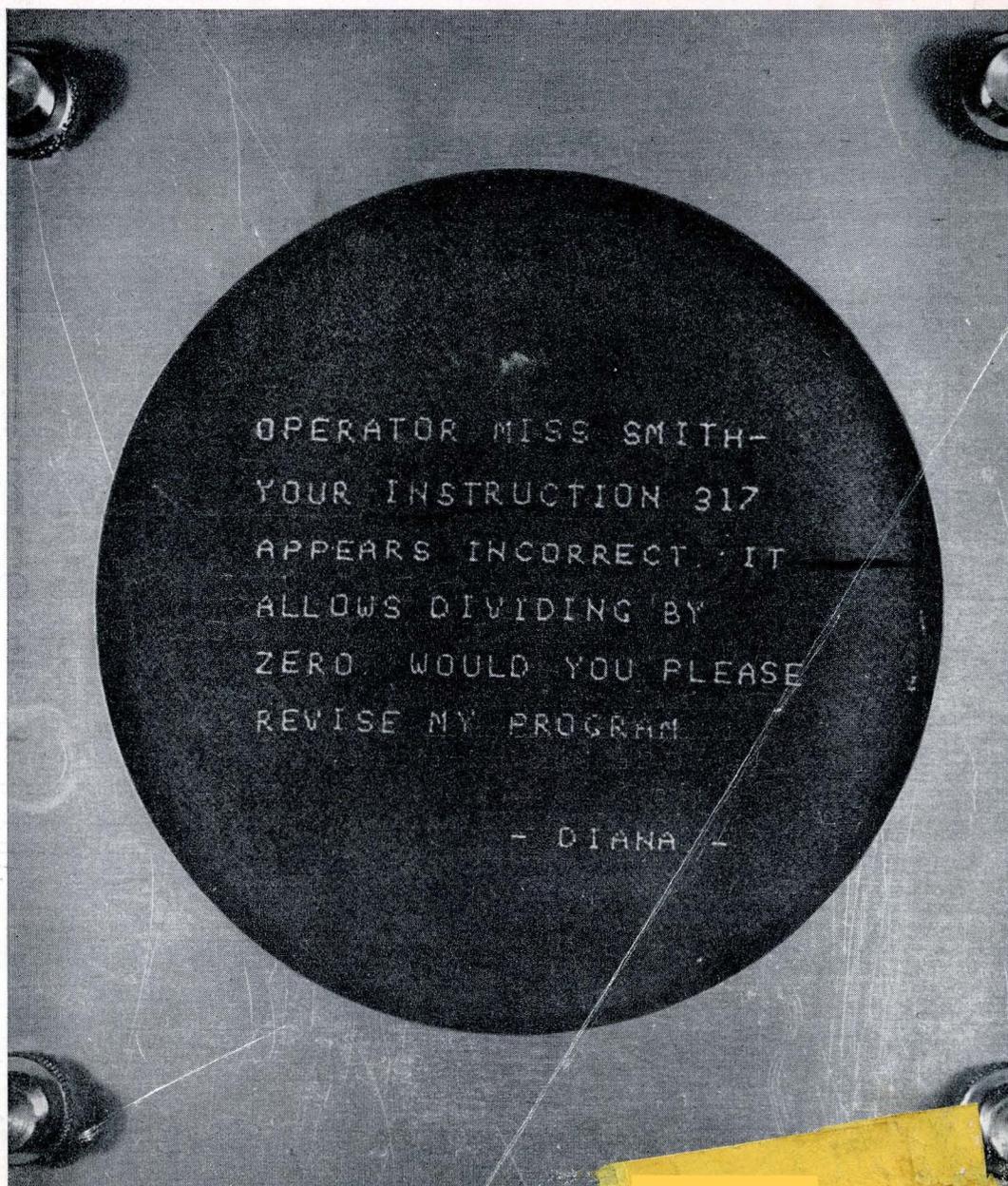


# COMPUTERS

*a n d* A U T O M A T I O N

DATA PROCESSING • CYBERNETICS • ROBOTS

**A  
PICTORIAL  
MANUAL  
ON  
COMPUTERS  
Part 1**



OPERATOR MISS SMITH-  
YOUR INSTRUCTION 317  
APPEARS INCORRECT. IT  
ALLOWS DIVIDING BY  
ZERO. WOULD YOU PLEASE  
REVISE MY PROGRAM.

- DIANA -

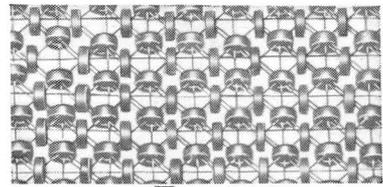
DECEMBER

1957

•

VOL. 6 - NO. 12

# Another Application for FERRAMICS®



Section of typical memory plane enlarged approximately 3 times.

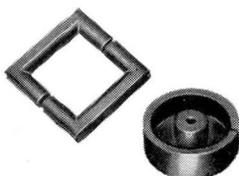
## Ferramic® Cores help IBM Sage Computer Perform Amazing Feats of Memory

General Ceramics Magnetic Memory Cores play an important role in the reliable functioning of the Sage Computer. G-C engineers developed rectangular hysteresis loop ferrites and worked closely with Lincoln Laboratories at MIT and IBM to perfect toroids with the required magnetic properties for this vital defense system.

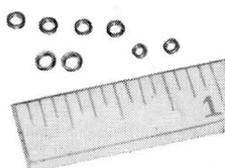
These dependable components provide increased speed and accuracy for computers and automatic controls. General Ceramics cores and completely assembled memory planes are available for automation systems. For complete information write today to General Ceramics Corporation, Keasbey, New Jersey—Dept. CU.

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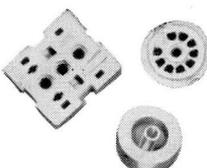
*Industrial Ceramics for Industrial Progress... Since 1906*



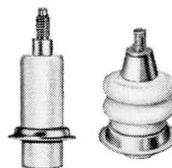
FERRAMIC CORES



MAGNETIC MEMORY CORES AND PLANES



PRECISION STEATITES

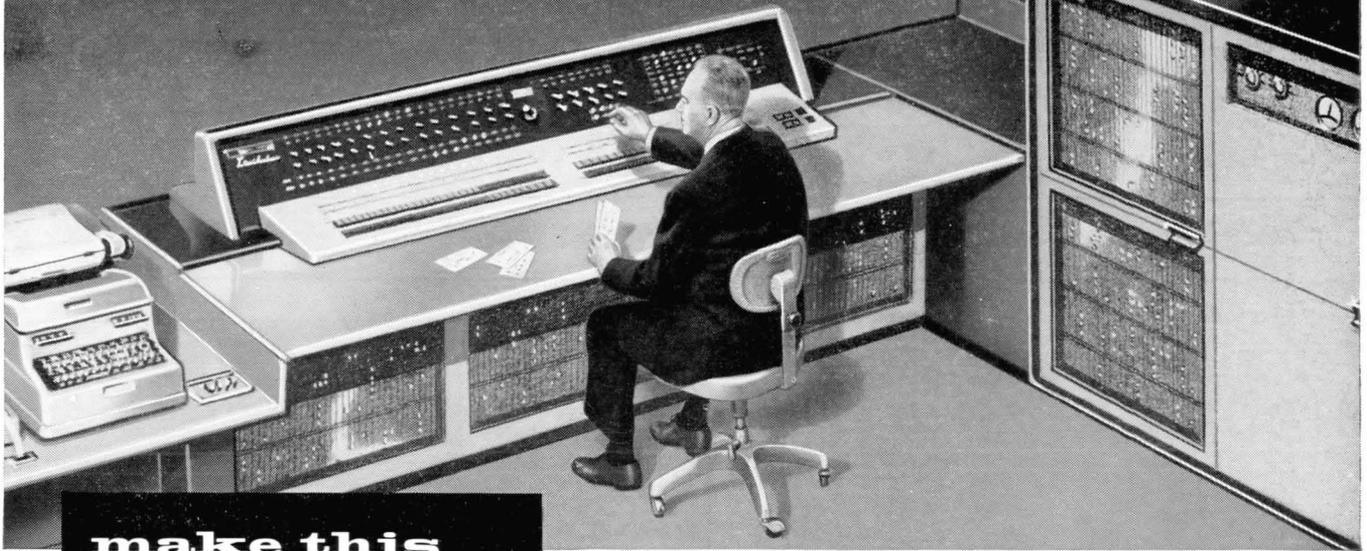


"ADVAC" HIGH TEMPERATURE SEALS



SOLDERSEAL TERMINALS

# compare...



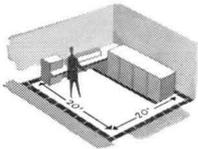
**make this  
point-by-  
point  
comparison  
of the new...**

## PHILCO *transac*\*

### ALL-TRANSISTOR MANAGEMENT "BRAIN"

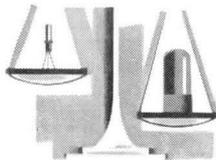
Here is the world's first and only large-scale, all-transistor data processing system . . . unsurpassed in capacity and performance. Transac is meeting the modern challenge for faster, smaller and more reliable large-scale data processing systems. Philco invites you to consider the many outstanding advantages of the new Transac S-2000 before you decide on *any* large scale data processing system.

