
Beckman Instruments
Central Scientific Div., Cenco Instruments
E. Vernon Hill
Kahl Scientific Instrument
Texas Instruments

275. Dewar Flasks
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Cryogenic Engineering
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Scientific Products

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Buchler Instruments
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Kern
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Oxford Labs.
Welch Scientific

278. Diamond Knives
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Baird-Atomic
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Ealing
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281. Diffusion Pumps, Vacuum. See 838

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283. Dilatometers
Brinkmann Instruments
Cooke, Troughton and Simms
Custom Scientific Instruments
Gaertner Scientific
Wm. J. Hacker
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284. Diluters, Automatic
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Automation Products
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National Instrument
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285. Disintegrators, Biological Cell, Mechanical
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Brinkmann Instruments
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Kontes Glass
McDonald Engineering
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286. Disintegrators, Biological Cell, Ultrasonic
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Branson Instruments
Brinkmann Instruments
Bronwill Scientific Div., Will Scientific
Electro Sonic Systems
Instrumentation Associates
Powertron Ultrasonics
Radionics
Ultrasonic Industries

Distillation

287. Distillation Equipment, Hydrocarbon
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Hudson Industries
Instruments for Research & Industry
Metro Industries
Microchemical Specialties
Micro-Tek Instruments
Nester & Faust
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Precision Distillation Apparatus
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Consolidated Vacuum
Delmar Scientific Labs.
Hudson Industries Corp.
Instruments for Research & Industry
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Microchemical Specialties
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289. Distillation Equipment, Water. See 956



Versatility and Sensitivity In New Gas Chromatography Instrument Package From F&M

Versatility is the keynote of F & M gas chromatographic instrumentation. With the Model 720 Dual Column Programmed High Temperature Gas Chromatograph and the Model 1609 Flame Ionization Attachment, many different operating modes are possible.

The dual columns of the Model 720 can be operated in four different ways, as compensating columns, as independent columns, in series, or with one column for single column operation.

Compensating Columns—With compensating columns the upper temperature limit to which a column can be programmed is greatly extended. Compensation of the baseline drift caused by substrate bleeding allows more accurate calculations and enables the utilization of automatic integrators.

Separate Independent Columns—With this arrangement two columns packed with different substrates can be installed for separate types of analyses. This eliminates downtime for column changing when a different sample is to be run.

Columns in Series—Connecting the columns in series permits the analysis of samples that were previously impossible without the use of dual detectors. This technique is very useful for the analysis of light hydrocarbons and permanent gases.

Single Column Operation—For scouting new column materials, single column operation is often more expedient. Once a column material is established, the compensation technique or another mode of operation is often used.

Flame Ionization Detection—The Model 1609 adds to this versatility the sensitivity of flame ionization detection. Either detection system can be used and less than a minute is required for switching from one to the other.

To further extend the versatility of the Model 720/1609 combination F & M offers a variety of sampling systems. For liquid samples a complete line of Hamilton Microliter Syringes is carried in stock. Also available from stock is the Model GV-10/11 Gas Sampling Valve for the reproducible introduction of gaseous samples and the Model SI-4 Solid Sample Injector for the analysis of any solid that will vaporize on heating.

For further information concerning the Model 720/1609 combination or any other F&M instrumentation, phone or write F & M Scientific Corporation, Avondale, Pennsylvania, 215-COlony 8-2281.

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291. Dosimeter Readers. See 637

292. Dosimeters. See 639

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296. Dry Ice Storage Cabinets
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297. Dust Collectors, Air Sampling
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J. B. Ficklen III
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Phoenix Precision Instrument
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298. Dust Free Cabinets
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301. Electrocardiographs
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Epsco
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Sanborn
Spacelabs
Starling

302. Electrocardiographs, Telemetering
Avionics Research Products
Beckman Instruments, Spinco Div.
Biocom
Epsco
Honig Labs.
Spacelabs
Starling
Telemedics
Thermolyne
Vector

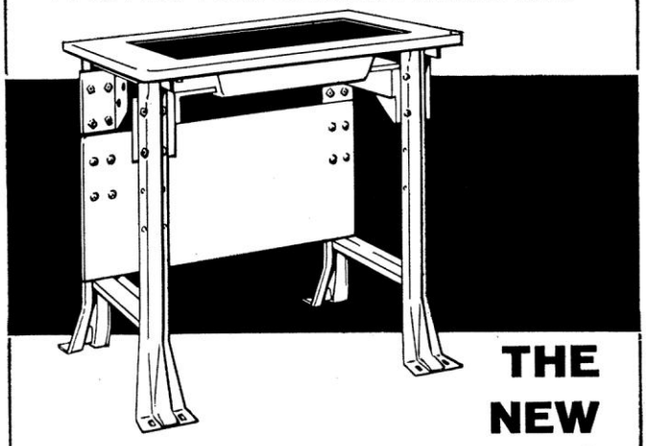
303. Electrodes pH. See 755

304. Electrodes, Spectrographic. See 924



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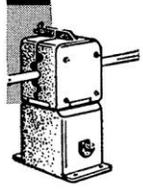
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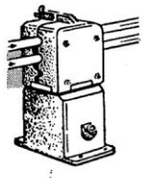
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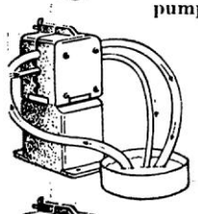
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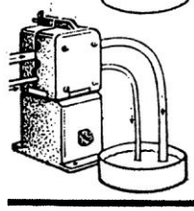
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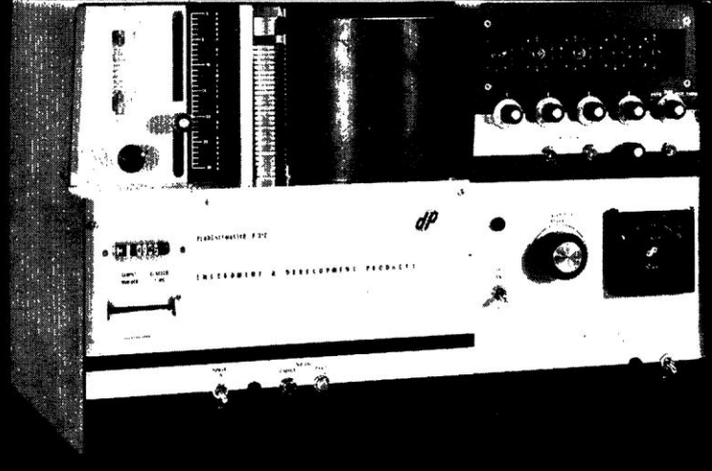
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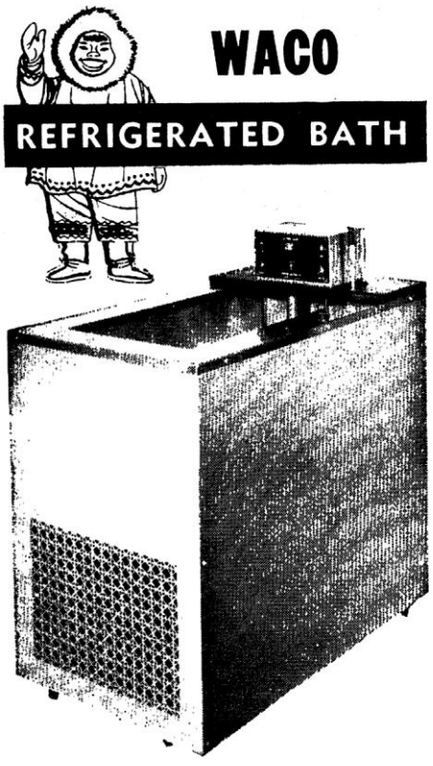
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306. Electrolytic Analyzers
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307. Electromagnets. See 507

308. Electrometers. See 640

309. Electron Diffraction Equipment
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Elion Instruments
General Electric, Industries Sales Operation
National Instrument Labs.
Philips Electronic Instruments
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310. Electron Microscope Shadow Casters, Vacuum Evaporators (for Sample Preparation)
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312. Electron Multipliers
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CBS Labs. Div., Columbia Broadcasting System
Nuclide Analysis Associates
Radionuclide Div., Nuclide

313. Electron Paramagnetic Resonance Equipment
Atomic Labs.
Elion Instruments
Strand Labs.
Varian Associates, Instrument Div.

314. Electron Probe Analyzers
Applied Research Labs.
Cambridge Instrument
Canal Industrial
Elion Instruments
Erb & Gray Scientific
Philips Electronic Instruments
Picker X-Ray

315. Electron Spin Resonance Equipment
Alpha Scientific Labs.
Atomic Labs.
Elion Instruments
Strand Labs.
Varian Associates, Instrument Div.

Electrophoresis

316. Electrophoresis Cells
American Instrument
Atomic Accessories
Beckman Instruments, Spinco Div.
Buchler Instruments
Consolidated Labs.
E-C Apparatus
Microchemical Specialties
Precision Glass Products
Research Specialties
Arthur H. Thomas

317. Electrophoresis Densitometers
Beckman Instruments, Spinco Div.
Buchler Instruments
Canal Industrial
E-C Apparatus
Gelman Instrument
National Instrument Labs.
Photovolt

318. Electrophoresis Equipment, Immuno.
Beckman Instruments, Spinco Div.
Brinkmann Instruments
Buchler Instruments
Colorado Serum
Consolidated Labs.
E-C Apparatus Corp.
Otto Hiller
LKB Instruments
Microchemical Specialties
National Instrument Labs.
Technicon Instruments

319. Electrophoresis Equipment, Liquid
American Instrument
Beckman Instruments, Spinco Div.
Buchler Instruments
LKB Instruments
Microchemical Specialties

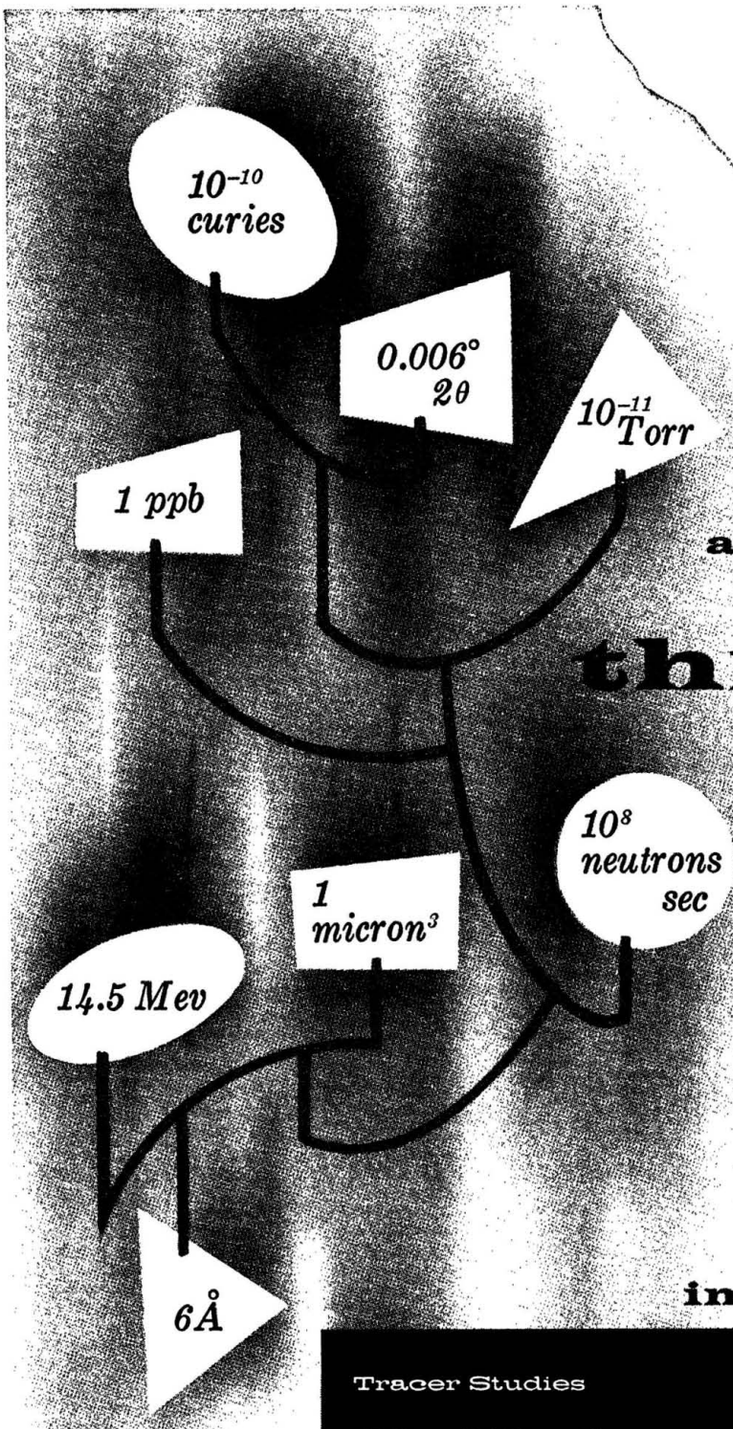
320. Electrophoresis Equipment, Liquid, Micro
American Instrument
Beckman Instruments, Spinco Div.
Buchler Instruments
Kern
Microchemical Specialties
National Instrument Labs.

321. Electrophoresis Equipment, Paper, Continuous Flow
Beckman Instruments, Spinco Div.
Brinkmann Instruments
Consolidated Labs.
Labline Instruments
Microchemical Specialties
Technicon Instruments

322. Electrophoresis Equipment, Paper Disk
Brinkmann Instruments

323. Electrophoresis Equipment, Paper Strip, High-Voltage
Beckman Instruments, Spinco Div.
Brinkmann Instruments
Buchler Instruments
Chromatography Corp. of America
Consolidated Labs.
E-C Apparatus
Ensco
Gelman Instrument
Gilson Medical Electronics
Polyanalyt
Research Specialties
Servonuclear
Technicon Instruments

324. Electrophoresis Equipment, Paper Strip, Low-Voltage
Beckman Instruments, Spinco Div.
Brinkmann Instruments
Buchler Instruments
Chromatography Corp. of America
Consolidated Labs.
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JKM Instrument
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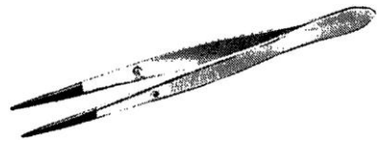
Scribe on glass



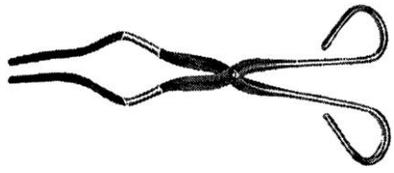
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326. Electrophoresis, Gel
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327. Electrophoresis, Glass Bead, Continuous Flow
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328. Electrophoresis, Paper-Strip Scanners
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(End of Electrophoresis)

329. Electroplating Analyzers
Manostat

330. Environmental Chambers
American Instrument
American Sterilizer
Associated Testing Labs.
Atlas Electric Devices
Autoclave Engineers
Baker
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Conrad
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Custom Scientific Instruments
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Precision Scientific
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331. Evaporators, Flash
Buchler Instruments
Kensington Scientific Corp.
Labline Instruments
LaPine Scientific
Precision Distillation Apparatus
VirTis

332. Evaporators, Metal. See 1048

333. Evaporators, Rotary Film
Buchler Instruments
Kensington Scientific Corp.
Labline Instruments
LaPine Scientific
Nester & Faust
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334. Exposure Meters, Photomicrographic. See 770

335. Extraction Apparatus, Fat
Delmar Scientific Labs.
Hudson Industries
Labline Instruments
Laboratory Construction
Metro Industries
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336. Extraction Apparatus, General Purpose
Cannon Instrument
Hudson Industries
Kensington Scientific Corp.
Kontes Glass
Labline Instruments
Metro Industries
Precision Distillation Apparatus

337. Eye Probes, Radiation Detecting. See 641

338. Fermentation Equipment
American Sterilizer
Hudson Industries
New Brunswick Scientific

339. Fetal Heart Monitors
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Electronic Medical Systems
Epsco
E & M Instrument
Instrumentation Lab.
Kenelco
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Parks Electronics Lab.
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340. Fiber Optics Probes
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American Optical
Avco, Research & Development Div.
Bausch & Lomb
Kollsman Instrument
Optics Technology

341. Fillers, Automatic. See 778

342. Film Badge Services. See 642

343. Film Badges. See 643

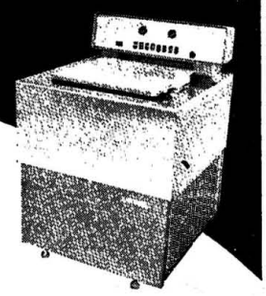
344. Film Reader, for Analyzing Photographic Films
Benson-Lehner
CBS Labs. Div., Columbia Broadcasting System
Engis Equipment
Fairchild Camera & Instrument, Defense Products Div.
Gaertner Scientific
Itek
Jarrell-Ash Co.
Optics Technology
Theta Instrument

Filtration

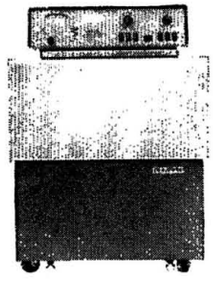
345. Filter Funnels
Ealing
Falcon Plastics Div., B-D Labs.
Gelman Instrument
Kontes Glass
Labco International
Metro Industries
Pall
Pioneer Plastics
Scientific Glass Apparatus
Selas Flotronics
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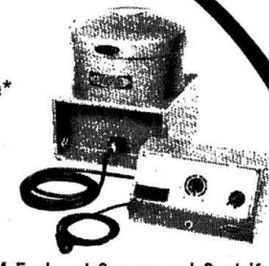
RC-2 Automatic Superspeed Refrigerated Centrifuge* — 17,500 rpm — 37,000 x G
Accepts six different rotors on Gyro-Action direct drive



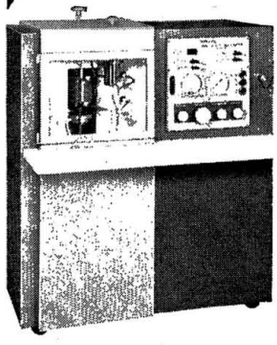
RC-3 Automatic Refrigerated Centrifuge — 5,000 rpm — 5,140 x G — 70 seconds to top speed, 90 seconds to stop. Ideal for routine operations



SS-3 Automatic Superspeed Centrifuge* — 17,000 rpm — 34,800 x G with push-button simplicity and armor-plate safety

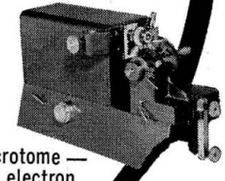


SS-4 Enclosed Superspeed Centrifuge* — 17,000 rpm — 34,800 x G with removable control panel for cold room or fume hood use



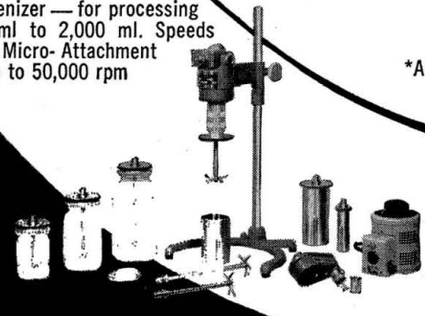
Ribi Refrigerated Cell Fractionator — for isolating cell walls and subcellular particles of the cytoplasm



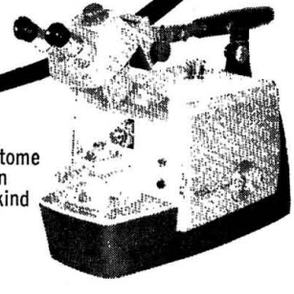


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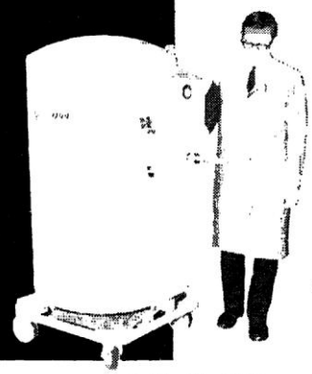
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Pharmacia Fine Chemicals

347. Filter Paper
Allied Chemical, General Chemical Div.
Ealing
Eaton-Dikeman
Gelman Instrument
Pall
H. Reeve Angel
E. H. Sargent
Carl Schleicher & Schuell

348. Filter Presses
Gelman Instrument
Sethco

349. Filter Pulp
Allied Chemical, General Chemical Div.
Johns-Manville, Celite Div.
H. Reeve Angel
Carl Schleicher & Schuell
Sethco

350. Filters, Bacteriological
Barnstead Still and Sterilizer
Brinkmann Instruments
Custom Scientific Instruments
Fisher Scientific
Gelman Instrument
Karl Heitz
F. R. Hormann
Matthews Research
Millipore Filter
H. Reeve Angel
Carl Schleicher & Schuell
Selas Corp. of America
Selas Flotronics
Sethco
VirTis

351. Filters, Membrane
Barnstead Still and Sterilizer
Gelman Instrument
LKB Instruments
Millipore Filter
Paillard
Pall
Carl Schleicher & Schuell
Selas Corp. of America
United States Stoneware

352. Filters, Optical, Colored Glass
Applied Instruments
Baird-Atomic
Bausch & Lomb
Ealing
Ednalite
Esco Products
Fairchild Camera & Instrument
Wm. J. Hacker
R. M. Lynn
Penn Optical
Phoenix Precision Instrument
Republic Lens
Tiffen Optical
G. K. Turner
Carl Zeiss

353. Filters, Optical, Interference
Applied Instruments
Baird-Atomic
Bausch & Lomb
Eastman Kodak
Ercona
Fairchild Camera & Instrument
Fish-Schurman
Wm. J. Hacker
Isomet
LKB Instruments
Max Levy
R. M. Lynn
National Instrument Labs.
Optics Technology
Penn Optical
Phoenix Precision Instrument
Photovolt
Republic Lens
Tiffen Optical
Carl Zeiss

354. Filters, Polarizing
Applied Instruments
Baird-Atomic
Ednalite
Wm. J. Hacker
Karl Heitz
Instruments for Research & Industry
Paillard
Phoenix Precision Instrument
Tiffen Optical
Carl Zeiss

(End of Filtration)

355. Flame Photometers
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Beckman Instruments, Scientific and Process Instruments Div.
Coleman Instruments
Eldorado Electronics
Epic
Gelman Instrument
Instrumentation Associates
Keyes Scientific
National Instrument Labs.
Optomechanisms
Process & Instruments
Research & Control Instruments
Schoeffel Instrument
Technicon Instruments
Waters Associates
Carl Zeiss

356. Flame Spectrophotometers. See 939

357. Flash Point Testers
Brinkmann Instruments
Fisher Scientific
Labline Instruments
Precision Scientific
Schuco Scientific Div., Schueler

358. Flash X-ray Systems
Field Emission

359. Flasks, Culture. See 248

360. Flasks, Dewar. See 275

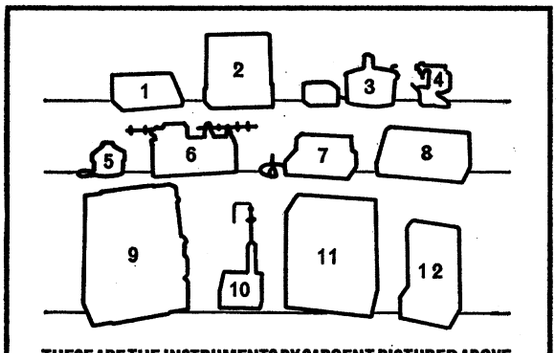
361. Flasks, Spinner
Bellco Glass
Kontes Glass

362. Flow Counters. See 626

363. Flow Meters, Gas
B-I-F Industries
Barton Instrument
C-Mar Instrument
Cox Instruments
F. W. Dwyer
Eclipse Fuel Engineering
Fischer & Porter
Fisher Scientific
Foxboro
Gelman Instrument
General Electric, Instrument Dept.
Roger Gilmont Instruments
E. Vernon Hill
Industrial Instrument
Instrumentation Associates
Kahl Scientific Instrument
MKS Instruments
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National Instrument Labs.
Ohio Chemical & Surgical Equipment
Penn Meter
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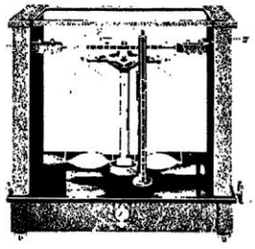
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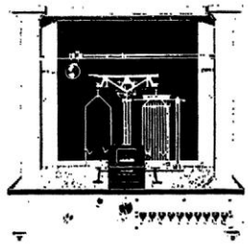
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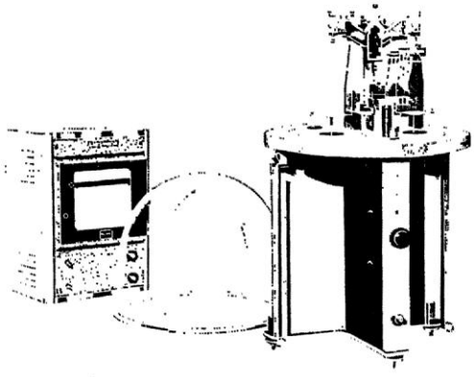
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Gelman Instrument
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Roger Gilmont Instruments
G. M. Manufacturing
Gulton Industries
Wm. J. Hacker
Hydropoise
Industrial Instrument
Manostat
Medicon Div., Quality Precision Products
Metro Industries
Penn Meter
Phoenix Precision Instrument
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Spacelabs
Standard Controls
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General Electric, Industrial Sales Operation
Liquid Metals
Medicon Div., Quality Precision Products

366. Fluid Dispensers
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Instrumentation Specialties
Kahlenberg Globe Equipment
Kensington Scientific Corp. of California
Kontes Glass
National Instrument
Research Specialties

367. Fluorometers, Photoelectric. See 920

368. Foils, Neutron Activation. See 644

369. Foods, Animal. See 34

370. Fraction Collectors, Gas. See 162

371. Fraction Collectors, Liquid. See 172

372. Fractionators, Countercurrent. See 217

373. Fractionators, Density Gradient. See 256

374. Freeze Drying Equipment, Laboratory
American Instrument
American Sterilizer
Associated Testing Labs.
Canal Industrial
Hotpack
Instrumentation Associates
Kontes Glass
LaPine Scientific
Missimers
New Brunswick Scientific
Pall
RePP Industries
F. J. Stokes
VirTis

375. Freezing Point Determination Equipment
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American Instrument
Automation Products
Conrad
Wm. J. Hacker
Industrial Instruments
Precision Scientific
Texas Instruments

376. Frequency Analyzers, Electrical
Anadex Instruments
Boonshaft & Fuchs
Electronic Designs Div., Maxson Electronic
Ensco
General Radio
Hewlett-Packard
London
Minneapolis-Honeywell, Heiland Div.
Minneapolis-Honeywell Regulator, Industrial Products Group
Muirhead Instruments
Ortho Industries
Sierra Electronic Div., Philco

377. Frequency Analyzers, Radio
Automation Industries
General Applied Science Labs.
General Radio
ITEK
H. H. Scott
Sierra Electronic Div., Philco

378. Frequency Analyzers, Sound
Electronic Applications
General Applied Science Labs.
General Radio
Minneapolis-Honeywell Regulator, Industrial Products Group
Quan Tech Labs.
H. H. Scott

Furnaces

379. Furnaces, Combustion. See 200

380. Furnaces, Crucible
Blue M Electric
Jelrus Technical Products
Lindberg Engineering
Lucifer Furnaces
Thermolyne

381. Furnaces, Crystal Growing
Autoclave Engineers
Despatch Oven
Kinney Vacuum
Lindberg Engineering
A. D. Little
Materials Research
NRC Equipment
Strong Electric
Westinghouse, Scientific Equipment Dept.

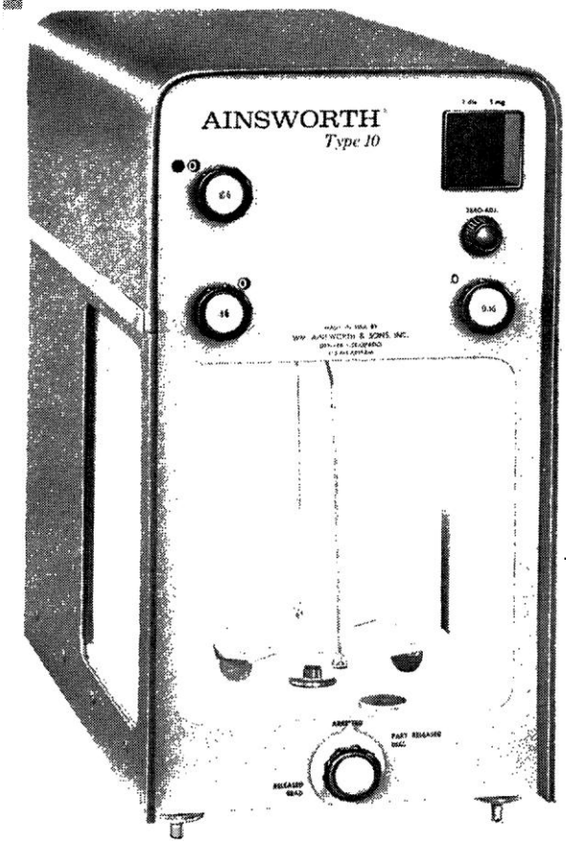
382 Furnaces, Induction
Fisher Scientific
General Electric Industrial Sales Operation
Laboratory Equipment
Lepel High Frequency Labs.
NRC Equipment
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383 Furnaces, Laboratory, General Purpose
Abar
Baird-Atomic
Blue M Electric
D. Brew
Brinkmann Instruments
Conrad
Despatch Oven
Grieve Hendry
General Electric, Industrial Sales Operation
C. I. Hayes
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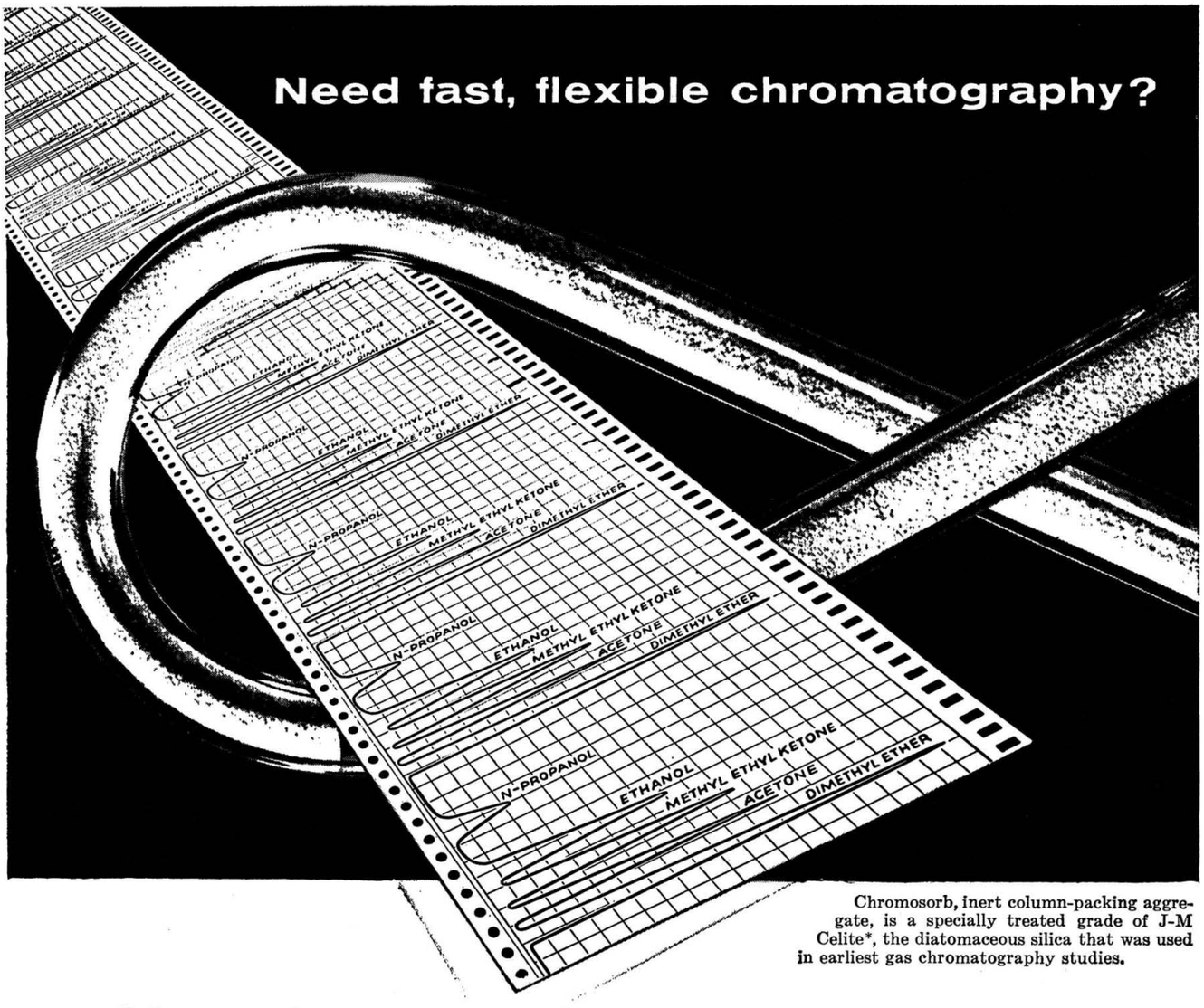
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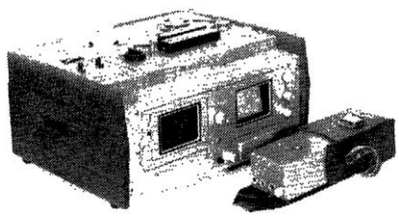
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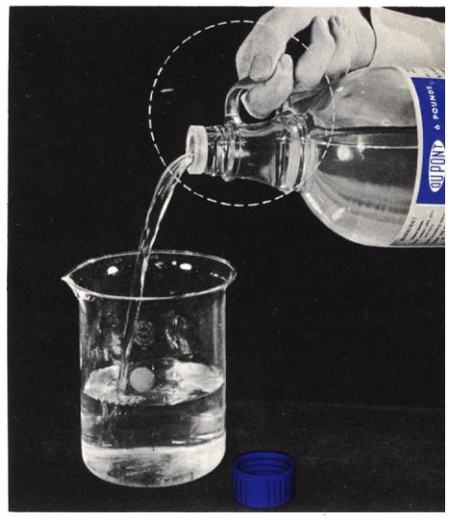
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Acetic Acid (CH_3COOH)	Min. 99.7%
Residue after Evaporation	Max. 0.0010%
Chlorides as Cl	Max. 0.00005%
Sulfates as SO_4	Max. 0.00005%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Substances reducing $KMnO_4$	Pass ACS Test
Dilution Test	Pass ACS Test

HYDROCHLORIC ACID REAGENT

Hydrochloric Acid (HCl)	Min. 36.5%, Max. 38.0%
Sulfites as SO_3	Max. 0.00008%
Sulfates as SO_4	Max. 0.00008%
Free Chlorine (Cl)	Max. 0.00005%
Heavy Metals as Pb	Max. 0.00005%
Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00001%
Arsenic (As)	Max. 0.000001%
Ammonium (NH_4)	Max. 0.0003%

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HYDROCHLORIC ACID REAGENT

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NITRIC ACID REAGENT

NITRIC ACID REAGENT

Nitric Acid (HNO_3)	Min. 69.0%, Max. 71.0%
Chlorides as Cl	Max. 0.00005%
Residue after Ignition	Max. 0.0004%
Heavy Metals as Pb	Max. 0.00002%
Sulfates as SO_4	Max. 0.00008%
Iron (Fe)	Max. 0.00002%
Arsenic (As)	Max. 0.0000005%

SULFURIC ACID REAGENT

Sulfuric Acid (H_2SO_4)	Min. 95.0%, Max. 98.0%
Nitrate (NO_3)	Max. 0.00005%
Chloride as Cl	Max. 0.00002%
Ammonium as NH_4	Max. 0.0001%
Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Arsenic (As)	Max. 0.0000005%
Substances reducing Permanganate as SO_2	Max. 0.0001%

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AMMONIUM HYDROXIDE REAGENT

Ammonia (NH_3)	Min. 28.0%, Max. 30.0%
Chlorides as Cl	Max. 0.00005%
Phosphates as PO_4	Max. 0.00005%
Heavy Metals as Pb	Max. 0.00005%
Substances reducing Permanganate as SO_2	Max. 0.002%
Carbon Dioxide (CO_2)	Max. 0.002%
Residue after Ignition	Max. 0.0003%
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Iron (Fe)	Max. 0.00002%

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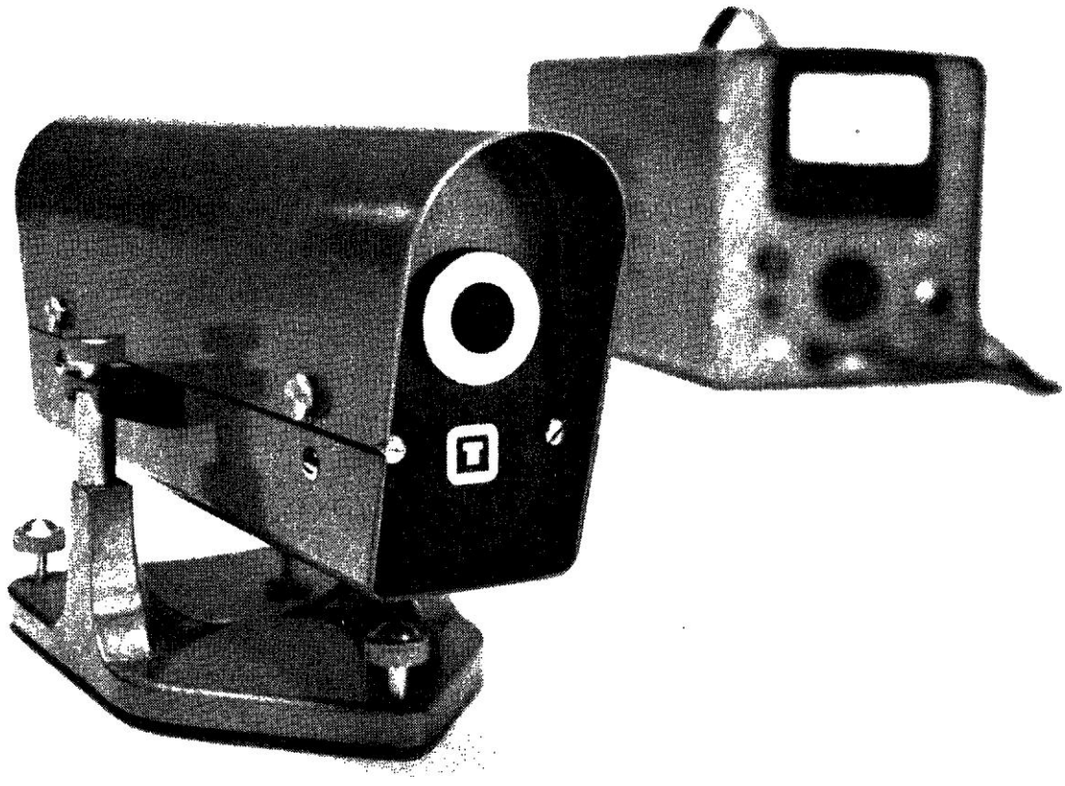
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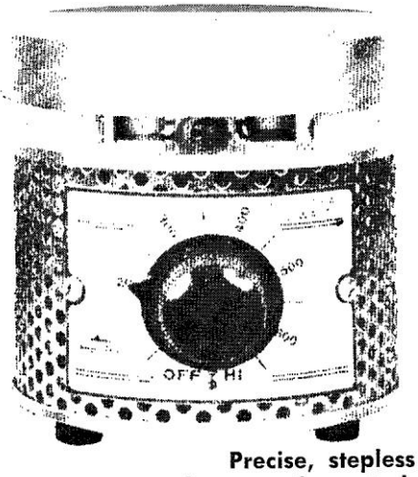
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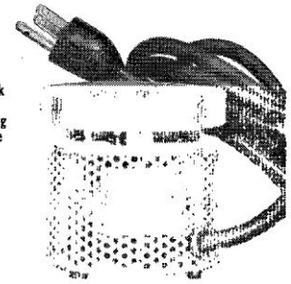
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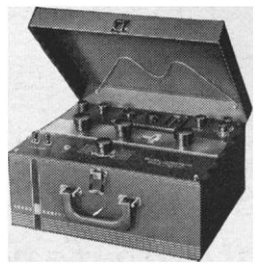
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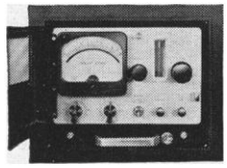
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The use of this three-dial 8686 Portable Potentiometer is rapidly spreading in research laboratories. It features a central reading window . . . where measured values appear as a row of digits plus a scale value . . . for rapid reading of test results. This instrument has a wide operating range of −10.1 to +100.1 mv and an accuracy of ±(0.05% of reading +3μv) without reference junction compensation; ±(0.05% of reading +6μv) with ref. jct. comp. Write for Data Sheet E-33(1a).

TO MAKE OXYGEN MEASUREMENTS RAPIDLY, ACCURATELY



For measurements of O_2 in medical and environmental research, in combustion processes and in testing applications, the new L&N 7308-G Thermo-Magnetic Oxygen Analyzer features maintenance-free operation, quick calibration against air and compact size (9-1/2″ x 11-1/2″ x 16-3/8″).

Available in three standard ranges, 0-5%, 0-10% or 0-25% O_2, this Analyzer has a sensitivity of 0.05% O_2 and an initial response of 2 seconds. A meter providing continuous O_2 indication and/or a Speedomax G or H millivolt recorder may be used. Write for Data Sheet ND46-91 (3).

TO OBTAIN DRIFT-FREE MEASUREMENTS OF pH AND REDOX



Only one initial calibration setting is required on the L&N Stabilized pH Indicator. Synchronous conversion of d-c input with amplification eliminates zero-drift. An electronic converter provides d-c feedback to stabilize gain. Ranges are 0 to 14 pH, in 0.1 pH divisions, and for measuring redox potentials, 0 to ± 700 mv and ± 1400 mv—both in 10 mv divisions. Write for Folder E-96(4).

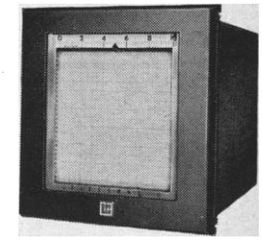
TO MAKE CONTINUOUS CONDUCTIVITY MEASUREMENTS "ON-LOCATION"



This continuous indicating Conductivity Monitor is competely transistorized. It is provided with a linear scale calibrated 0 to 100 micromhos/cm (scale reading is multiplied by cell constant). Lightweight, the Monitor is extremely convenient for checking in the laboratory or on the process line. Exceptional design permits automatic or manual compensation . . . provides d-c output signal for recorder or other data-logging equipment. Write for Data Sheet E-95(3).

With L&N Automated Equipment

TO RECORD TEMPERATURE & MILLIVOLTS MEASUREMENTS



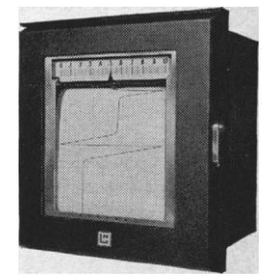
These compact, low-cost Speedomax® H Recorders are widely used in laboratories for measuring temperatures, millivolts, pH, gas chromatography, etc. With interchangeable ranges—50 for temperature and six for millivolt (0 to 1, 0 to 5, 0 to 10 mv, etc.)—these instruments will record practically any variables encountered in research work with a limit of error of ±0.3% of span. Write for Data Sheet ND46-51(100).