#### Compare!



**1/10 THE FLOOR SPACE.** The complete Transac S-2000 system will fit into a 20' x 20' floor space. A tremendous economic advantage where space is at a premium.

#### Compare!



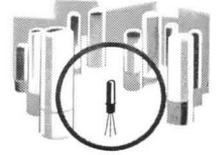
**LESS THAN 1/10 THE WEIGHT.** Transac actually weighs less than a comparable area of filing cabinets.

#### Compare!



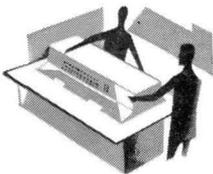
**1/10 THE POWER CONSUMPTION.** All transistor circuitry operates on 7-10 kilowatts as opposed to the 70-100 kilowatts required by vacuum tube systems. Transac S-2000 plugs into conventional 110V outlets.

#### Compare!



**MULTI-MILLION HOUR TRANSISTOR RELIABILITY.** Computer transistors have amassed more than 60 million transistor hours of service . . . with highest performance reliability.

#### Compare!



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#### Compare!



**NO EXPENSIVE SITE PREPARATION.** No special reinforcing or ducting of floors, installation of power lines, etc., are necessary for quick installation or relocation of Transac S-2000.

#### Compare!



**NO COSTLY AIR CONDITIONING.** Transistors generate practically no heat. Transac S-2000 needs little air conditioning as compared to the 40 tons or more required by vacuum tube systems.

#### Compare!



**GET ALL THE FACTS.** Please write for illustrated brochure describing the modern Philco Transac S-2000 system.

*At Philco, career opportunities are unlimited in computer, electronic and mechanical engineering, systems analysis, programming, sales representation.*

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\*"Transac"—Trademark of Philco Corporation for Transistor Automatic Computer.

# COMPUTERS

## and AUTOMATION

DATA PROCESSING • CYBERNETICS • ROBOTS

Volume 6  
Number 12

DECEMBER 1957

Established  
September 1951

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Part 2, for lack of space in this issue, will be published in the January issue.

- A: "Abbreviations Used in the Who's Who," 6/E1 (Extra Issue), 14  
ABSTRACTS: Eastern Joint Computer Conference, New York, Dec. 1956, 5/12 (Dec. 1956), 20;  
Eastern Joint Computer Conference, Washington, D.C., December 9-13, 1957, 6/11 (Nov.), 26;  
IRE National Convention, March 1957, New York, Papers Bearing on Computers and Data Processors, 6/5 (May), 30;

- Meeting of Association for Computing Machinery, Houston, Texas, June 19 to 21, 1957, 6/7 (July), 18;  
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"Air Traffic Control System," Bendix Pacific Div., 6/2 (Feb.), 32  
"Airline Automation: A Major Step," by C. E. Ammann, 6/8 (Aug.), 10  
American Airlines, "Simulators for Training Airplane Crews" 6/3 (Mar.), 10  
The American Society of Mechanical Engineers, Instruments and Regulators Conference, Chicago, April 7-10, 1957, 6/3 (Mar.), 47  
Ammann, C. E., "Airline Automation: A Major Step," 6/8 (Aug.), 10  
"Analog Computer in Use for Design of Instruments," 6/10 (Oct.), 1, 3  
"Analog to Digital Converter Flashes Actual Thickness of Steel Strip," 6/6 (June), 94  
"Analogue Computers in Europe," by P.A.R. Wright, 6/5 (May), 42  
"Are Automatic Computer Speeds Faster Than Business Needs?," by Ned Chapin, 6/10 (Oct.), 12

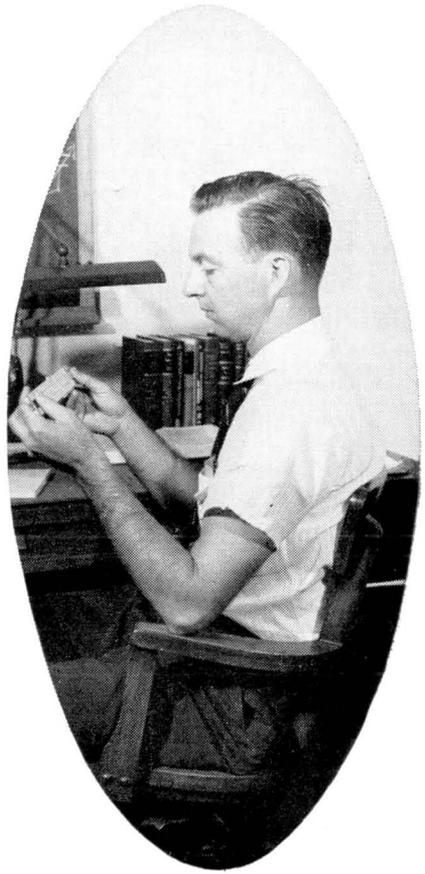
[Please turn to page 26]

COMPUTERS and AUTOMATION for December, 1957



Early European Glass Blower

when  
you  
have  
ken \*  
—  
you  
can!



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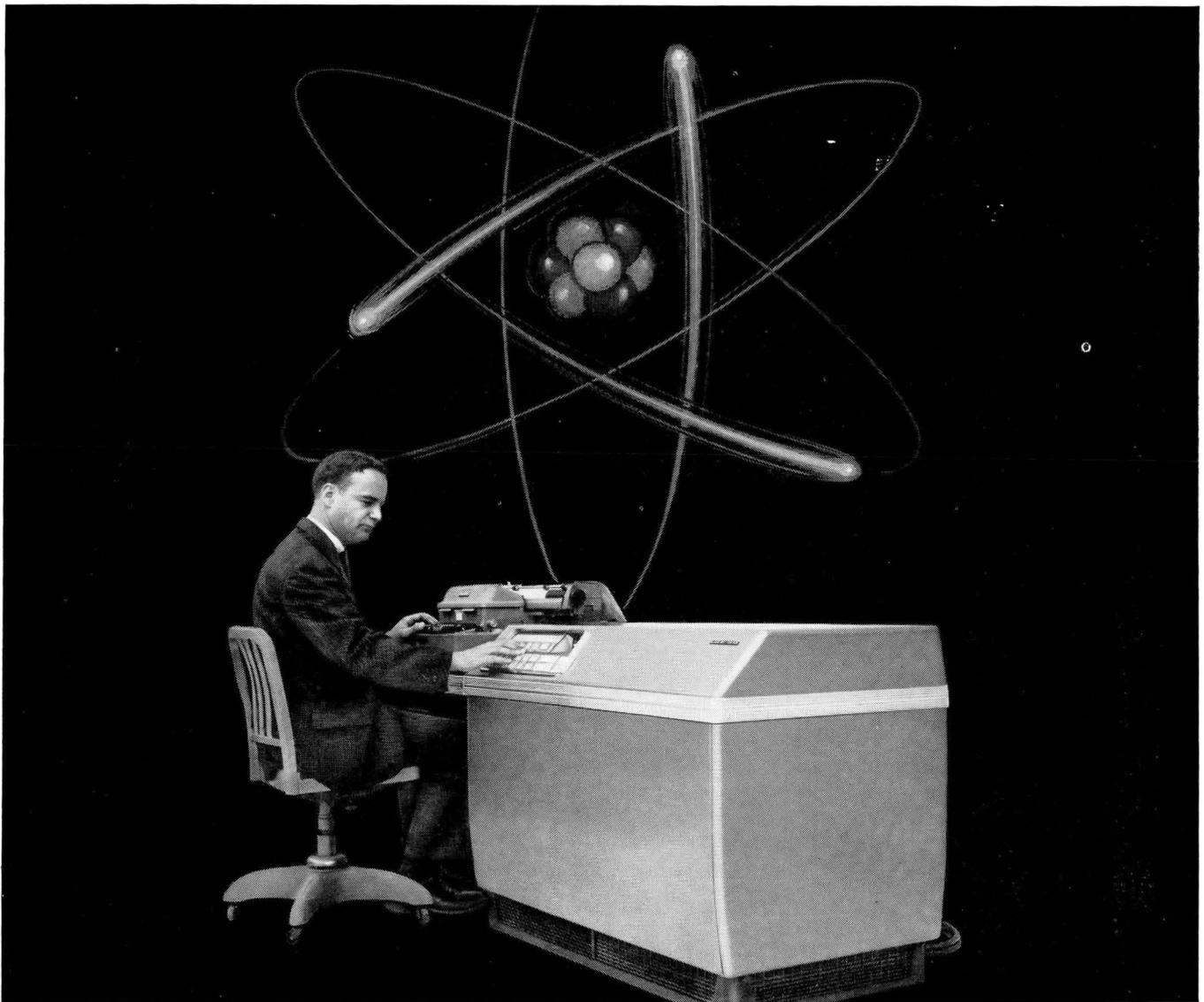
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## At last! A large-capacity electronic computer you use right at your desk! ROYAL PRECISION LGP-30

### High-speed computation at the lowest cost ever for a complete computer system

No more waiting in line for those answers you need! No more lost time in executing preliminary calculations or modifying equations! Not with the LGP-30! Wheeled right to your desk, operated from a regular wall outlet, LGP-30 allows you to follow your work personally from beginning to end . . . to change formulae on the spot . . . to simulate optimum designs without weeks of mathematical analysis. Thus you get faster answers . . . added time for *creative* work.

**Easy to use.** LGP-30 is a general-purpose stored-program computer — internally binary, serial, single address. Just the few orders in the command structure give complete internal programming. Controls are so simplified, you get an “overnight” feel for your computer.

**Unusual memory capacity.** With a magnetic drum memory of 4096 words, LGP-30 is the most powerful computer of its size yet developed. Fully automatic, it executes self-modifying programs.

**Exceptional versatility and value.** Both the scope of LGP-30's applications and the range of calculations it

can perform are almost limitless. It gives speed and memory equal to computers many times its size and cost, yet initial investment is the smallest ever for a complete computer. Maintenance costs are extremely low . . . service facilities available coast-to-coast.

#### Outstanding features of LGP-30

- Alpha-numeric input-output via electric typewriter or punched paper tape.
- Optional input-output equipment available.
- Unusually large memory — 4096 words.
- Library of sub-routines . . . programs for wide variety of applications.
- Mobile . . . no expensive installation . . . self-cooled.
- Nation-wide sales and service.

For further information and specifications, write Royal McBee Corporation, Data Processing Equipment Division, Port Chester, N. Y.

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WORLD'S LARGEST MANUFACTURER OF TYPEWRITERS AND MAKER OF DATA PROCESSING EQUIPMENT



LOADING OR UNLOADING SPEED:

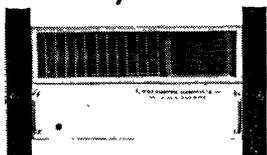
14  $\mu$  SEC/CHARACTER

# 144-BQ8 CORE MEMORY

3075 TELETYPE CORES

## A SMALL, TRANSISTORIZED UNIT FOR SYSTEM COMPATIBILITY IN:

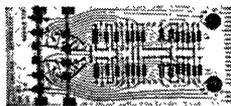
data processing, computing and automation systems. Another member of Telemeter Magnetics' growing family of coincident current magnetic core storage buffer units, this neatly designed package containing storage capacity for 1152 binary digits, switching and driving circuitry to load and unload information and a self-contained power supply, measures



only 8 $\frac{3}{4}$  inches high and 14 inches deep in standard relay rack mounting. Like the larger Telemeter Magnetics buffers, it is designed to provide compatibility between two data systems having different operating characteristics. Pioneer work in the development and manufacture of magnetic core storage buffers has made Telemeter Magnetics a specialist in this field. Call them in to solve any memory or buffering problem, or for specific information regarding the 144-BQ8 or the 1092 series of buffers, write:

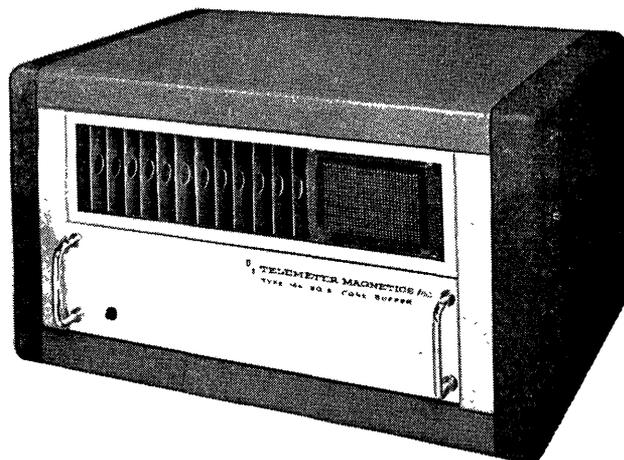


**TELEMETER MAGNETICS Inc.** 2245 Pontius, Los Angeles 64, California



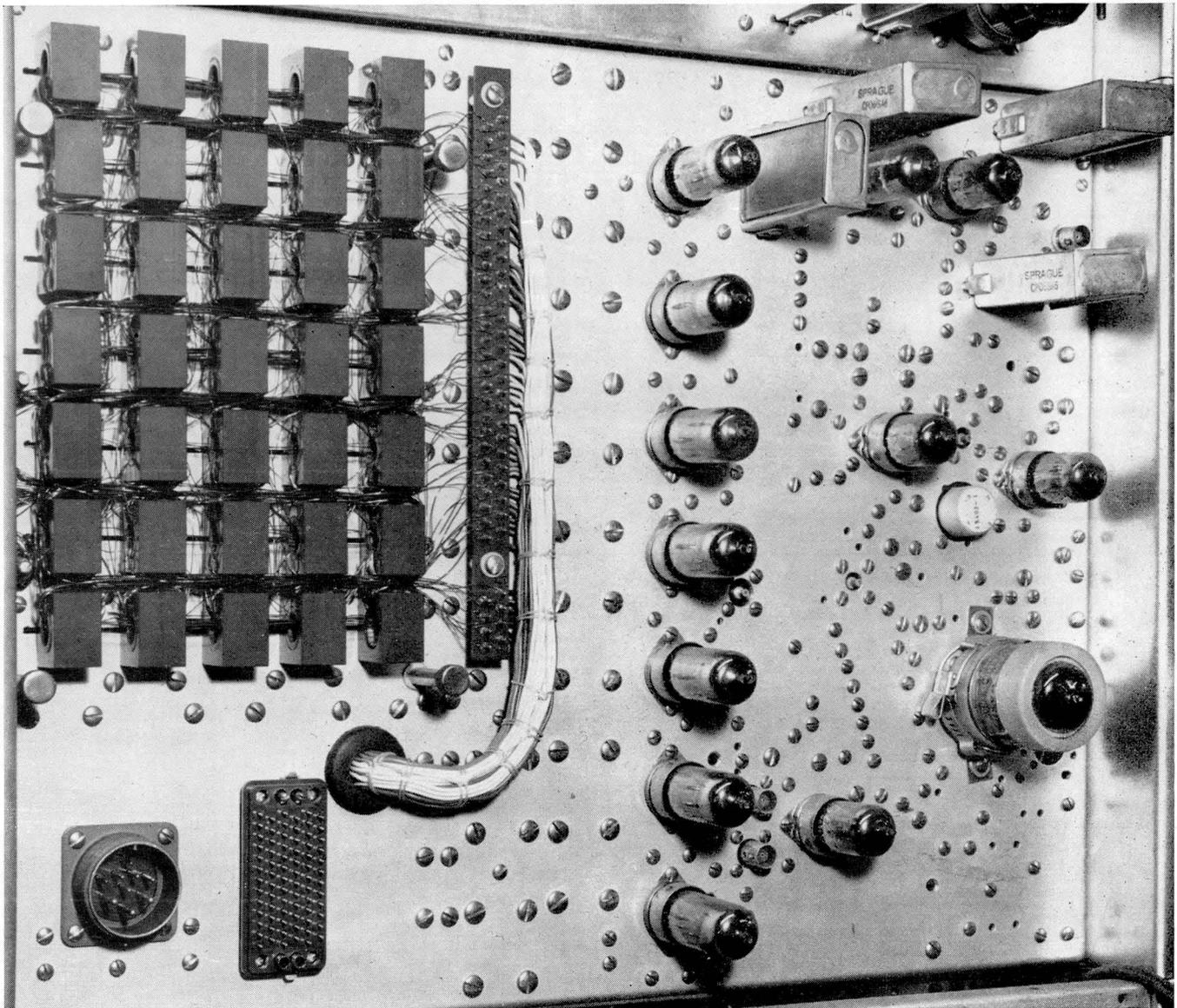
For use as: delay,  
temporary storage or  
buffer, specify the

# 144-BQ8



**SPECIFICATIONS:** Number of characters: 144; Number of bits/characters: 8\*, loaded or unloaded simultaneously; Loading or Unloading Speed: 14  $\mu$  sec/character; Solid state components only. Signal Amplitudes: Input: ZERO - 5 Vdc, ONE + 5 Vdc, Output: Pulse: ZERO - 5V, one + 5V. Load Sync: +10v, Unload Sync. +10v. Power: 1 amp at 115v, 60 cps.