TO MAKE FAST, ACCURATE POLAROGRAPHIC ANALYSES

For analyzing metals, organics or biochemicals in solution, the combination of the L&N Electro-Chemograph® and Polarotron® is unmatched in accuracy and speed. The Electro-Chemograph provides: fast determination — one-second recorder balancing time for full scale travel; minimum error—polarizing accuracy to 4 mv. The Polarotron facilitates time-saving operation; stable (reference) half-cell comes prepared for immediate use. Write for Data Sheet E-97(1).

TO RECORD TEMPERATURES WITH AN ACCURACY OF ±0.01 C

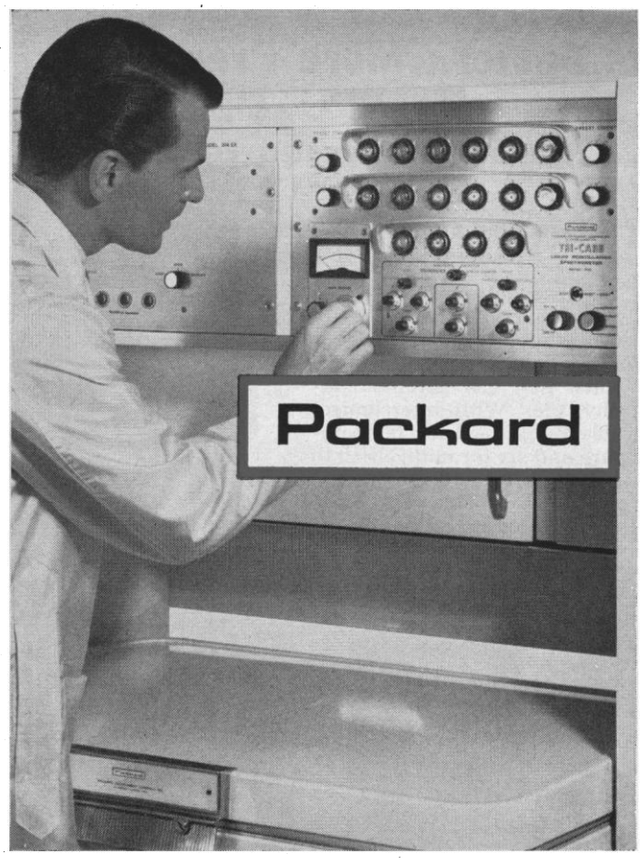


Invaluable in advanced research laboratories, this High Precision Speedomax G Recorder is used with L&N Resistance Thermometers for a variety of temperature measurements over a range of −190 to +500 C with an accuracy of ±0.01 C. An "automatic Mueller Bridge," this recorder is used in cryoscopic determinations of purity, in measuring boiling ranges of liquids and in general calorimetry, etc. Write for Data Sheet E-ND46(7).

These are only a few of the modern, precise instruments that L&N provides for today's exacting research requirements. For further details, write to Leeds & Northrup Co., 4926 Stenton Ave., Philadelphia 44, Pa.

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BE SURE TO REQUEST YOUR COPY OF BULLETIN AD-1016 DESCRIBING THE COMPLETE PACKARD LINE. ☐

TRI-CARB® *liquid scintillation spectrometers*

There are 9 Tri-Carb Liquid Scintillation Counting Systems in a wide range of prices for counting alpha and beta-emitting isotopes such as Carbon-14 and Tritium. Manual, semi-automatic or automatic operation for counting up to 200 samples in either non-refrigerated or refrigerated systems. Fully transistorized for maximum reliability and reproducibility. Available in single or multiple-channel models.

☐ **Bulletin AD-1002**

AUTO-GAMMA® *spectrometers*

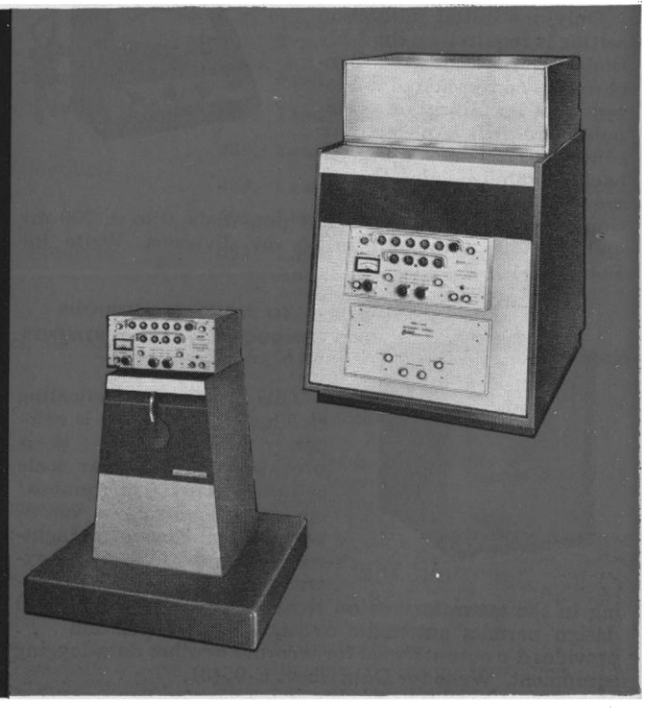
From manual spectrometer and detector to completely automatic gamma detection systems with automatic sample changer and printer, the Packard line has the instrumentation for your laboratory. Unique "narrow-window" and expander-amplifier circuitry enables more accurate definition of true photopeaks and decreases calibration time significantly. 100 sample capacity changer with constant background is an additional system feature.

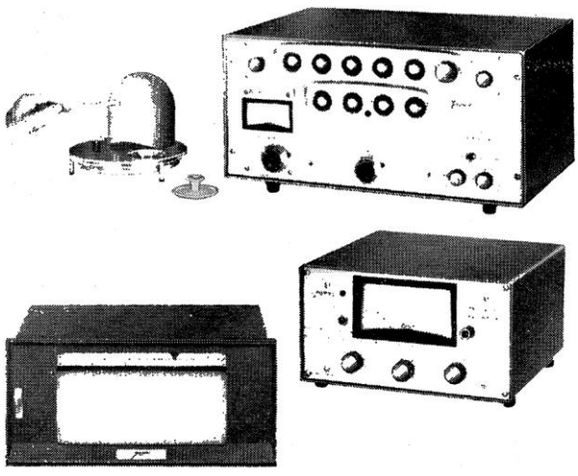
■ Bulletin AD-1004

ARMAC® *scintillation detector*

For counting radioactivity in small animals, bulk samples and as an arm-only counter for humans the Armac is unequalled for speed, simplicity and sensitivity. The Armac Detector is designed to measure any gamma emitter with energies in excess of 70 kev as well as the Bremmstrahlung from hard beta emitters such as P^{32} and Sr^{90}. High sensitivity and excellent counting geometry permit the use of minute quantities of radioisotopes well below established tolerance levels.

■ Bulletin AD-1005





gas flow counters and scalers

Two types of counter available—window or windowless for Geiger and proportional counting. Eliminates aging effects that are encountered in sealed counting tubes. Gives essentially unlimited counter life. Full 2 pi geometry for maximum counting efficiency, low background count, and maximum sensitivity for counting solid samples that emit soft radiations.

Packard scalers when used with appropriate detectors provide an integral count of radioactive samples. Decade timer reads in hundredths of minutes up to 100 minutes. Decade scaler has a 1 million count capacity with resolving time of 1 microsecond. A precision discriminator with a front panel helical potentiometer is provided for integral type pulse height analysis.

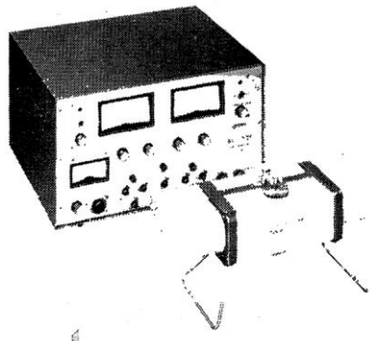
☐ Bulletin AD-1007

ratemeters and recorders

For differential counting of radioactive samples Packard offers single or dual channel ratemeters with a five decade log range and nine linear ranges. The Ratemeter may be used to drive a separate strip chart recorder in conjunction with Packard Spectrometers or Scalers.

Packard offers recorders having 5 or 11 inch chart widths, single or double ballpoint pen, self-balancing, 1 second full span pen travel and 1, 10 and 100 millivolt sensitivity full scale.

☐ Bulletin AD-1011

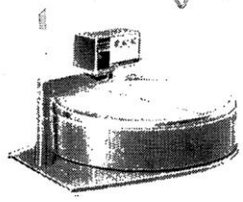


TRI-CARB®* *flow monitor / flow detectors

The Flow Detector automatically and continuously detects peaks of radioactivity in the effluent stream from gas or column chromatographs. C^{14} activity in amino acids has been measured with counting efficiencies of 25-30%, with backgrounds on the order of 20-25 cpm.

The Flow Monitor contains the electronic circuitry and self-contained ratemeters. Coincidence circuitry plus dual channels of pulse height analysis permit accurate count of two isotopes simultaneously.

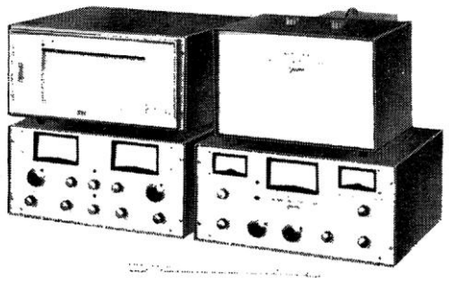
☐ Bulletin AD-1003



column fraction collectors

Automatic Fraction Collectors for drop and/or time counting operations and capacities from 100 to 400 standard size test tubes allow choice of instrumentation to fit the needs of any laboratory. For collecting the effluent from a column chromatograph, adjustments are provided for time operation from 0.01 to 100 minutes and from 1 to 10^4 drops for drop counting. Volumetric operation is optional.

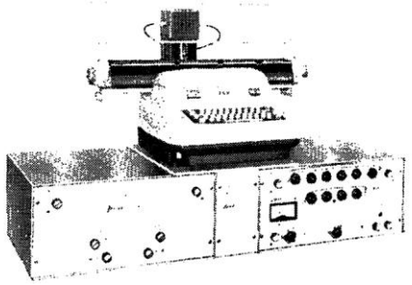
☐ Bulletin AD-1012



gas chromatography systems

New gas chromatography systems make it convenient to collect and count radioactivity in the effluent gas. Systems consist of an oven, proportional temperature controllers, regulated DC power supply and ionization detectors. Either a straight column oven or a compact coiled column oven are available and each has provision for mounting two columns and running them simultaneously and independently. A pre-heater oven and a detector oven with an argon ionization detector is supplied with each column.

☐ Bulletin AD-1015



radiochromatogram scanner

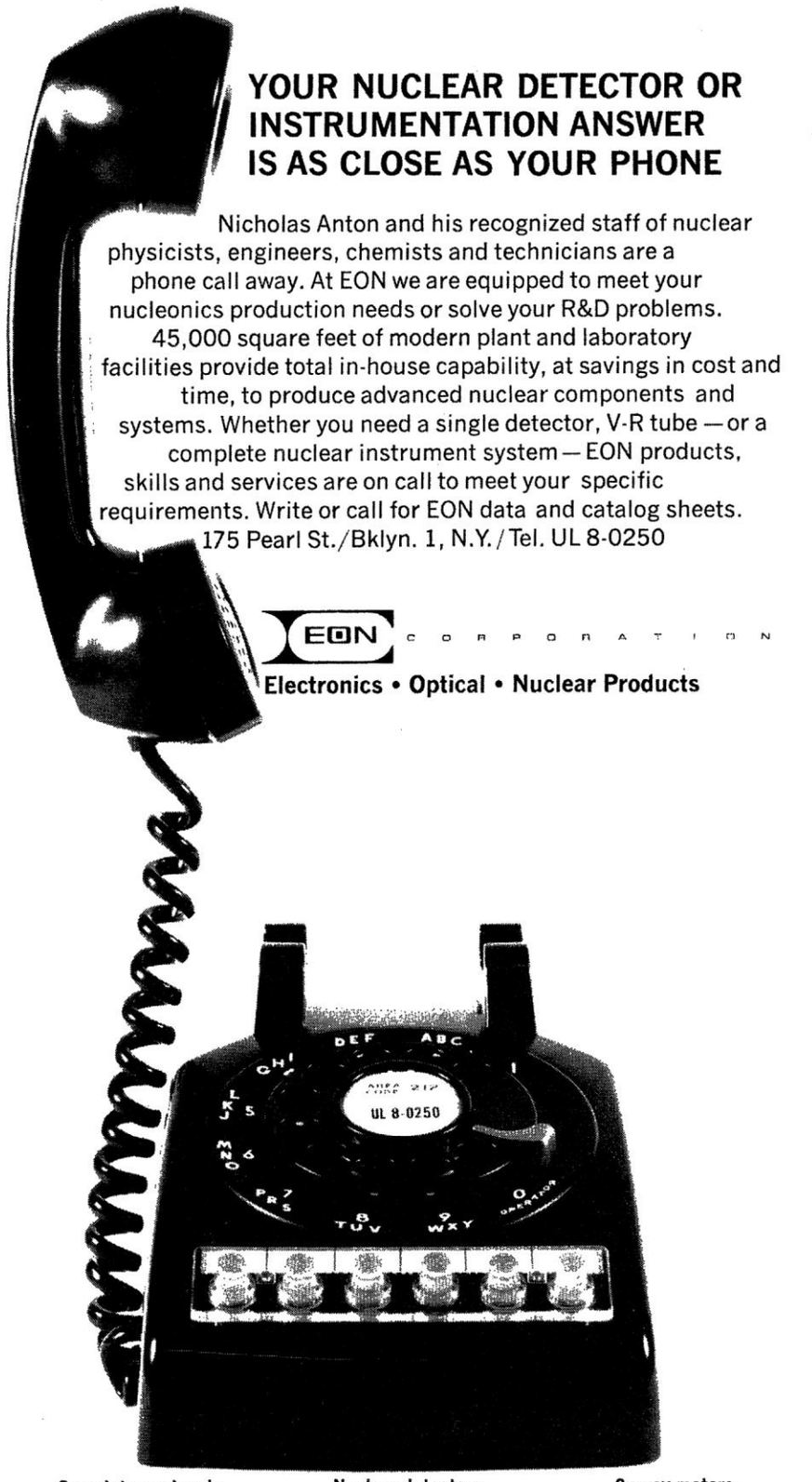
For rapid location and measuring of radioactivity on paper chromatograms. Examines a complete bi-dimensional chromatogram and presents digital information of the location, zone shape and amount of radioactivity present. Active zones are shown in red digits—intermediate activity in black. Maximum individual area resolution is less than 0.05 $in.^2$ for sheets. For strips, the maximum resolution is achieved with steps 0.167 inch long.

☐ Bulletin AD-1009

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Farrand Optical
Flight Research
Wm. J. Hacker
Hershey
Kemlite Labs.
Macbeth
Sage Instruments
Sanders Labs.
Schoeffel Instrument

494. Light Sources, Hollow Cathode
Hershey
Jarrell-Ash
Micro-Tek Instruments

495. Light Sources, Infrared
Beckman Instruments
Electronic Communications
Wm. J. Hacker
Kemlite Labs.
Measurement Systems
Pinlite Div., Kay Electric
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496. Light Sources, Microscope. See 542

497. Light Sources, Stroboscopic
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Central Scientific
Chadwick Helmuth
Communication Measurements Lab.
Edgerton, Germeshausen & Grier
Flight Research
General Radio
Hershey
Hurletron
Kahl Scientific Instrument
Kemlite Labs.
Minneapolis-Honeywell, Heiland Div.
Stansi Scientific
Herman H. Sticht

498. Light Sources, Ultraviolet
Atomic Labs.
Beckman Instruments
Black Light Eastern
Burton Medicquipment
Canal Industrial
Central Scientific
Farrand Optical
Geophysics Corp. of America
Wm. J. Hacker
Jarrell-Ash
Kemlite Labs.
McPherson Instrument
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O. C. Rudolph & Sons
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Carl Zeiss

499. Light Sources, Zirconium
Burton Medicquipment Co.
Wm. J. Hacker
O. C. Rudolph & Sons
Schoeffel Instrument
Perfection Mica

(End of Light Sources)

500. Liquid Scintillation Counting Systems. See 663, 664

501. Liquefied Gas Containers. See 236

502. Liquefiers, Gas, Cryogenic. See 237

503. Low-Level Counting Systems. See 665

504. Magnet Systems, Solenoid Type for Plasma Studies
Magnion
Westinghouse Electric

505. Magnetic Shielding
Perfection Mica

506. Magnetometers, Oceanographic. See 712

507. Magnets, Electric, High-Power
Alpha Scientific Labs.
Atomic Labs.
Harvey-Wells
Laboratory for Science
Magnion
Nuclide Analysis Associates
Spectro Magnetic Industries
Sunshine Scientific Instrument
Varian Associates, Instrument Div.

508. Magnets, Electric, Super Conducting
Andonian Associates
Cryo Sonics
Harvey-Wells
Magnion
Westinghouse Electric

509. Magnets, High Field, Pulsed
Magnion
Pearson Electronics

510. Magnets, Permanent Type
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Eriez Magnetics
Indiana General
Nuclear Analysis Associates
Permanent Magnet
Varian Associates

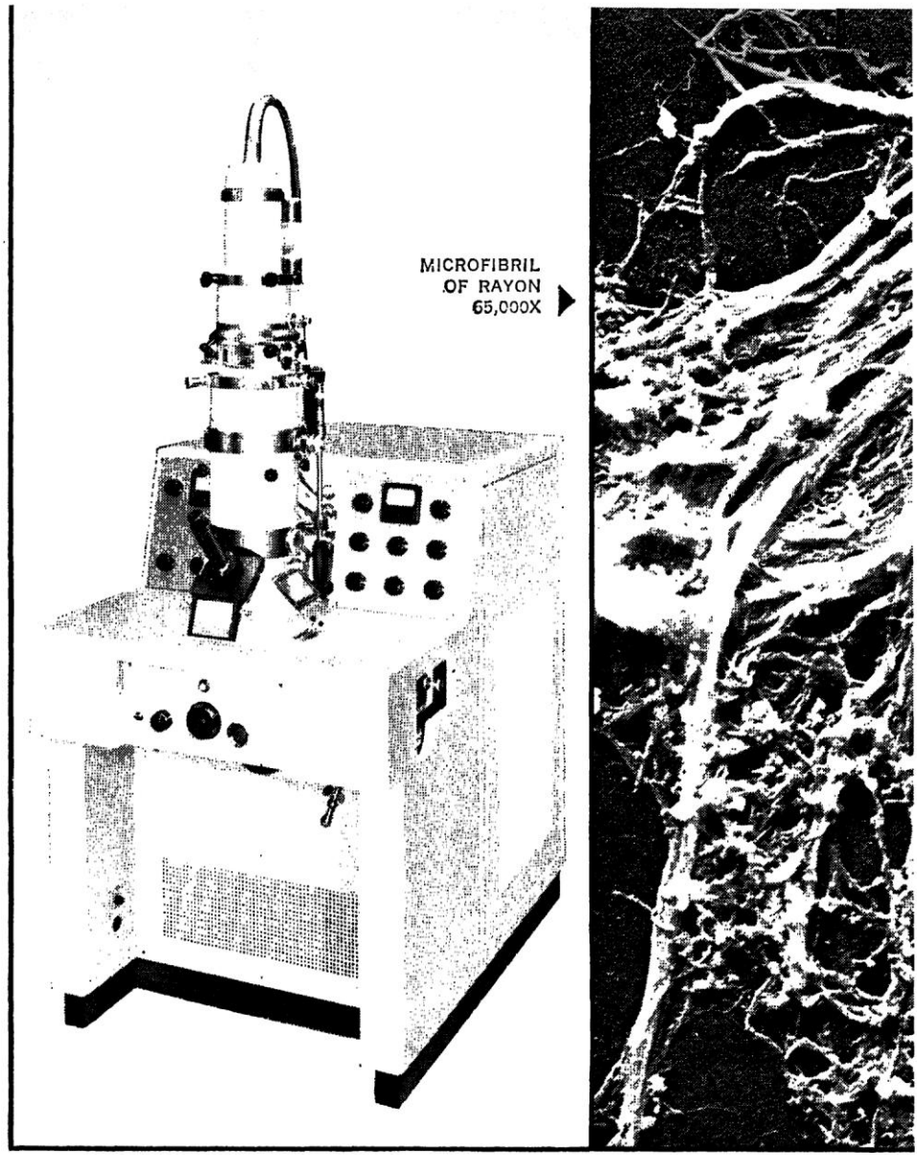
511. Magnifiers, Comparator Type for Measuring
American Thermo Ware
Bausch & Lomb
Ealing
Engis Equipment
Finescale
Gaertner Scientific
Goldberg Instrument
W. & L. E. Gurley
Luxo Lamp
Nikon
Carl Zeiss

512. Magnifiers, Laboratory Type
American Thermo Ware
Bausch & Lomb
Central Scientific Div., Cenco Instruments
Ercona
Carl Zeiss

513. Magnifiers, Stereo
American Thermo Ware
Bausch & Lomb
Engis Equipment
Ercona
Finescale
E. Leitz
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514. Manipulators, Master-Slave. See 666

515. Manometers
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Atomic Labs.
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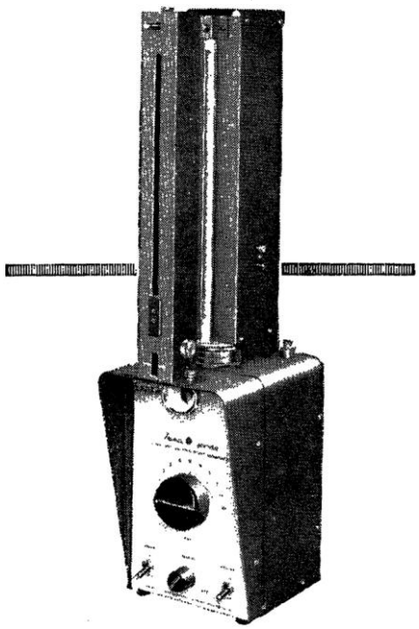
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THE HOOVER MELTING POINT APPARATUS, "Uni-Melt," which is rapidly becoming a standard instrument for determination of capillary melting points, has recently been improved to overcome fluctuation in laboratory lighting. Glareless illumination, restricted to the scale of the thermometer, is provided by an 8-watt fluorescent lamp in ventilated metal housing. More sharply visible thermometer meniscus promotes greater accuracy and decreases the time for a series of determinations especially when used with the Periscopic Thermometer Reader.

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For more detailed description, see pp 624-625 of our 1961 catalog

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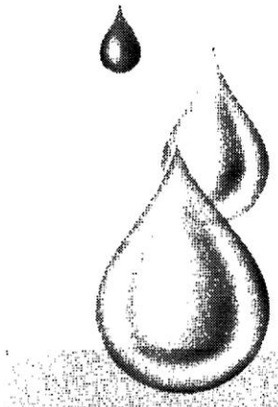
534. Microforge, for Making Tools for Micromanipulators
Aloe Scientific Div., Brunswick
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Brinkmann Instruments
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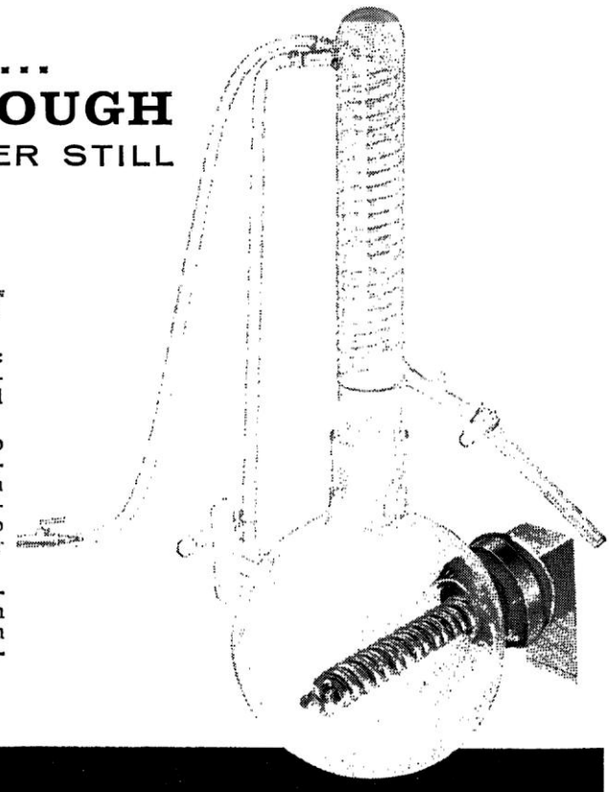


COMPACT: Only 3 components: condenser, boiling reservoir, immersion heater (automatic overload protected).

INGENIOUS: Reservoir fills from tap and automatically maintains constant water level. Cooling water in condenser recycles to boiling reservoir . . . *preheated.* Steam trap allows only vapor to enter condenser -- no solids.

EFFICIENT: Distillate produced is pyrogen free and analyses have shown it to contain less than one part in 10 millions of iron, copper, chromium or nickel.

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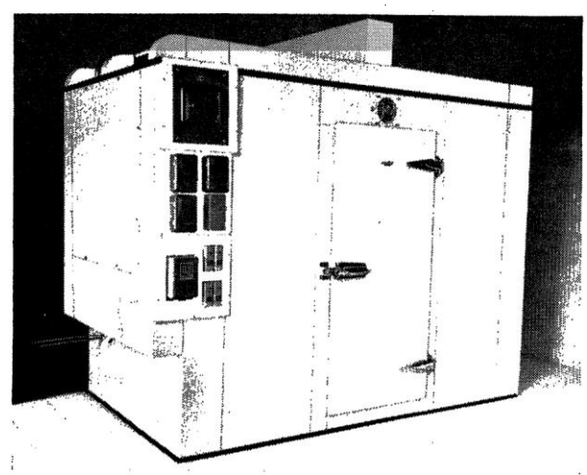


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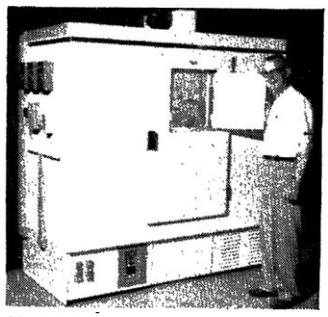
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PLANT GROWTH LAB

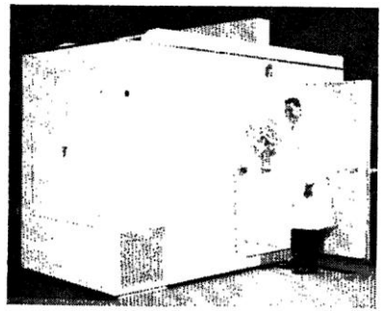
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Model PGC-78—Compact, portable model with self-contained unit. Inside working area 30″ x 52″.



Model PGW-132—Basically the same as PGW-108 except refrigeration unit is self-contained.

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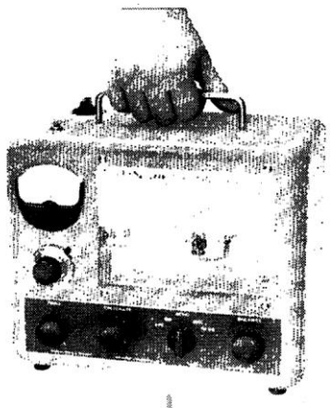
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BALANCE

to 0.1 microgram (10^{-7} grams)
Capacity: 1.5 grams

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537. Microphones, Sound Pressure Type. See 713

538. Microphones, Heart Sound
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539. Microprojectors
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Criterion
Eberbach
Elgeet Optical
Wm. J. Hacker
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540. Microscope Cameras. See 768, 769

541. Microscope Cover Glasses
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542. Microscope Illuminators, General Purpose
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543. Microscope Illuminators, Infrared
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546. Microscope Illuminators, Xenon Flash
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549. Microscope Slide Labels
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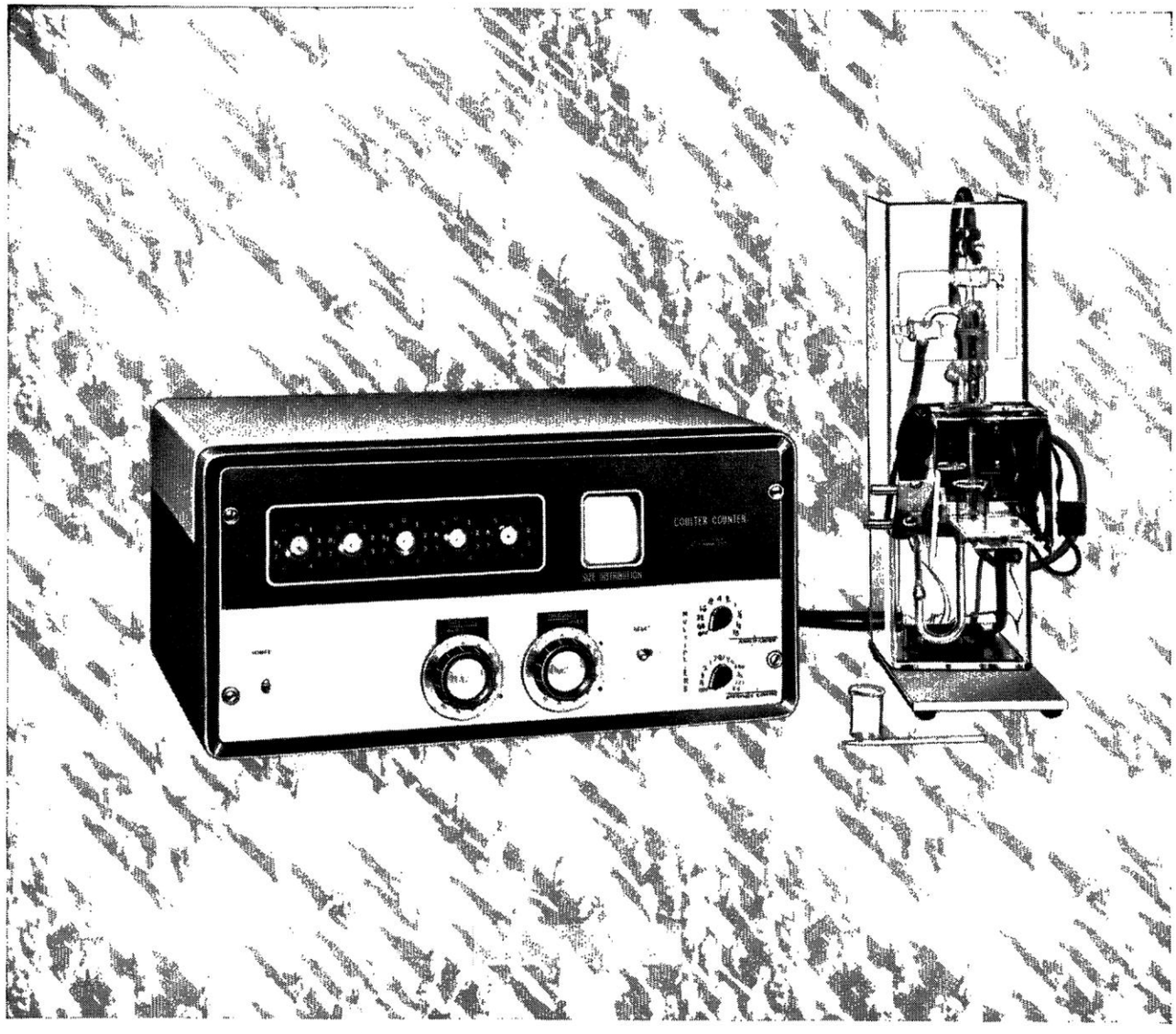
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551. Microscopes, Electron. See 311

552. Microscopes, Fluorescence
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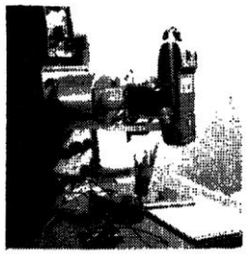
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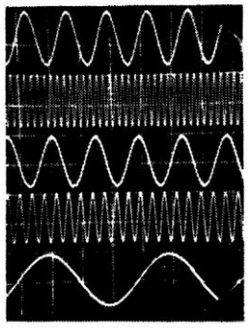
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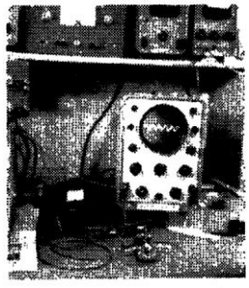
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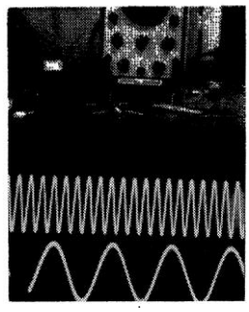
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556. Microscopes, Metallurgical. See 526

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564. Microscopes, Television. See 980

565. Microscopes, Toolmaker Type
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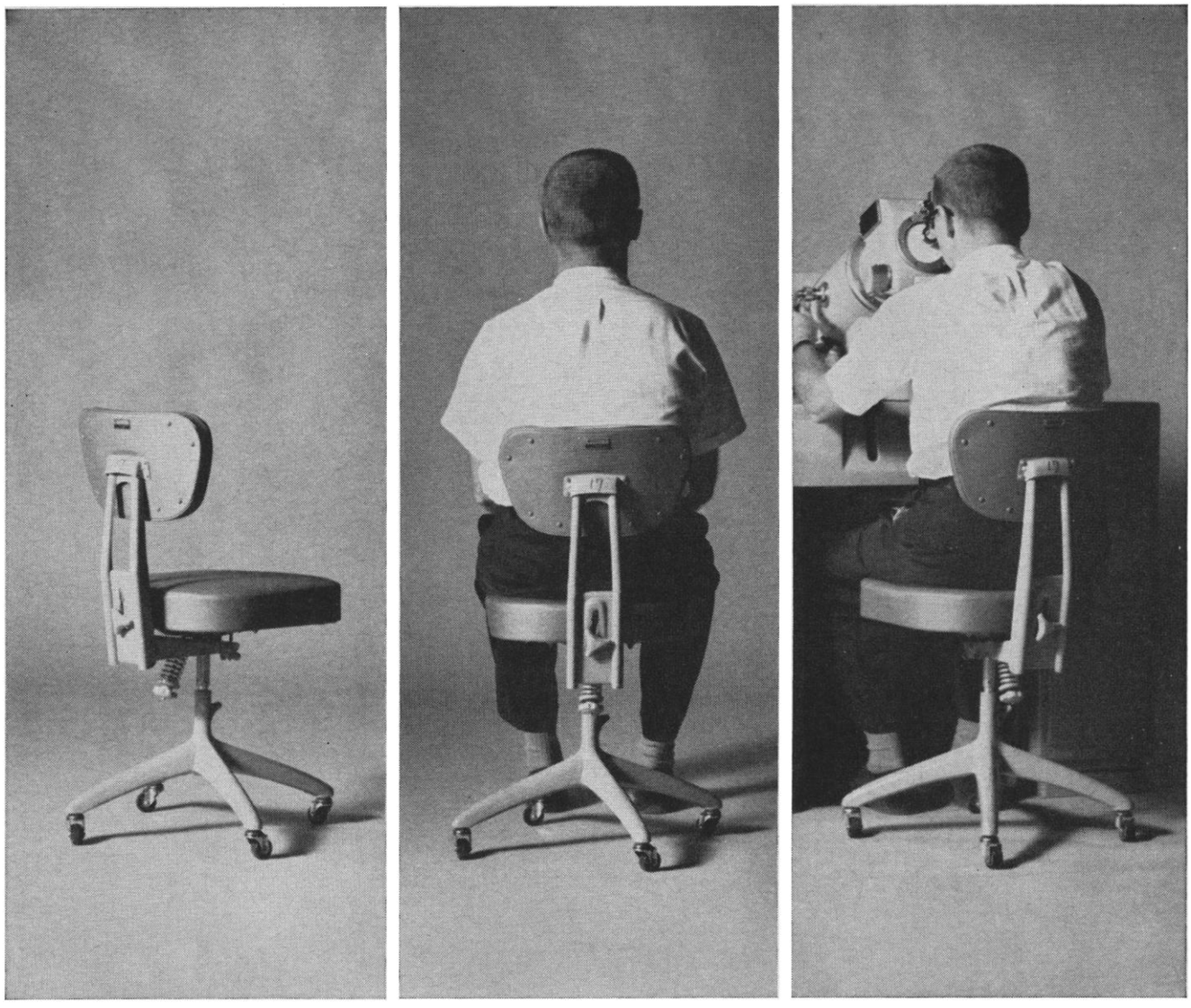
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580. Mixers, Laboratory. See 959

581. Models, Crystal Lattice
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582. Moisture Balances. See 59

583. Moisture Meters
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584. Molecular Models
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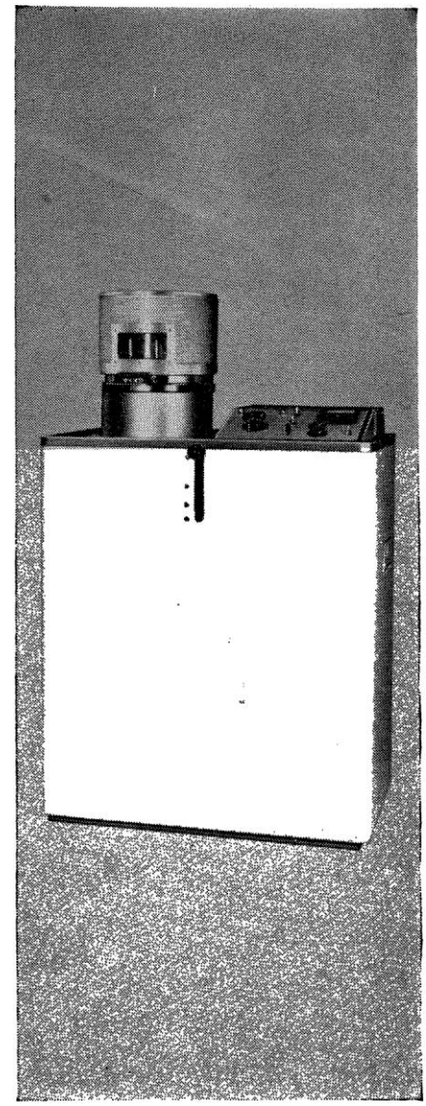
585. Monitors, Radiation. See 667

586. Monochromators
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Beckman Instruments
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587. Monochromators, Scanning
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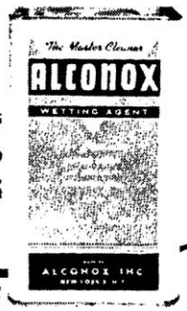
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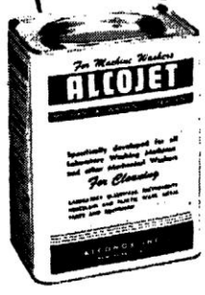


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594. Nephelometers
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595. Neutron Generators. See 669

596. Neutron Sources. See 670

597. Nitrogen Analyzers, Automatic
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598. Nitrogen Analyzers, Kjeldahl. See 478

599. Nitrogen Dioxide Monitors
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601. Nuclides, Radio. See 656

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604. Air Particle Monitoring Equipment
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605. Air Samplers, Radiation
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606. Alarms, Radiation
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Technical Associates
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607. Analyzers, Pulse Height, Multichannel
Baird-Atomic
Electronic Designs Div., Maxson Electronic
Franklin Systems
General Applied Science Labs.
Hogan Faximile
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Nuclear Corp. of America, Instrument & Control Div.
Nuclear Data
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609. Balances, Analytical, Remote Control
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610. Brain Probes
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611. Brain Tumor Localization Systems
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612. Chemicals, Isotope Labeled. See 655

613. Chromatograph Ionization Detectors, Gas. See 161

614. Chromatograph Scanner Systems, Radioisotope
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Baird-Atomic
Forro Scientific
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615. Cloud Chambers
Atomic Accessories
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616. Coats, Laboratory, Disposable
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617. Cobalt Sources
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Curtis Nuclear
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619. Counters. See 625–634

620. Counters, Whole-Body Scintillation. See 705

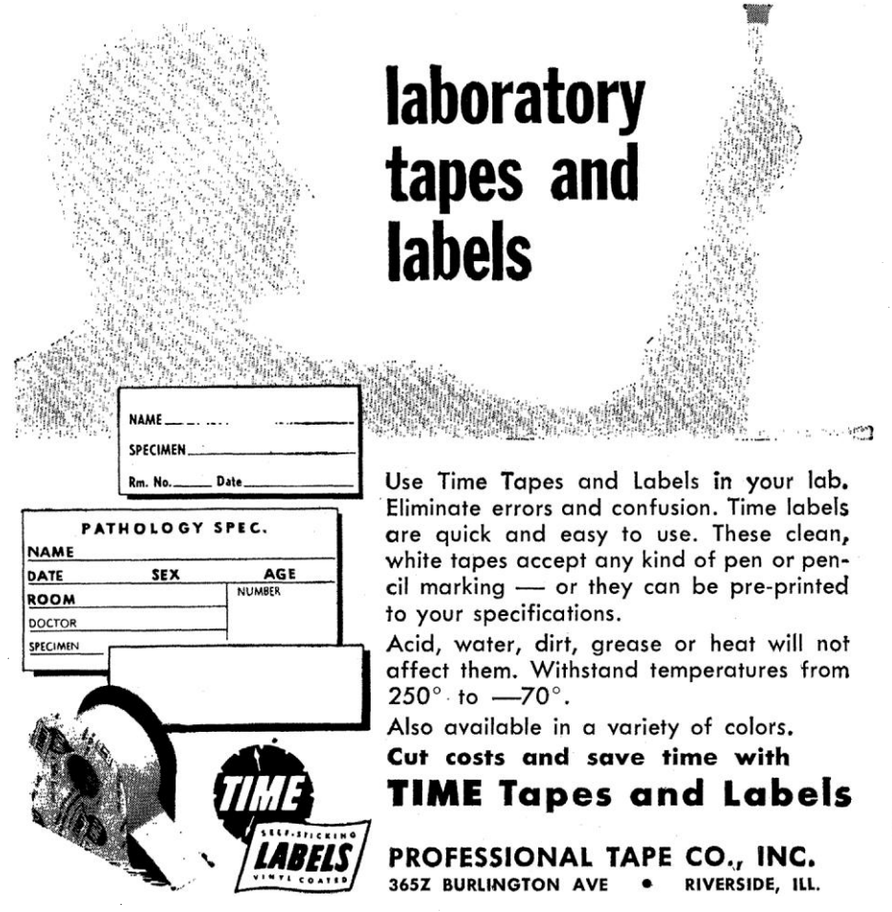
621. Counting Systems, Liquid Scintillation. See 663, 664