\*Available in 4 bit model, specify 144-BQ4



please revise my program? — Diana —." The words for such a message (with a blank for specifying the number of an instruction), and similar words for other messages, can of course be stored in the registers of an automatic computer, for use when a program is being checked. Then the automatic computer can draw them out of its memory and use them on appropriate occasions, depending on the program-checking routine.

The machine in this case displays education, and simulates thinking and conversation. The degree of simulation can in theory be carried out to such an extent that a human being in another room, talking to the machine on a teletype, could be mystified for more than a full half hour, wondering whether he is conversing with a human being or a machine.

#### NON-NUCLEAR ENGINEERING PROBLEMS IN SHIPBUILDING SOLVED BY HIGH SPEED AUTOMATIC COMPUTERS

William Hetzel  
Atomic Power Research Dept.  
Newport News Shipbuilding and Dry Dock Co.  
Newport News, Va.

WHAT NON-NUCLEAR engineering problems in  
COMPUTERS and AUTOMATION for December, 1957

shipbuilding are being solved by high speed automatic computers? What types of machines are they being solved on? Where can information be gotten about these problems? To get answers to these questions a questionnaire was sent to several shipyards, universities, and research centers.

Below is a list of such problems, type machine solved on, name of the person to contact, and his company.

"Weights and Moments," "Tank Capacity Calibration," "Tank Area Characteristics," "Ship Displacement," and "Ship Waterline Characteristics," IBM 607 Model 5, F. A. Dooley, Alabama Dry Dock and Shipbuilding Corporation, P.O. Box 190, Mobile, Alabama.

"Shock Isolators," general purpose analog. "Shock Spectra" and "Normal Mode Calculations," NAREC, Dr. Horace M. Trent, Head, Applied Mathematics Branch, U.S. Naval Research Laboratory, Washington 25, D.C.

"Weights and Moments," "Ullage Tables," "Form Calculations," "Pipe Stress," IBM 650. "Large Ship Maneuvering," "Torsional Vibration of Turbine-Reduction Gear-Generator Systems," "Compartment Pres-

[Please turn to page 27]

# A PICTORIAL MANUAL ON COMPUTERS

## I. What Is "Operating a Computer" Like?



The new Computing Center at the Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa., showing its powerful modern automatic digital computer, a Remington Rand Univac. The central machine is the supervisory control. (Figure 1)



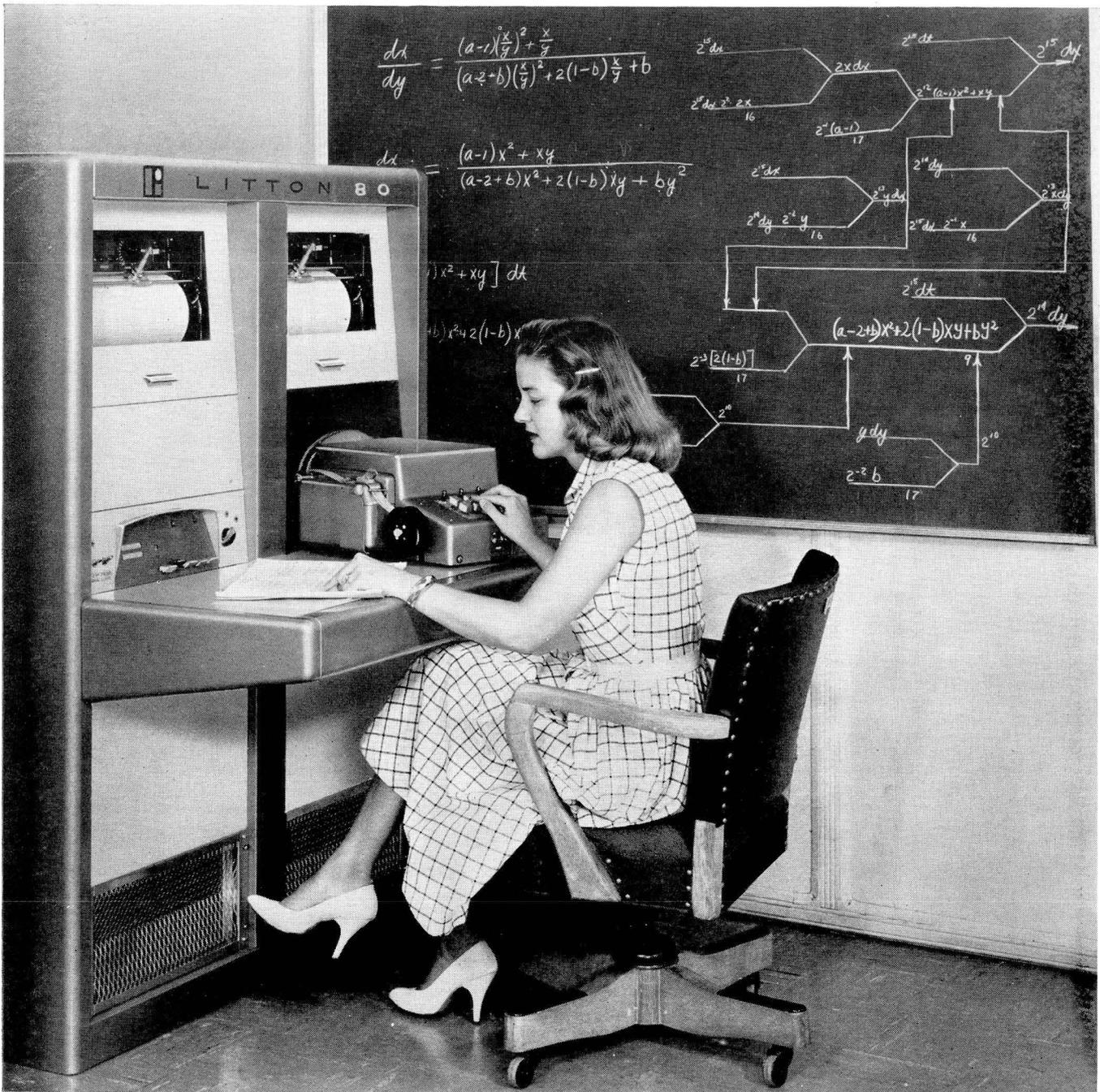
Another view of the same center, looking from the opposite direction. The machines at the left (Uniservos) are magnetic tape handlers. (Figure 2)



Operating the Bizmac, a very large automatic electronic computer, made by Radio Corporation of America, and installed at the Detroit headquarters of the Army Ordnance Tank-Automotive Command. The Bizmac system includes about 220 units of nineteen different types of equipment. (Figure 3)



The "System Central" of the RCA Bizmac in Detroit, which functions like a telephone exchange. An operator at any one of these consoles can connect any of the 182 magnetic tape stations to the appropriate data processing machine by pressing a button; and she can tell from a glance at the control panel which machines are busy and which can take on a new job. (Figure 4)

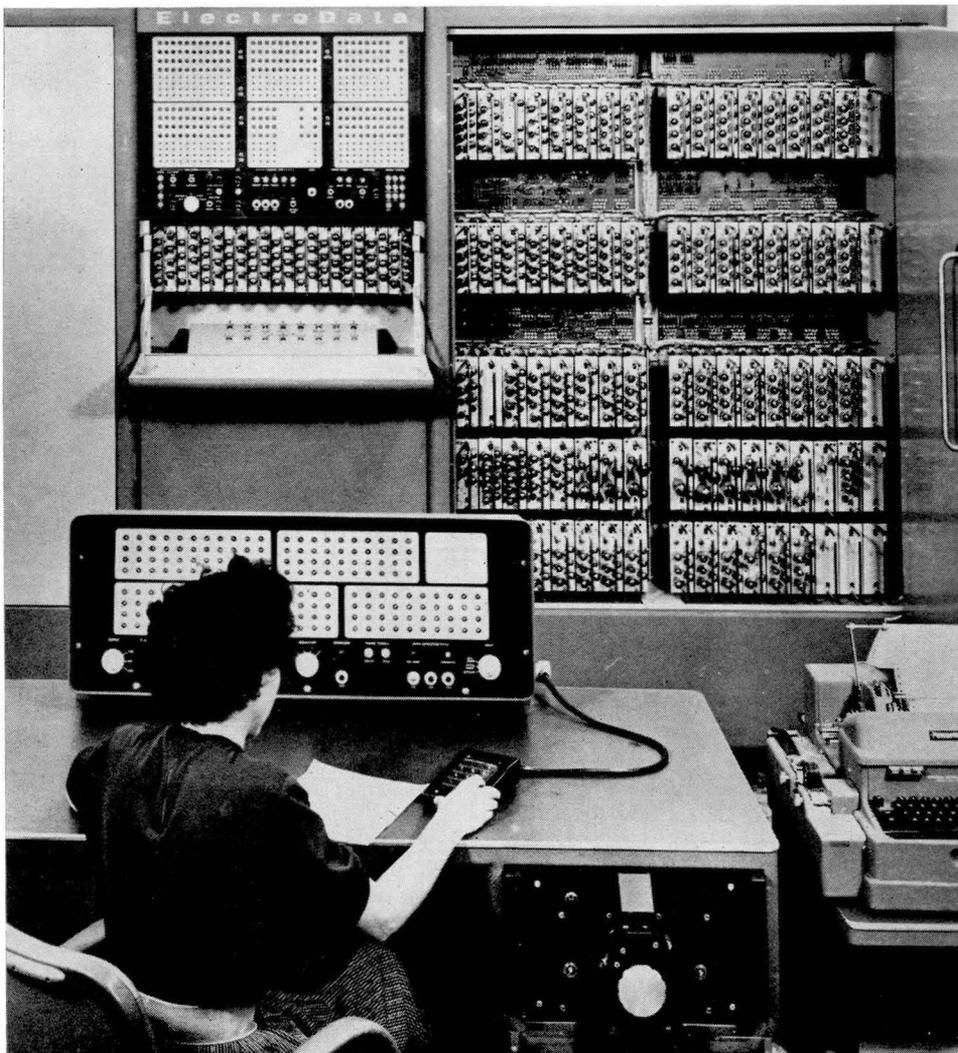


Operating a small automatic combined-digital-analog computer, mainly used for solving differential equations: the Litton-80 Digital Differential Analyzer, made by Litton Industries, Beverly Hills, Calif. This computer contains 80 integrators. The computer controls are at the left at desk level. The girl operating the machine is using the paper tape punch, at the right at desk level. The drums at the top of the machine give graphical output, and may take in graphical input. (Figure 5)



(Above)

Operating a small automatic digital computer, which can be used for computations ranging from actuarial mathematics to jet plane design. This is International Business Machine Corp. Type 610 Auto-Point Computer, a "desk-side" machine, with automatic positioning of the decimal point. At the extreme right are the main input keys; next is an electric typewriter for output. (Figure 6)



(At left)

Operating a medium-sized automatic digital computer in the Naval Ordnance Laboratory near Washington, D.C. This computer is the Datatron 205, made by ElectroData Division of Burroughs Corp., Pasadena, Calif. It is in use for solving engineering and scientific problems. (Figure 7)

# design your pulse circuits from Aladdin's pulse transformer ENCYCLOPEDIA...

- 39 turns ratio tables like this
- 12 pages of text
- 2 pages of blocking oscillator data

Aladdin Pulse Transformer Encyclopedia  
Issued March 18, 1957 Page 111

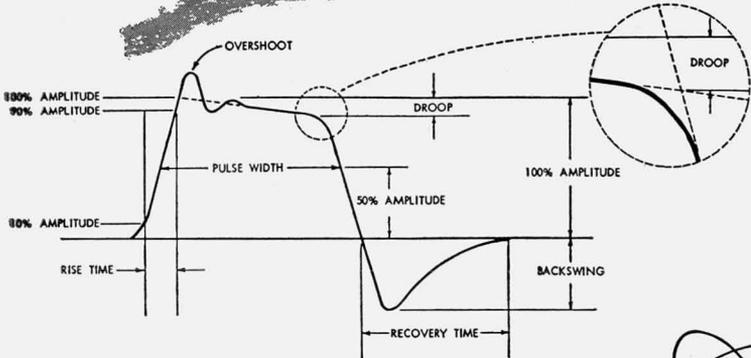
## 1:2 TURNS RATIO

### IN ORDER OF INCREASING PULSE WIDTH

Range of Pulse Widths In Microseconds Maximum Minimum	Source Impedance (Ohms)	Load Impedance (Ohms)	Maximum Rise Time (μsec)	Aladdin Part Numbers
0.1 to 0.06	130	560	0.025	*-121 90-621
0.1 to 0.10	200	820	0.050	*-122 90-622
0.1 to 0.04	100	390	0.020	*-121 90-621
0.2 to 0.06	68	270	0.030	*-121 90-621
0.2 to 0.08	130	560	0.040	*-122 90-622
0.3 to 0.06	100	390	0.030	*-122 90-622
0.3 to 0.08	51	220	0.040	*-121 90-621
0.4 to 0.08	150	560	0.035	*-123 90-623
0.4 to 0.08	51	220	0.040	*-122 90-622
0.4 to 0.08	100	390	0.035	*-123 90-623
0.5 to 0.08	200	820	0.055	*-124 90-624
0.5 to 0.12	180	680	0.070	*-124 90-624
1.0 to 0.14	820	3300	*-125 90-625	
1.0 to 0.26	75	330	0.130	*-123 90-623
1.0 to 0.08	68	270	0.040	*-123 90-623
1.1 to 0.12	110	470	0.080	*-124 90-624
2.0 to 0.16	430	1800	0.130	*-125 90-625
2.0 to 0.26	1200	4700	0.200	*-126 90-626
2.0 to 0.40	82	330	0.070	*-124 90-624
2.0 to 0.14	300	1100	0.130	*-125 90-625
3.0 to 0.26	820	3300	0.200	*-126 90-626
4.0 to 0.40	150	560	0.250	*-126 90-626
4.0 to 0.50	390	1500	0.200	*-125 90-625
5.0 to 0.40	200	560	0.230	*-125 90-625
8.0 to 0.46				