622. Counting Systems, Low-Level. See 665

623. Crystals, Scintillation. See 688

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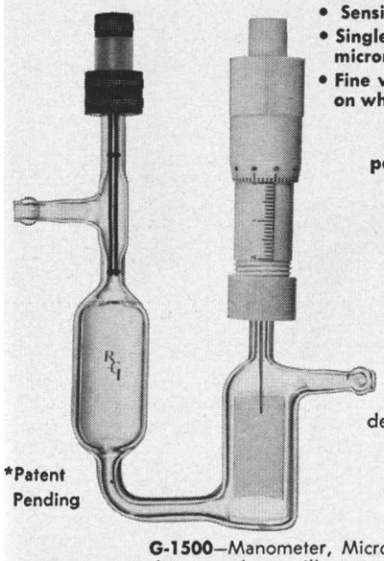
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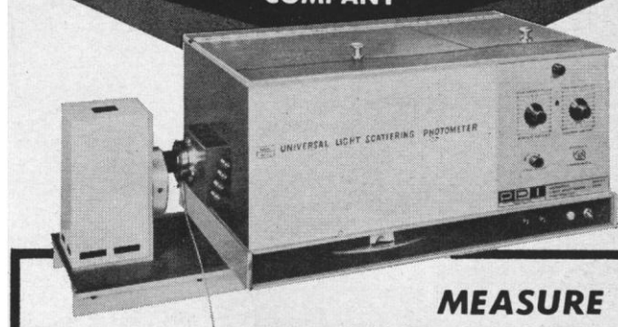
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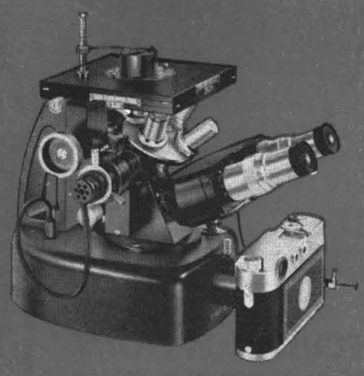
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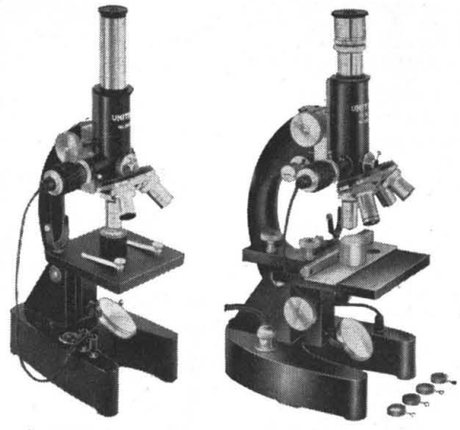
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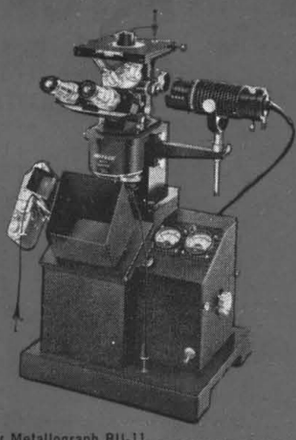
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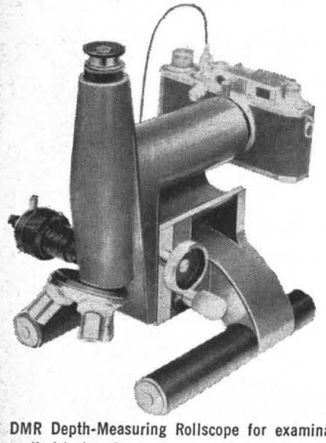
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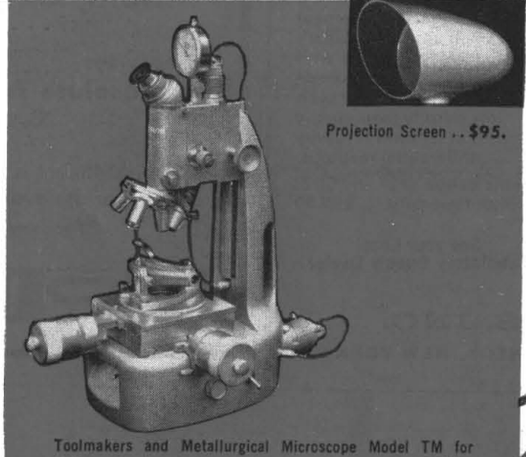
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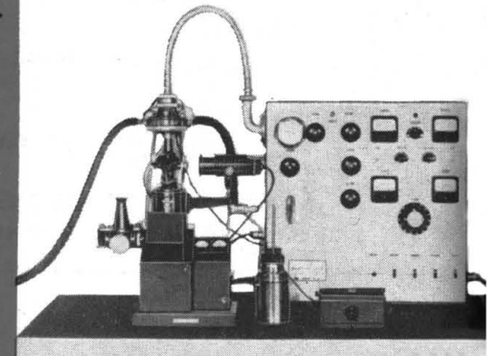
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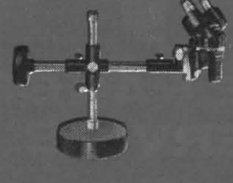
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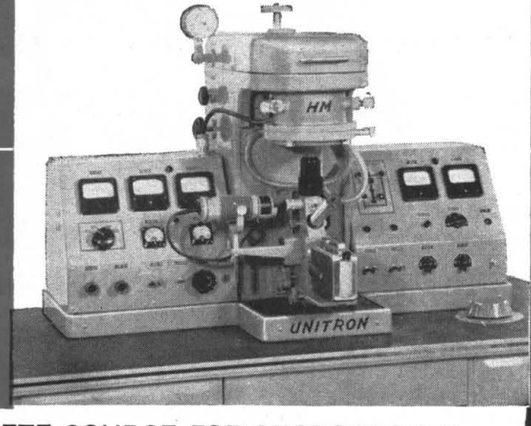


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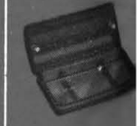
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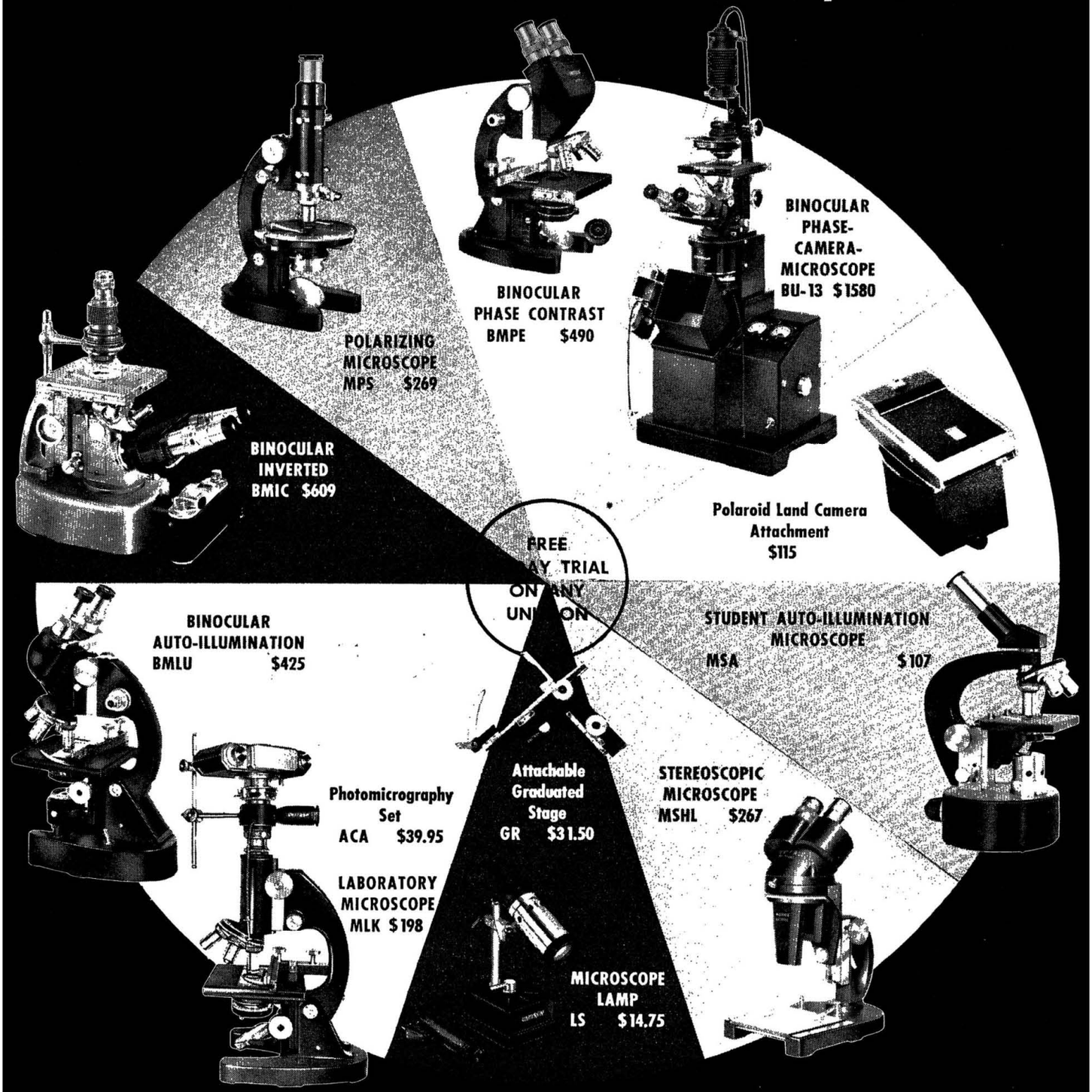
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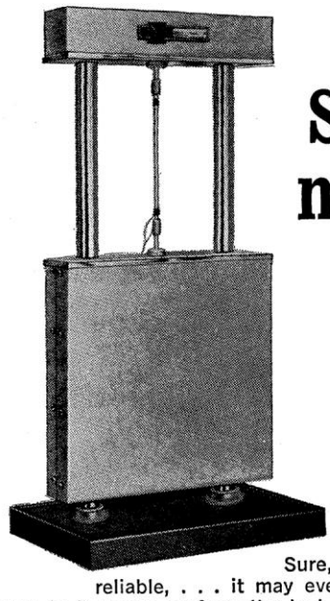
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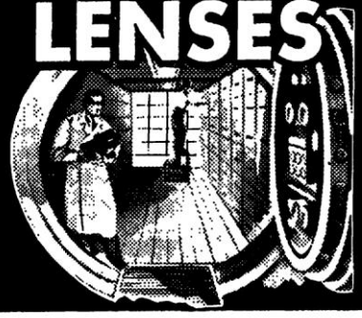
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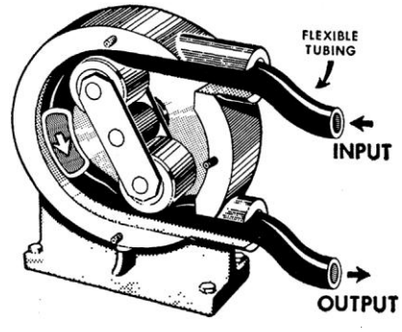
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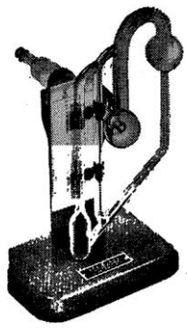
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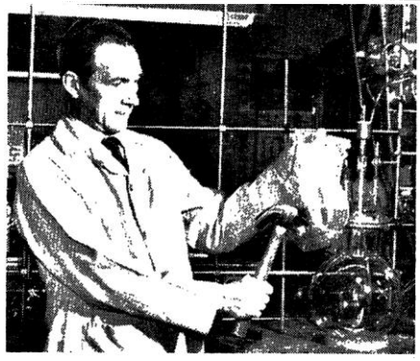
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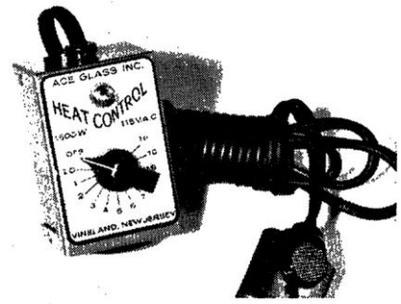
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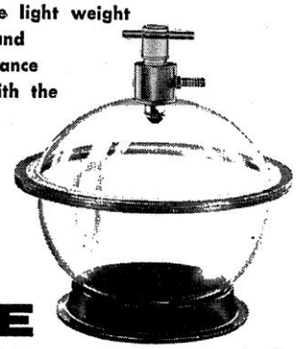


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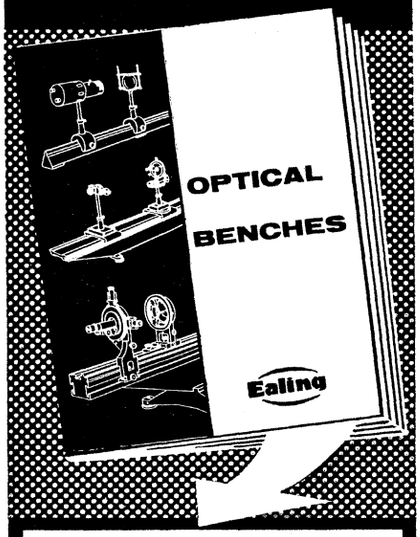
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Ohio Nuclear
Packard Instrument
Philips Electronic Instruments
Picker X-Ray
Pilot Chemicals
Radiation Counter Labs.
Technical Associates
Technical Measurement
Tracerlab
United States Nuclear
Victoreen Instrument

635. Detectors, Semiconductor, Radiation
Block Associates
Controls for Radiation
EON
Franklin Systems
General Electric, Industrial Sales Operation
Hamner Electronics
Infrared Industries
Measurement Systems
NUMEC Instruments & Controls
Oak Ridge Technical Enterprises
Siemens New York
Solid State Radiations

636. Dosimeter Chargers
Atomic Accessories
Baird-Atomic
Bendix, Cincinnati Div.
Controls for Radiation
Kahl Scientific Instrument
Nuclear-Chicago
Nuclear Industries
Picker X-Ray
Tracerlab
Victoreen Instrument

637. Dosimeter Readers
Atomic Accessories
Baird-Atomic
Bausch & Lomb
Block Associates
Controls for Radiation
Nuclear-Chicago
Nuclear Industries
Tracerlab
G. K. Turner Associates
Victoreen Instrument

638. Dosimeter Services
Baird-Atomic
Controls for Radiation
Edgerton, Germeshausen & Grier
Nuclear Industries
Tracerlab
United States Nuclear

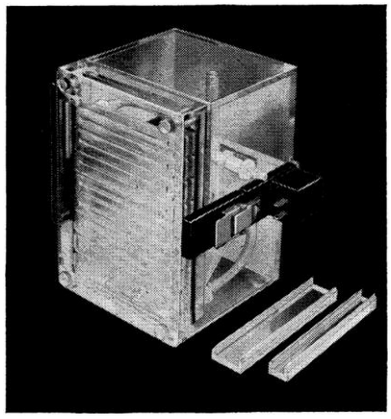
639. Dosimeters
Atomic Accessories
Baird-Atomic
Bausch & Lomb
Bendix, Cincinnati Div.
Block Associates
Cambridge Instrument
Controls for Radiation
Edgerton, Germeshausen & Grier
Elcor
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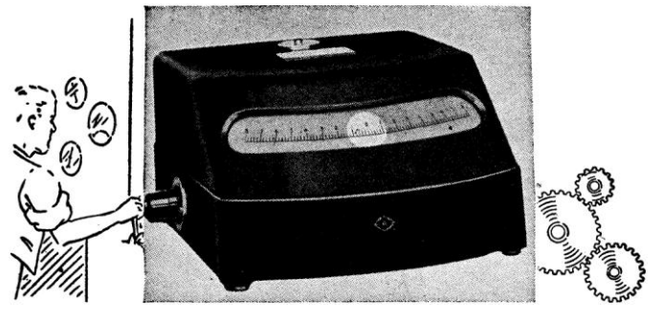


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641. Eye Probes
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644. Foils, Neutron Activation
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645. Furniture, Radioisotope Laboratory
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Browne-Morse
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646. Furniture Tops, Plastic. See 396

647. Gamma Ray Spectrometers
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General Electric, X-ray Dept.
Hamner Electronics
Metrix
Nuclear-Chicago
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Nuclear Measurements
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Philips Electronic Instruments
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Radiation Instrument Development Lab.
Scientific Products
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648. Geiger-Mueller Tubes. See 629

649. Generators, Neutron. See 669

650. Generators, Pulse. See 675

651. Hoods, Radioisotope, Fume
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652. Ion Sources
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653. Ionization Chambers. See 630

654. Ionization Detectors for Gas Chromatography. See 161

655. Isotope-labeled Compounds
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Hazelton-Nuclear Science
Isotopes Specialties
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656. Isotopes, Radioactive
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657. Isotopes, Stable
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Isotopes Specialties
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658. Kidney Function Analyzing Systems
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Curtis Nuclear
Landsverk Electrometer
Nuclear-Chicago
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659. Labels, Radioactive Warning. See 702

660. Lead Bricks
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661. Lead Shields, Laboratory
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Charleston Rubber
Instrument & Development Products
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Nuclear-Chicago
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662. Liquid-level Controllers for Small Vessels
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Magnetic Instruments
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M. Roy
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663. Liquid Scintillation Counting Systems, Automatic Sampling
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Franklin Systems
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Nuclear Enterprises
Packard Instrument
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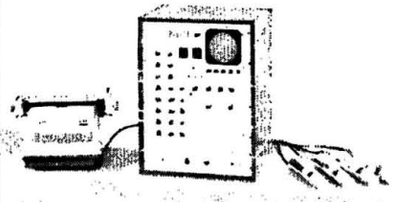
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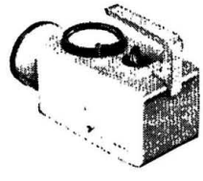
SURVEY METERS



MULTICHANNEL ANALYZERS



SURVEY METERS



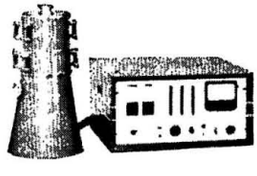
X-RAY MEASUREMENT



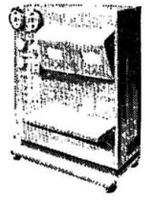
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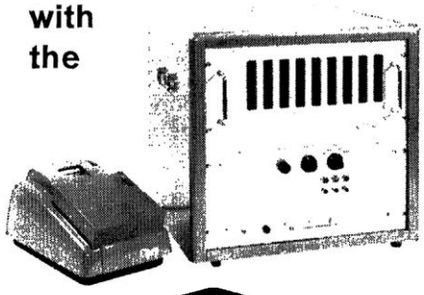
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Input: Full scale ranges—50 mv standard or 1 mv with preamplifier.

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665. Low-level Counting Systems
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Delta Instrument
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Image Instruments
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666. Manipulators, Master-Slave
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667. Monitors, Radiation
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Delta Instrument
Eberline Instrument
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Electronic Designs Div., Maxson Electronic
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Picker X-Ray
Radiation Counter Labs.
Radionuclide Div., Nuclide
Technical Associates
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668. Multichannel Analyzers. See 607

669. Neutron Generators
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Electro Mechanical Research
High Voltage Engineering
Hughes Aircraft
Kaman Nuclear
Nuclear-Chicago
Nuclear Enterprises
Philips Electronic Instruments
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670. Neutron Sources
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Nuclear-Chicago
Philips Electronic Instruments
Reactor Experiments
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671. Nuclear Teaching Equipment, Specific for Teaching
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Baird-Atomic
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LaPine Scientific
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Radiation Instrument Development Lab.
Scientific Products
Tracerlab
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672. Ovens, Planchet Drying
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673. Pipetters, Remote Control
Atomic Accessories
Instrumentation Specialties
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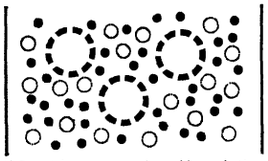
674. Planchets
Atomic Accessories
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Nuclear-Chicago
Nuclear Industries
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Sigma Chemical
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675. Pulse Generators
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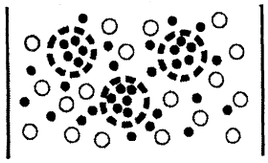
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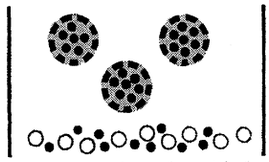
SEPHADEX gel particle with immobile water
large molecule
small molecule



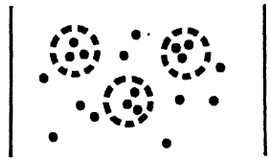
1. Outside water replaced by solution



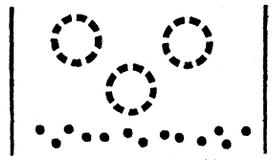
2. Small molecules move into the gel until equilibrium



3. Volume outside gel particles replaced by water



4. Small molecules move from the gel until equilibrium



5. Outside volume replaced by water to empty gel particles completely

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All of the types are in the following sieve fractions: *Coarse* for industrial uses and when high flow rates are important; *medium* for standard laboratory usage; and *fine* for experiments where high resolution is essential.

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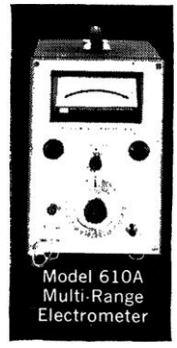
Company _____

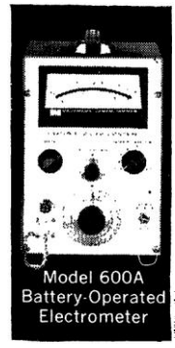
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610A Line-operated, 64 ranges. Covers extreme spans of dc voltage, current, and resistance. Also useful as dc preamplifier driving oscilloscopes and recorders. Varying input resistance from one ohm to over 10^{14} ohms permits optimum balance of low circuit-loading vs minimum pick-up. Cabinet Model 610A; Rack Model 610R. **$565.00**


Model 610A Multi-Range Electrometer

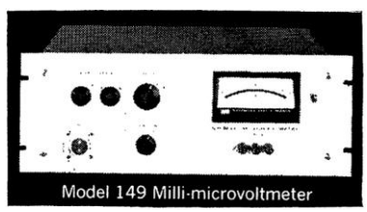

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Specifications	MODEL 610A	MODEL 600A
RANGES: Voltage	0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30 and 100 volts f.s.	0.01, 0.03, 0.1, 0.3, 1, 3 and 10 volts f.s.
Current	10^{-13} to 3 amp f.s. 1x, 3x overlapping ranges	10^{-13} to 3 amp f.s. 1x, 3x overlapping ranges
Resistance	10 to 10^{14} ohms f.s. 1x, 3x overlapping ranges	10^{4} to 10^{13} ohms f.s. 1x, 3x overlapping ranges
ACCURACY: Voltage	2% of f.s. on all ranges	2% of f.s. on all ranges
Current	3% of f.s. to 10^{-10} amp. 4% of f.s. to 10^{-13} amp	3% of f.s. to 10^{-10} amp, 4% of f.s. to 10^{-13} amp
Resistance	3% of f.s. to 10^{10} ohms, 5% above 10^{10} ohms	4% of f.s. to 10^{9} ohms, 5% to 10^{12} ohms, 6% to 10^{13} ohms
INPUT RESISTANCE	Selectable, from one ohm to over 10^{14} ohms	Selectable from one ohm to over 10^{14} ohms
ZERO DRIFT	Less than 2 mv per hour after 1 hour warmup	Less than 2 mv per hour after 1 hour warmup
OUTPUT	Two outputs furnished: 10 volts or 1 ma f.s.	1 v for f.s. deflection all ranges. Drives 10 or 50 mv recorders.
AMPLIFIER CHARACTERISTICS	dc to 500 cps on 10-mv range, rising to 10 kc on 100 v range. Noise below 2% f.s. each range.	dc to 100 cps on 10-mv range, rising to 1500 cps on 10 v range. Noise below 2% f.s. each range.

microvoltmeters—


150A


Model 149 Milli-microvoltmeter

149 Milli-Microvoltmeter

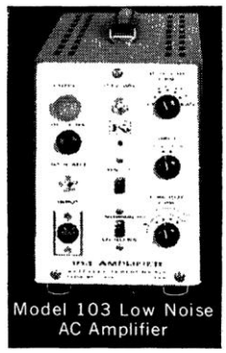
Measures 0.1 μv full scale. Ranges up to 100 mv full scale; 100 x f.s. zero suppression. Max. gain as dc amplifier is 10^{8}. Speed of response to 90% of f.s. is less than 0.5 second on most ranges. Short term noise is within 6 x 10^{-10} volt RMS. **$895.00**

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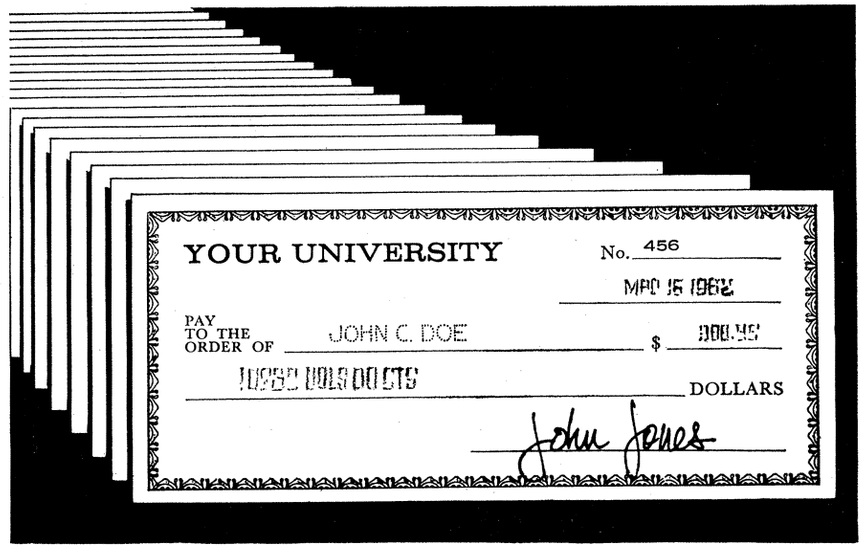
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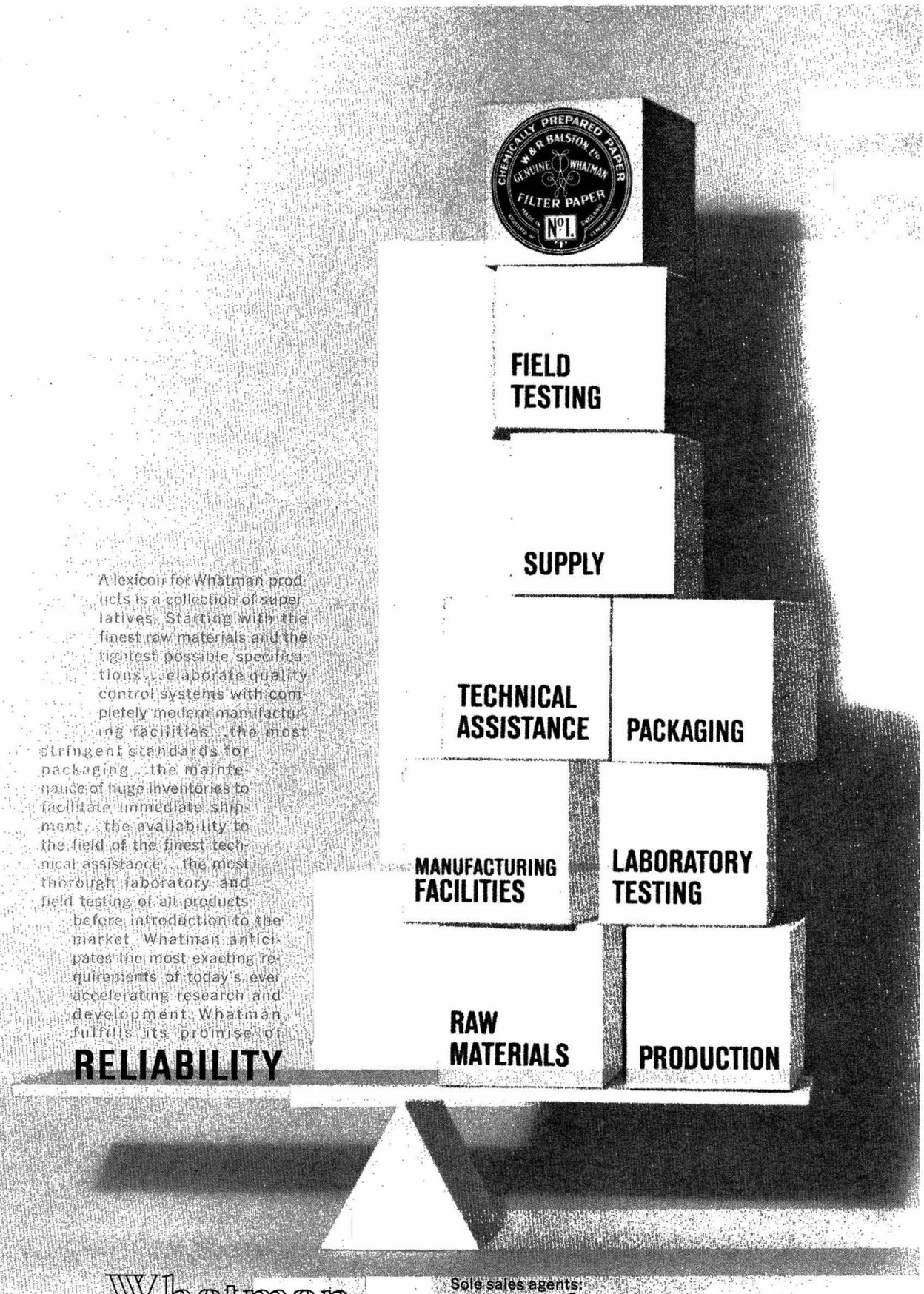
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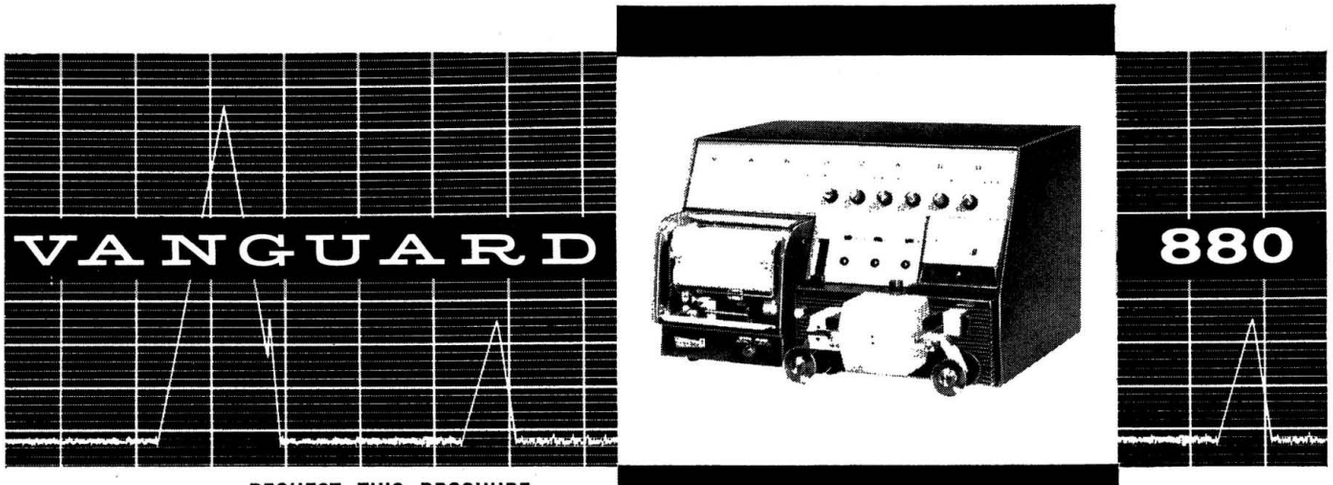
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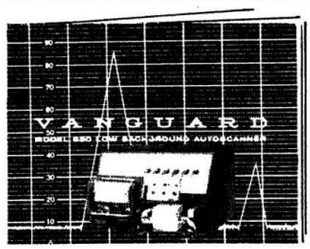
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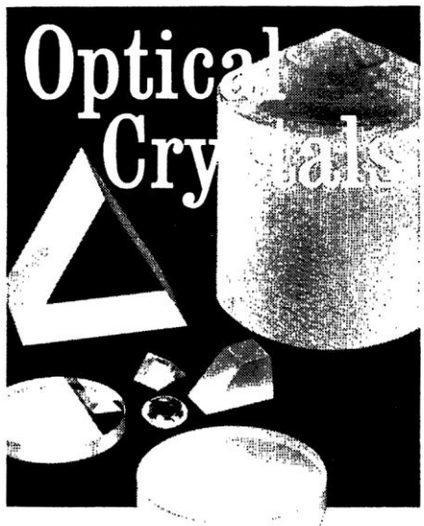
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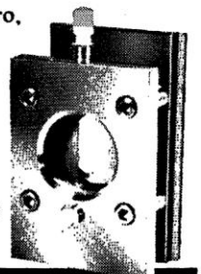
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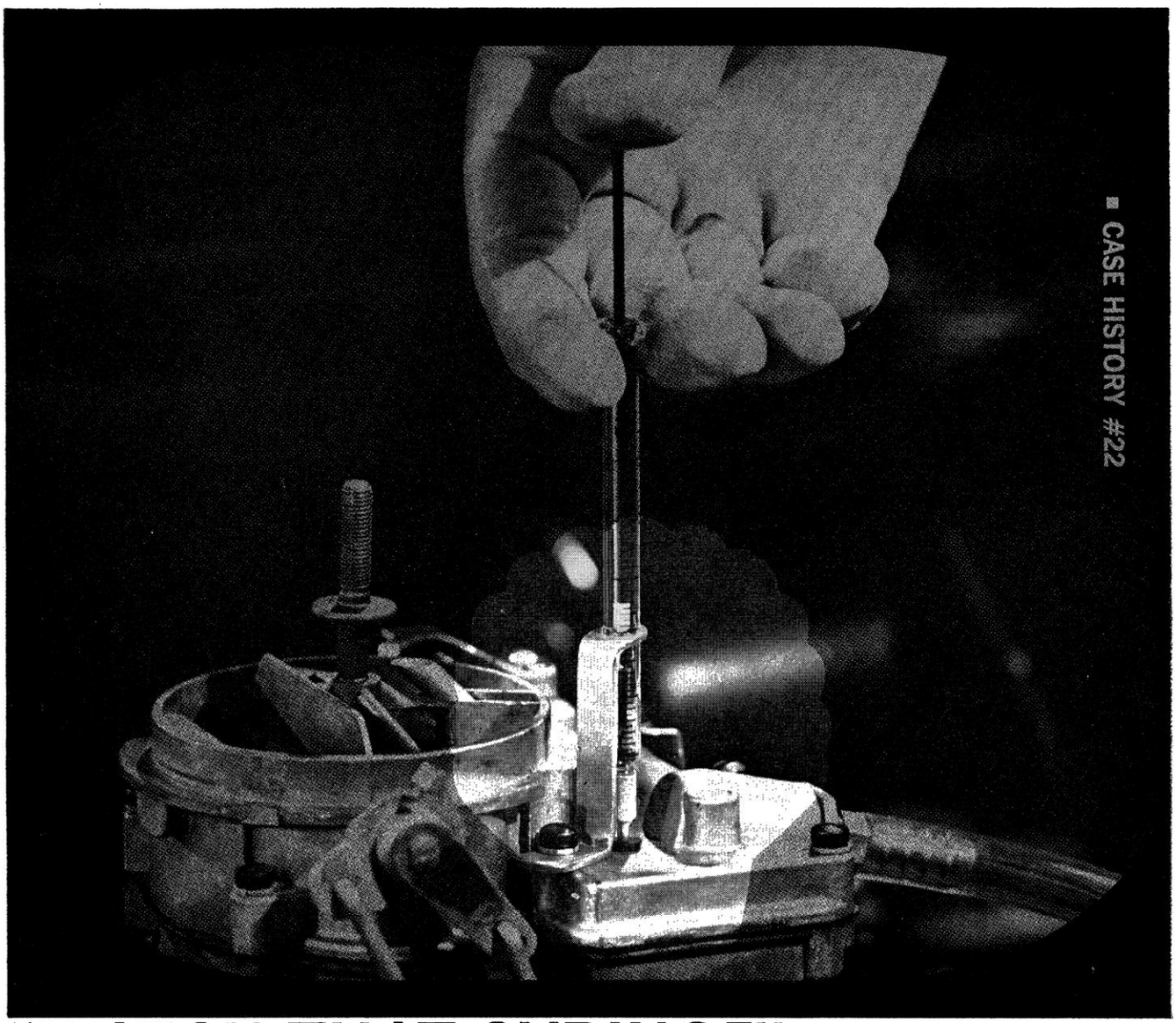
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. . . says an announcer in a current Shell Oil Company television demonstration. Naturally, Shell is not selling Hamilton microliter syringes . . . but they are using one to inject an accurate 0.01 ml of antiknock mix directly into a carburetor containing 90 ml of gasoline. Filmed at Shell Development Company Laboratories, Emeryville, California, this demonstration shows the almost instantaneous benefit of this tiny portion of antiknock mix in Super Shell gasoline. Quick mixing was provided by the high velocity stream produced by the syringe needle. No loss of liquid or vapor to the surrounding air was a stringent but necessary requirement. Shell says that without the inherent handling safety provided by the syringe, this television demonstration would not have been possible. Like Shell scientists, research people in many fields of science and industry have discovered that they can depend on Hamilton for precision measuring equipment. **Hamilton manufactures a complete line of precision syringes from a capacity of 0.5 μl to 500 μl and other related chromatograph equipment.**

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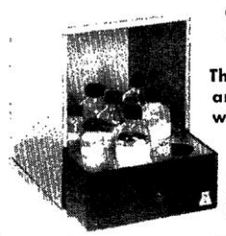
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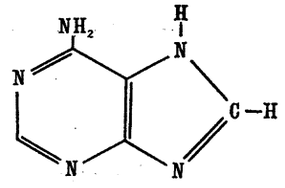
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(End of Oxygen Analysis)

738. Ozone Generators
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739. Ozone Meters
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740. Ozone Test Chambers
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744. Patient Monitoring Equipment
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745. Perimeters, Eye Testing
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746. Periodic Table of Elements
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747. Peristaltic Pumps. See 837

748. Petri Dish Holders
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749. Petri Dishes, Plastic. See 791

750. Petri Dishes, Prepared
Carolina Biological Supply
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751. Petri Dishes, Prepared, Antibiotic Testing. See 38

*p*H

752. pH Buffer Solutions
Analytical Measurments
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Carolina Biological Supply
Central Scientific Div., Cenco Instruments
Coleman Instruments
Fisher Scientific
Hartman-Leddon
Kahl Scientific Instrument
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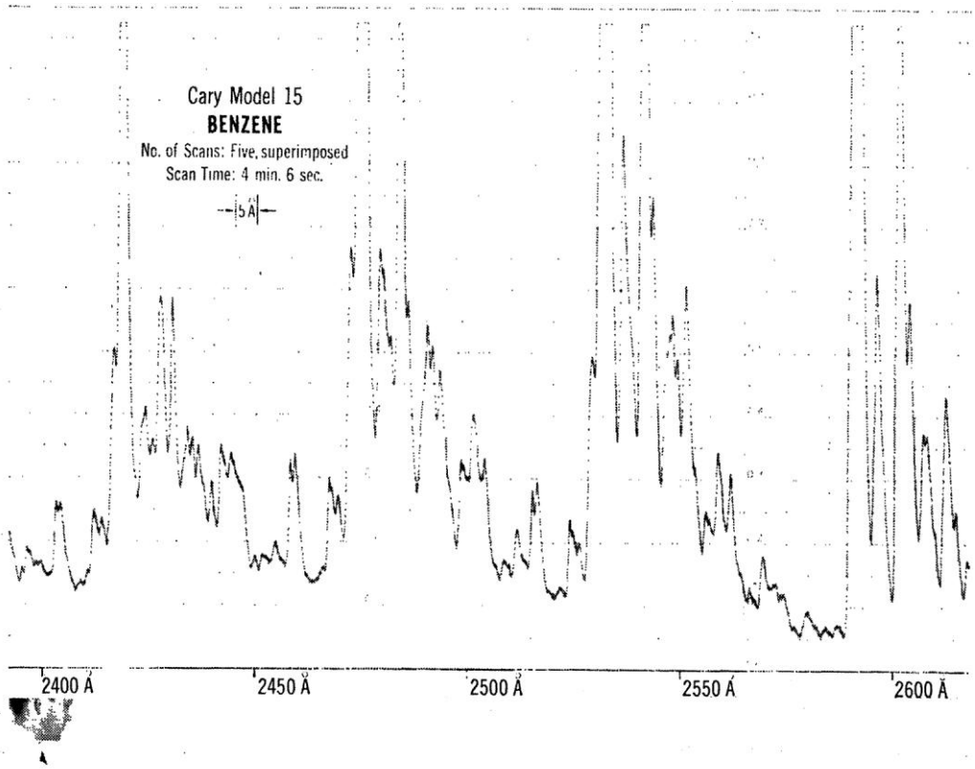
753. pH Controllers, Laboratory
Analytical Measurements
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Foxboro
JKM Instrument
LaMotte Chemical Products
Leeds & Northrup
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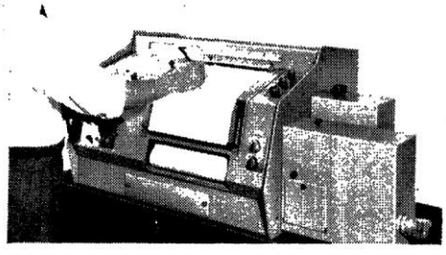
754. pH Electrodes, Blood pH. See 92

755. pH Electrodes, General Purpose
Analytical Measurements
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Brinkmann Instruments
Cambridge Instrument
Coleman Instruments
Ealing
Leeds & Northrup
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756. pH Meters, Battery Operated
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Kahl Scientific Instrument
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(End of pH)

761. Phosphors, Scintillation. See 689

762. Photoelectric Cells, Barrier Layer
Atomic Labs.
Emi/Us
Farmer Electronic Products
International Telephone & Telegraph, Industrial Labs. Div.
Lafayette Radio Electronics
Measurement Systems

763. Photoelectric Cells, Photoconductive Type
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Infrared Industries
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Veeder Root

764. Photoelectric Tubes, Electron
CBS Labs. Div. Columbia Broadcasting System
Emi/Us
Electro Mechanical Research
Geophysics Corp. of America
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765. Photographic Equipment, Time Lapse Moving Picture
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Brinkmann Instruments
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766. Photometers, Flame. See 355

767. Photometers, Light Scattering. See 491

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Request Bulletin 68

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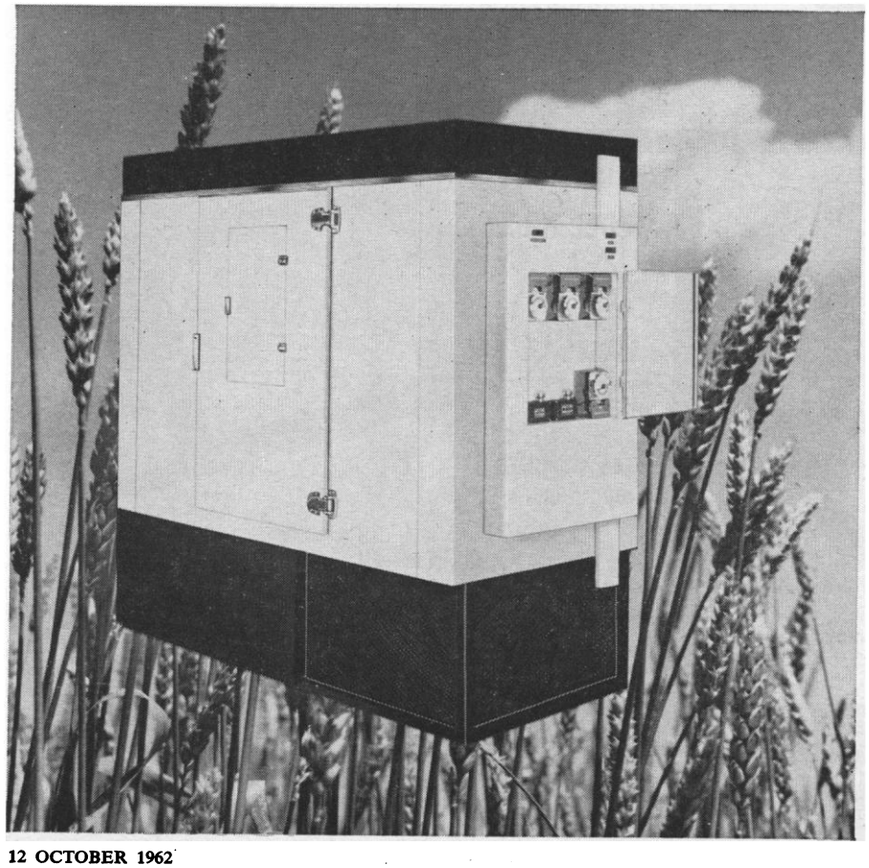
MODEL TYPE	T-1	T-10	T-100
Optical Scale in Grams	0-1 g.	0-10 g.	0-100 g.
Scale Divisions	1-mg	10-mg	100-mg
Legibility with Vernier	0.1-mg	1-mg	10-mg
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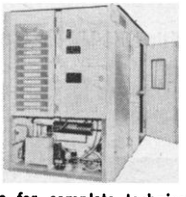
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Sherer's Model CEL 512-37 (stationary) still features: No Barrier Under The Lights; Uniform Air Flow and Temperatures; Adjustable Plant Beds, And Easy Installation.