### IN ORDER OF INCREASING SOURCE IMPEDANCE

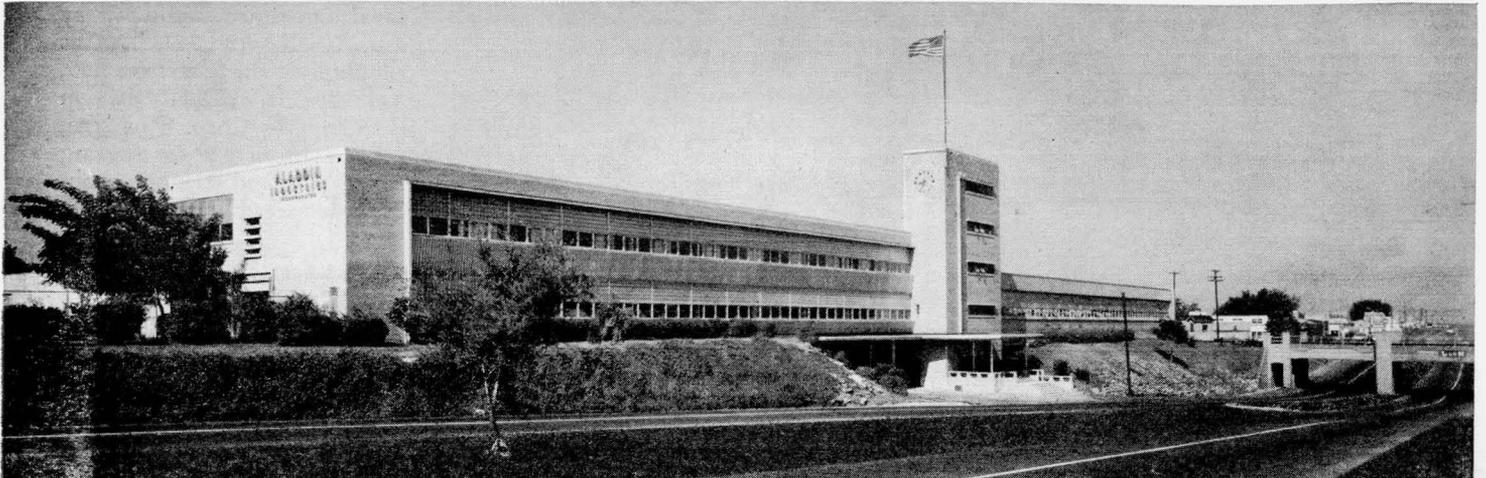
Source Impedance (Ohms)	Load Impedance (Ohms)	Range of Pulse Widths In Microseconds Maximum Minimum	Maximum Rise Time (μsec)	Aladdin Part Numbers
51	220	0.3 to 0.08	0.040	*-121 90-621
51	220	0.4 to 0.08	0.040	*-122 90-622
68	270	1.5 to 0.12	0.055	*-123 90-623
68	270	0.2 to 0.06	0.030	*-121 90-621
75	330	1.1 to 0.08	0.040	*-123 90-623
82	330	0.2 to 0.14	0.070	*-124 90-624
100	390	0.1 to 0.04	0.030	*-121 90-621
100	390	0.3 to 0.06	0.035	*-122 90-622
100	470	0.5 to 0.08	0.080	*-123 90-623
110	470	2.0 to 0.16	0.070	*-124 90-624
130	560	0.1 to 0.06	0.025	*-121 90-621
130	560	0.2 to 0.08	0.040	*-122 90-622
130	560	0.4 to 0.08	0.035	*-123 90-623
150	560	4.0 to 0.50	0.250	*-126 90-626
150	680	1.0 to 0.14	0.070	*-124 90-624
180	820	8.0 to 0.46	0.230	*-126 90-626
200	820	0.1 to 0.10	0.050	*-122 90-622
200	820	0.5 to 0.12	0.055	*-123 90-623
200	1100	3.0 to 0.26	0.200	*-125 90-625
200	1500	5.0 to 0.40	0.200	*-126 90-626
300	390	2.0 to 0.26	0.130	*-125 90-625
390	1800	4.0 to 0.40	0.130	*-126 90-626
430	3300	1.0 to 0.26	0.200	*-125 90-625
820	3300	2.0 to 0.40	0.200	*-126 90-626
1200	4200			



Aladdin's complete manufacturing and Quality Control facilities include a ferrite processing plant, insuring an adequate stock of ferrite pulse transformer cores made under the technical supervision of our Quality Control engineers.

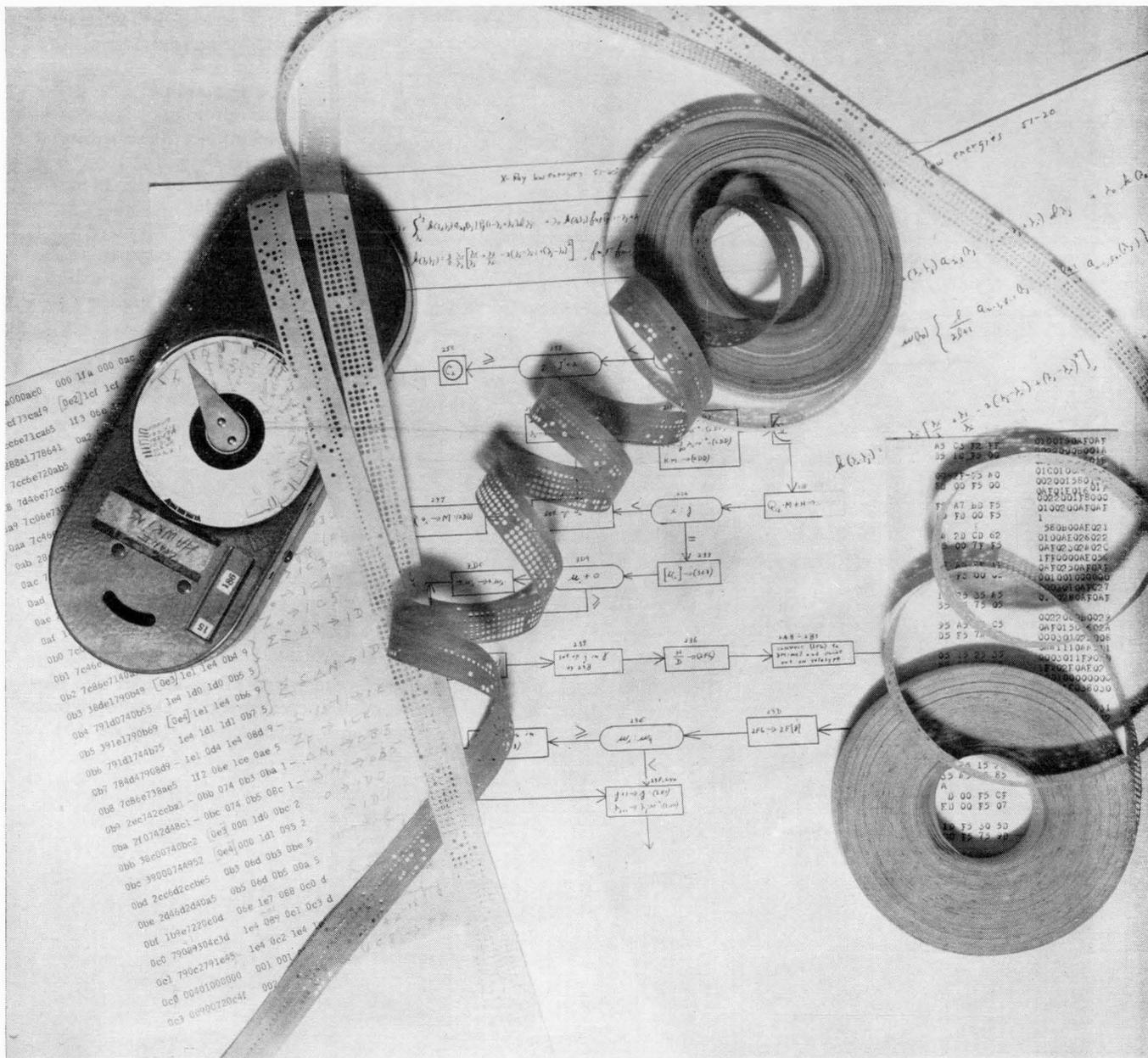
A comprehensive engineering handbook of tables, circuit diagrams and technical discussion. Easy-to-use tables of data on pulse transformers that are AVAILABLE. MILITARY and COMMERCIAL quality units. Double-ended units and plug-in styles. Available on letterhead request.

**Aladdin<sup>®</sup> ELECTRONICS**  
A Division of Aladdin Industries, Inc.  
716 Murfreesboro Road, Nashville 2, Tenn.  
Tarrytown, N. Y.; Pasadena, Cal.



## 2. What Is "Computer Programming Like?"

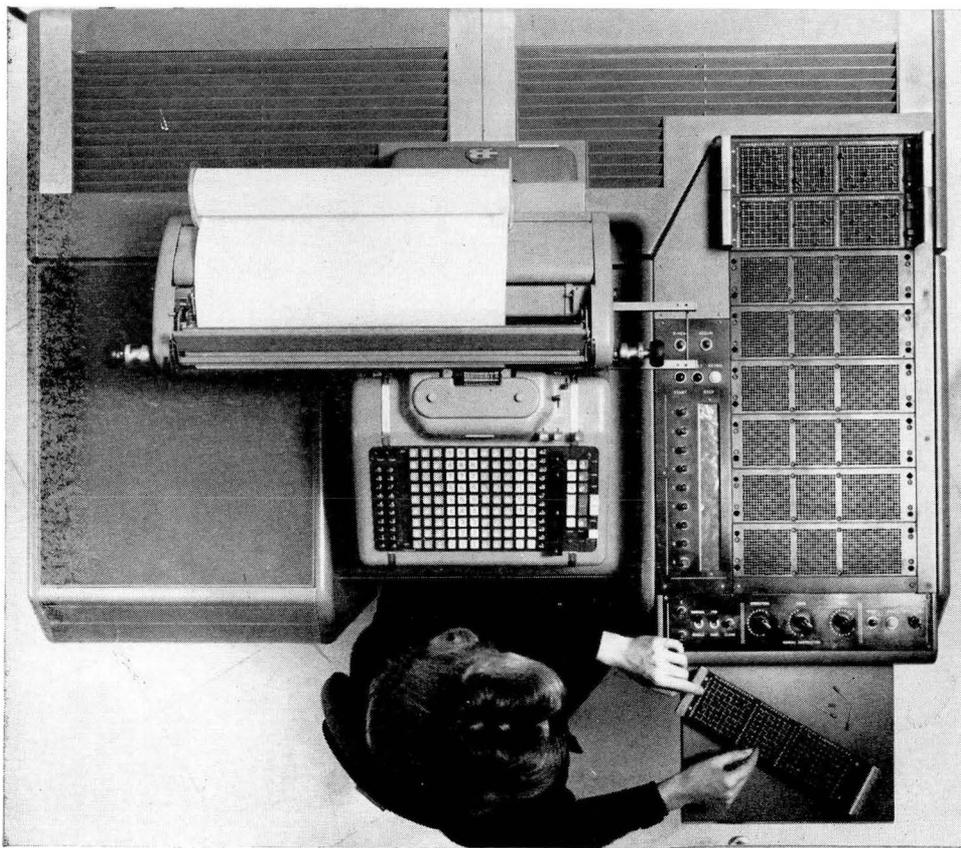
Most of the time the programming of an automatic computer, the long sequence of instructions, is quite invisible. It is stored within the machine. But every now and then it becomes visible to some extent. Here are a few pictures in which programming is "visible."