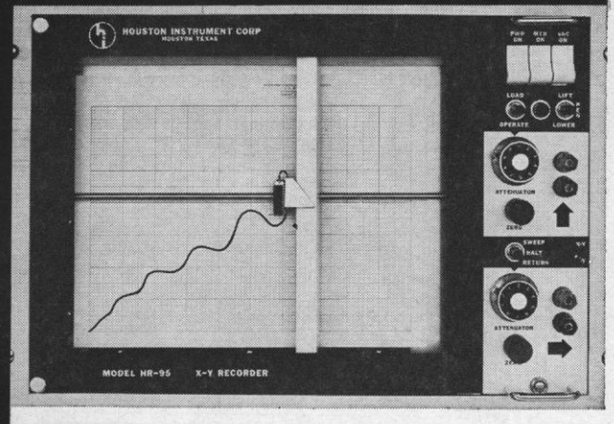
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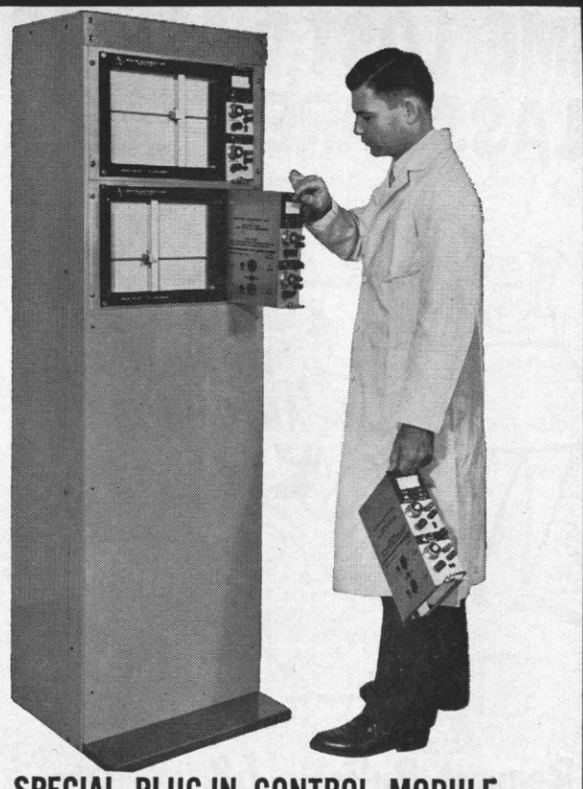
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Marshall 3, Michigan

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for automatically recording any variable vs. any other variable on linear or logarithmic scales





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- 1 MV per inch sensitivity
- Vacuum paper hold down system
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- Precision 10 turn attenuators permit recording of wide range of input signals
- Zener reference supply

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MODEL HR-95T from $1150

Optional C-1 case and D-1 cart extend usefulness of basic HR-95T X-Y Recorder. Write for other available accessories.

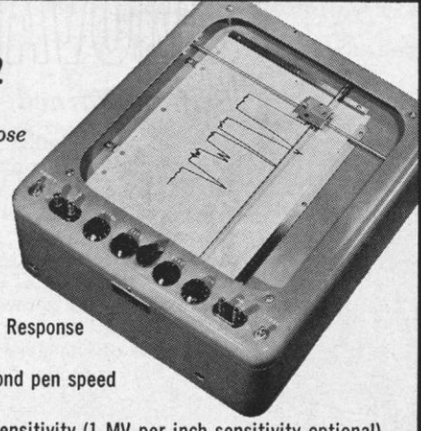


X-Y RECORDER
MODEL HR-92

Rugged *All Purpose*

8½ x 11″

X-Y Recorder

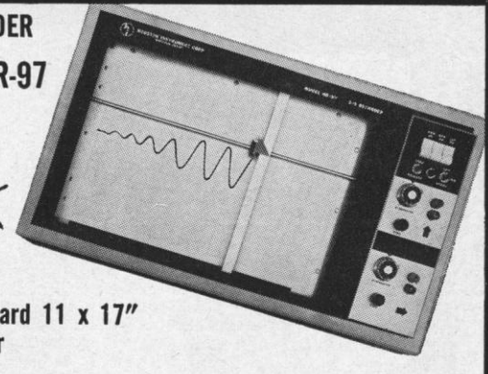


- ½% accuracy
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- 7½ Inch per second pen speed
- 10 MV per inch sensitivity (1 MV per inch sensitivity optional)
- Clip on pen—interchangeable for multi-color traces

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MODEL HR-97

NEW in '62



Uses standard 11 x 17″ Graph Paper

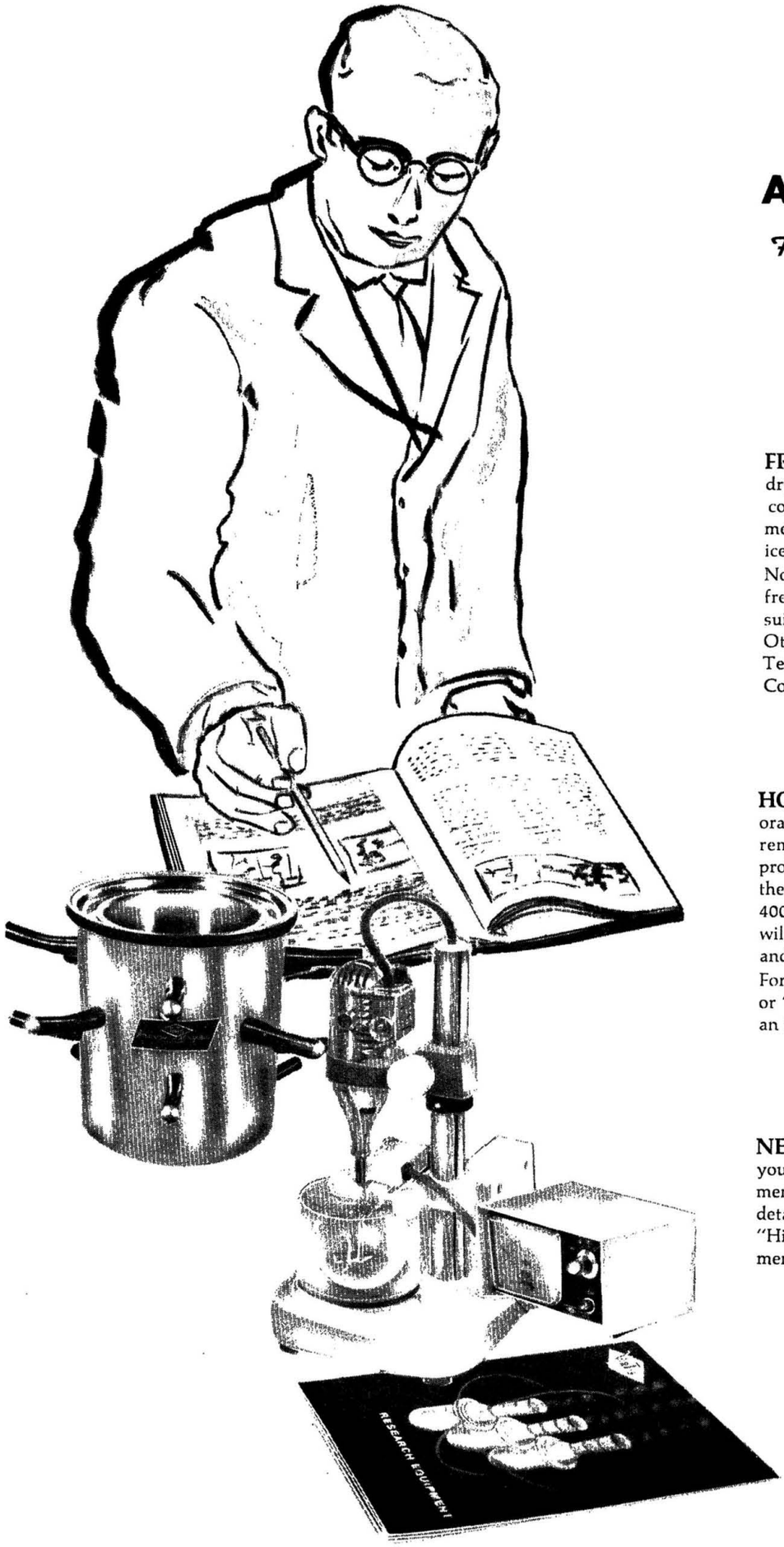
- 0.25% accuracy
- 15 inch per second pen speed
- 1 MV per inch sensitivity
- Vacuum paper hold down system
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771. Photomultiplier Photometers. See 591

772. Photomultiplier Tubes
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Geophysics Corp. of America
International Telephone & Telegraph, Industrial Labs. Div.
Nuclear Industries
Phoenix Precision Instrument
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773. Physiological Recorders. See 862

774. Physiological Transducers. See 1024

Pipettes

775. Pipette Cans
Bronwill Scientific Div., Will Scientific
Central Scientific Div., Cenco Instruments
National Appliance

776. Pipette Jars, Plastic. See 792

777. Pipette Pluggers
Bellco Glass

778. Pipettes, Automatic Hand Operated
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779. Pipettes, Micro
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780. Pipettes, Plastic. See 793

(End of Pipettes)

781. Planchet Drying Ovens. See 672

782. Plant Growth Chambers
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783. Plastic Beakers
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787. Plastic Connectors for Tubing
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788. Plastic Cylinders, Graduated
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789. Plastic Fume Hoods
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791. Plastic Petri Dishes
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792. Plastic Pipette Jars
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793. Plastic Pipettes, Disposable
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794. Plastic Sink Traps
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795. Plastic Sinks, Laboratory
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Linde Cryobiology NEWS

REPORT NO. 2 FROM LINDE COMPANY, DIVISION OF UNION CARBIDE CORPORATION

Achieve maximum recovery of viable tissues, cells and microorganisms with liquid nitrogen

A PRACTICAL TECHNIQUE

Biologists and clinicians in many areas of science can now preserve tissue and cell cultures more efficiently and effectively because of recent advances made in cryobiology.

In fact, new techniques make it possible to preserve successfully many tissues and cell cultures which were formerly thought to be destroyed by the freezing process. Many of the inherent areas of risk in long-term experiments—such as chromosomal change or mutation, contamination of culture with bacteria or viruses or other cell lines, and loss of cultures—have been virtually eliminated.

Basically, best results in freezing and storing of viable specimens have been obtained by:

1) Cooling at a precisely controlled rate (in the range of 1°C. per minute to 15°C. per minute).

2) Using the proper amount of protective additive (usually glycerol or dimethyl sulfoxide).

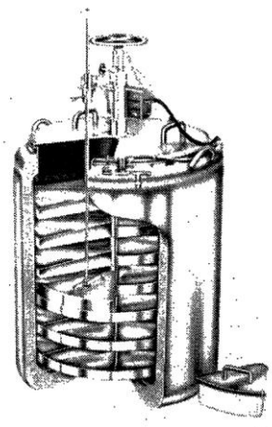
3) Storing at liquid nitrogen temperature (–196°C).

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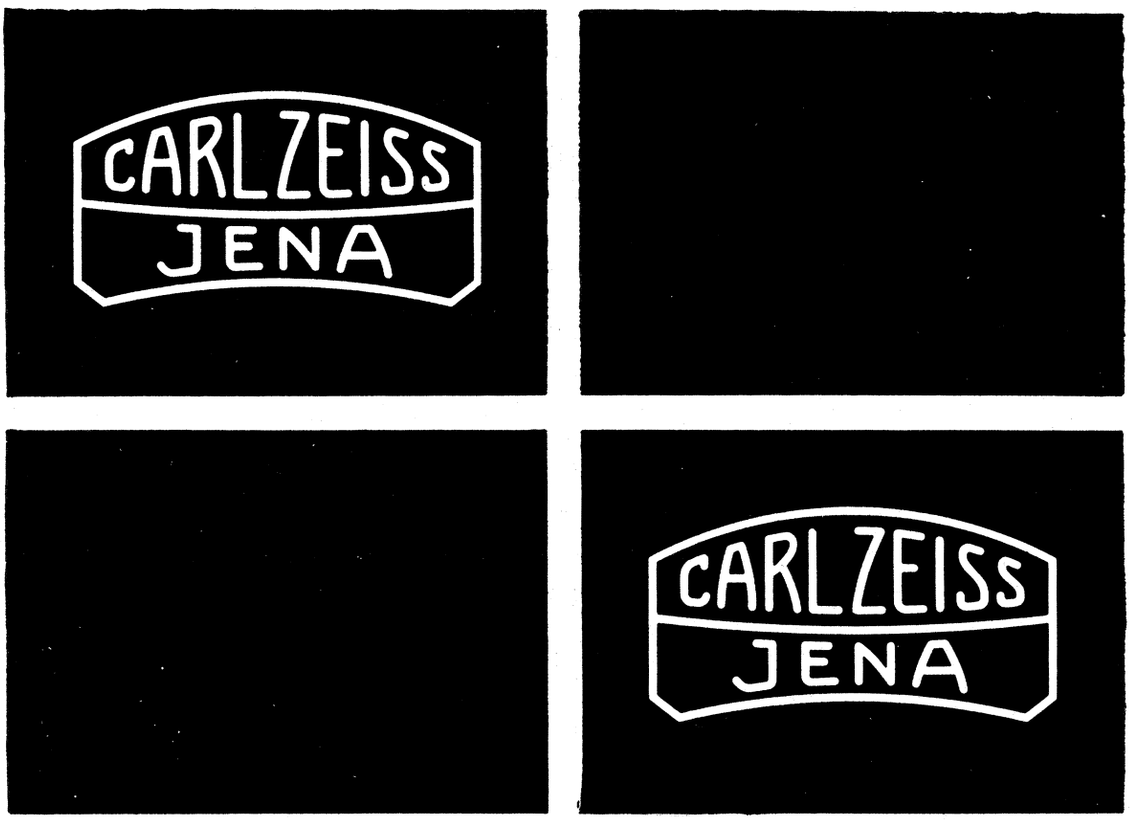
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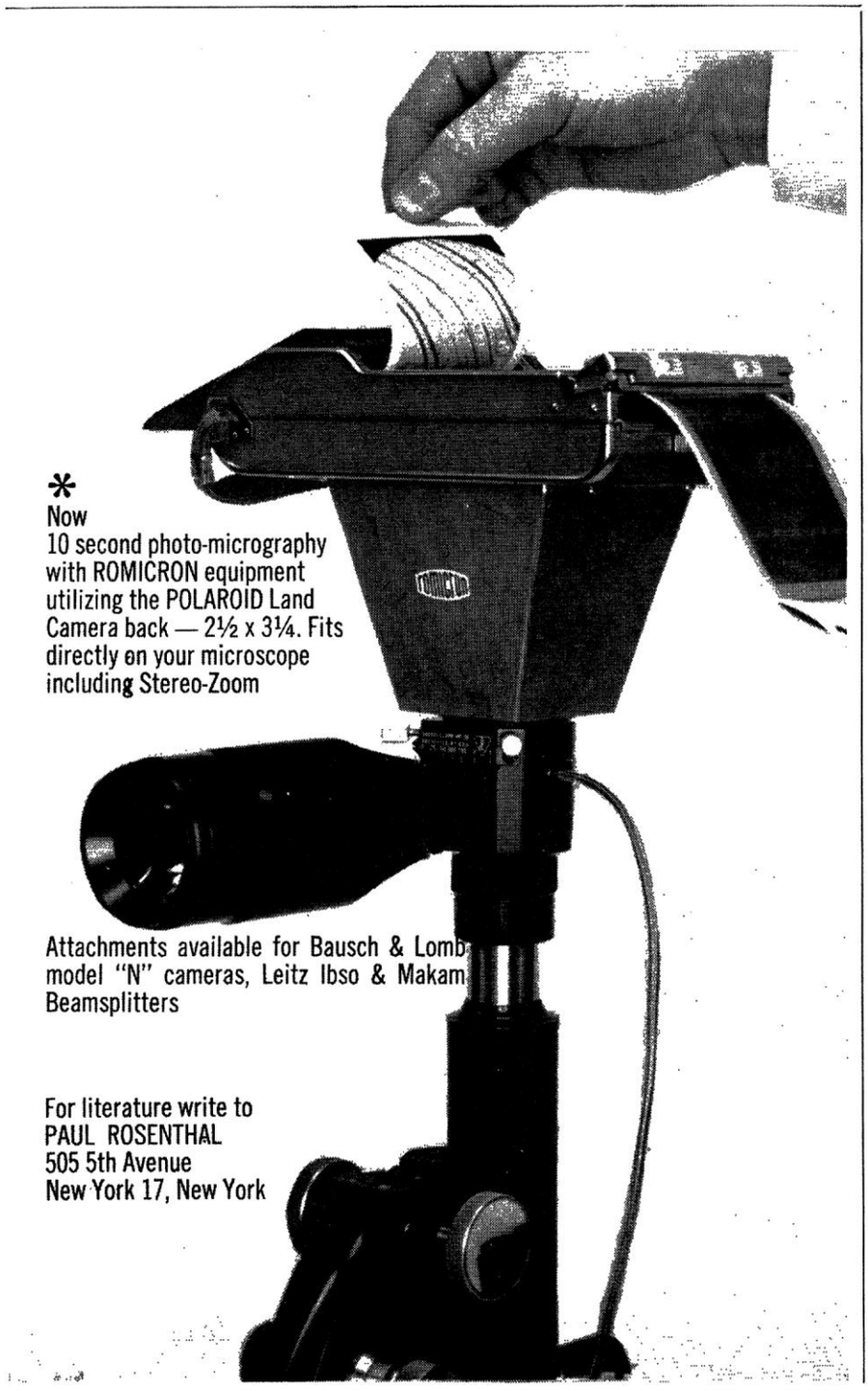
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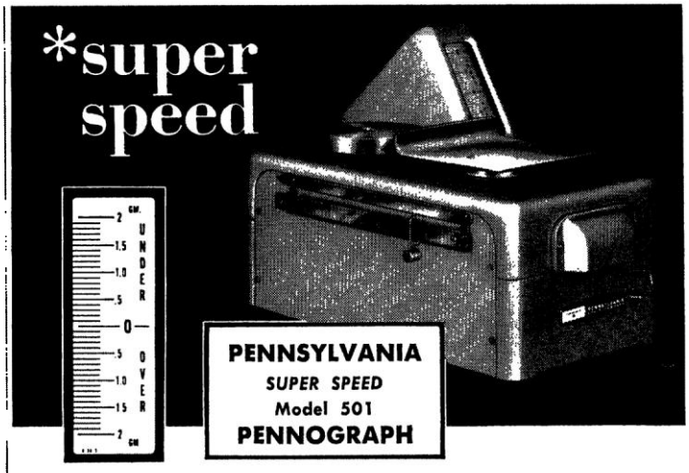
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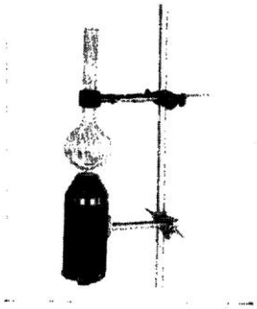
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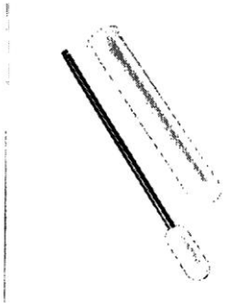
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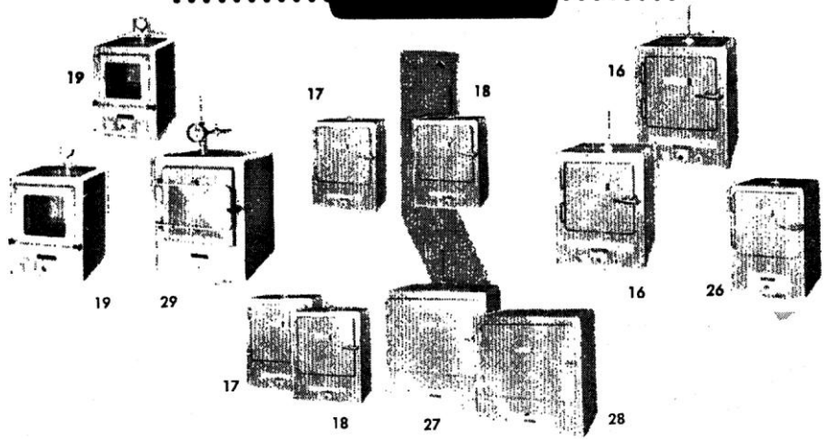


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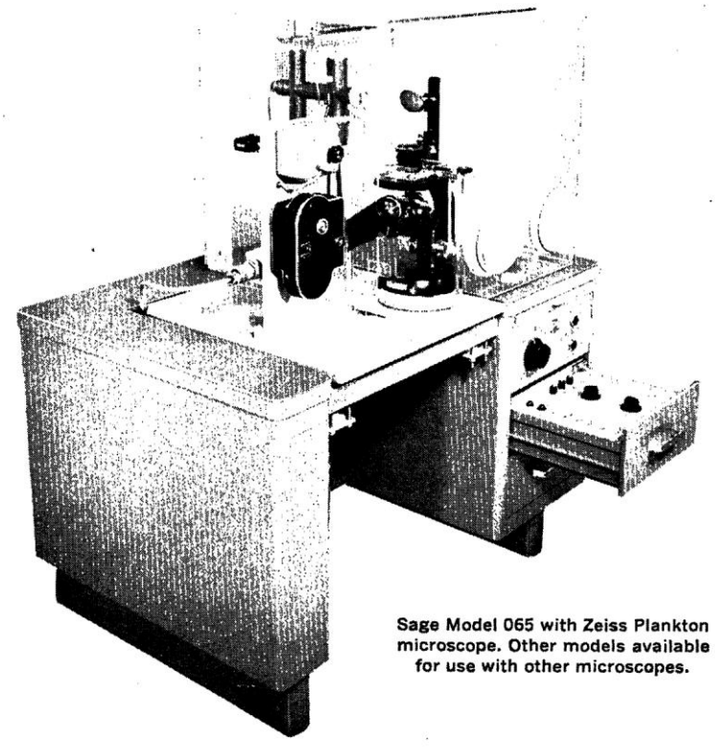
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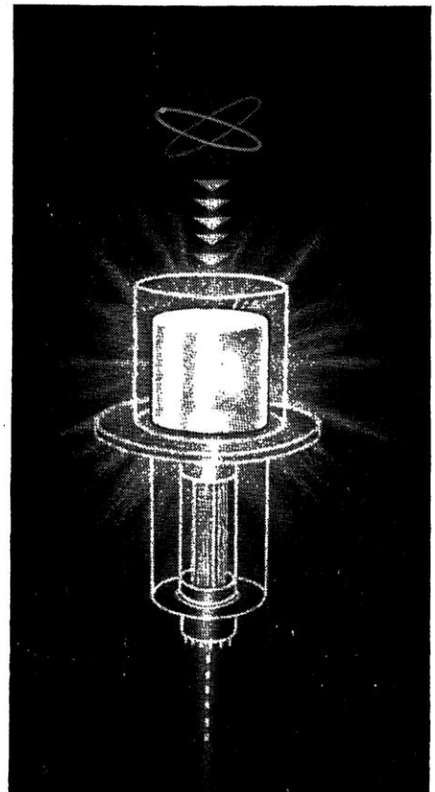
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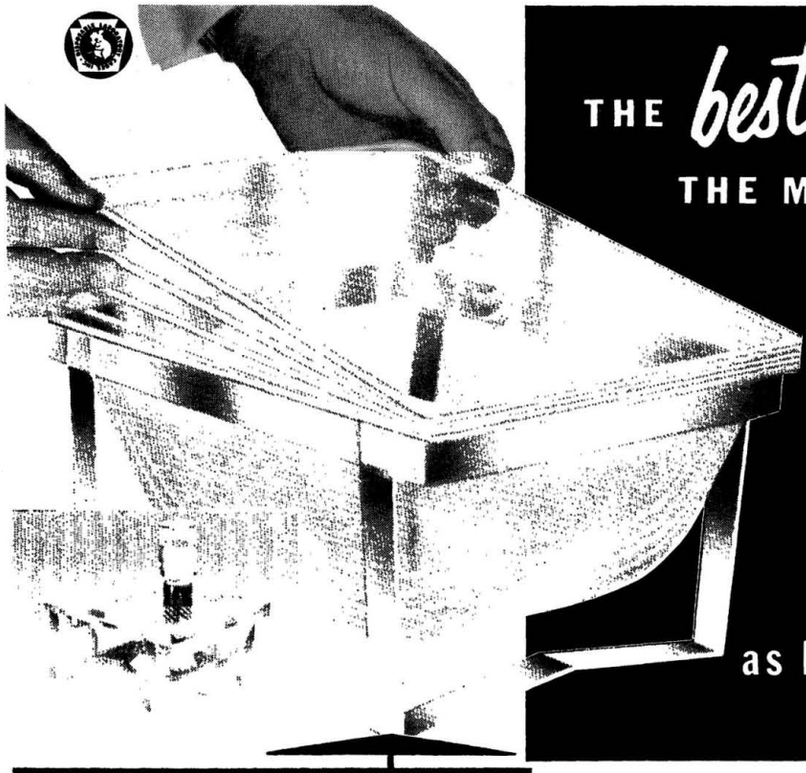
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854. Recorders, Integrating. See 164

855. Recorders, Magnetic Tape, Data Recording
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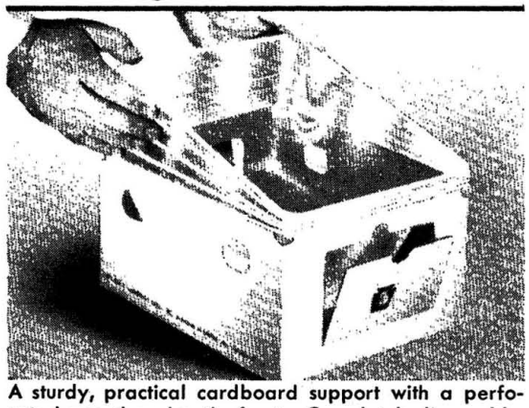
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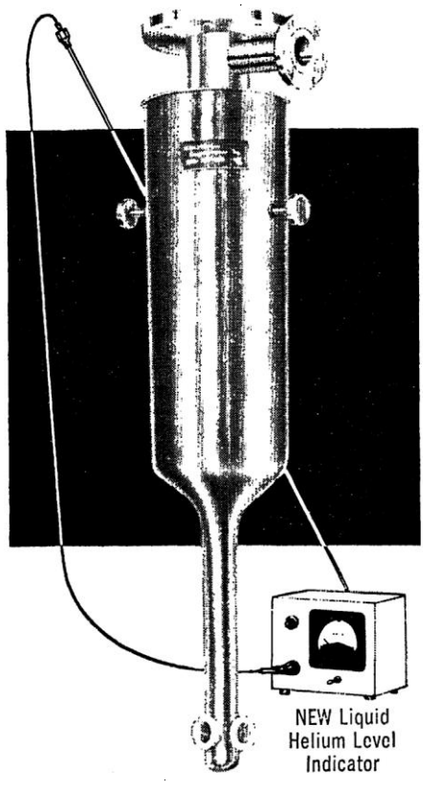
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885. Scales. See 60

886. Scanners, Paper Chromatogram. See 183

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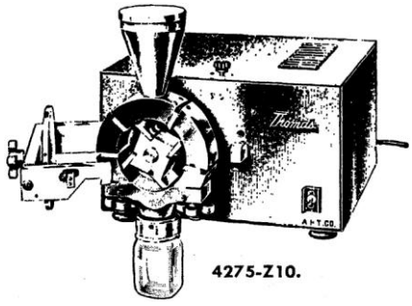
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894. Shadow Casters. See 310

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905. Shielding, Radiation. See 691

906. Shielding, Radio Frequency
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908. Sinks, Laboratory, Plastic. See 795

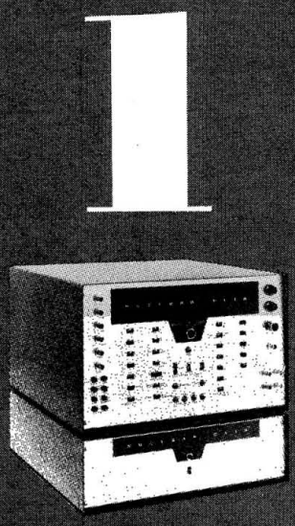
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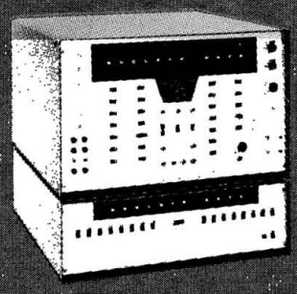
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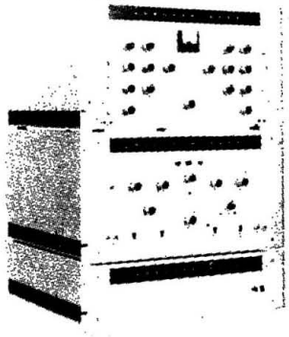


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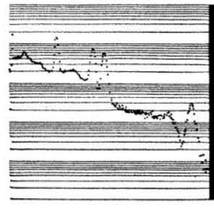


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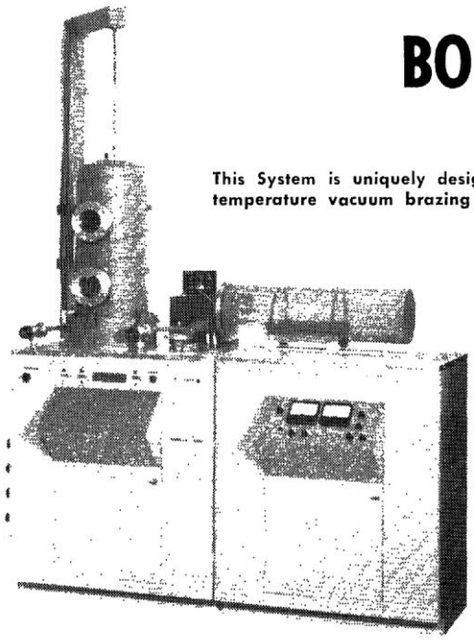


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916. Specimen Embedders, Metallurgical
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917. Specimen Polishers, Metallurgical. See 531

918. Spectral Charts, Infrared
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927. Spectrographs, Light, Diffraction Grating Type
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Bausch & Lomb
Block Associates
Central Scientific Div., Cenco Instruments
Engis Equipment
Jarrell-Ash
Measurement Systems
National Instrument Labs.
Perkin-Elmer
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928. Spectrographs, Light, Prism Type
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Bausch & Lomb
Brinkmann Instruments
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929. Spectrographs, Mass. See 518

930. Spectrographs, Raman
Applied Physics
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Engis Equipment

(End of Spectrographs)

931. Spectrometers, Gamma Ray. See 647

932. Spectrometers, Mass. See 519

933. Spectrophosphorimeters
American Instrument

Spectrophotometers

934. Spectrophotometer Cells, Infrared
Baird-Atomic
Beckman Instruments, Scientific and Process Instruments Div.
Connecticut Instrument
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Limit Research
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935. Spectrophotometer Cells, Ultraviolet
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936. Spectrophotometer Data Plotter, Hand
Connecticut Instrument

937. Spectrophotometer Light Sources
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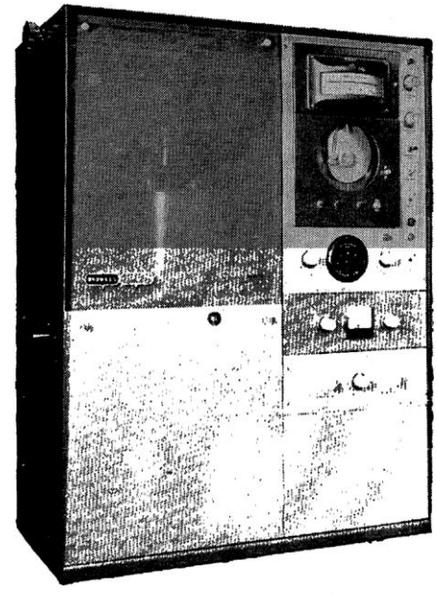
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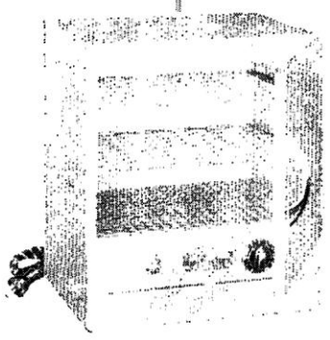
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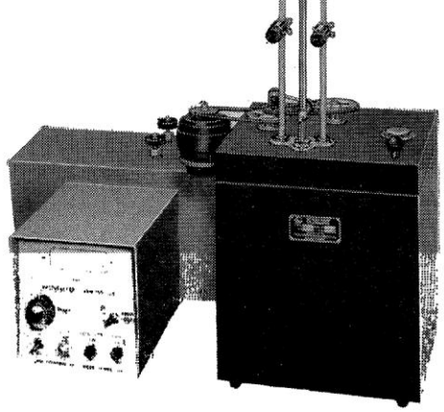
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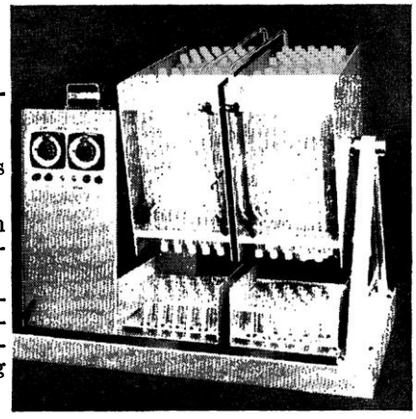
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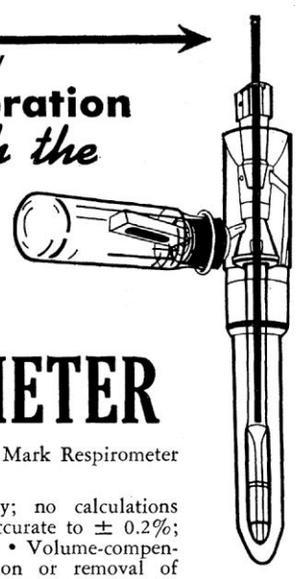
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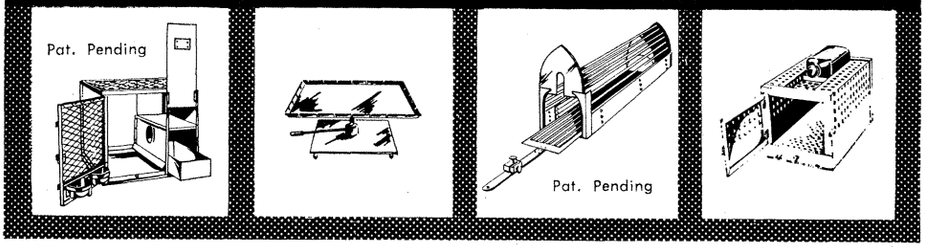
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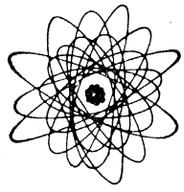
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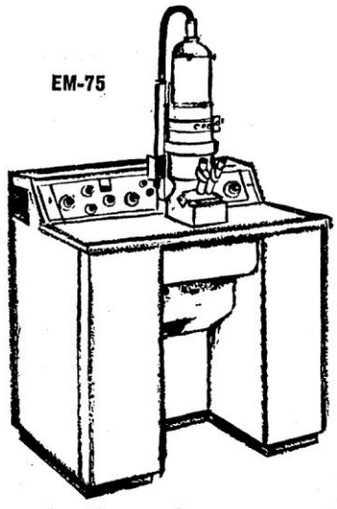
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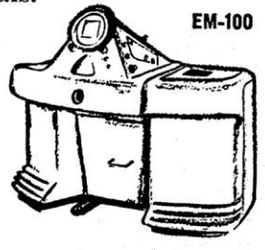
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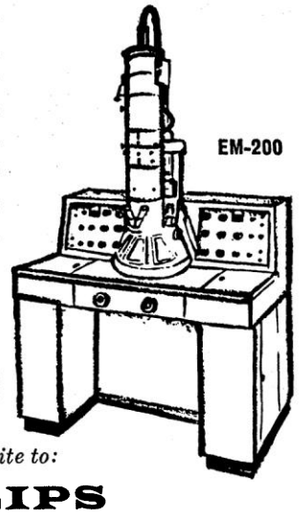
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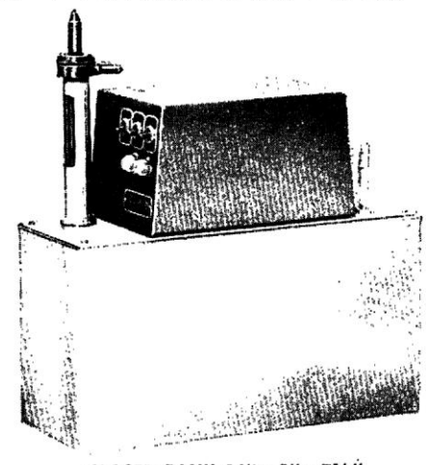
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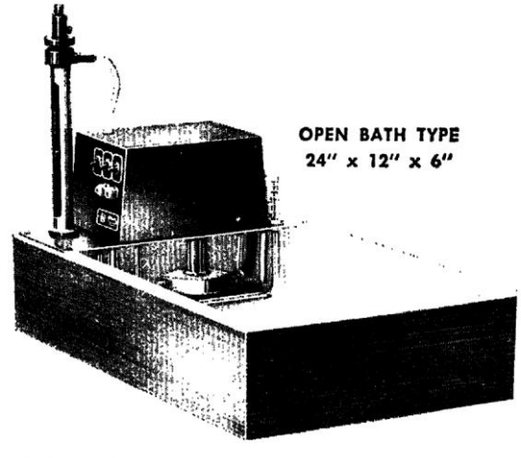
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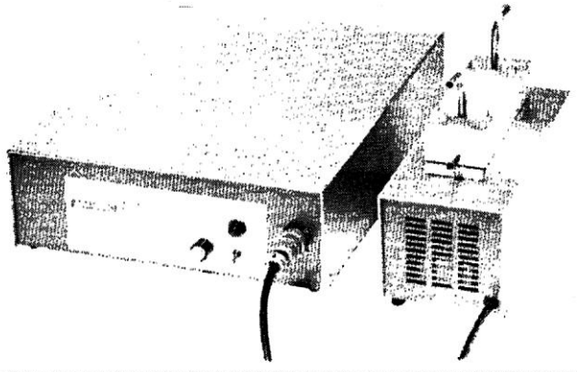
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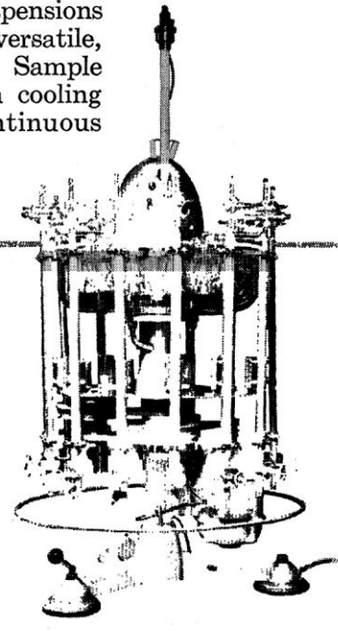
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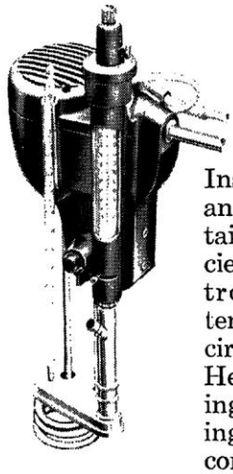
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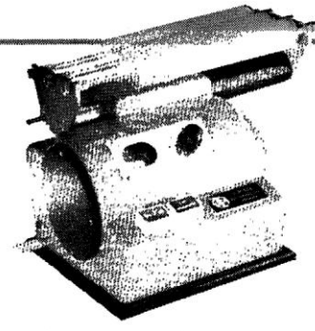
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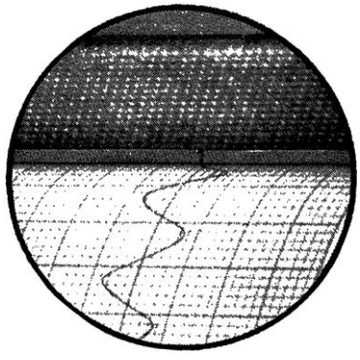
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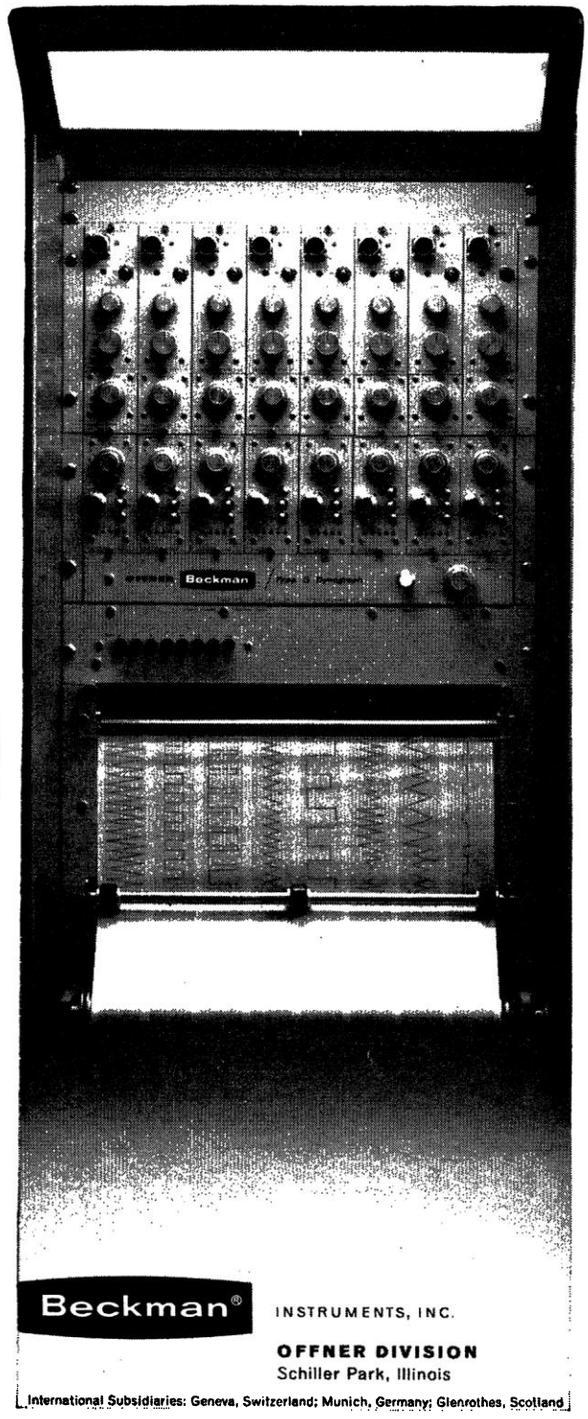
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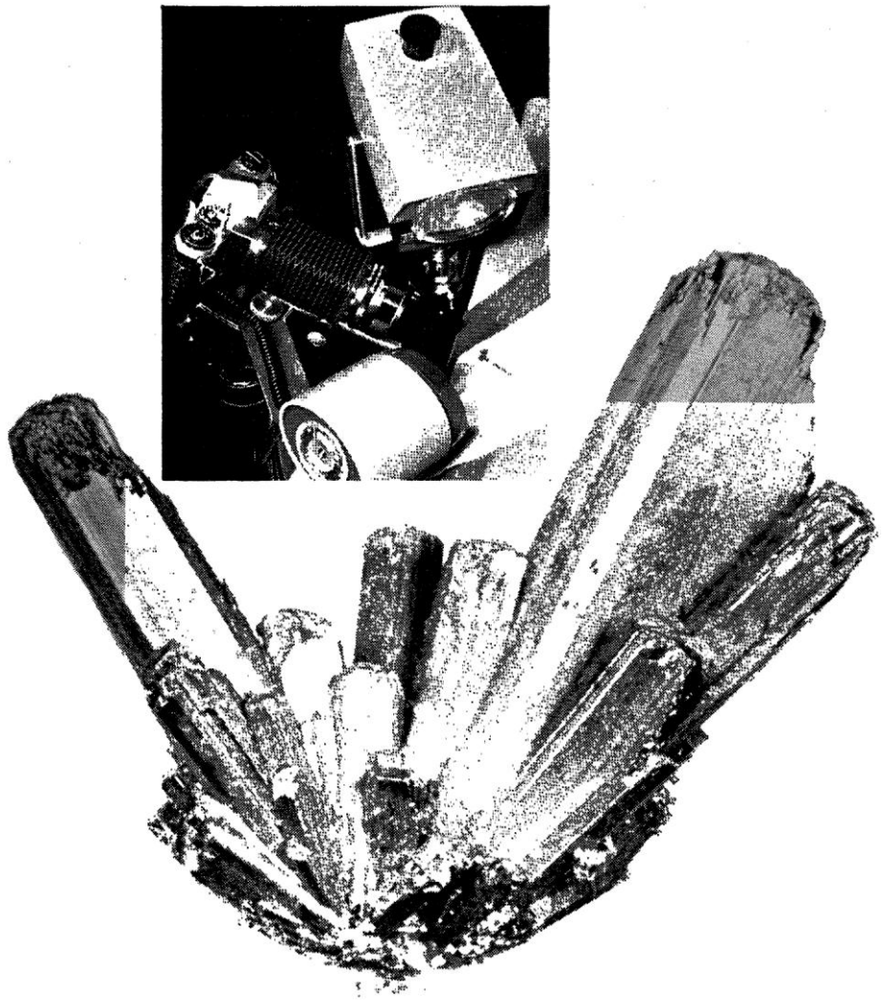
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4.0 msec at 10 mm deflection
NOISE:
With preamp <0.5 μv, RMS
Without preamp invisible
HYSTERESIS:
0.1% (full scale) locked in by positional feedback
RESOLUTION:
0.1% (full scale) locked in by positional feedback
LINEARITY:
0.15% (full scale) for DC; or AC within maximum amplitude envelope
DRIFT:
With preamp 1 μv/hr at max. gain
Without preamp <0.05 mm/hr (shorted input)
RECORDING AMPLITUDE:
Full chart channel width from DC —30 cps with progressive reduction to 5mm at 150 cps
INPUT:
With preamp...differential
Without preamp...single-ended
INPUT IMPEDANCE:
With preamp 2 megohms
With preamp 1 megohm
ZERO SUPPRESSION:
With preamp 50cm
Without preamp 15cm
CALIBRATION:
Internal
PAPER SPEEDS:
8 push button selected, standard speeds 0.1, 0.2, 0.5, 1, 2.5, 5, 10, 25 cm/sec. Other speeds on special order
PAPER SPEED ACCURACY:
1.0%
AMBIENT TEMPERATURE RANGE:
–20°C to +50°C
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60 w. average; 140 w. max (8 channels)
WARM-UP TIME:
Instantaneous
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+15v, 0.5 amps DC
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HIGH-IN, HIGH-OUT SWITCH:
For recording DC or low frequency signals. Signal frequencies above 50 cps (approx) attenuated in "High-Out" position
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063-208

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This specimen of an unusual Stibnite crystal has been lighted with Honeywell Strobonar electronic flash units and photographed with the Pentax H-1 camera, appropriately outfitted with Bellows Unit.

The electronic flash shown in the foreground is the 65-A. It is fitted with a Neutral Density Lens from the accessory kit of four interchangeable lenses. The 65-A is triggered by the camera shutter, and its light synchronously triggers the other light source, which is a Modeling Slave Strobonar, model 52-A.

The crystal photograph was made with the 55mm, f/2.2 Takumar lens, standard on the Honeywell Pentax H-1 camera. The bellows unit is set 105 mm; aperture f/16.

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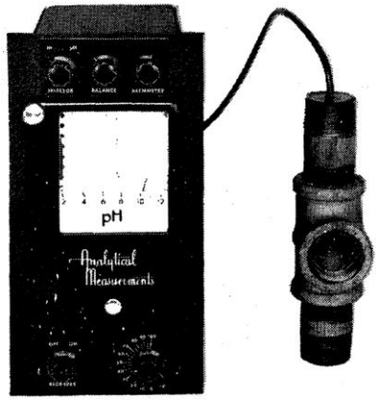
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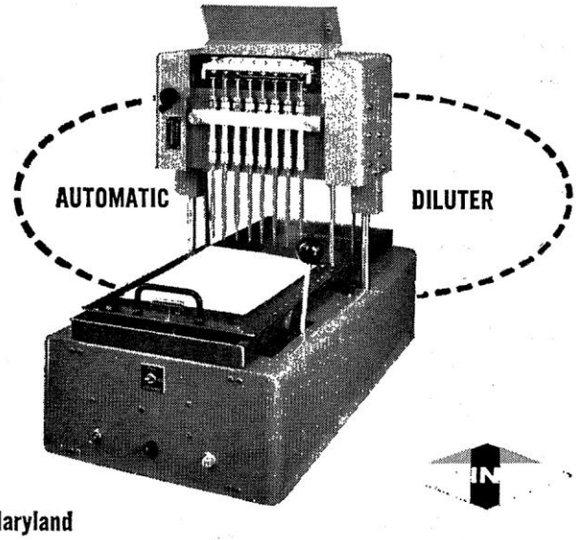
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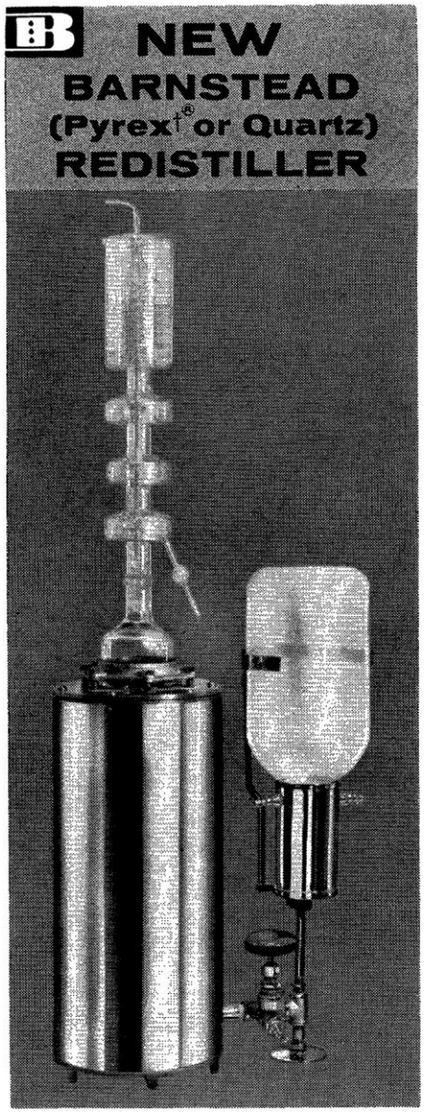
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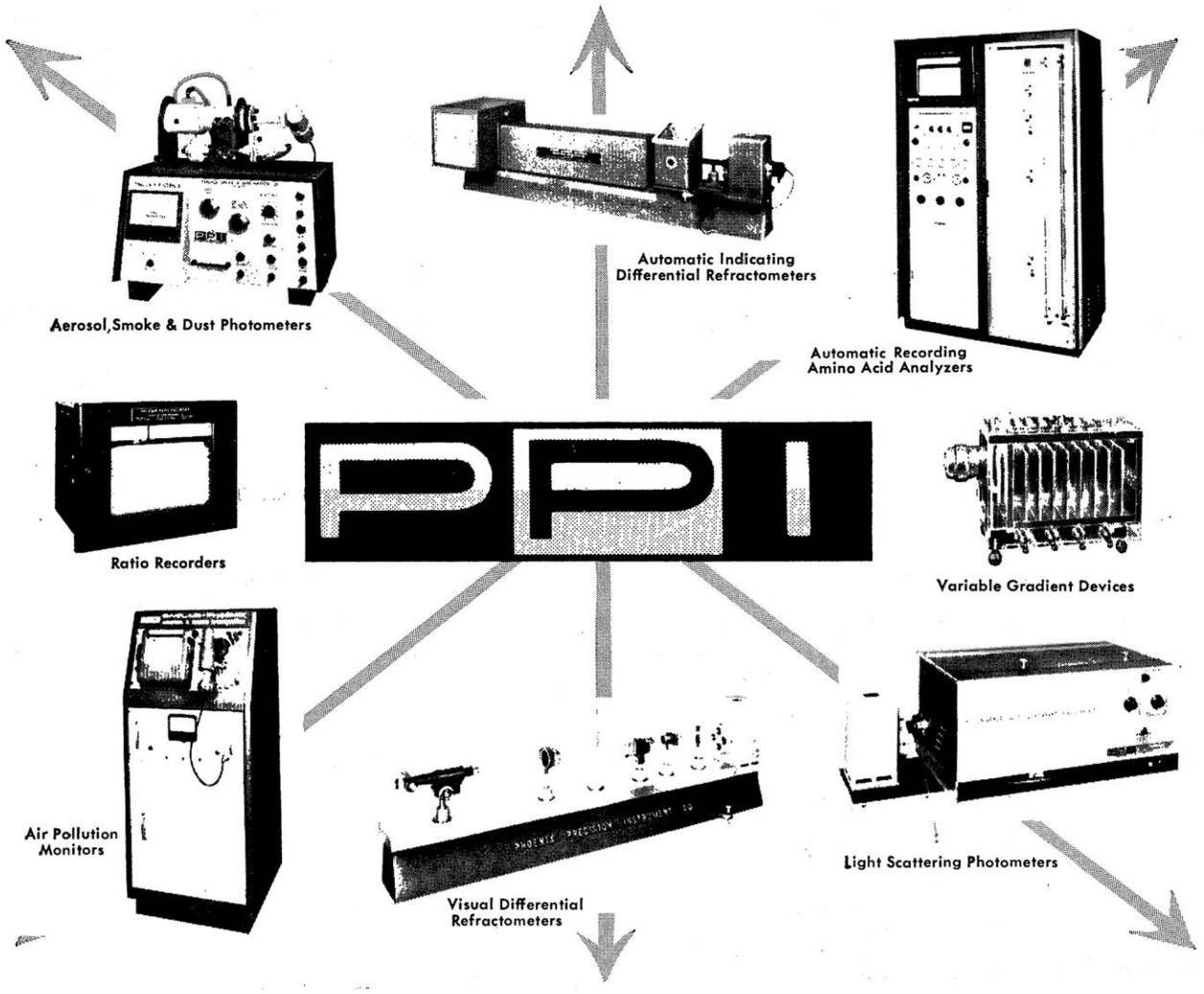
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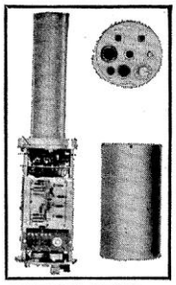
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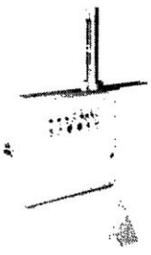
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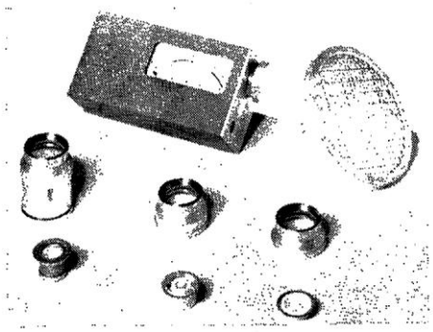
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E & M Instrument
Gilford Instrument Labs.
W. & L. E. Gurley
Kenelco
Machinery Electrification

1024. Transducers, Physiological
Avionics Research Products
Beckman Instruments, Spinco Div.
Biocom
Dynisco Div., American Brake Shoe
E & M Instrument
Electronic Medical Systems
Honig Labs.
Minneapolis-Honeywell Regulator, Industrial Products Group
Starling
Yellow Springs Instrument

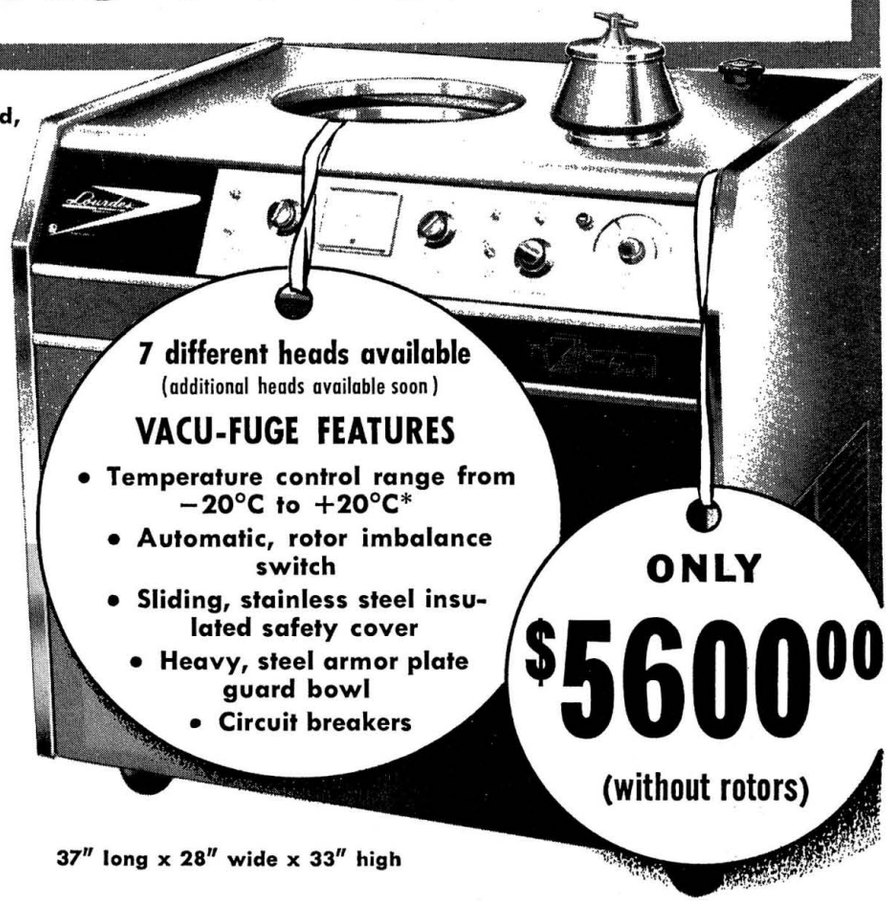
1025. Transducers, Pressure
Biotronics
Bourns
Clark Electronic Labs.
Consolidated Controls
Dynisco Div., American Brake Shoe
E & M Instrument
Electro Mechanical Research
Fairchild Controls
General Electric, Instrument Dept.
Gulton Industries
Hastings-Raydist
Hays
Industrial Instrument
Kaman Nuclear
Kollsman Instrument
Lunar Engineering
MKS Instruments
Philips Electronic Instruments
Pioneer Central Div., Bendix
Rosemount Engineering
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Firm/Institution_____

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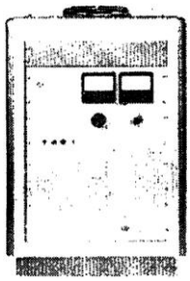
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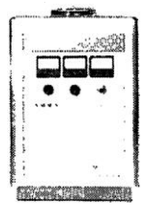
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Westinghouse, Scientific Equipment Dept.
Worden Lab.

1026. Transducers, Pressure, Ingestible for Physiological Measurements
Cambridge Instrument
E & M Instrument
Wianco Engineering

1027. Transducers, Pulse
Biocom
Cambridge Instrument
E & M Instrument
Franklin Systems
Starling
Veeder Root

1028. Transducers, Respiration Type
Beckman Instruments
Biocom
Cambridge Instrument
E & M Instrument
Kollsman Instrument
Minneapolis-Honeywell Regulator, Industrial Products Group
Starling

1029. Transducers, Solenoid
Midwestern Instruments

1030. Transducers, Sound
Blackstone
Electronic Applications
General Instrument
Hytech Div., Bissett Berman
Massa Div., Cohu Electronics
Minneapolis-Honeywell, Heiland
Radionics
Research Mfg.
H. H. Scott
Starling

1031. Transducers, Temperature, Resistance Type
Alnor Instrument
Atkins Technical
Barber-Colman
Consolidated Controls
Thomas A. Edison, Instrument Div.
Fenwal
Foxboro
General Electric, Industrial Sales
Hytech Div., Bissett Berman
Leeds & Northrup
Minco Products
Minneapolis-Honeywell Regulator, Industrial Products Group
National Instrument Labs.
Rosemount Engineering
E. H. Sargent
Sensitive Research Instrument
Starling
Trans-Sonics
U.S. Gauge Div., Ametek
Victory Engineering
Yellow Springs Instrument

1032. Transducers, Temperature, Thermistor
Atkins Technical
Beckman & Whitley
Conrad Carson Electronics
E & M Instrument
Fenwal
Gulton Industries
Hytech Div., Bissett Berman
Instrumentation Lab.
National Instrument Labs.
Ohio Semiconductors
Philips Electronic Instruments
Pioneer Central Div., Bendix
Powers Regulator
Rosemount Engineering
Starling
Trans-Sonics
United Control
Victory Engineering
Williamson Development
Yellow Springs Instrument

(End of Transducers)

1033. Transformer Power Supplies
Alfred Electronics
Carad
Central Scientific Div., Cenco Instruments
Davenport Div., Duncan Electric
Eder Instruments
Elcor
J. Fluke
Gates Electronic
General Electric, Industrial Sales Operation
General Radio
JKM Instrument
Lehigh Valley Electronics
Quan Tech Labs.
Radionuclide Div., Nuclide
Superior Electric

1034. Transformers, Variable, for Control of Laboratory Equipment
Acme Electric
Atlas Engineering
Cohu Electronics, Kin Tel Div.
General Radio
North Atlantic Industries
Research
Standard Electrical Products
Superior Electric

1035. Tritium Monitors. See 701

1036. Tubing, Plastic. See 801

1037. Tubing, Rubber
Clay-Adams
Kent Latex Products
Arthur H. Thomas

1038. Tuning Forks
Clay-Adams
Ealing
Riverbank Labs.

1039. Turbidimeters
American Instrument
Beckman Instruments, Scientific and Process Instruments Div.
E. I. du Pont de Nemours, Instrument Products Div.
Ercona
Kahl Scientific Instrument
Measurement Systems
Phoenix Precision Instrument
Precision Scientific
G. K. Turner Associates

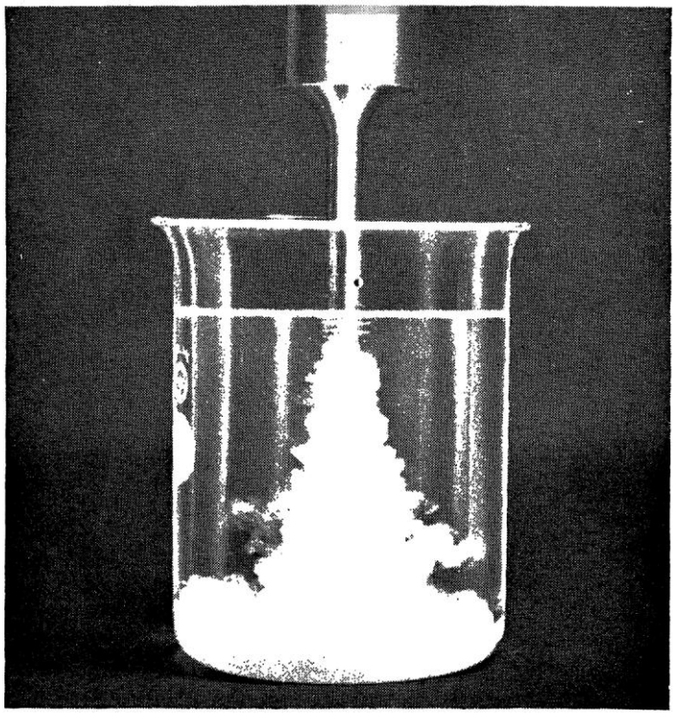
1040. Ultracentrifuges
Beckman Instruments, Spinco Div.
International Equipment
Lourdes Instrument
VirTis

1041. Ultrasonic Cleaners
Acoustica Associates
American Sterilizer
Atomic Accessories
Bendix
Branson Instruments
Blackstone
Electro Sonic Systems
Gulton Industries
National Ultrasonic
Nuclear Industries
Pioneer Central Div., Bendix
Powertron Ultrasonics
Southern Cross
Ultrasonic Industries

1042. Ultrasonic Disintegrators. See 286

1043. Ultrasonic Probes
Acoustica Associates
Branson Instruments
Bronwill Scientific
Blackstone
Curtiss-Wright
Electro Sonic Systems
Gulton Industries
Instrumentation Associates
Oceanic Instruments
Powertron Ultrasonics
Radionics
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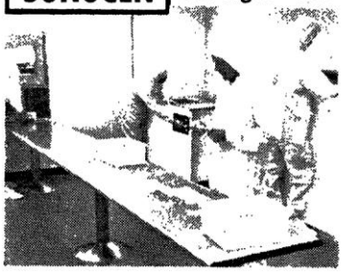
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These and other recent applications make the Sonifier one of the world's most versatile and useful pieces of ultrasonic equipment. Ask your Branson man or write for Bulletin No. 803.

SONOGEN® *... right for "white rooms"*



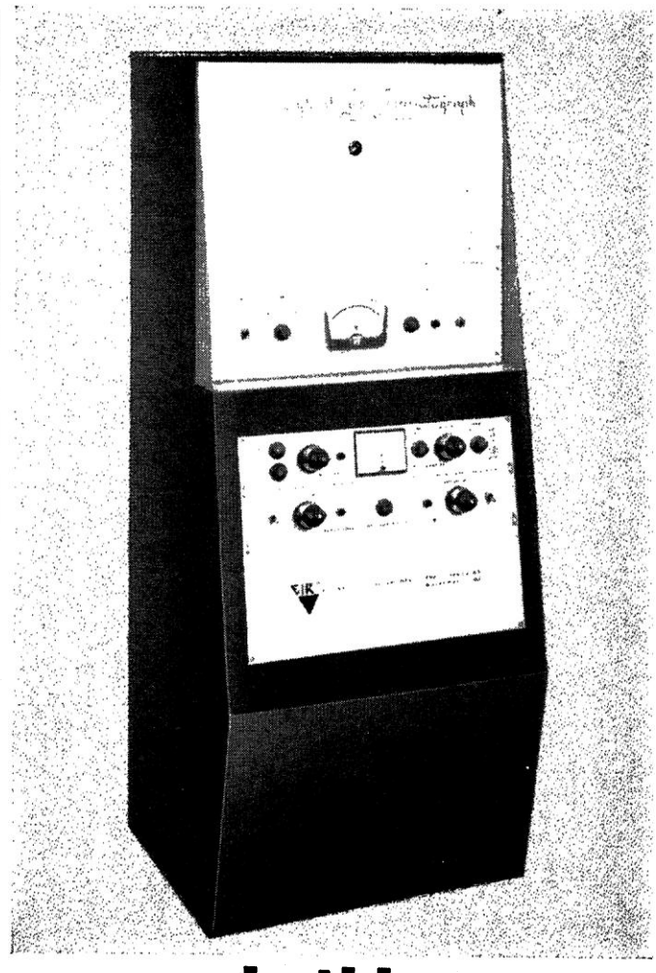
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1044. Ultraviolet Analyzers
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Chromatography
E. I. du Pont de Nemours, Instrument Products Div.
Gilford Instrument Labs.
Gilson Medical Electronics
Hallikainen Instruments
Karl Heitz
Instrumentation Specialties
LKB Instruments
Ultra-Violet Products
Vanguard Instrument

1045. Ultraviolet Light Sources. See 498

1046. Underwater Cameras, Oceanographic. See 708

Vacuum

1047. Vacuum Evaporators, for Sample Preparation in Electron Microscope. See 310

1048. Vacuum Evaporators, Metal
Alloyd Electronics
Bendix, Cincinnati Div.
Consolidated Vacuum
Electron Heating
Edwards High Vacuum
Elion Instruments
High Vacuum Equipment
International Pump
Kinney Vacuum
MRC Manufacturing
Materials Research
Mikros
NRC Equipment
Optics Technology
Precision Scientific
Royal Research
Tri Metal Works
Vactite
Vactronic Lab. Equipment
Vacuum Electronics
Vacuum Specialties
Varian Associates

1049. Vacuum Evaporators, Rotating, for Liquids
LaPine Scientific
Phipps & Bird
Rinco Instrument
Swissco Instruments
VirTis

1050. Vacuum Gauges
Beach-Russ
Canal Industrial
Central Scientific
Consolidated Vacuum
Crosby Valve & Gage
F. W. Dwyer
Elion Instruments
Fischer & Porter
General Electric, Instrument Dept.
Geophysics Corp. of America
Roger Gilmont Instruments
Hastings-Raydist
High Vacuum Equipment
Kinney Vacuum
Kollsman Instrument
Kontes Glass
LaPine Scientific
MKS Instruments
Manostat
Matheson
Minneapolis-Honeywell Regulator, Industrial Products Group
NRC Equipment
Nelson Vacuum Pump
Nester & Faust
Nuclear Corp. of America, Instrument & Control Div.
Nuclide Analysis Associates
Ohio Chemical & Surgical Equipment
Pall
Precision Distillation Apparatus
Sierra Electronic Div., Philco
Arthur F. Smith
F. J. Stokes
Vactite
Vacuum Electronics
Varian Associates, Vacuum Div.
Wallace & Tiernan
Weksler Instruments
Welch Scientific
Westinghouse, Scientific Equipment Dept.

1051. Vacuum Gauges, McLeod
Ace Glass
Beach-Russ
Central Scientific
Consolidated Vacuum
Delmar Scientific Labs.
Elion Instruments
Geophysics Corp. of America
Roger Gilmont Instruments
Kinney Vacuum
Kontes Glass
LaPine Scientific
MKS Instruments
Manostat
Scientific Glass Apparatus
F. J. Stokes
Todd Scientific
VirTis

1052. Vacuum Leak Detectors
Acme Industrial
Canal Industrial
Elion Instruments
Gelman Instruments
Geophysics Corp. of America
High Voltage Engineering
MKS Instruments
NRC Equipment
Newark Controls
Nuclear Enterprises
F. J. Stokes
U.S. Testing
Varian Associates, Vacuum Div.

1053. Vacuum Locks for Changing Samples in High Vacuum Systems
S. Blickman
Consolidated Vacuum
Forma Scientific
International Pump
Mikros
Nuclear Enterprises
Nuclide Analysis Associates
Varian Associates

1054. Vacuum Ovens. See 733

1055. Vacuum Pumps. See 838–841

1056. Vacuum Systems for Ultra High Vacuum
Amperex Electronic
Andonian Associates
Atomic Labs.
Beach-Russ
Coleman Instruments
Conrad
Consolidated Vacuum
Cryo-Sonics
Delmar Scientific Labs.
Elion Instruments
General Vacuum
Granville Phillips
Ilikon Corp.
International Pump
Jennings Radio
Kinney Vacuum
LaPine Scientific
MRC Mfg.
Mikros
NRC Equipment
Nuclide Analysis Associates
Precision Distillation Apparatus
Royal Research
Scientific Engineering Systems
F. J. Stokes
Sulfrian Cryogenics
Tri Metal Works
Ultek
Vactite
Vactronic Equipment
Vacuum Electronics
Vacuum Instrument
Vacuum Specialties
Varian Associates
Welch Scientific

1057. Vacuum Valves
Beach-Russ
Canal Industrial
A. W. Cashvalue
Central Scientific
Circle Seal Products
Conoflow
Consolidated Vacuum
Elion Instruments
Hanson Research
High Vacuum Equipment
High Voltage Engineering
Hydromatics
Jamesbury
Kinney Vacuum
Kontes Glass
LaPine Scientific
Matheson
Mikros
NRC Equipment
Robbins Aviation
F. J. Stokes
Vactite
Vacuum Specialties
Valcor Engineering
Varian Associates, Vacuum Div.
Westinghouse, Scientific Equipment Dept.

(End of Vacuum)

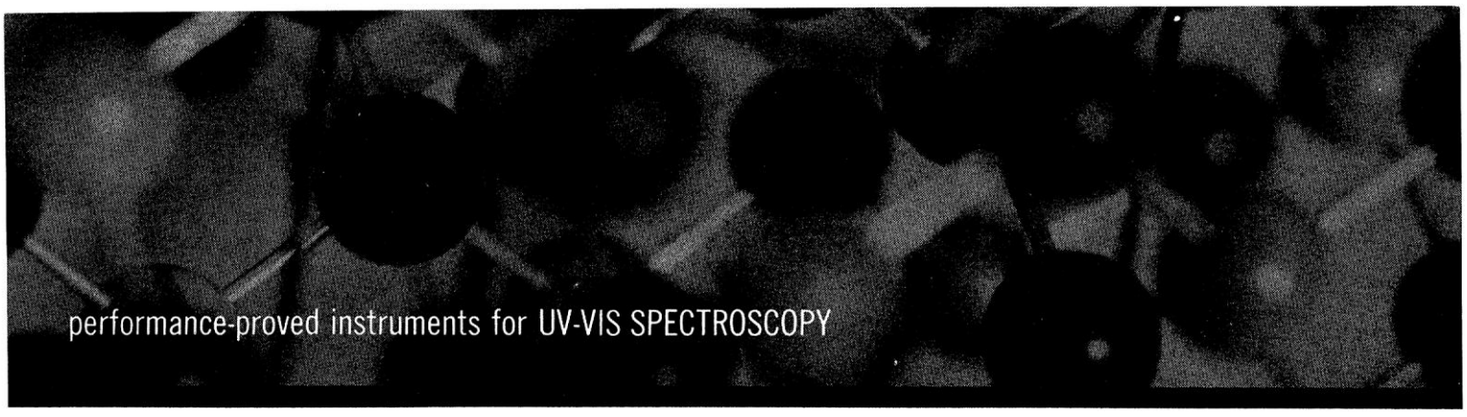
1058. Vapor Pressure Apparatus
Central Scientific
Fisher Scientific
Hallikainen Instruments
Labline Instruments
MKS Instruments
Precision Scientific
Telostat

1059. Viewing Cabinets, Chromatographic. See 185

1060. Viral Reagents
Animal Blood Centre
Baltimore Biological Lab.
Difco Labs.
Flow Labs.
Microbiological Associates

1061. Viscometers, Blood. See 95

1062. Viscometers, General Purpose
Apex Scientific
Automation Products
Bendix, Cincinnati Div.
Bico
C. W. Brabender Instruments
Brookfield Engineering Labs.
Cannon Instrument
R. P. Cargille, Labs.
Fann Instrument
J. W. Fecker Div., American Optical
Ferranti Electric
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Hallikainen Instruments
Kensington Scientific Corp. of California
Labline Instruments
Metro Industries
National Instrument
Precision Scientific
Rao Instrument
Scott Testers
Techne
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U.S. Testing
Viscosel
Westronics

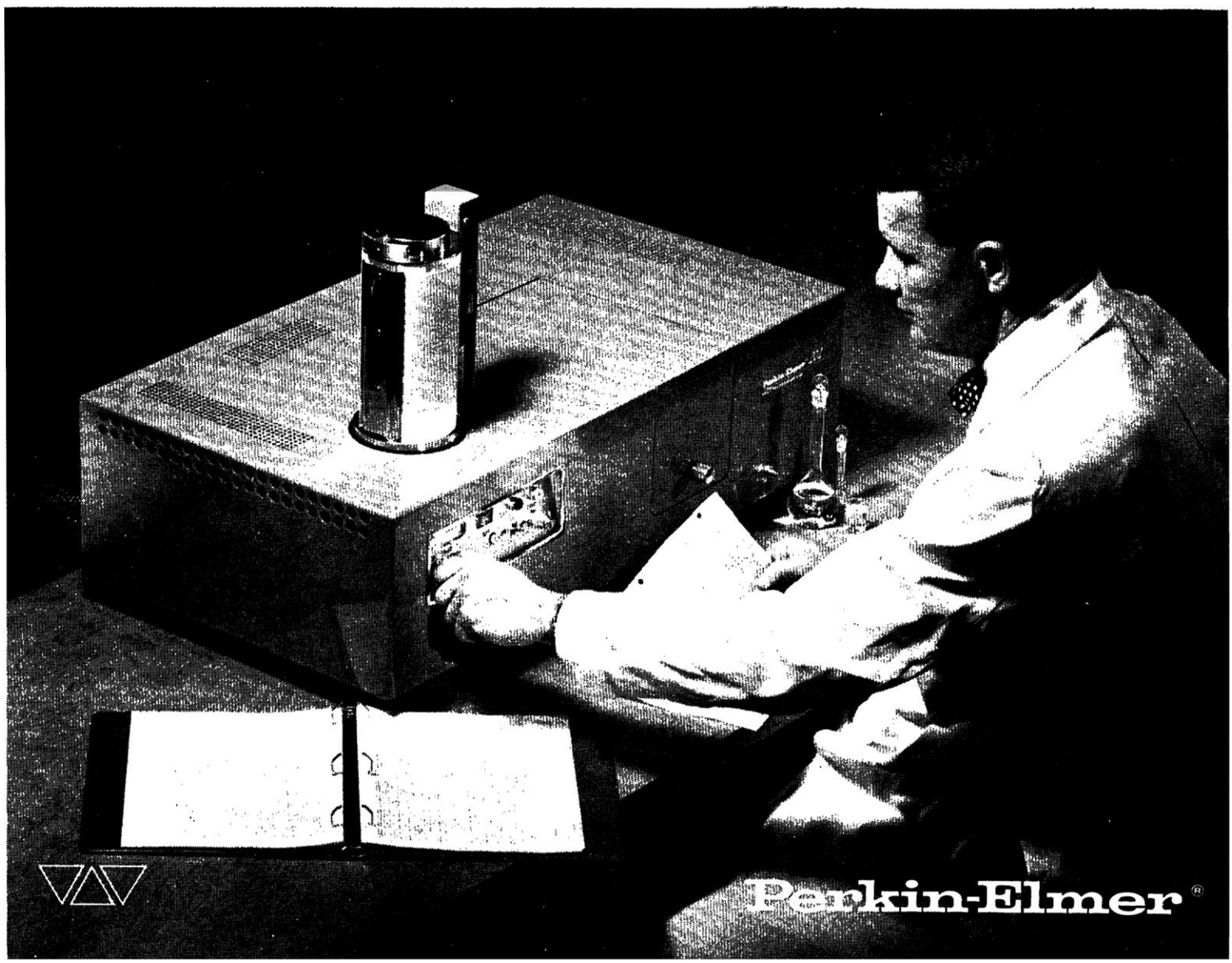


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Apex Scientific
Bico
Conrad
Fisher Scientific
Forma Scientific
Hallikainen Instruments
Hotpack
Modern Lab. Equipment
Precision Scientific
E. H. Sargent

1064. Voltmeters, Digital
Cohu Electronics, Kin Tel Div.
Electro Instruments
J. Fluke
Franklin Electronics
General Electric, Instrument Dept.
Hewlett-Packard
Industrial Instruments
Non-Linear Systems
Performance Measurements
Thermolyne

1065. Voltmeters, Standard
Assembly Products
Astrodata
Calibration Standards
Central Scientific
Ealing
Electro Instruments
Epic
J. Fluke
General Meters
Industrial Instruments
Keithley Instruments
London
Minneapolis-Honeywell Regulator, Precision Meter Div.
Muirhead Instruments
North Atlantic Industries
Parker Electrical Instrument
Philips Electronic Instruments
Simpson Electric
Theta Instrument
Welch Scientific

1066. Warburg Apparatus. See also 877
American Instrument
Bronwill Scientific
Roger Gilmont Instruments
Gilson Medical Electronics
Precision Scientific
Tech Glass
Arthur H. Thomas

1067. Warburg Manometer Calibrators
Mark
Micro-Metric Instrument

1068. Warburg Manometer Recorders
VirTis

1069. Warburg Manometers
American Instrument
Bronwill Scientific
Roger Gilmont Instruments
Mechrolab
Precision Scientific
Arthur H. Thomas

1070. Washers, Glassware. See 423

1071. Waste Containers, Radioisotope. See 703

Water

1072. Water Baths, General Purpose
Ac-Lab Equipment
Aloe Scientific
American Instrument
Apex Scientific
Barnstead Still and Sterilizer
Blue M Electric
Central Scientific
Fisher Scientific
Hallikainen Instruments
Hotpack
Hydor Therme
Instrumentation Lab.
Labline Instruments
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National Appliance
Precision Scientific
Research Manufacturing
E. H. Sargent
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U.S. Testing
Wilkens-Anderson

1073. Water Baths, Serological
Ac-Lab Equipment
Aloe Scientific
American Instrument
Blue M Electric
Central Scientific
Fisher Scientific
Hotpack
Hydor Therme
Labline Instruments
Modern Lab. Equipment
National Appliance
Precision Scientific
Arthur H. Thomas

1074. Water Bath Shakers. See 903

1075. Water Hardness Testers
Elgin Softener
LaMotte Chemical Products
Hayes G. Shimp

1076. Water Pressure Controllers
Industrial Instrument

(End of Water)

1077. Weights, Balance
Clay-Adams
Fisher Scientific
W. & L. E. Gurley
August Sauter of America
Seederer Kohlbusch
Torsion Balance

1078. Well Counters, Radiation. See 625, 628, 634

1079. Wheatstone Bridges
Cambridge Instrument
Central Scientific
Ealing
Eppley Lab.
General Radio
Industrial Instruments
Minneapolis-Honeywell Regulator, Industrial Products Group
Muirhead Instruments

1080. Wholebody Counters. See 705

1081. X-ray Diffraction Equipment
Brinkmann Instruments
Erb & Gray Scientific
Fish-Schurman
General Electric, X-ray Dept.
Hamner Electronics
Jarrell-Ash
Materials Research
Philips Electronic Instruments
Picker X-Ray
Tem Pres Research

1082. X-ray Equipment Flash. See 358

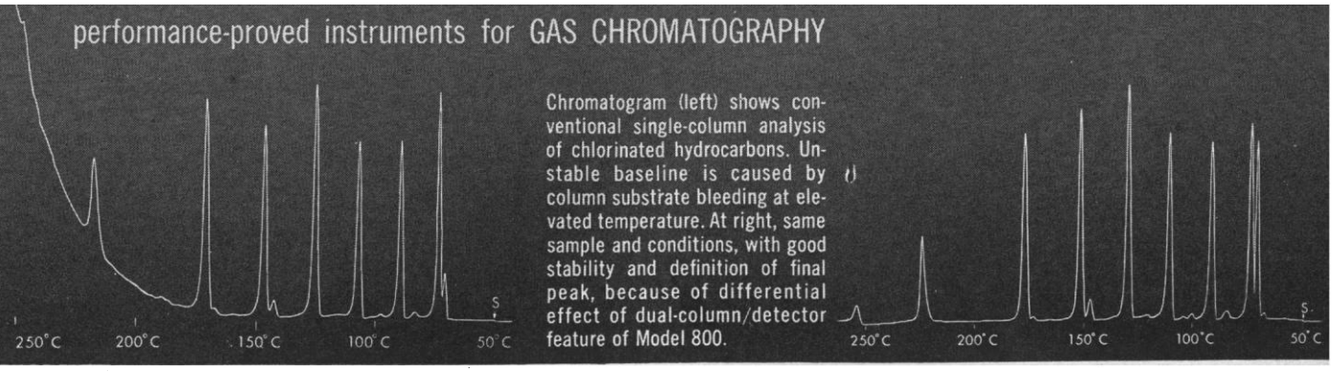
1083. X-ray Fluorescence Equipment
Applied Research Labs.
Avco Research & Advance Development Div.
Engis Equipment
Limit Research
Philips Electronic Instruments
Siemens New York

1084. X-Y Plotters. See 867

1085. Zirconium Light Sources. See 499

1086. Zone Refiners
Alloyd Electronics
Fisher Scientific
Materials Research
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Chromatogram (left) shows conventional single-column analysis of chlorinated hydrocarbons. Unstable baseline is caused by column substrate bleeding at elevated temperature. At right, same sample and conditions, with good stability and definition of final peak, because of differential effect of dual-column/detector feature of Model 800.

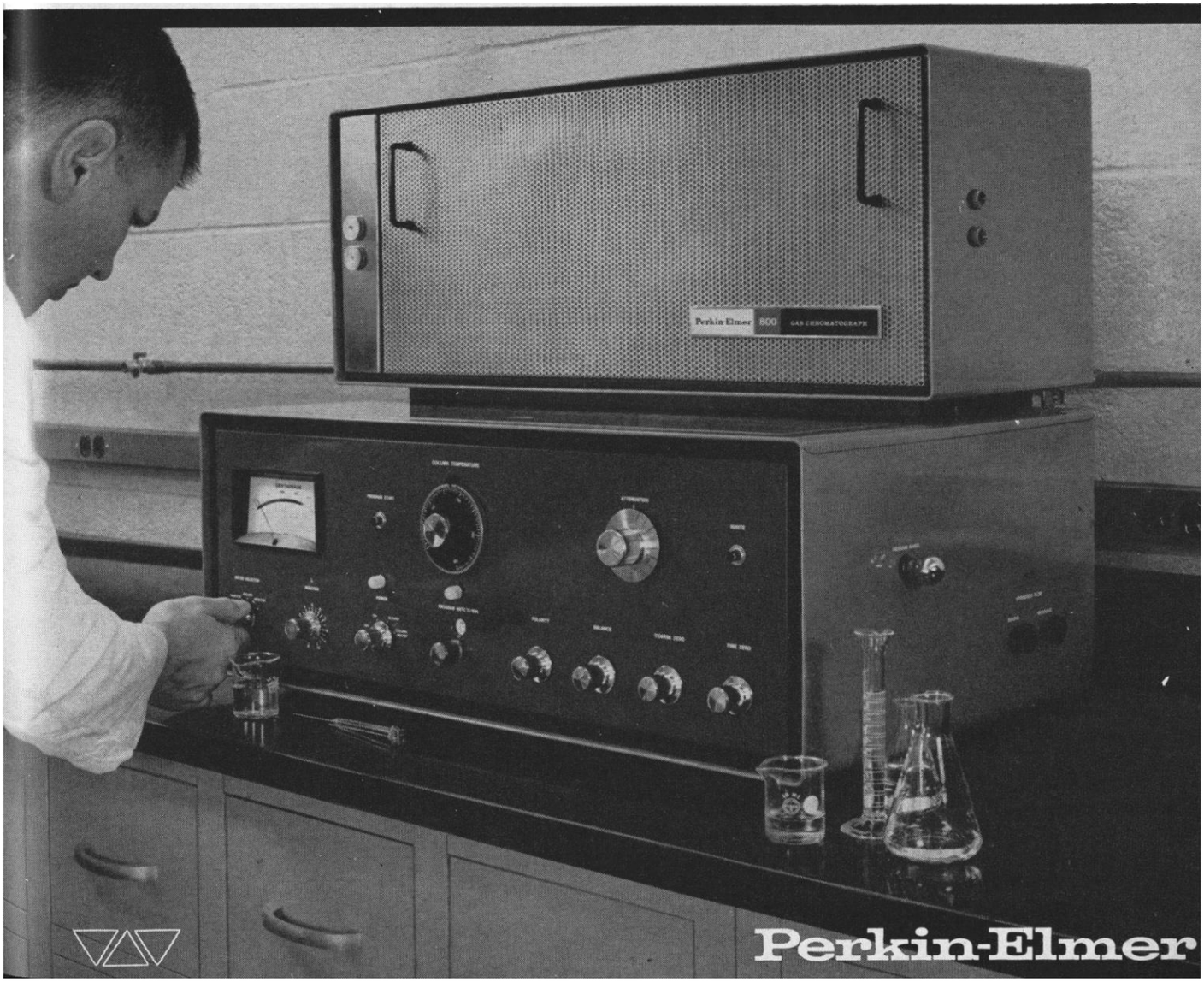
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For more information on the Model 800 gas chromatograph, write to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.