A mathematical formula is reduced to a flow pattern. The programming is worked out in a series of instructions. For example, the sixth instruction from the bottom is:

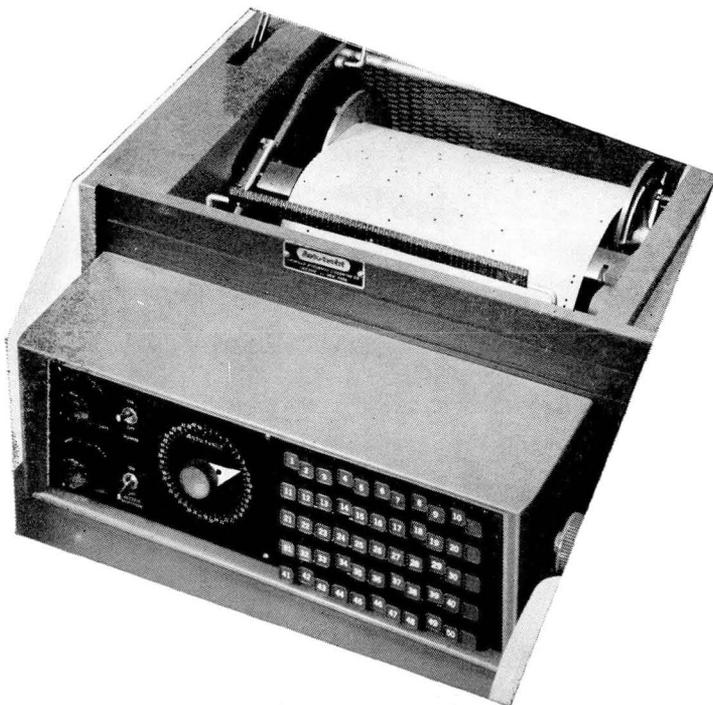
Obc 2d46d2940a5 Ob5 06d 0b5 00a 5

The instructions are then punched on paper tape, converted into polarized spots on magnetic wire, and fed to SEAC, the National Bureau of Standards Eastern Automatic Computer, Washington, D.C. This machine began to be dismantled in 1957, but did much useful work before then. Reason: the cost of maintenance on SEAC became greater than the sum of the amortized cost and the cost of maintenance on a new, more powerful computer. (Figure 8)



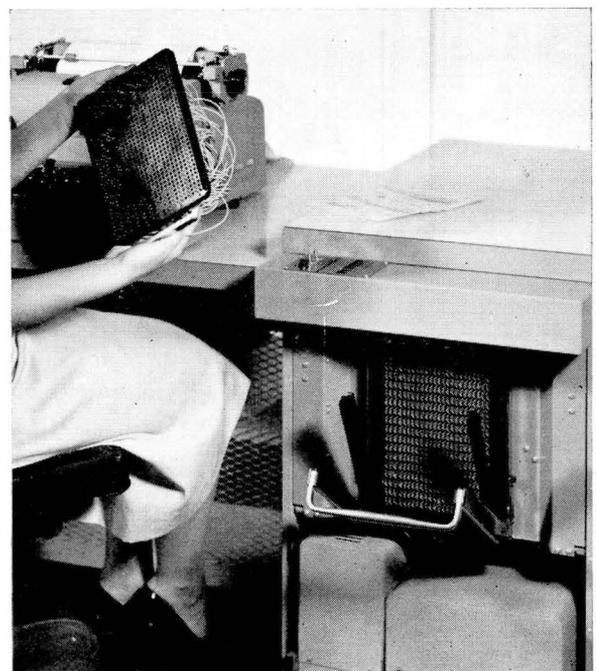
(At left)

Here a programmer places pins into a pinboard, which placed in a receptacle expresses the programming of the computer. The computer is a general-purpose desk-size automatic digital computer, the Burroughs Corp. Type E 101, marketed by the Electro-Data Division of Burroughs, Pasadena, Calif. The picture is taken looking vertically downward. (Figure 9)



Above is a punched paper roll which automatically programs the keys of an electric typewriter, so that it will print any desired stored words or sentences. The machine is the Autotypist, made by the American Automatic Typewriter Co., Chicago. (Figure 10)

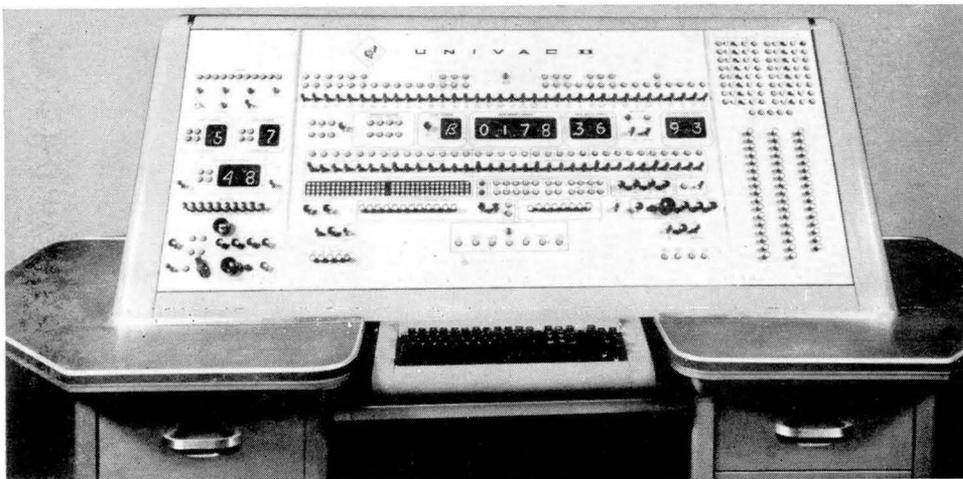
Below is the wired plugboard of the Underwood Typewriter Co.'s Dataflo, which programs that machine. (Figure 11)





William Snow and Miss Loretta Kassel, programmers, check a program of instructions at the supervisory console of GEORGE, new automatic electronic computer installed in 1957 at Argonne National Laboratory, Lemont, Ill. Snow is feeding punched paper tape through a high-speed photo-electric reader. The reader, manufactured by Ferranti Electric, is capable of reading 200 characters per second. Miss Kassel checks data coming from an automatically controlled electric typewriter, a means of output used here to obtain results from the program at a speed slower than usual. The typewriter, made by International Business Machines Corp., was modified for computer use by Soroban Engineering, Inc.