Model R7 Recipro-Glide Shaker
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Ranging in size from bench-top shakers to large, 4-tier industrial models, this apparatus is available in a wide range of speeds and strokes. Some units are equipped with facilities for gassing; others are refrigerated and illuminated for low temperature and photosynthesis studies.

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Model S-3 Gyrotory Shaker
Variable speed range: 85-285 rpm or 140-400 rpm. Uniform ¾″ stroke. Holds 25/250-ml flasks*.



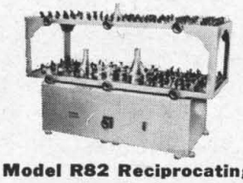
Model G76 Gyrotory Water Bath Shaker
Speed ranges: 85-285 rpm or 140-400 rpm. ½″ stroke. Temperature adjustable to 100° C ± 0.5 C. Cooling coil and gassing hood optional. Models available with reciprocal agitation. Holds 9/250-ml flasks*.



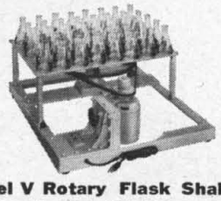
Model G10 Gyrotory Shaker
Variable speed range: 140-400 rpm or 50-150 rpm. Uniform 1″ stroke. Holds 40/250-ml flasks*. Larger platform holds 70/250-ml flasks*.



Model G25 Gyrotory Incubator-Shaker
Variable speed range: 140-400 rpm or 50-150 rpm. Uniform 1″ stroke. Thermostatic temperature control to 60° C ± 0.5° C. Optional connections for gassing. Larger refrigerated models also available. Holds 40/250-ml flasks*.



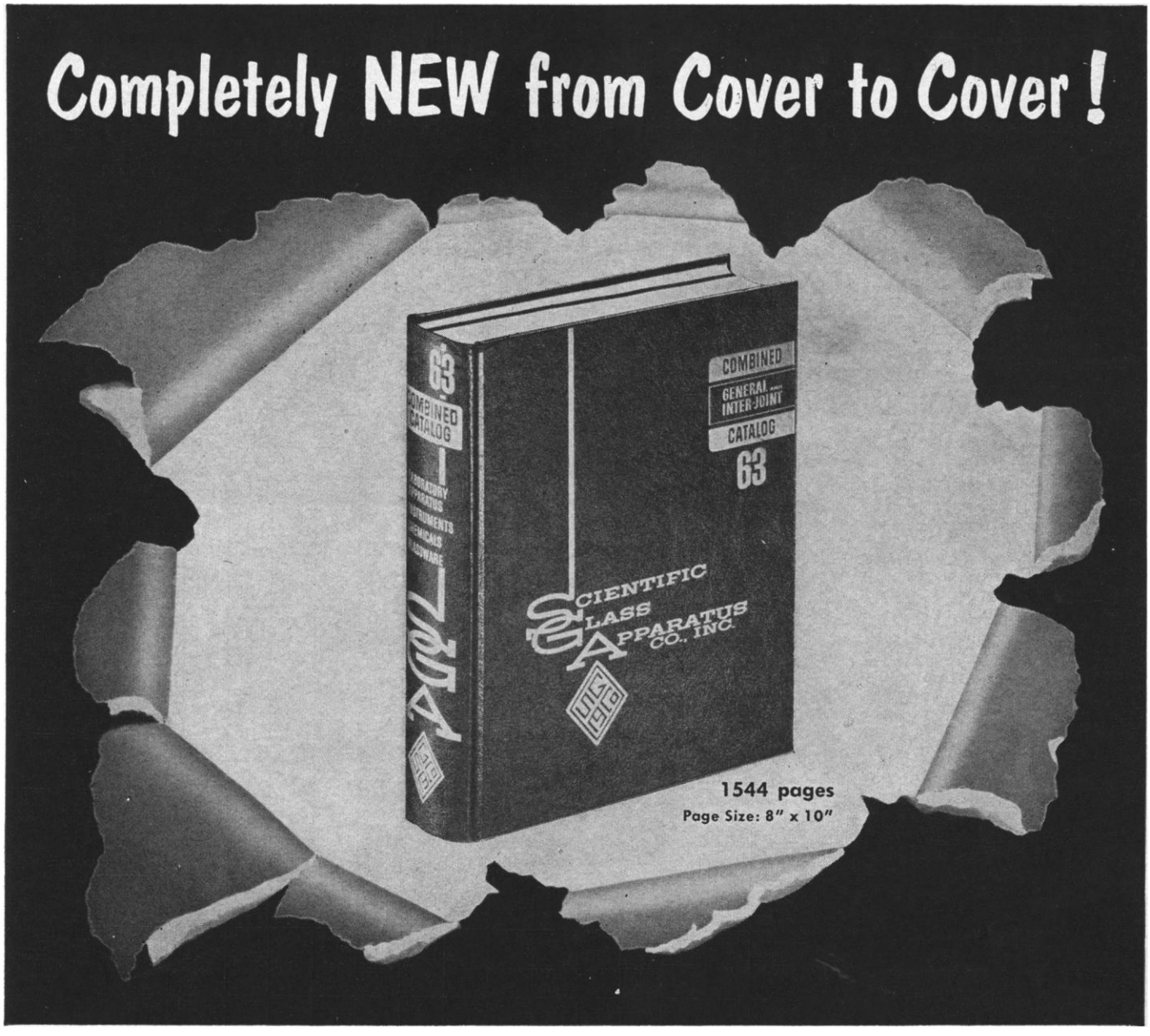
Model R82 Reciprocating Tier Shaker
Speed range: 35-200 strokes per min. Continuously adjustable stroke from 0-4″. Holds 192/250-ml flasks on 6 removable trays*.



Model V Rotary Flask Shaker
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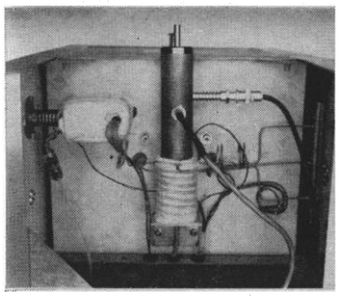
TYPE		X-RAY	ALPHA	BETA	GAMMA	COSMIC RAY	NEUTRONS: FAST	NEUTRONS: SLOW
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	Windowless	—	X	X	X	—	—	—
End Window	Metal	—	X	X	X	—	—	—
	Glass	—	X	X	X	—	—	—
Organic Quench	Metal	—	—	—	—	X	X	—
	Glass	X	—	X	X	—	—	—
BF_3		—	—	—	—	—	—	X
Helium-3		—	—	—	—	—	—	X
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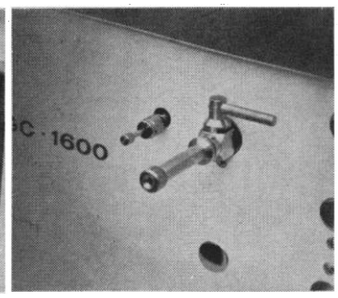
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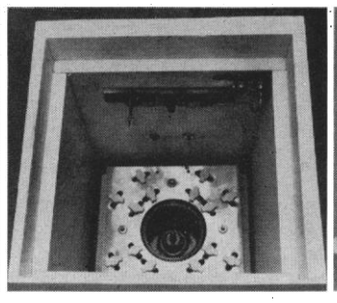
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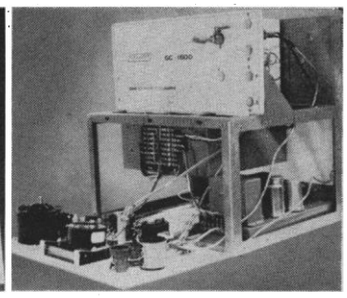
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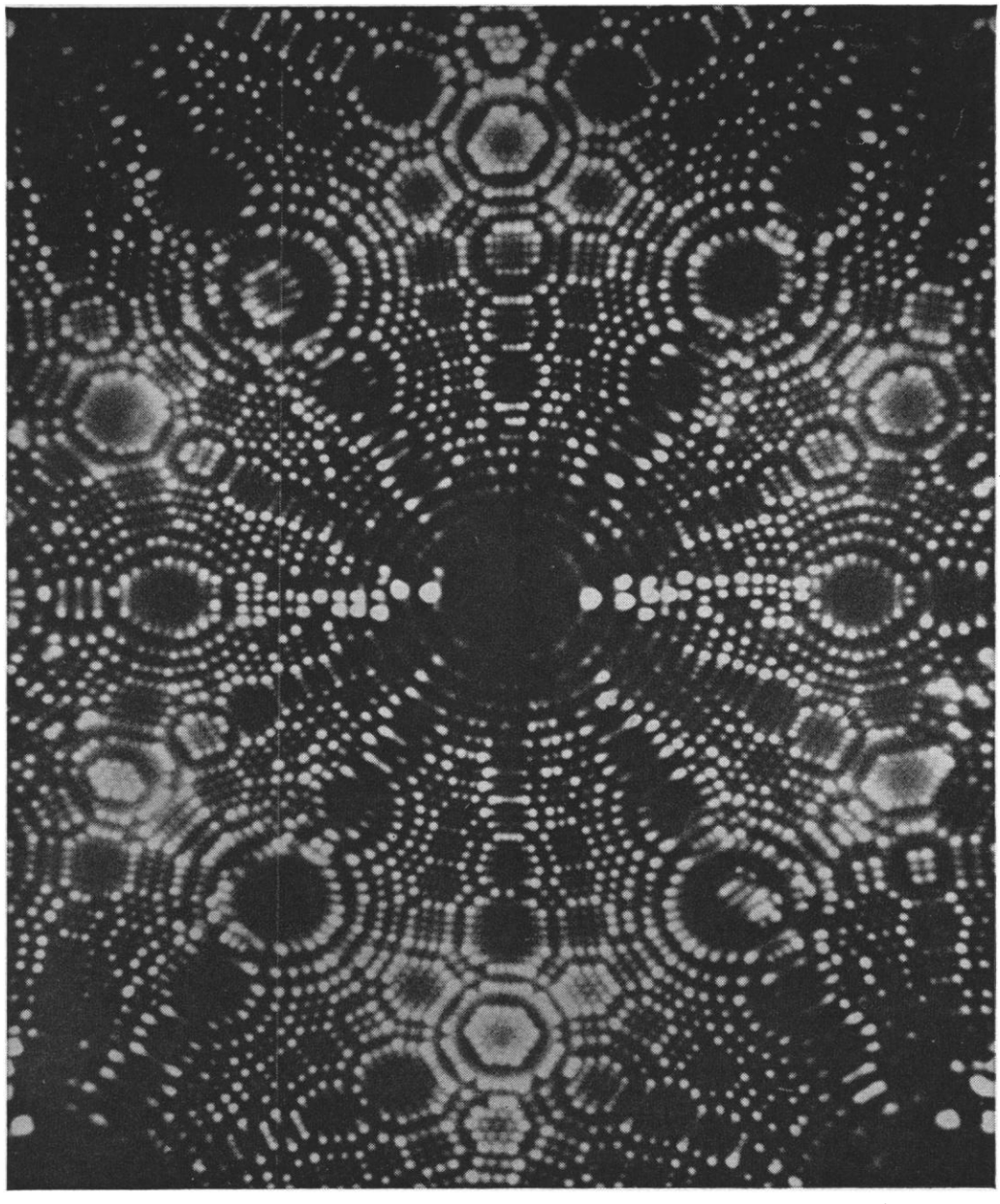
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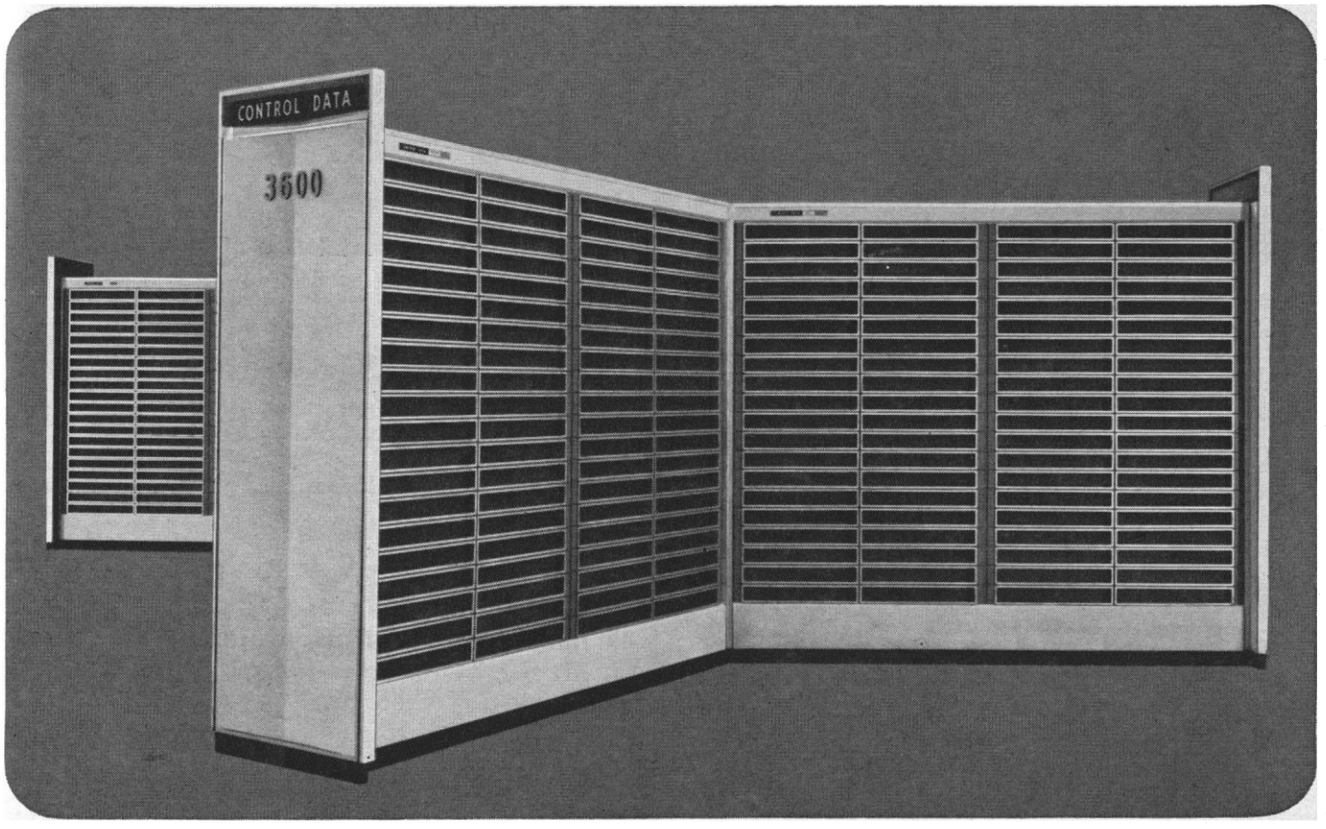
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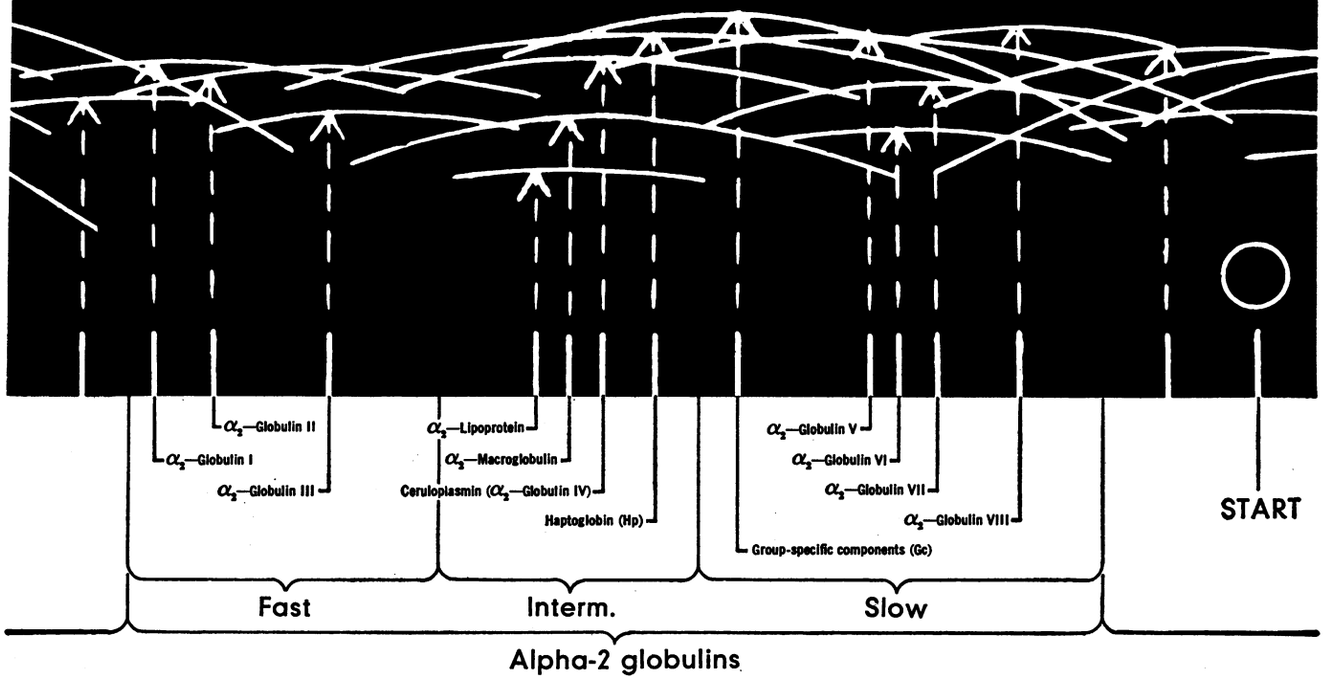
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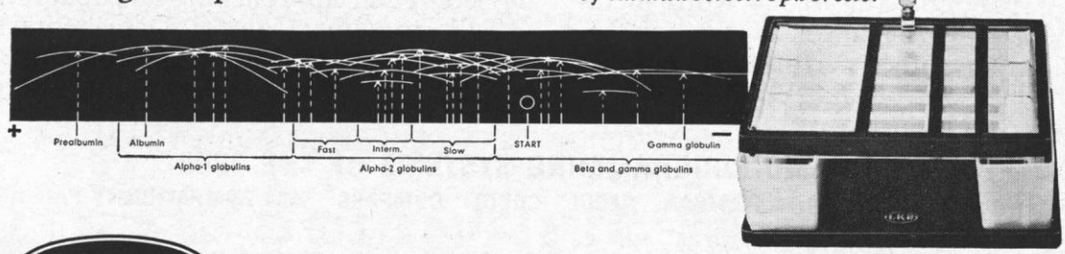
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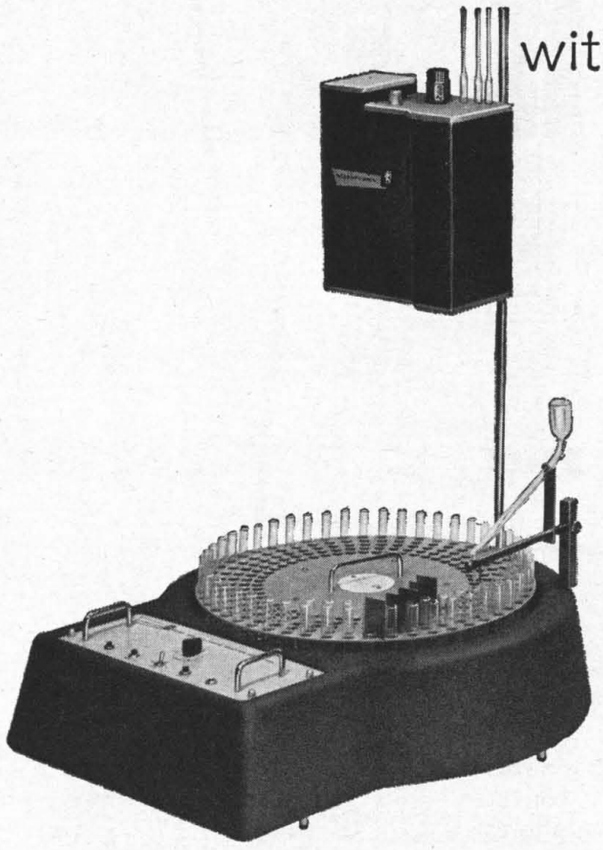
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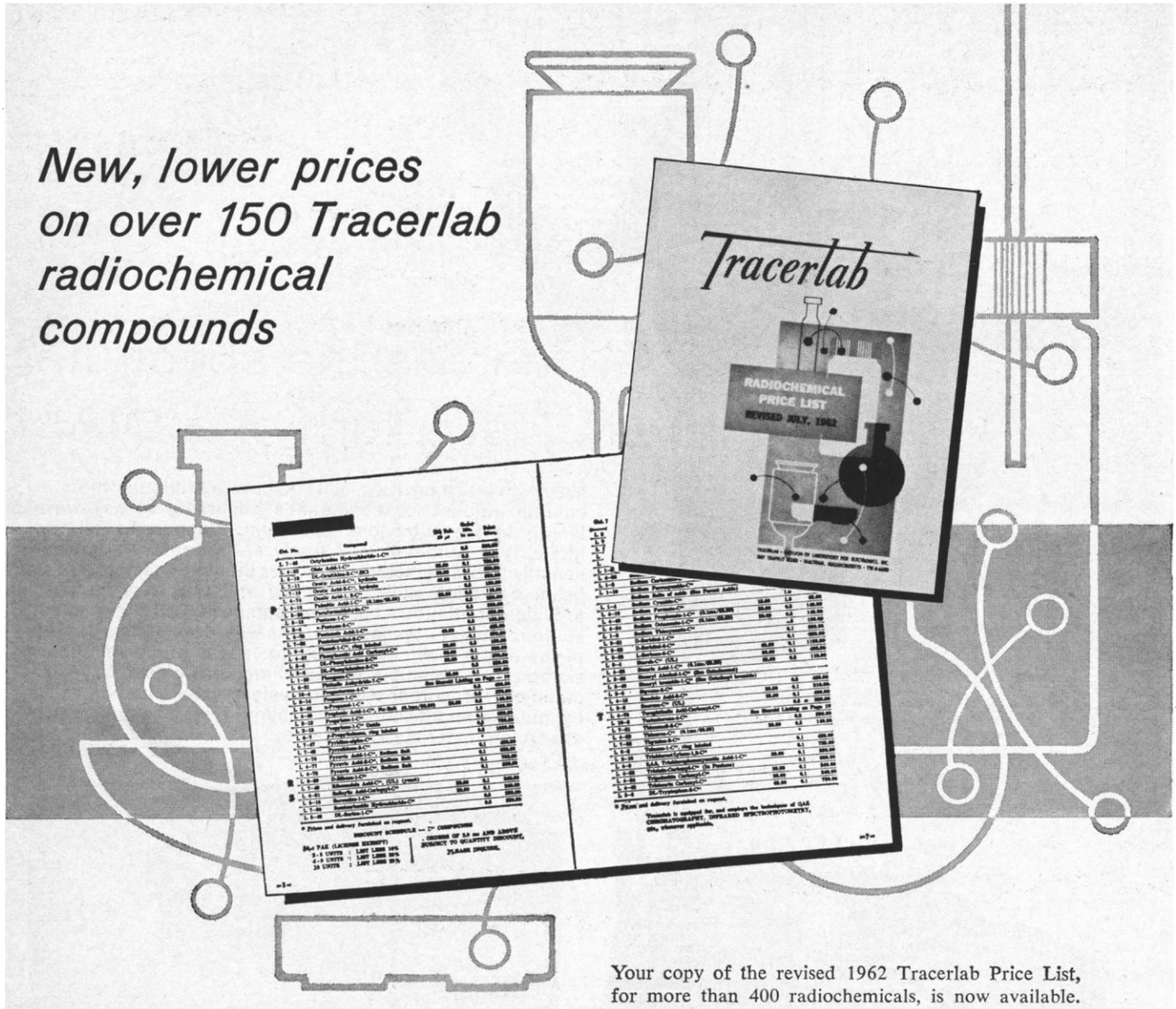
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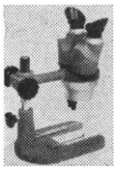


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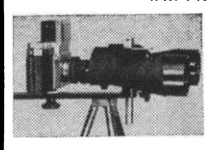
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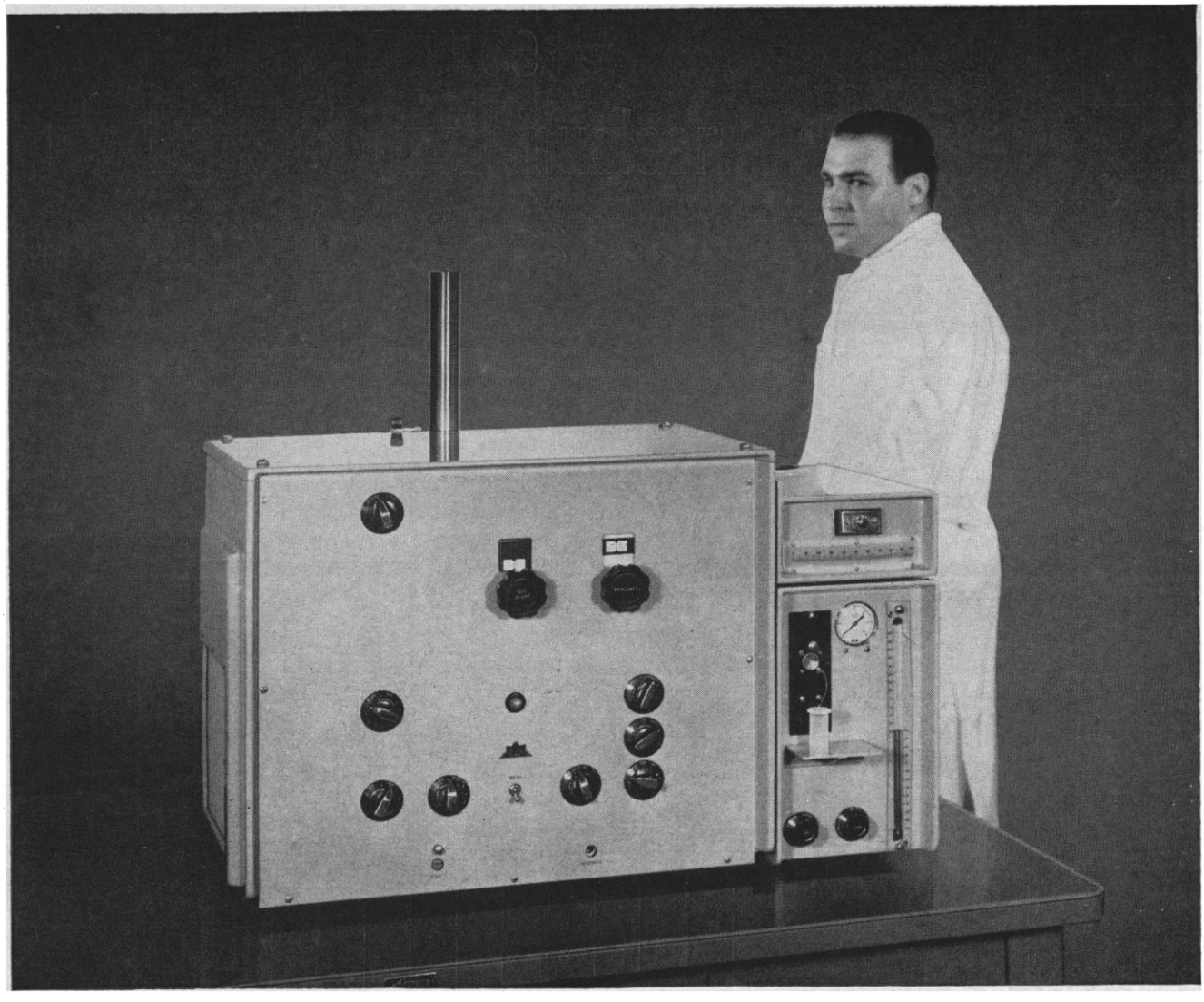
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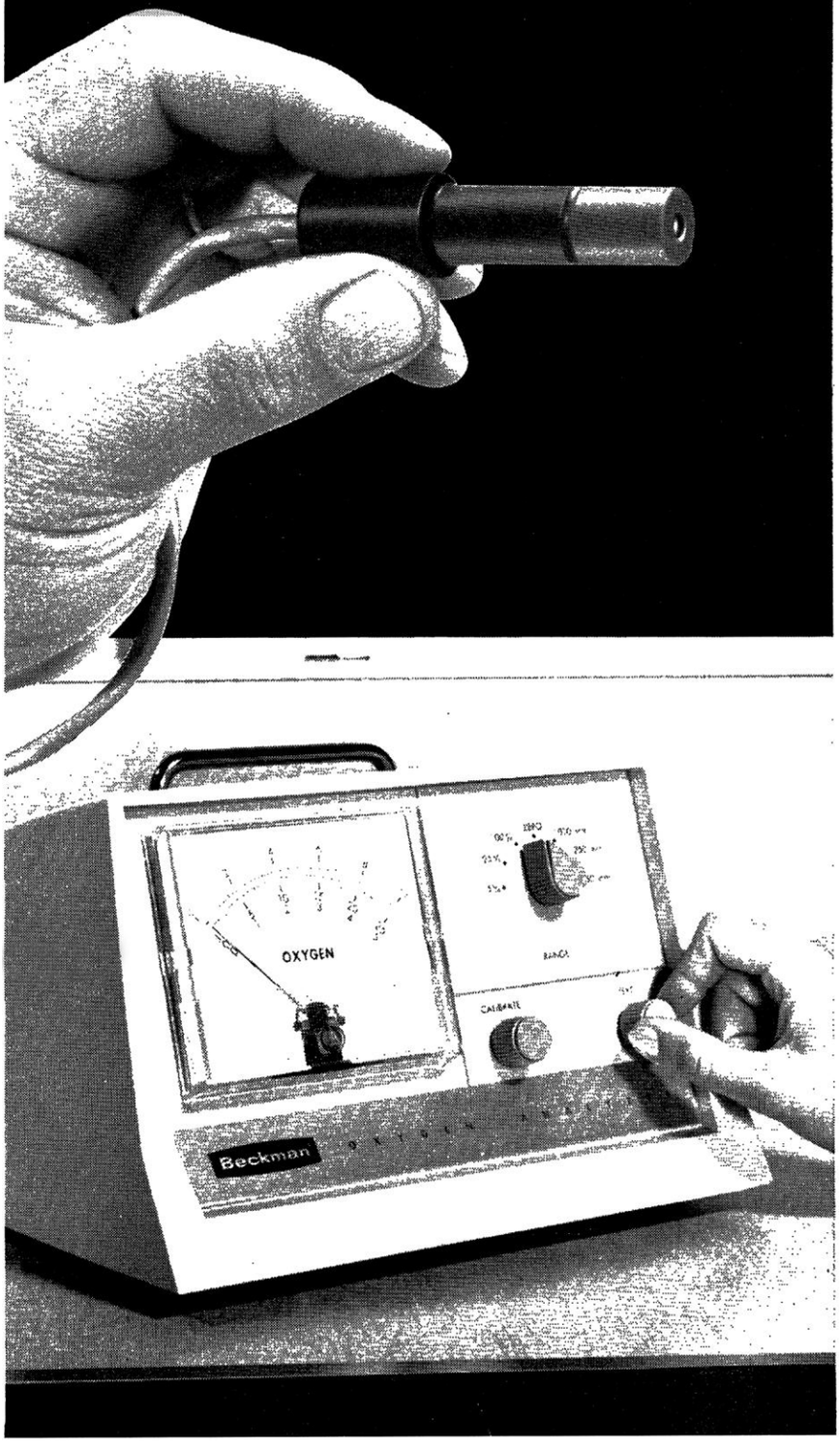
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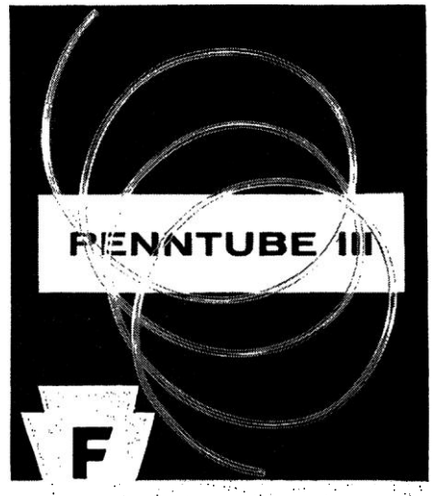
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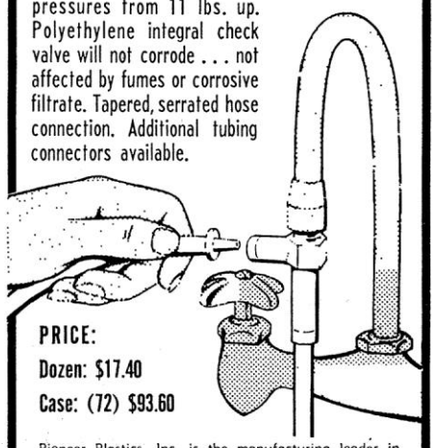
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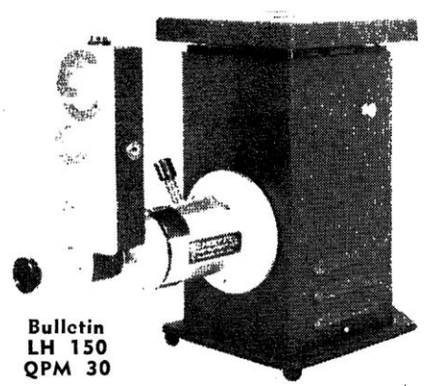
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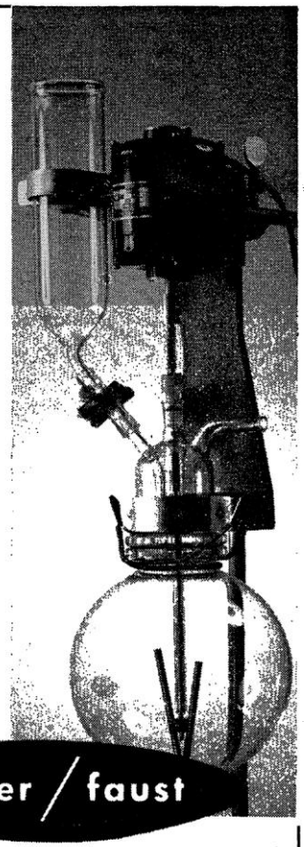
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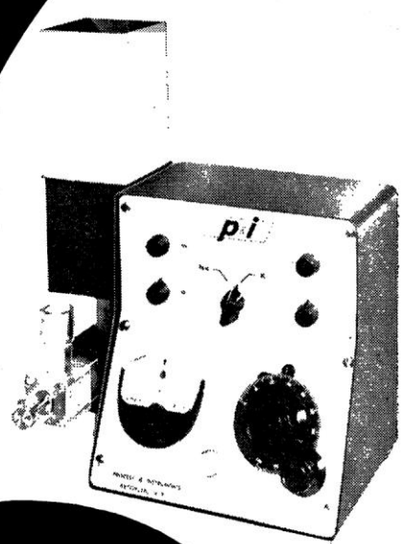
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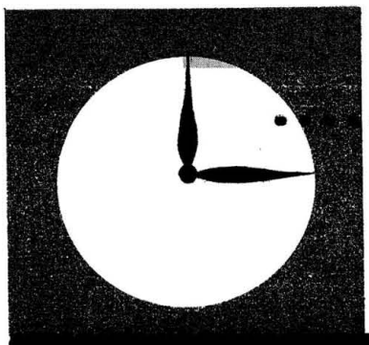
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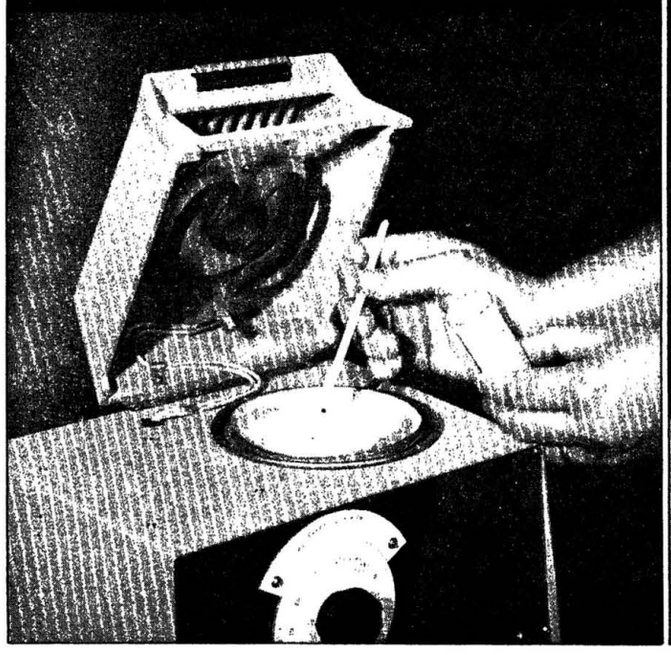
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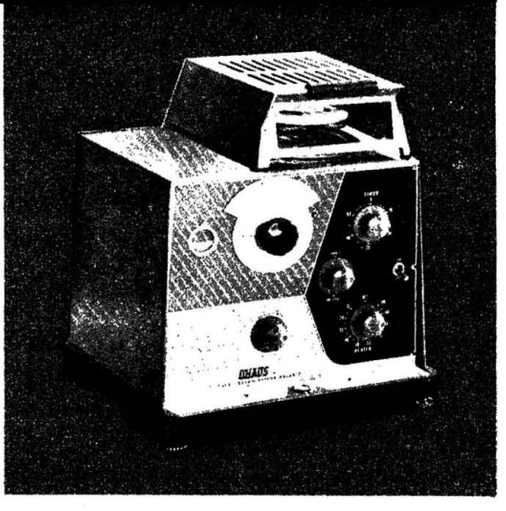


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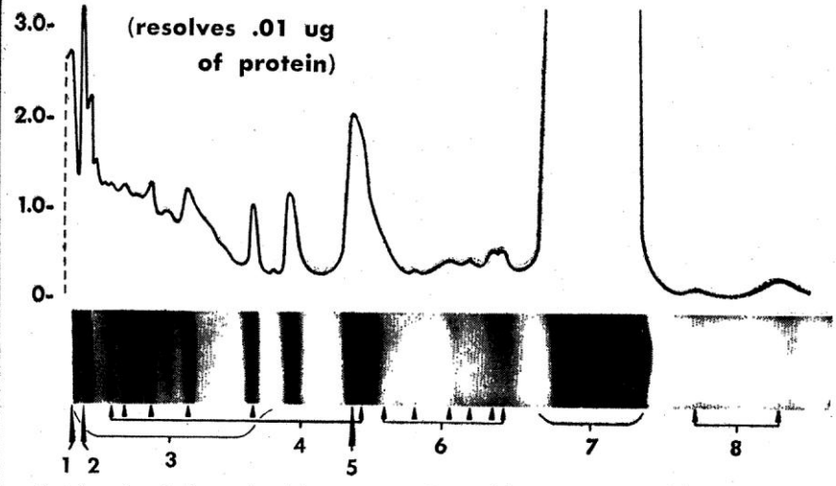
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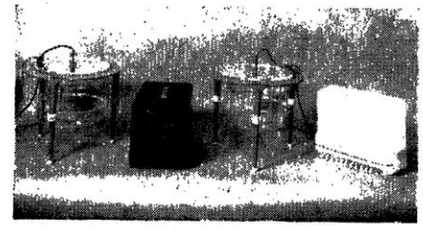


Proteins of a 3 ul sample of human serum (haptoglobin type 2-1, no free hemoglobin or hemoglobin-haptoglobin complexes): (1) slow beta 1 lipoprotein; (2) slow alpha 2 macroglobulin; (3) region of "7S" gamma globulins; (4) haptoglobins; (5) transferrin; (6) post-albumins; (7) albumin; (8) pre-albumins. Optical density traced by CANALCO Model E Microdensitometer.

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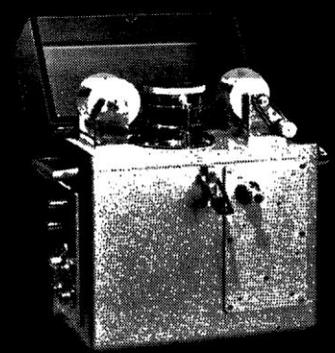
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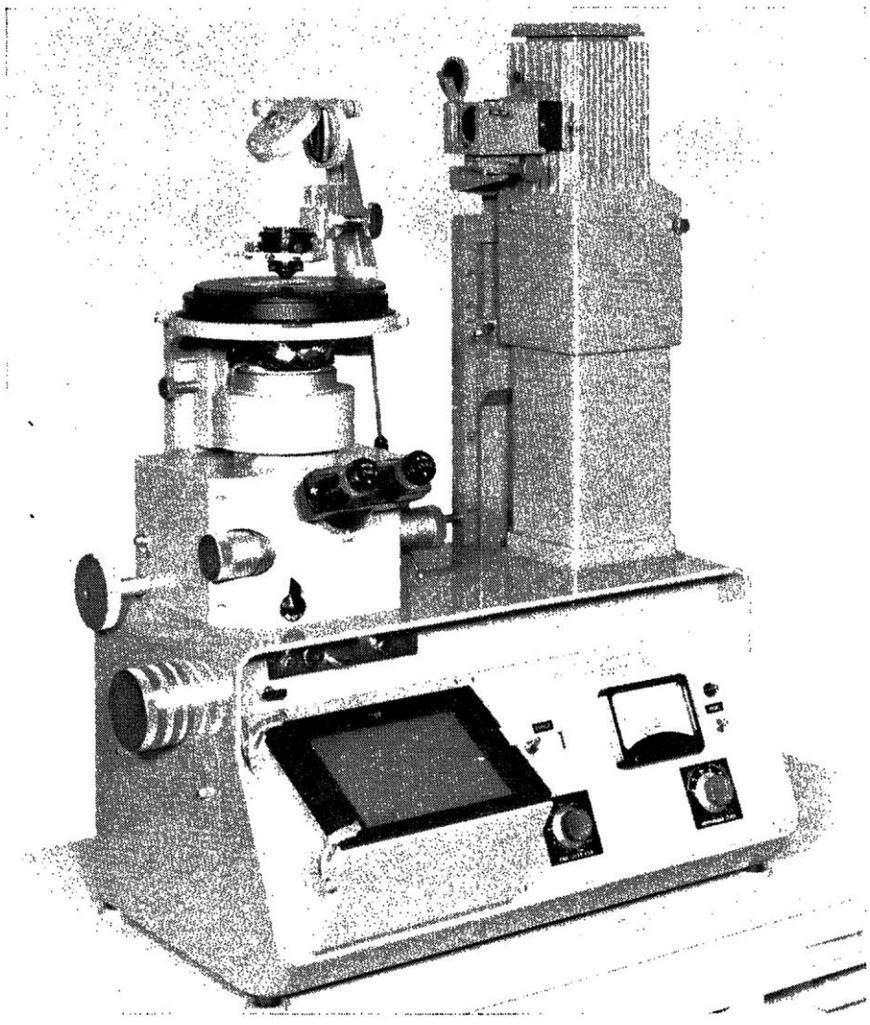
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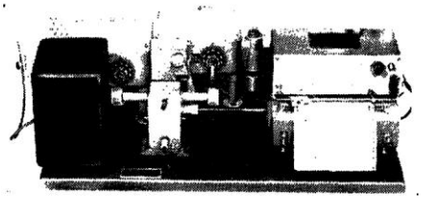
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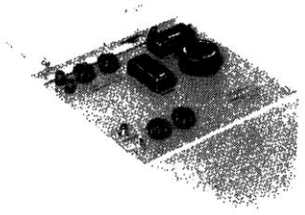
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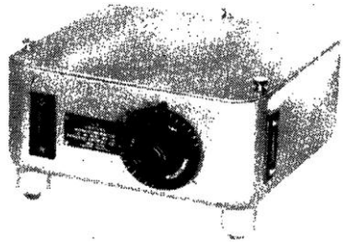
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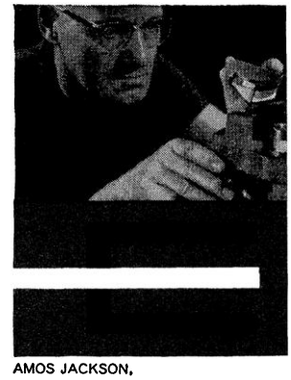
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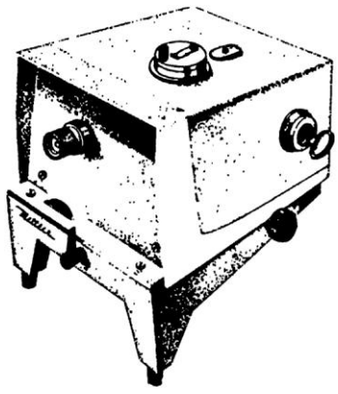


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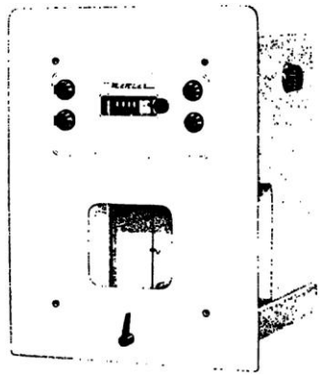


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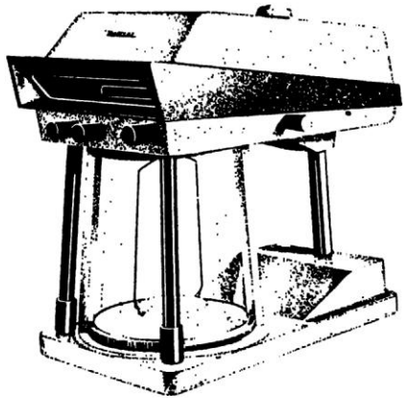
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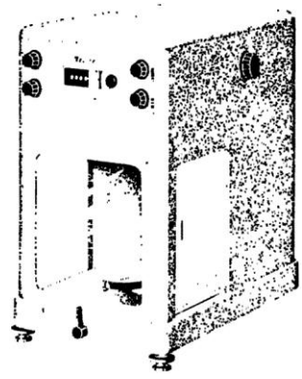
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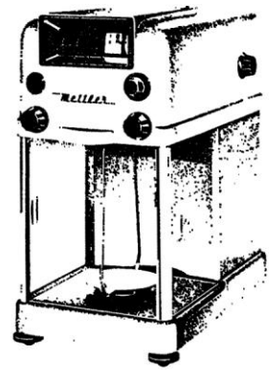
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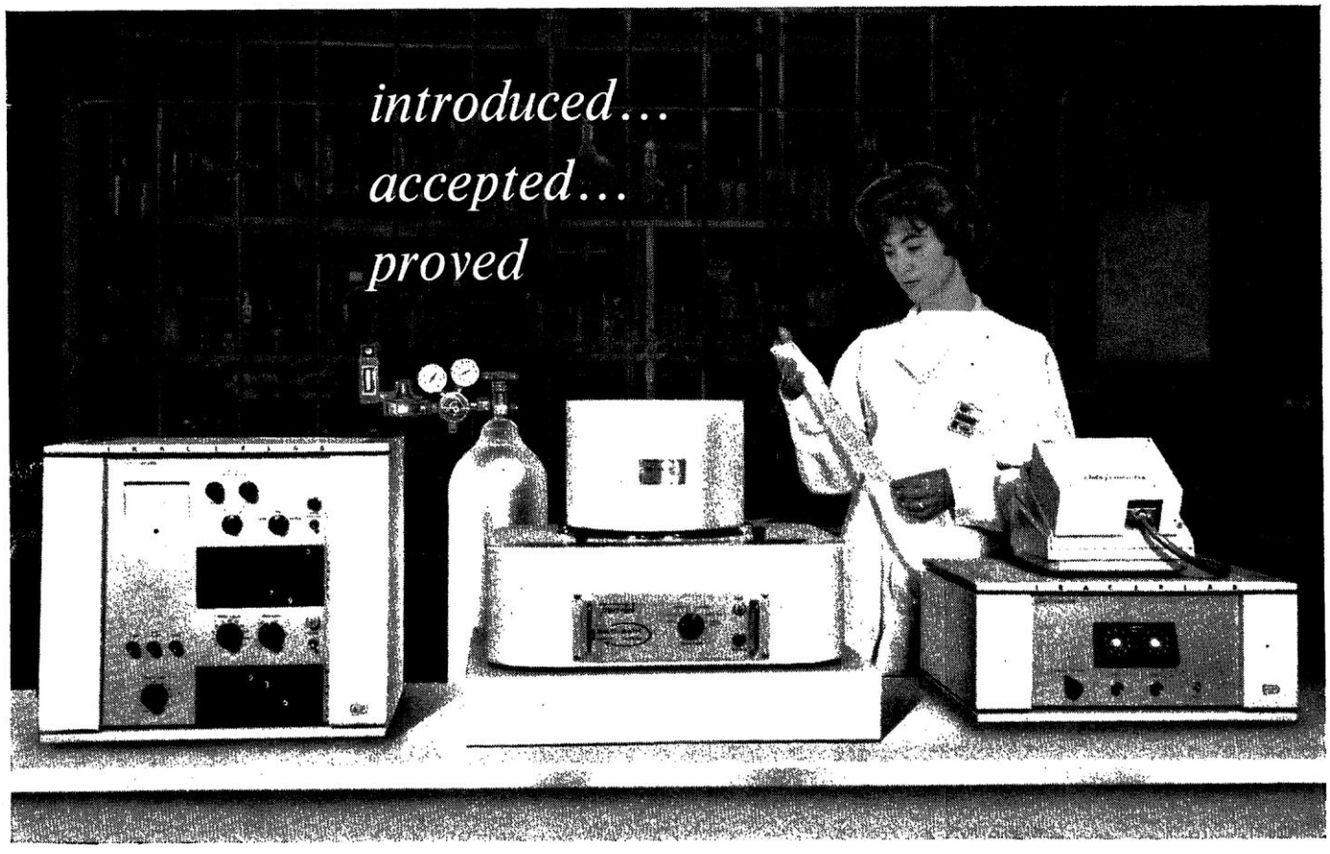
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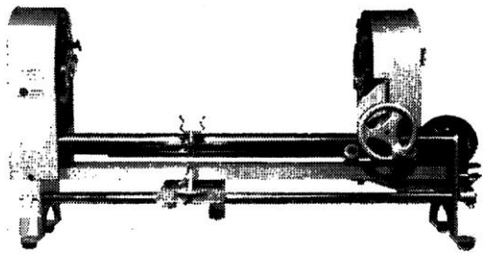
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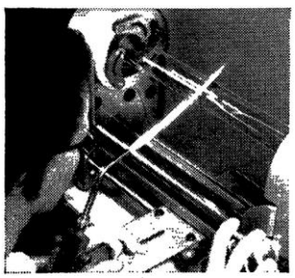
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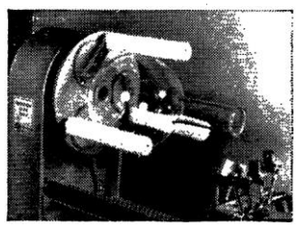


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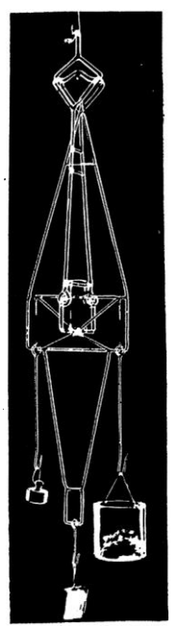
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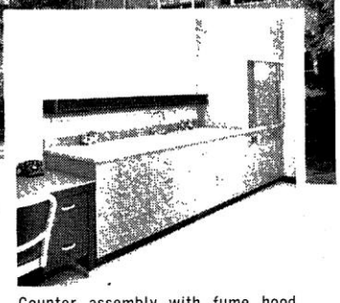
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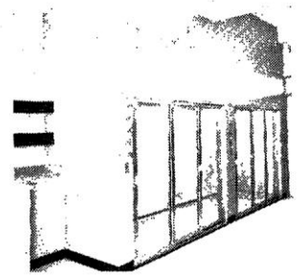


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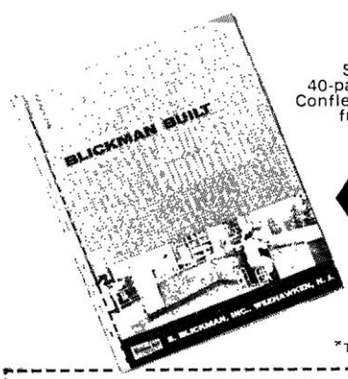


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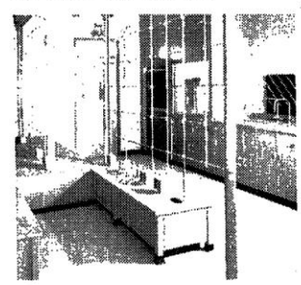
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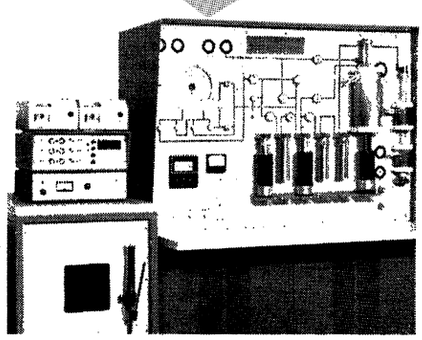
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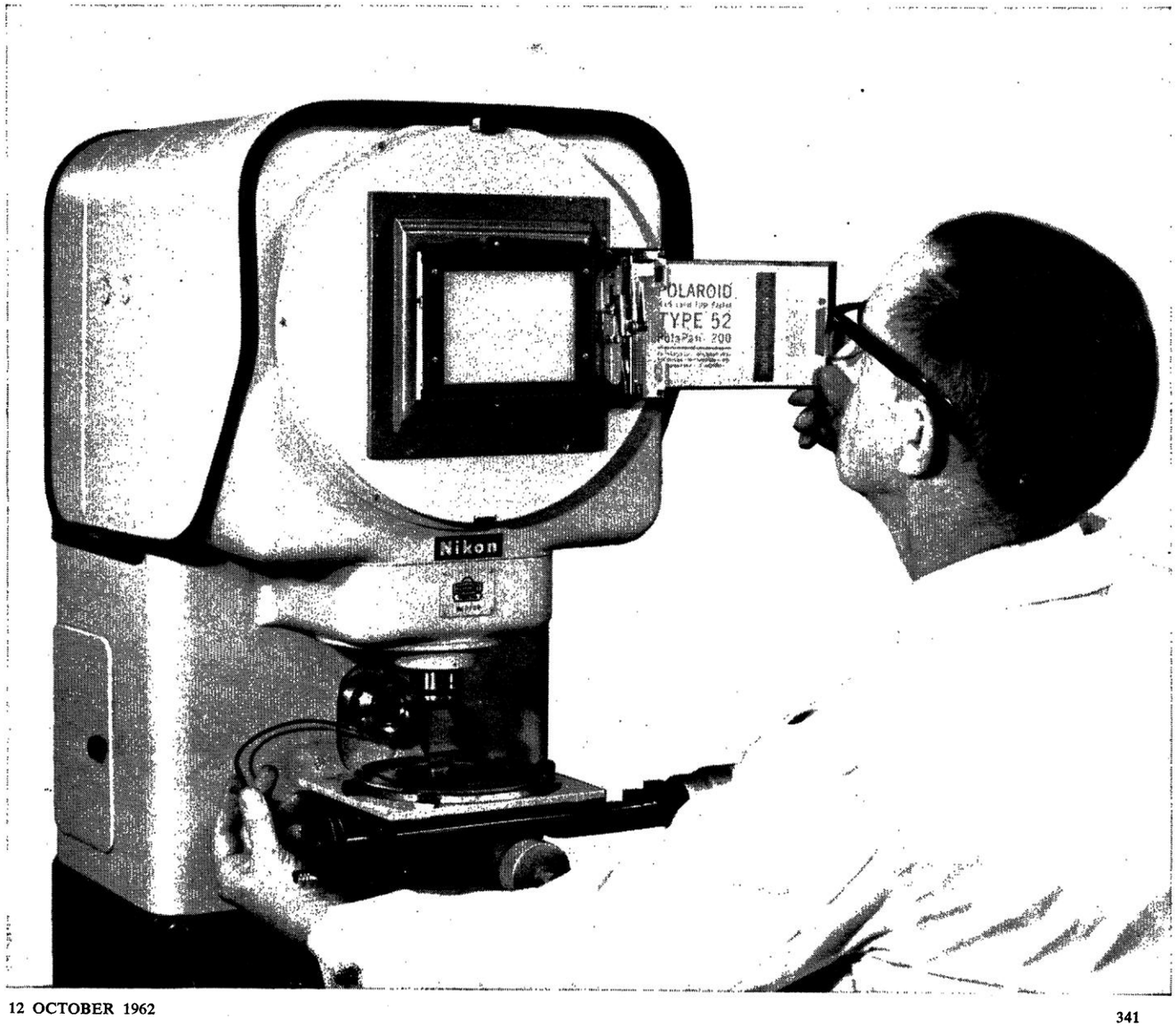
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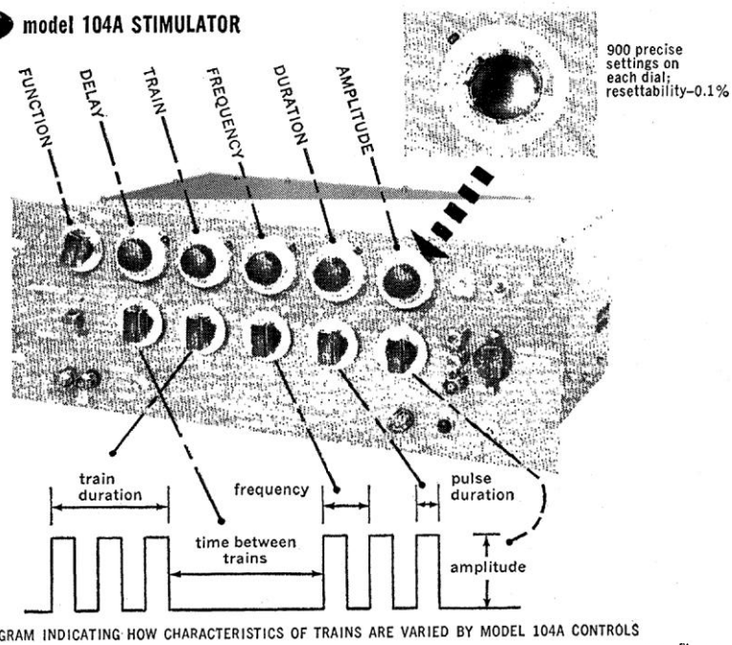
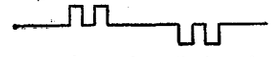


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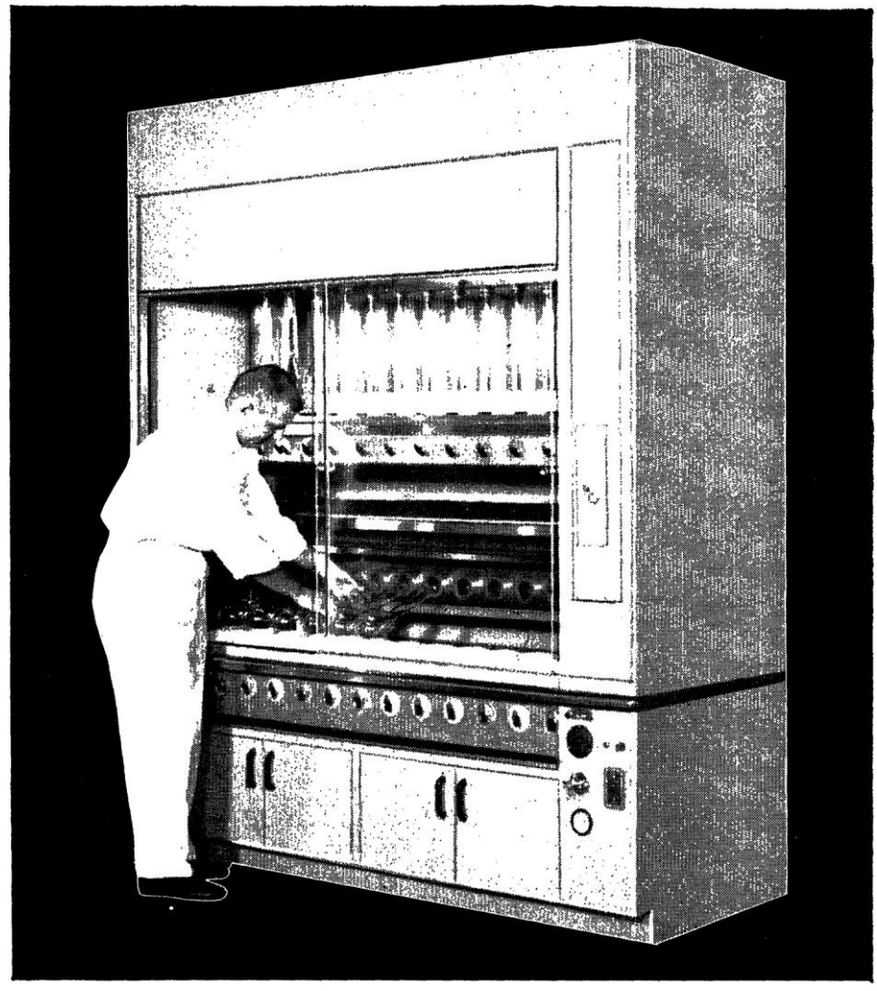
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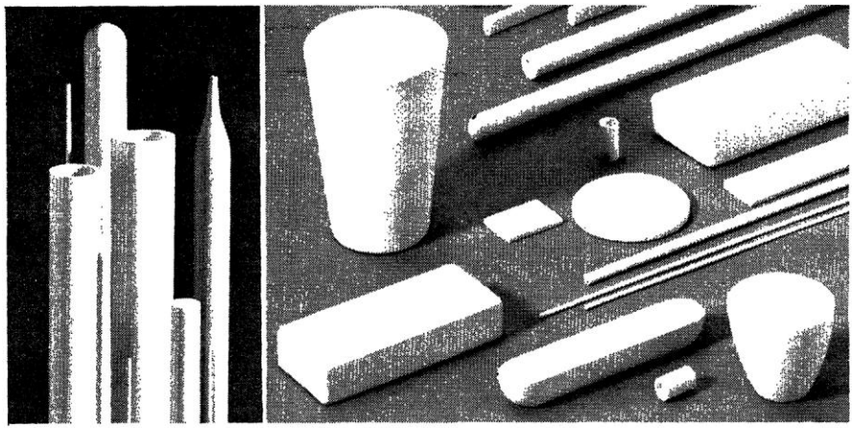
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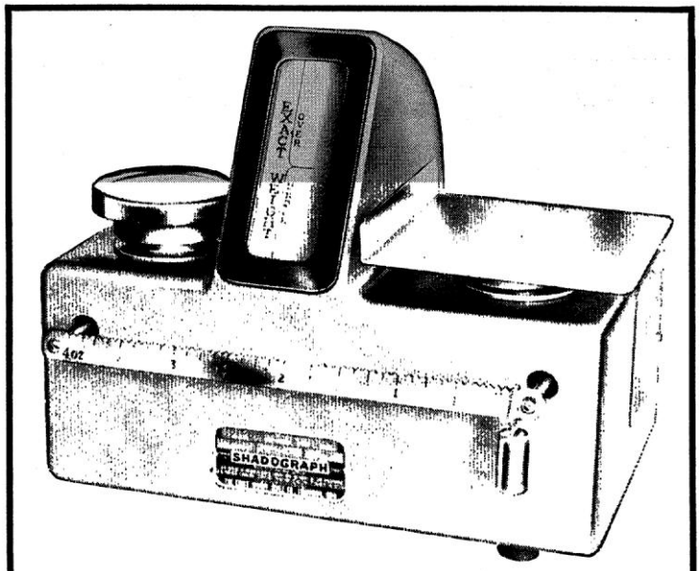
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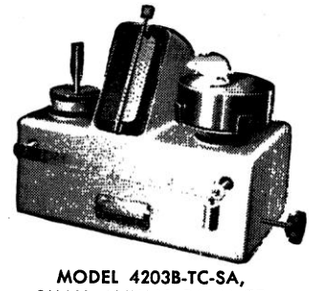
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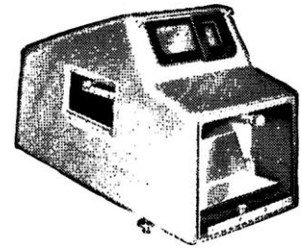
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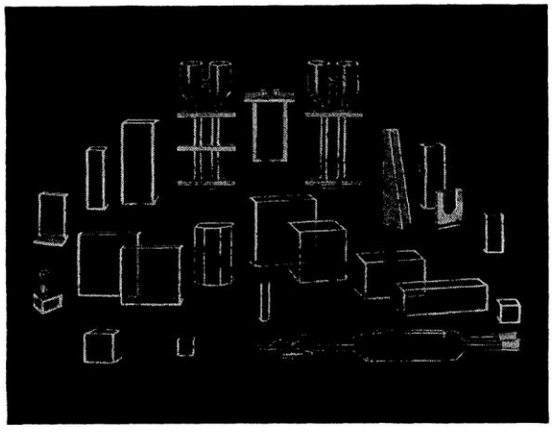
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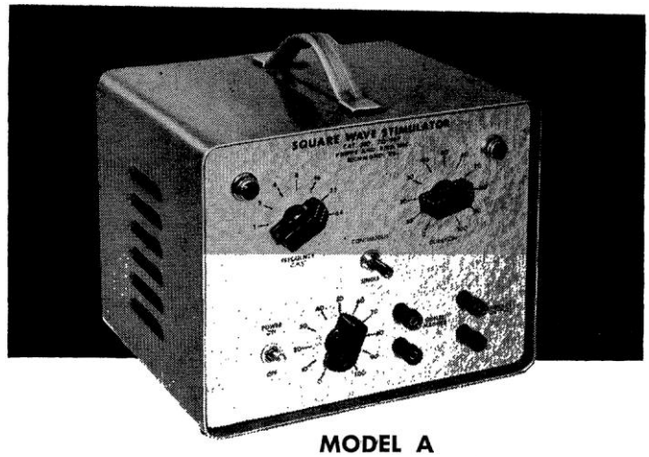
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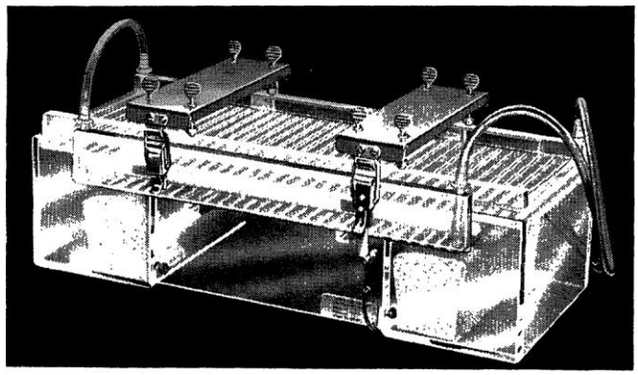
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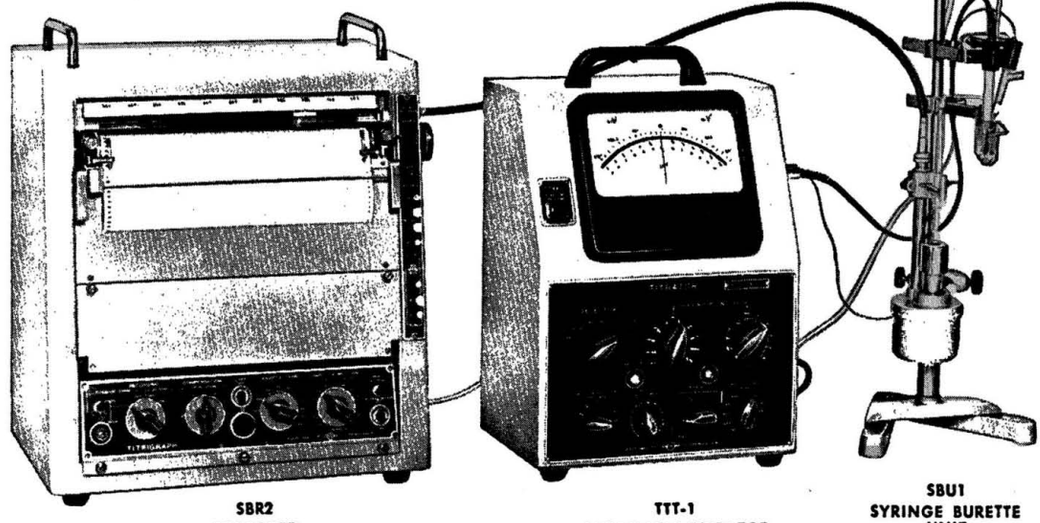
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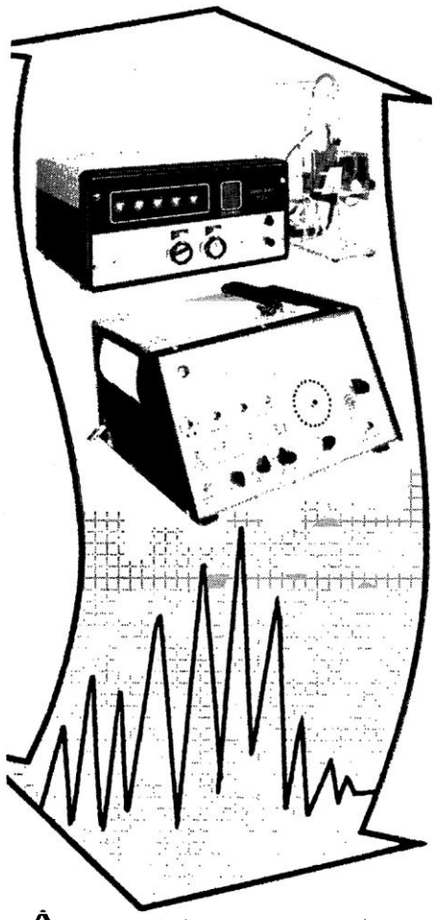
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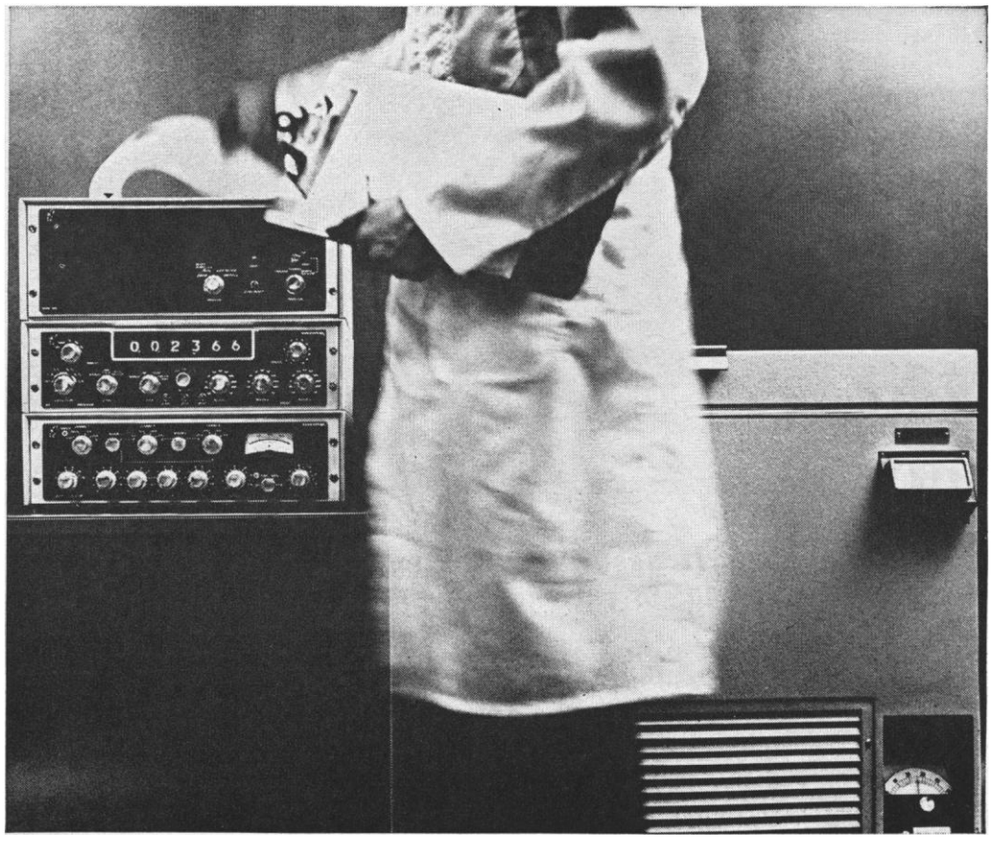
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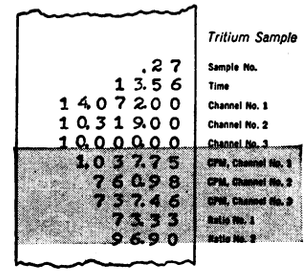
All Nuclear-Chicago liquid scintillation systems are guaranteed without reservation for one year. The guarantee fully covers all service that may be required during the first year without any cost to the customer.

Calculator provides extra data on each sample

The most important user convenience of the calculator is the ease with which it lends itself to the Channels Ratio method of automatically determining the counting efficiencies of samples.

Since quenching always produces a downward shift of an isotope's energy spectrum and a subsequent loss of counting efficiency, it also produces a change in the relative proportion of counts that will normally appear in each channel. The ratio of total counts measured in one channel to total counts measured in another channel for a given isotope is an indication of the spectrum distribution. There is a known correlation between this ratio and the efficiency with which the sample is counted. This ratio is calculated for each sample by the 720 series liquid scintillation systems.

Calculation permits an immediate check on the counting efficiency of each sample and can be used for direct conversion to total disintegrations per minute or for normalizing data.



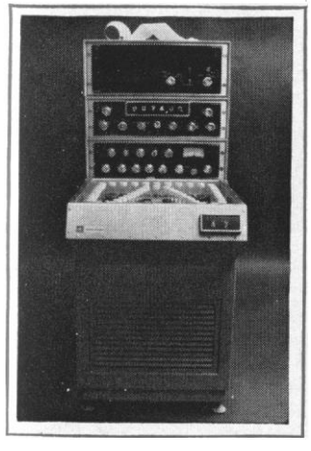
Unshaded area of tape depicts data listing functions of the 722 and 724. The shaded area illustrates the additional calculation capability of the 723 and 725. Counts-per-minute data is automatically printed out. Channels ratio provides time-saving, valid information about the sample at no extra cost.

Operation at temperatures above freezing

Reproducibility of measurement is difficult with samples which undergo phase separation or precipitation at temperatures below freezing. With the 724-725, these samples can be counted from 10° to 50°F at constant temperature without appreciable loss of counting efficiency.

Research with all types of photomultiplier tubes resulted in the choice of two 11-stage EMI photomultiplier tubes in all Nuclear-Chicago systems. The gain stability of these tubes is markedly superior. As a result of high gain with stability, less amplification is required.

The inherent low noise characteristics of the phototubes and the advanced transistorized circuitry permits operation over wide temperature ranges. If small losses in efficiency and reduced sample capacity are acceptable, the Nuclear-Chicago 722-723 systems which operate at room temperature are recommended.



The 722 and 723 are the only commercially available room temperature, automatic liquid scintillation systems. They offer 50 sample capacity, preferential sample programming, and three channel operation.

Advanced techniques in sample handling and temperature control

The automatic sample changers of the 724 and 725 systems are built into the only temperature control chamber designed exclusively for liquid scintillation counting. This chamber offers several important benefits to the user not available with conventional units designed for consumer use.

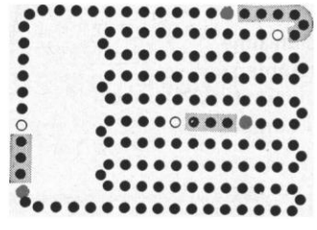
All mechanical, heat-producing parts are located outside the cooled volume. The interior is all stainless steel. A magnetic gasket around the lid assures an efficient seal.

The sample changer also offers several unique features.

A bottle sensor rejects all off-size sample bottles that might jam the sample changing mechanism.

Positive sample identification is accomplished by locking electronically the three numbers which identify the sample. These are: (1) the number of the sample receptacle, (2) the electronic display of sample number on the outside of the chamber, and (3) the sample number printed on the tape.

Programming permits preferential counting of a group or groups of samples.

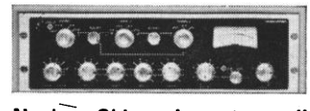


Diagrammatic representation of "preferred" sample programming. Red circles indicate sensors, white circles are unused sample receptacles, and black circles represent samples. Shaded region between sensors and unused receptacles represent samples which will be preferentially counted.

The advantage of a beta spectrometer designed solely for liquid scintillation counting

In applications such as dual labelled sample counting and counting of samples with high specific activities, Nuclear-Chicago liquid scintillation systems give more accurate results because the spectrometer is designed specifically to handle fast beta pulses. From the experience gained in the design of gamma-ray analyzers, it was found that beta spectrometry presented a different design requirement.

A beta pulse in a liquid scintillator emits all its light in 1/50th of the time that a gamma pulse emits its light in a sodium iodide crystal. If conventional amplifier circuitry, as used in gamma-ray analyzers, were used for beta spectrometry, the overload recovery time from high energy pulses would be too long. This would result in complete loss or distortion of pulses following overload.



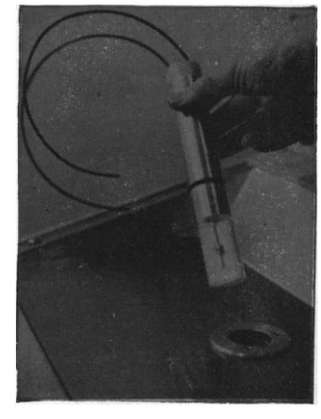
Nuclear-Chicago's systems all use the ZCO88A beta spectrometer, a completely transistorized, three-channel analyzer specifically designed for liquid scintillation counting. Fast amplifier recovery time eliminates losses from overload.

Continuous flow monitoring in liquid chromatography

You can automatically, continuously, and precisely assay beta-emitting isotopes in the effluent stream of your liquid chromatography column. Simply insert the 6770 Chroma/Cell in any Nuclear-Chicago liquid scintilllation system. The conversion takes only minutes.

Efficiency for carbon-14 is 27—40% with a background of 25 counts per minute. Tritium efficiency is 2—3% for tritiated water with a background of 20 cpm.

The Chroma/Cell is available as a reasonably priced accessory for all Nuclear-Chicago systems. It is supplied with interchangeable cells of 1, 2, and 4 ml capacity which permit the user to increase sensitivity or resolution, depending upon his counting requirement.



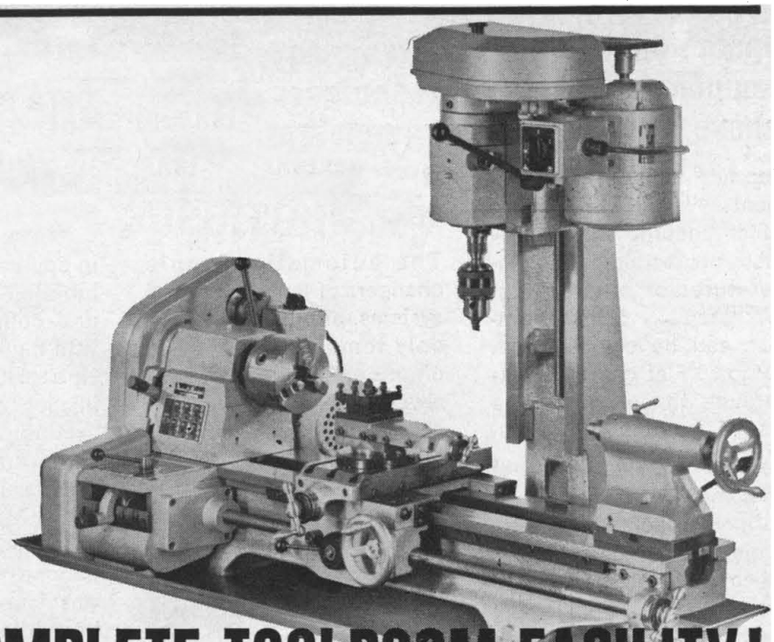
The conversion from bottle samples to continuous liquid flow is quickly made by simply inserting the Chroma/Cell into the optical cell of the liquid scintillation system.

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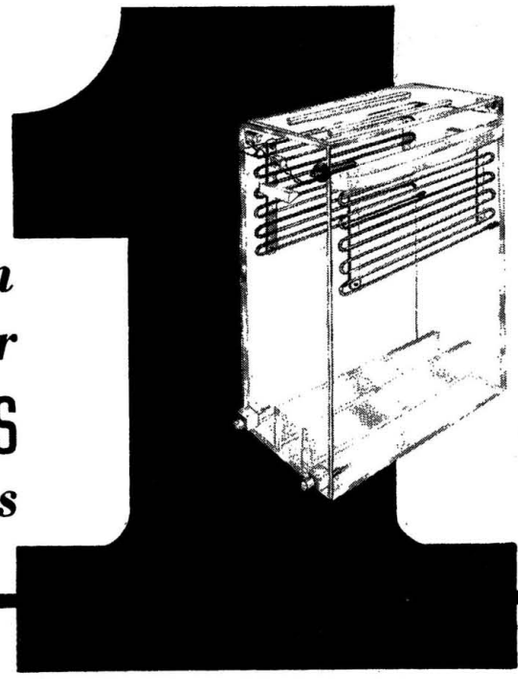
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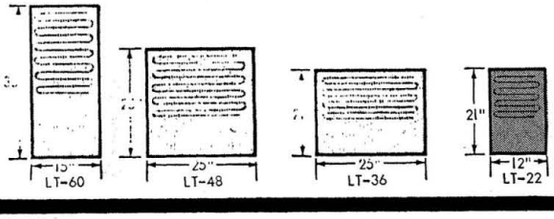
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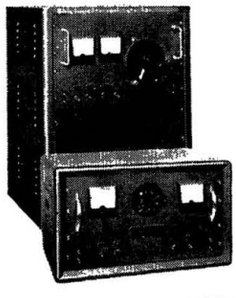
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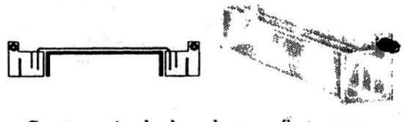


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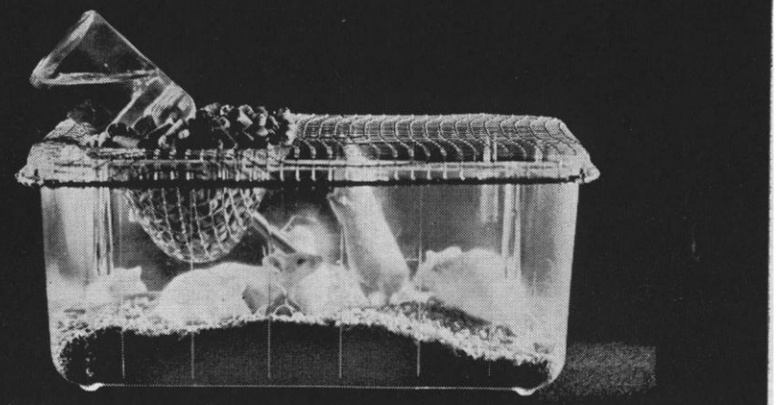
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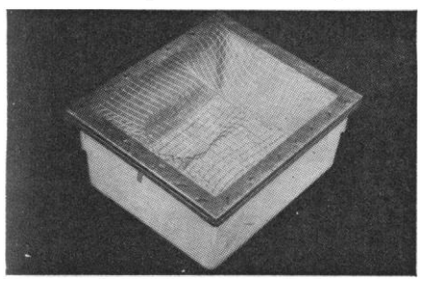
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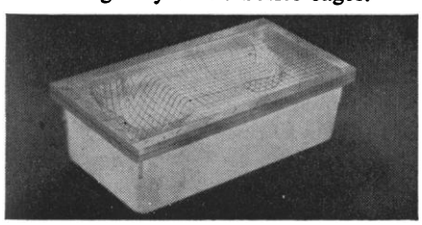
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The New Disposable Econo-Cage #21, Pictured Above, Brings To Animal Care A Rigid Plastic Disposable Cage That Spells Real Economy. It Stands By Itself Requiring No Expensive Supports That Prevent Full Visibility. Designed Primarily For Mice, The Cage Is 11½" X 7½" X 5" Deep. The Floor Area Of 84 Square Inches Will Adequately House Up To 12 Mice. All 20 Series Lids Fit The New Disposable Econo-Cage #21.



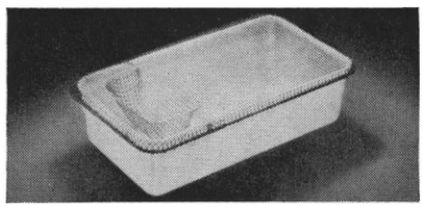
ECONO-CAGE #50 SERIES

The new 50 Series Econo-Cages and lids are designed for Hamsters or rats. Dimensions are 12⅞" X 14⅞" X 6⅝" deep with room for 11 adult Hamsters per cage. The cages are available in clear Acrylonitrile-Styrene Copolymer—Econo-Cage #53, Linear Polyethylene—Econo-Cage #54 and Polypropylene—Econo-Cage #55. All 50 Series lids fit interchangeably on 50 Series cages.



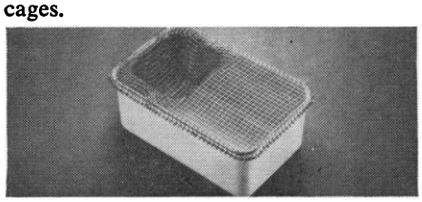
ECONO-CAGE #40 SERIES

Number 40 Series cages can be used interchangeably for Hamsters and/or rats. #43 is made of clear Acrilonitrile-Styrene-Copolymer, #44 of Linear Polyethylene and #45 of translucent Polypropylene. All 40 Series lids are standard ½" mesh designed for rat housing and fit interchangeably on all 40 Series cages. All 30 Series lids also fit all 40 Series cages but have the $\frac{5}{16}$" for mice.



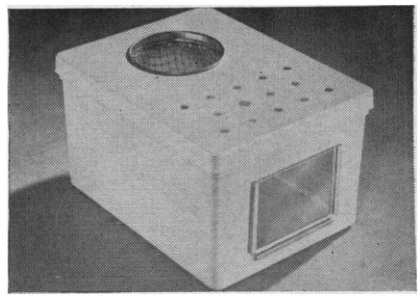
ECONO-CAGE #30 SERIES

Number 30 Series cages are designed as breeding and holding cages for mice. The over-all dimensions are 19" X 10½" X 5⅛" deep. Cage #32 is made of fiberglass, reinforced by plastic. Cage #33 is made of clear Acrylonitrile-Styrene Copolymer. Cage #34 is made of linear high density Polyethylene. Cage #35 is made of Polypropylene. All 30 Series lids are interchangeable on 30 Series cages.



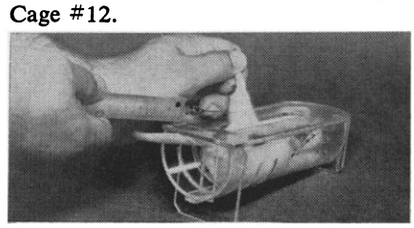
ECONO-CAGE #20 SERIES

Econo-Cages in the 20 Series are designed primarily for mice. Over-all dimensions of the cages are 11½" X 7½" X 5". This cage is used for housing animals during experimentation and also as a one-to-one and two-to-one breeding cage. The cages are available in Polystyrene — new disposable Econo-Cage #21, Fiberglass, reinforced plastic — Econo-Cage #22, clear Styrene-Acrylonitrile Copolymer — Econo-Cage #23, transculent Linear Polyethylene—Econo-Cage #24, autoclavable Polypropylene—Econo-Cage #25 and Polycarbonate Resin—Econo-Cage #27. All 20 Series lids are interchangeable on 20 Series cages.



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Over-all dimensions of the Econo-Cage general purpose unit are 11½" X 8" X 6" deep. This cage is designed especially for laboratories with changing animal use requirements. It can be used to house mice, Hamsters, rats and guinea pigs. Because of its versatility, it is ideal in teaching situations. The cage is available with or without windows. It is made of fiberglass reinforced polyester plastic. All #12 lids can be used on General Purpose Cage #12.



ECONO-RESTRAINING CAGES #90 SERIES

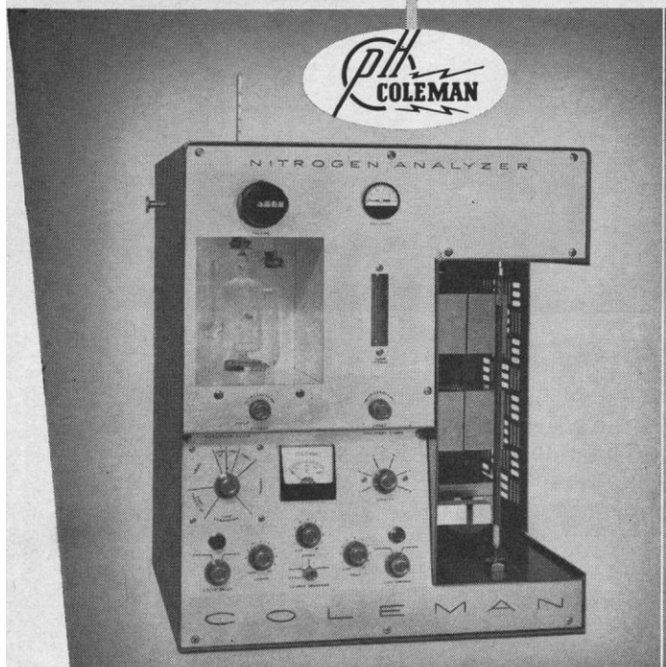
The small Restraining Cage #88 can be varied from 2" to 3½" in length and is 1¼" wide. Econo-Cage #90 can be varied from 4½" to 6" in length and is 2½" wide. Econo-Cage #91 can be varied from 5" to 7" in length and is 3" wide. All these units can be cleaned chemically or with hot water. They are not autoclavable.

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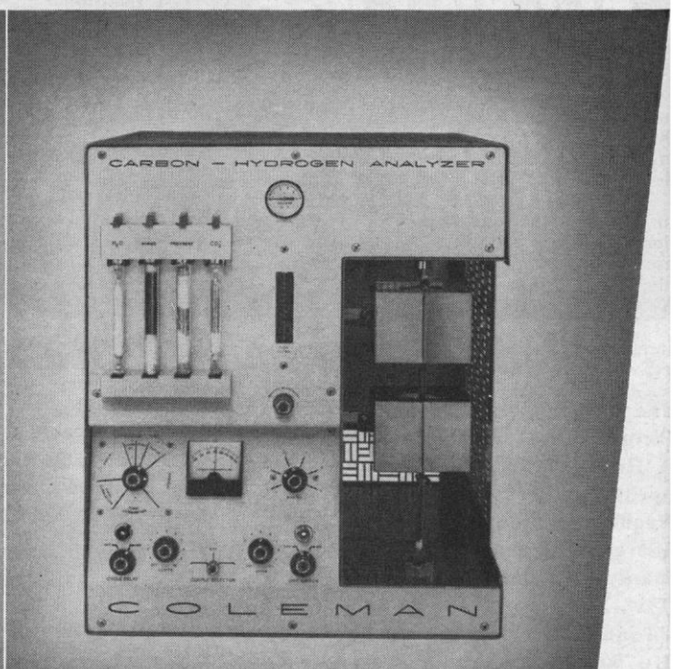
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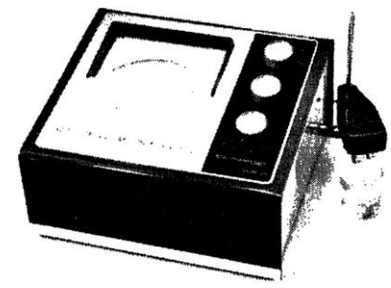
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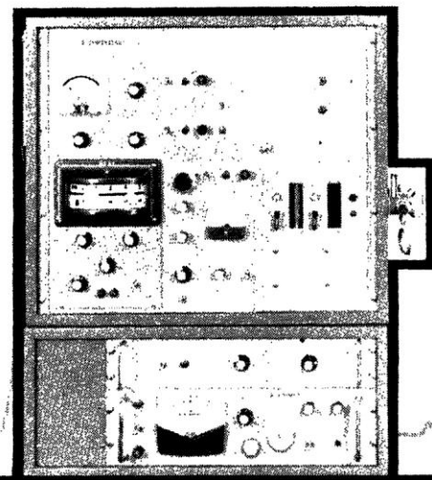
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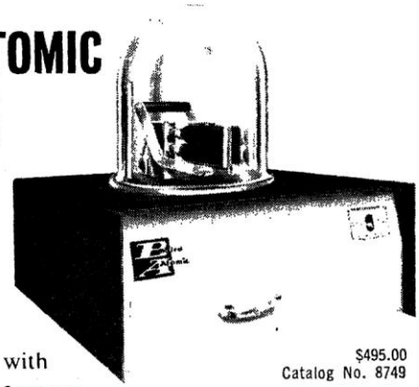
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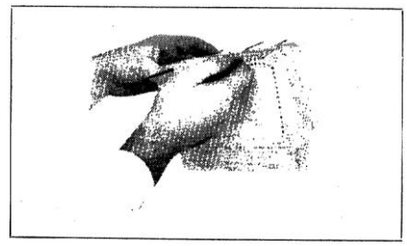
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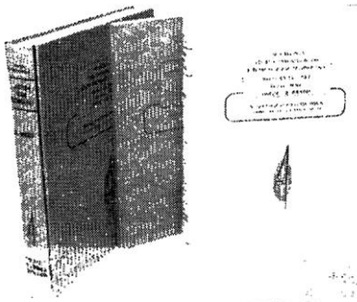
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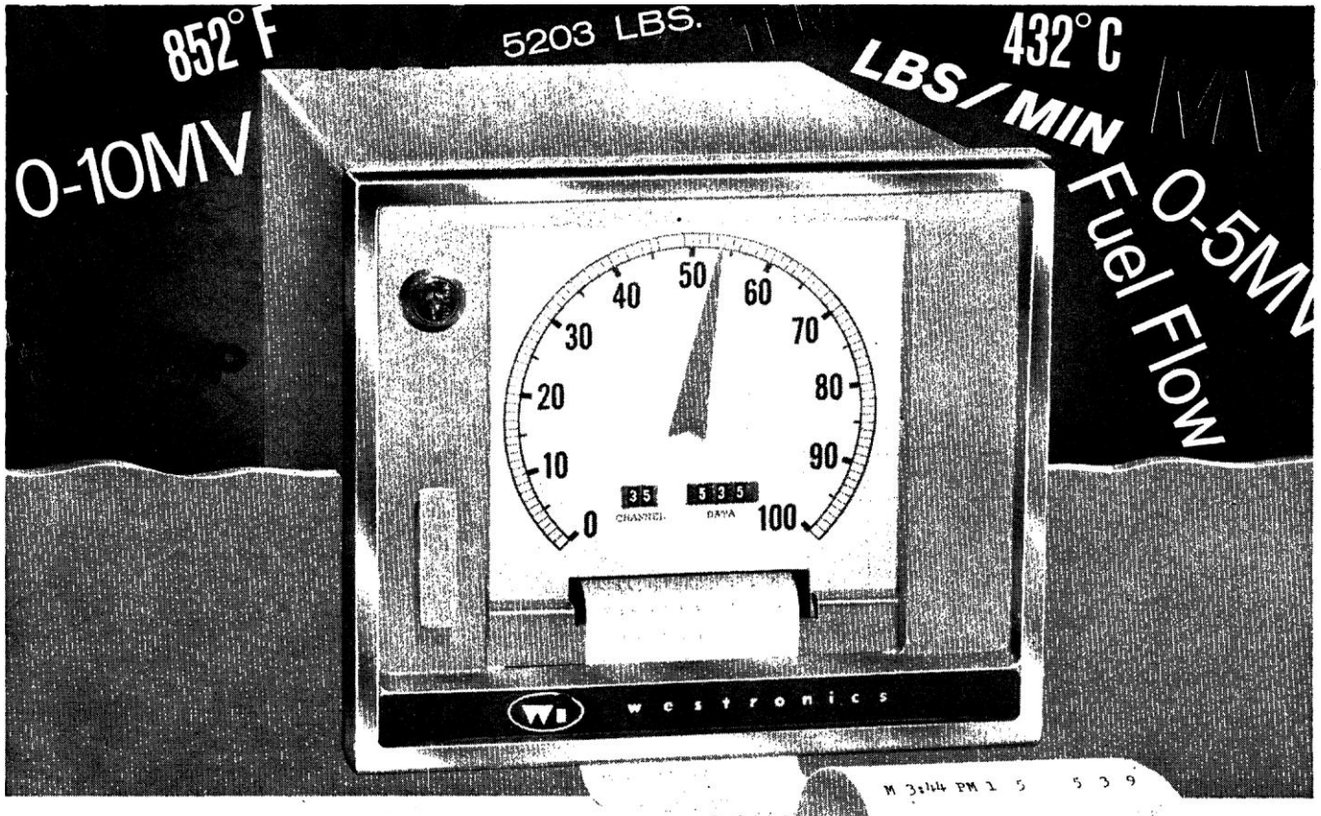
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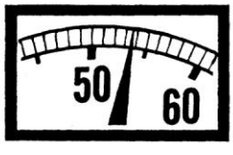
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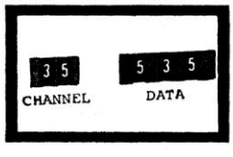
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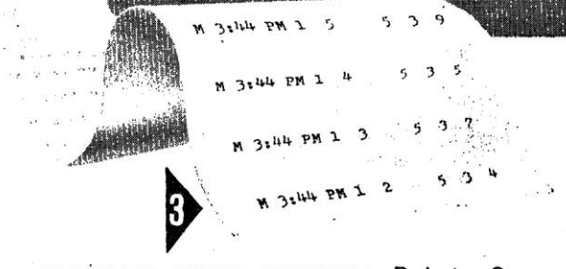




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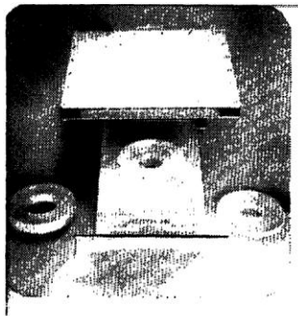
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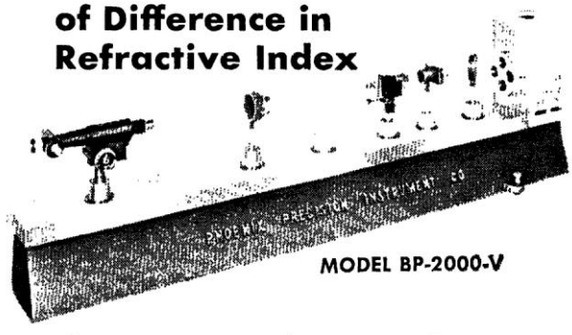
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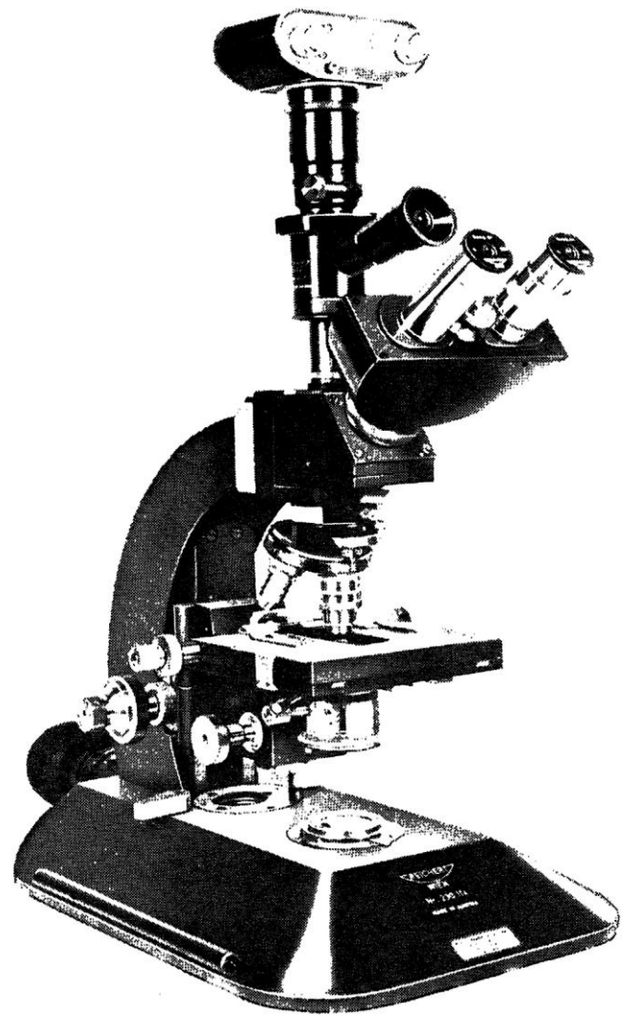
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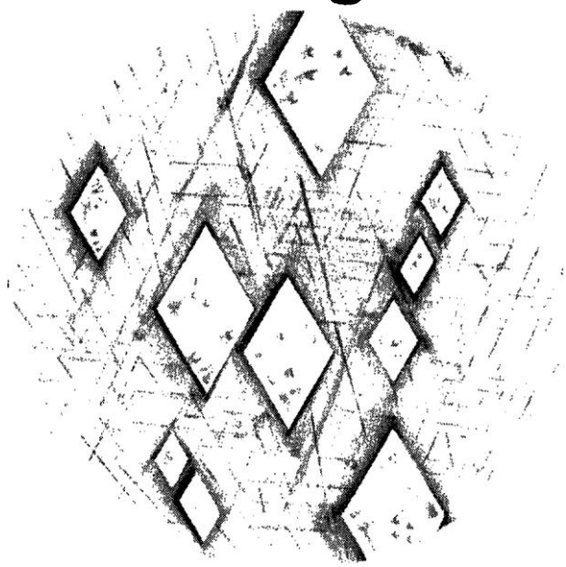
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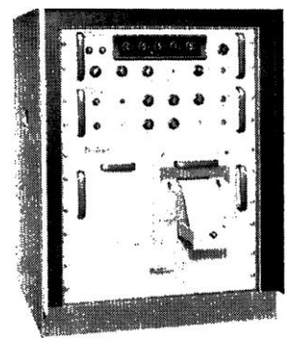
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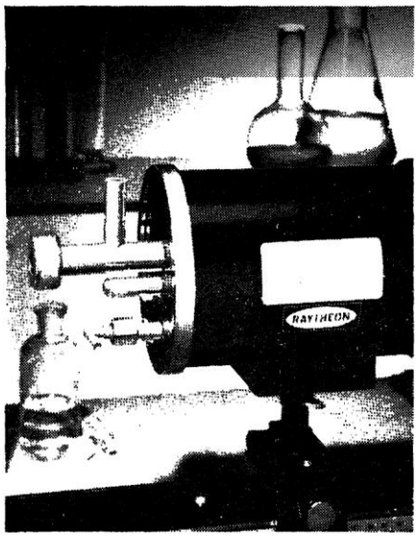
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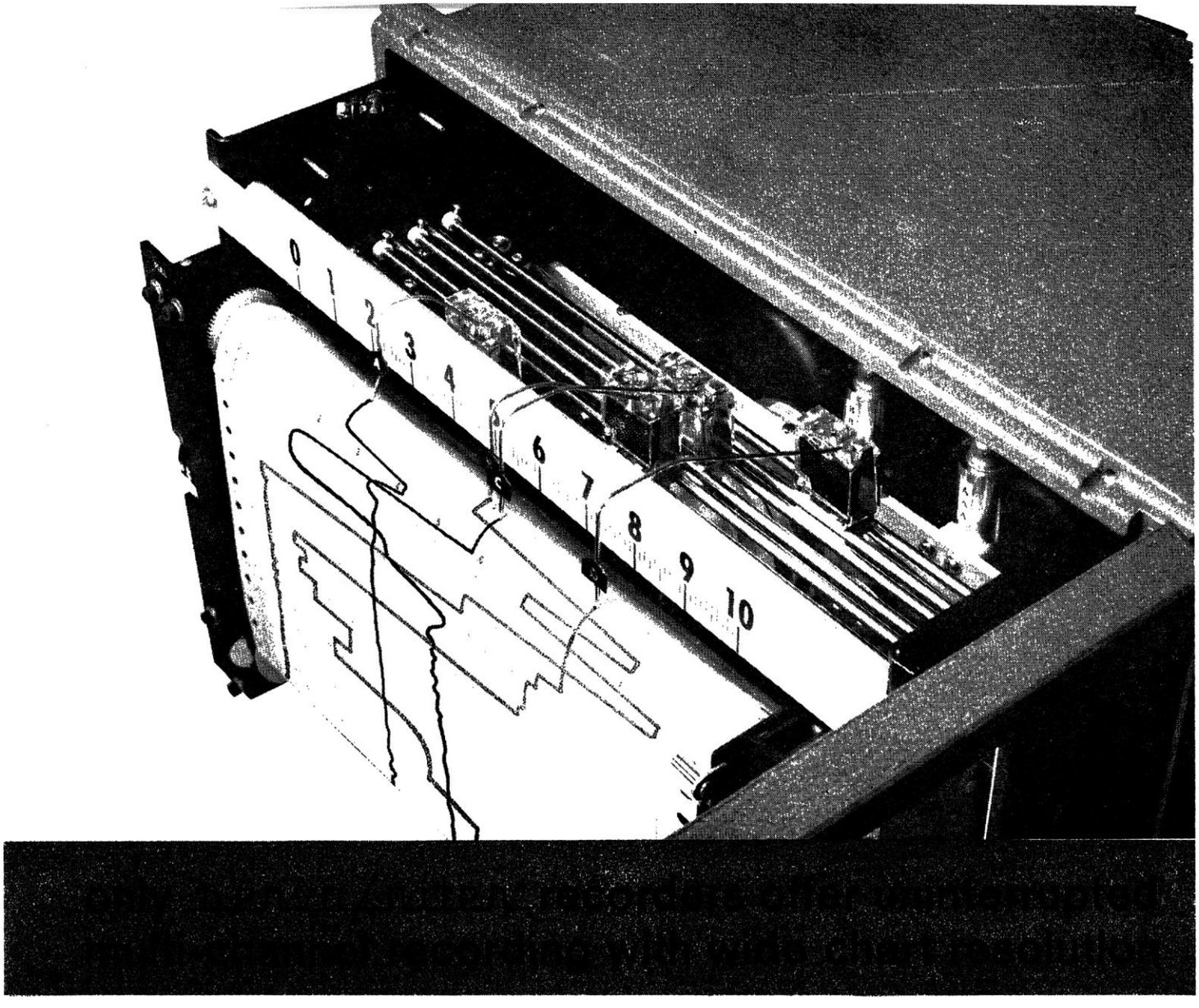
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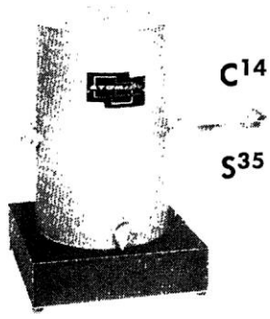
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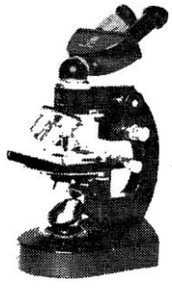
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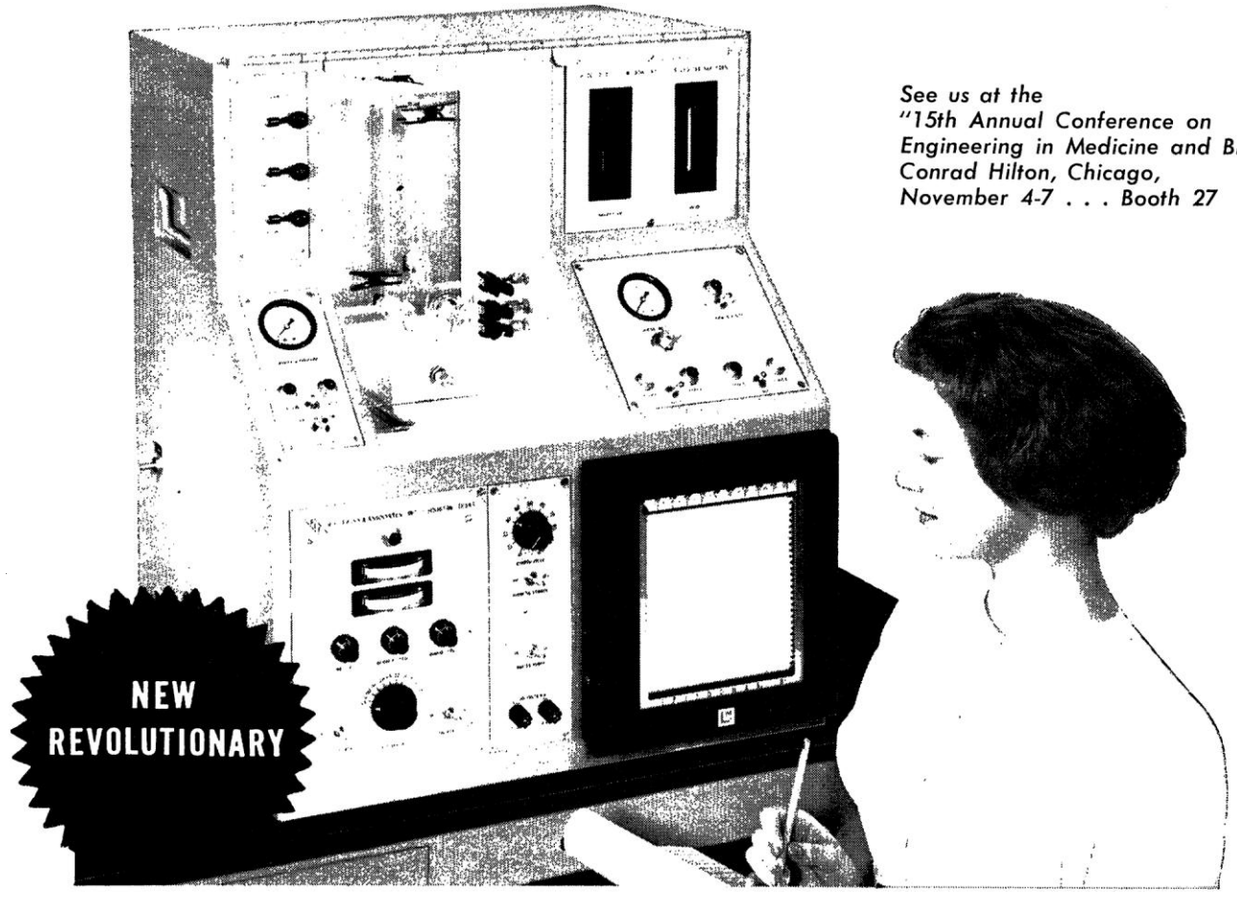
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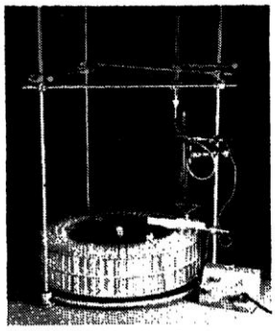
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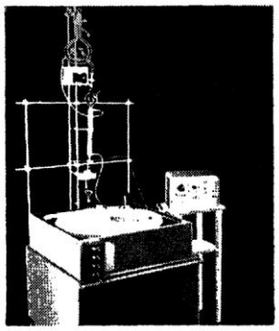
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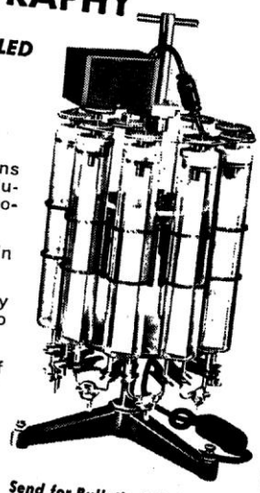
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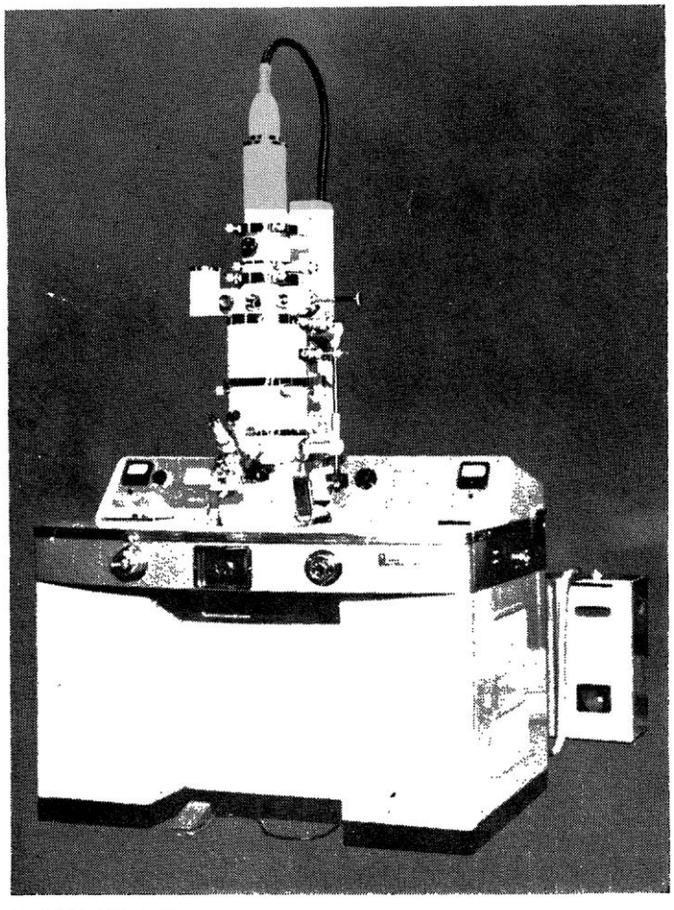
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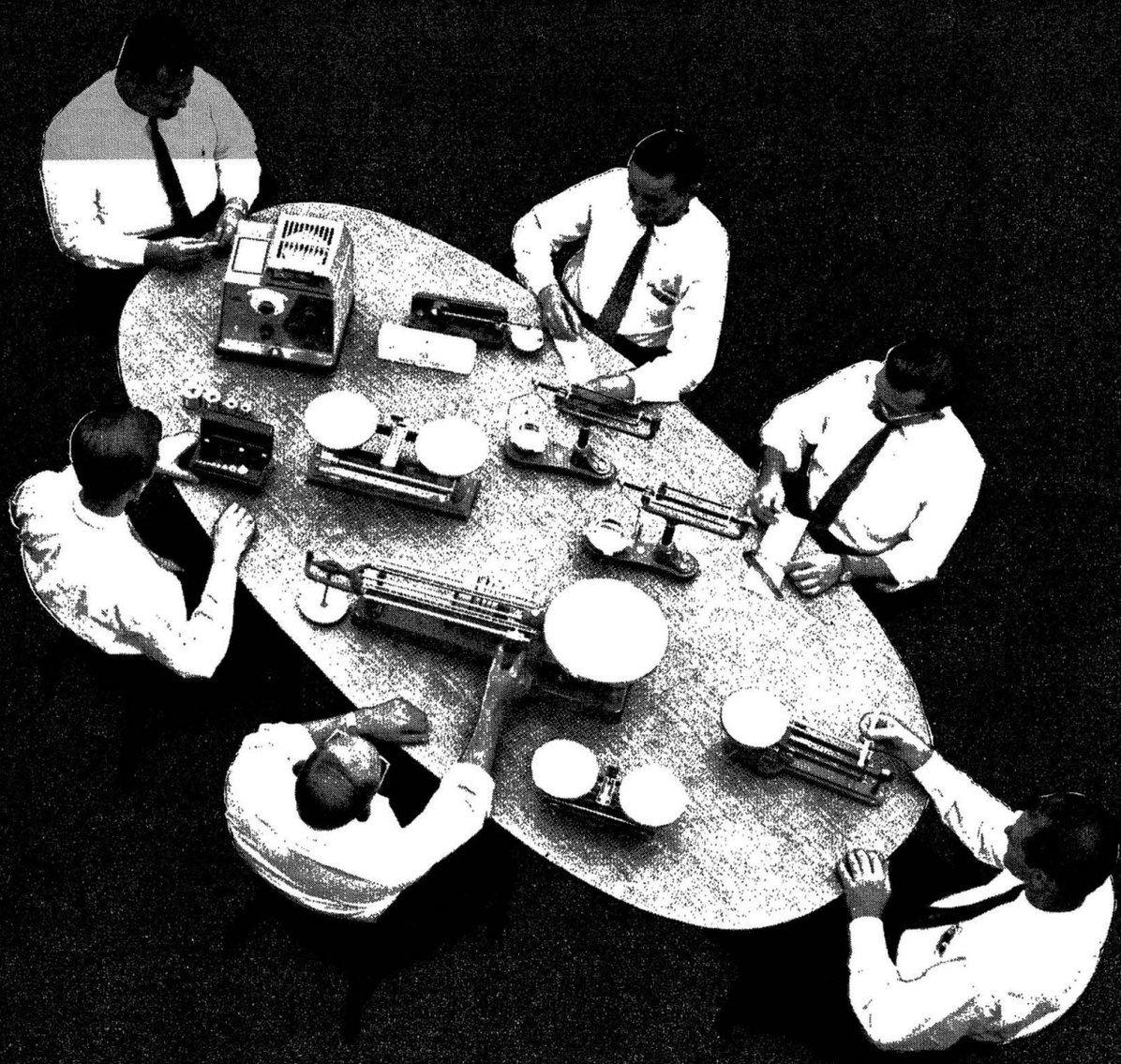
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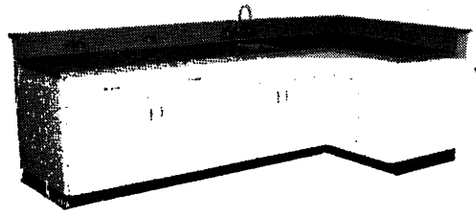
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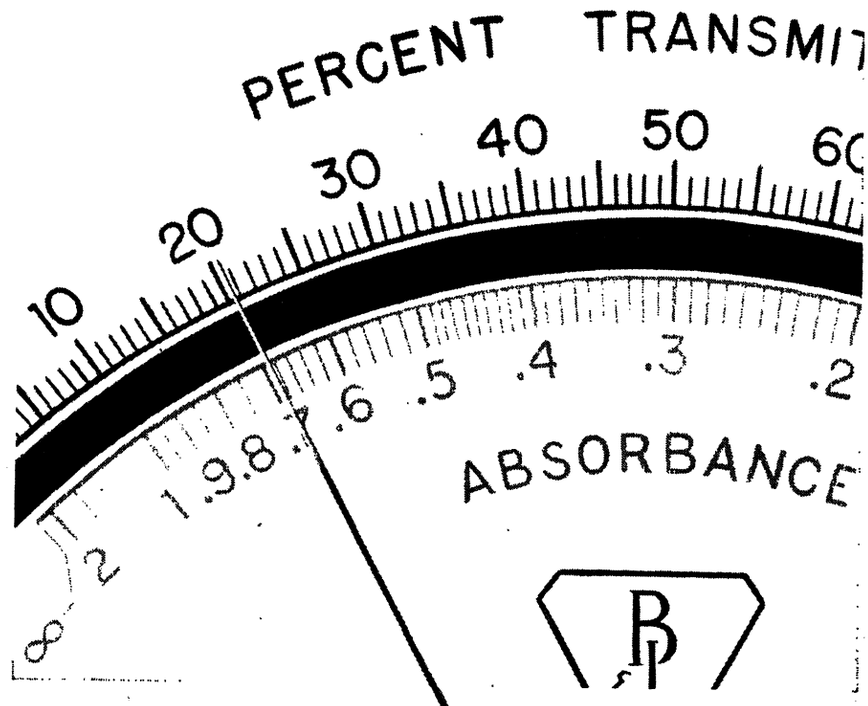
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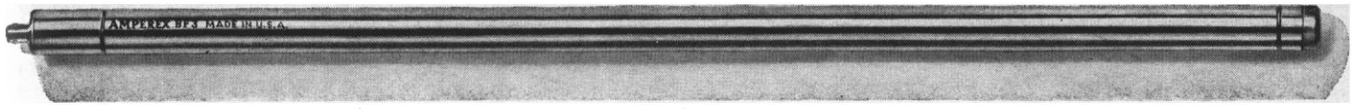
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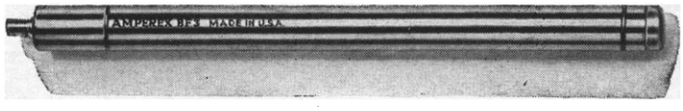
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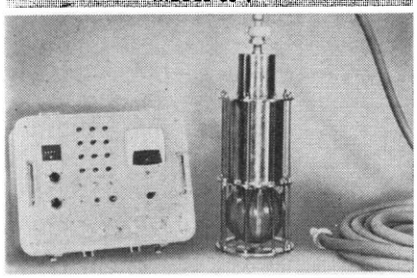


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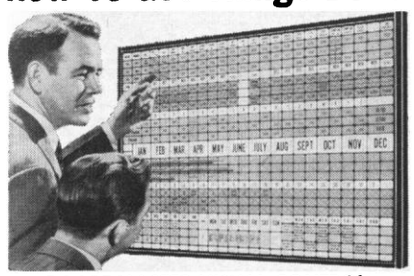
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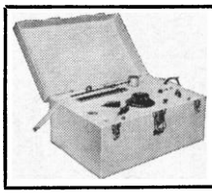
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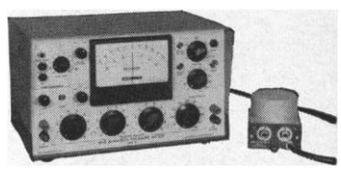
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Serum Fractions	8	14
Compounds that can be separated	Serums, dyes	Blood - serums - lipo-proteins-carbohydrates - dyes
Inertness	Adsorbs compounds	Inert, non-adsorbent
Strength	Tears when wet	Strong, either dry or wet
Separation sharpness	Blurred Zones	Each zone sharply separated
Physical variation	+ or — 7% thickness variation	+ or — 1%—Optical evaluation 7 times more accurate
Reproducibility	Must run standards each time used	+ or — 3% strip to strip — negligible batch variation
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Transparency	Translucent, not transparent	Fully transparent with simple treatment
Colorimetric analysis	Difficult	Easily dissolved

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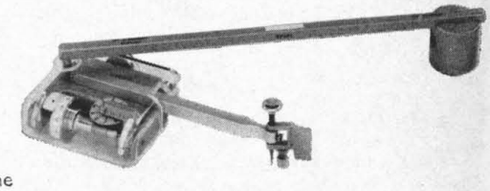


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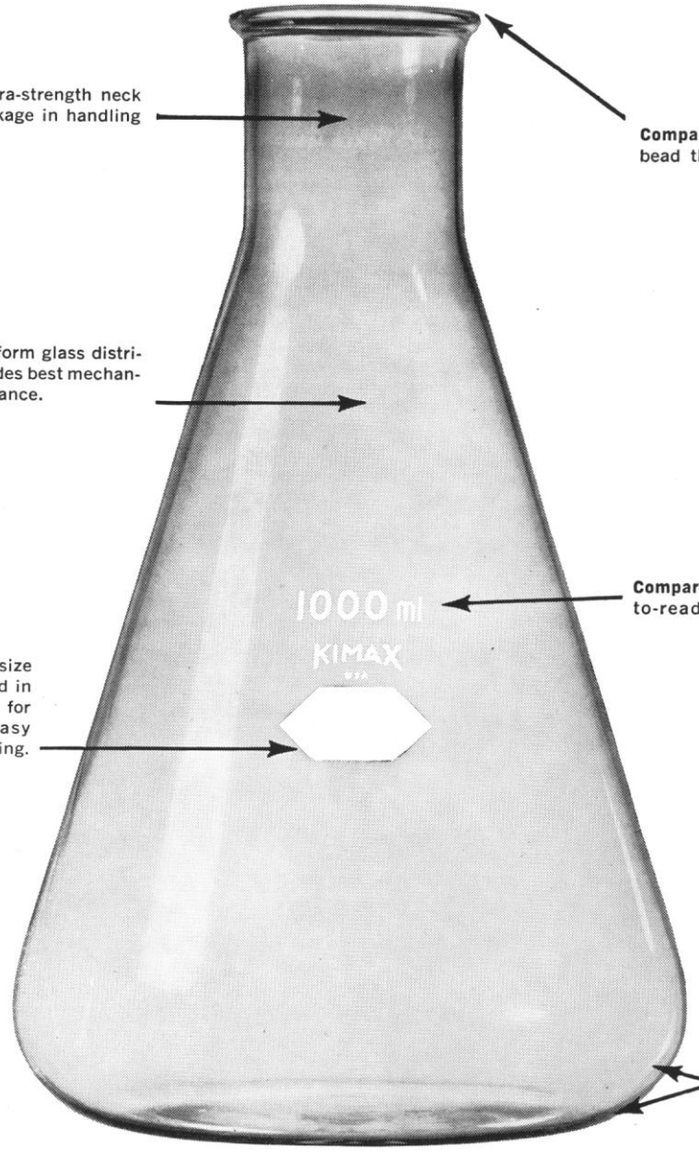
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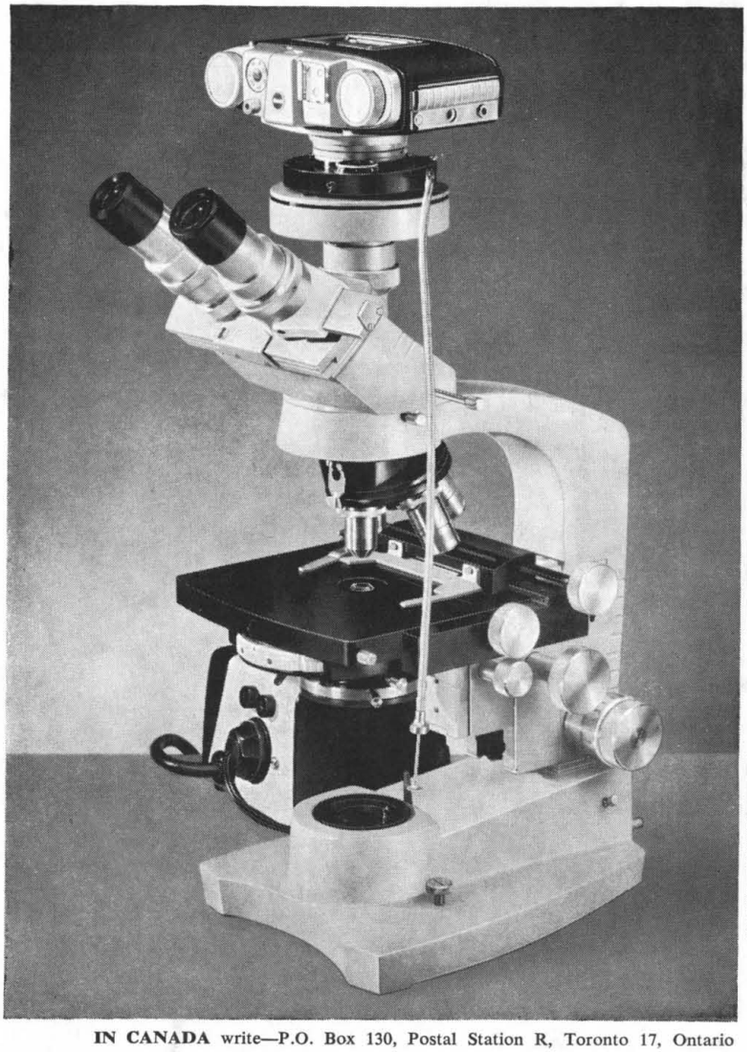
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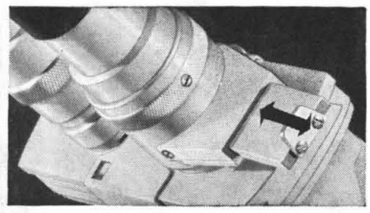
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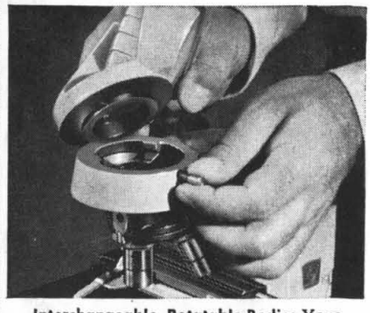
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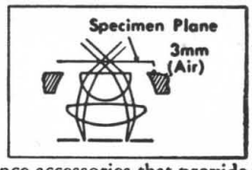
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