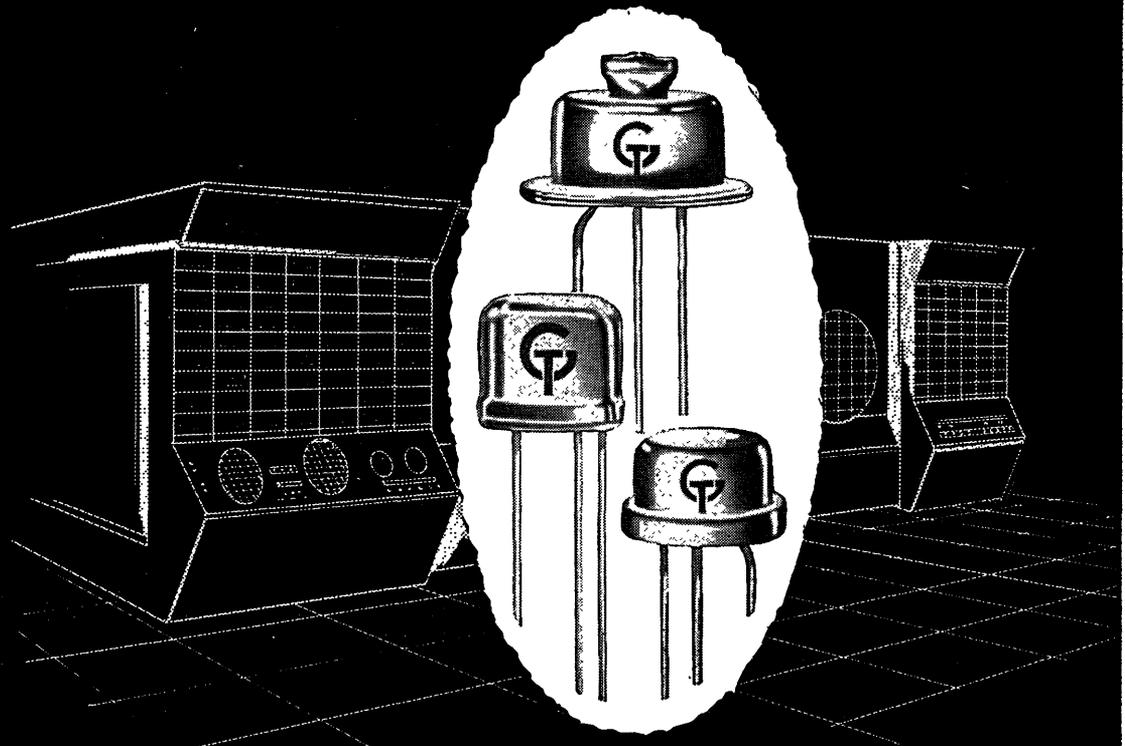
GEORGE is one of two high-speed digital electronic computers recently installed for the Argonne Applied Mathematics Division. It was designed and manufactured in part by the Argonne Electronics Division. It has a random-access magnetic-core memory of 4,096 words of 40 binary digits. A magnetic tape supplemental memory of Argonne-developed design is being constructed for this computer. (Figure 12)



The supervisory control of Univac II, a very large high speed automatic computing system, made by Remington Rand Univac. The key board on the panel enables the operator to "talk" to the computer; a control printer enables the computer to "talk back" to the operator. (Figure 13)

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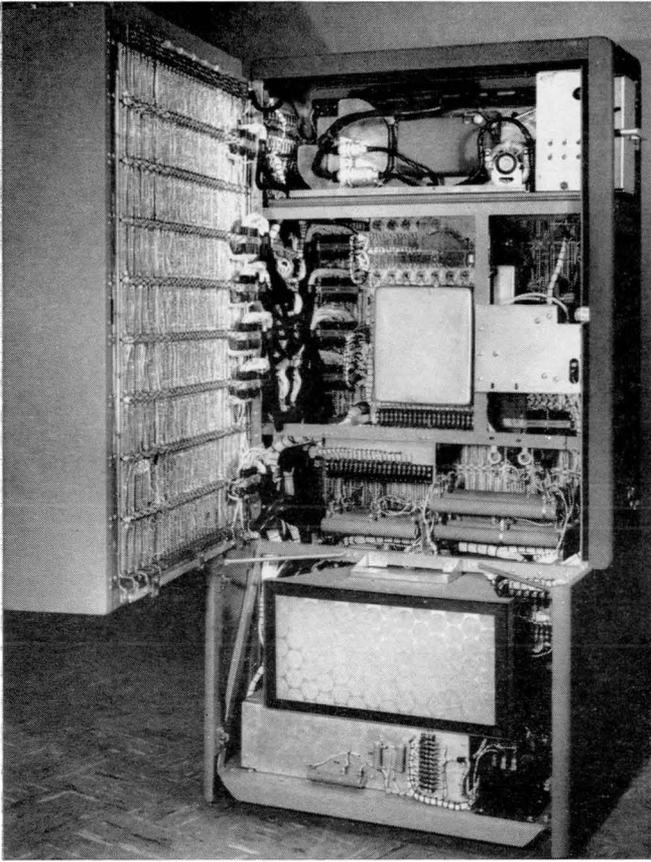
- Relay Amplifier
- Direct Current Switch
- Photoelectric readout & control
- Micro and millisecond switching
- Servo driver applications
- Control lighting
- Phase detector circuitry
- Low level modulation



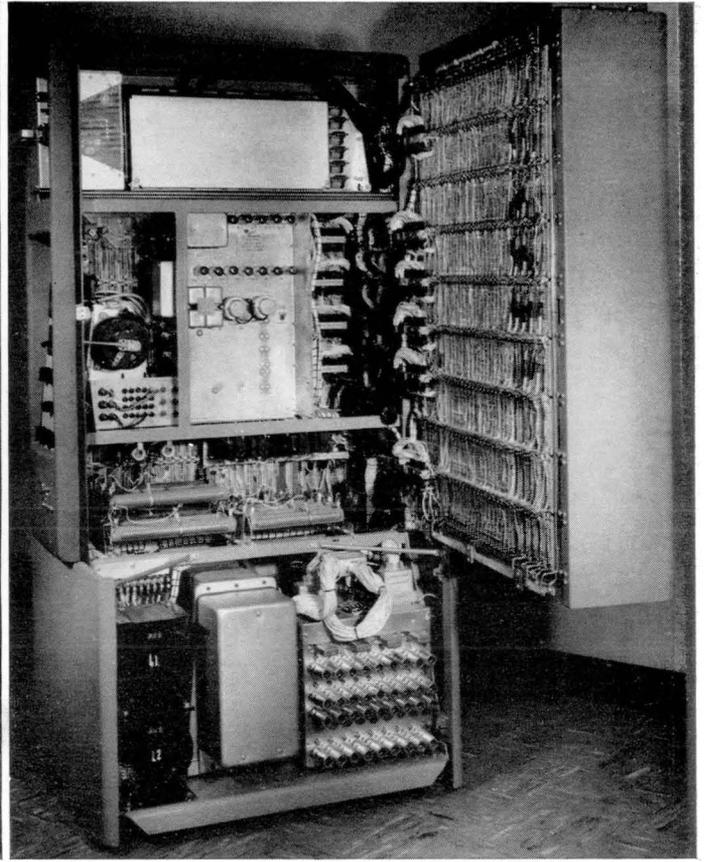
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### 3. What does the Inside of a Computer Look Like?

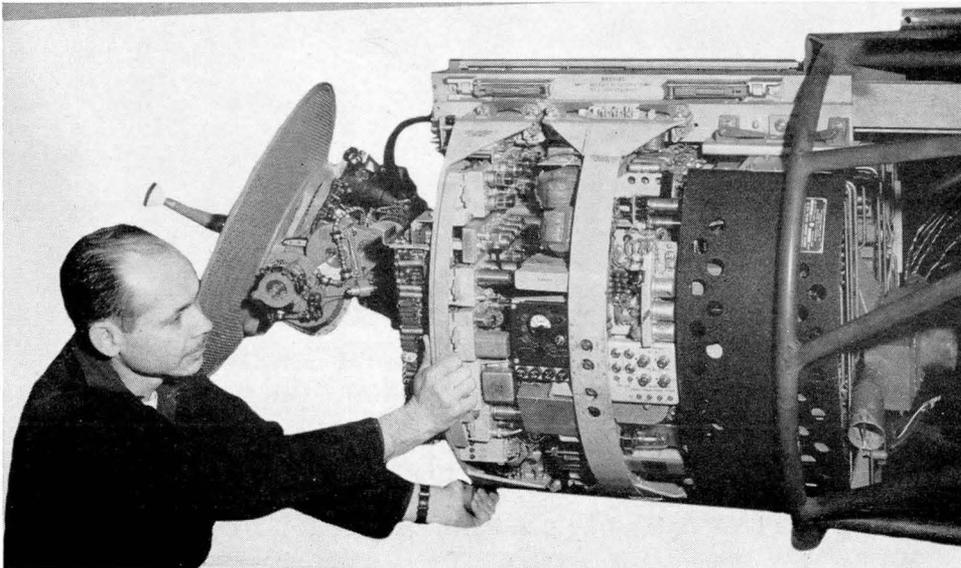


(Figure 14)

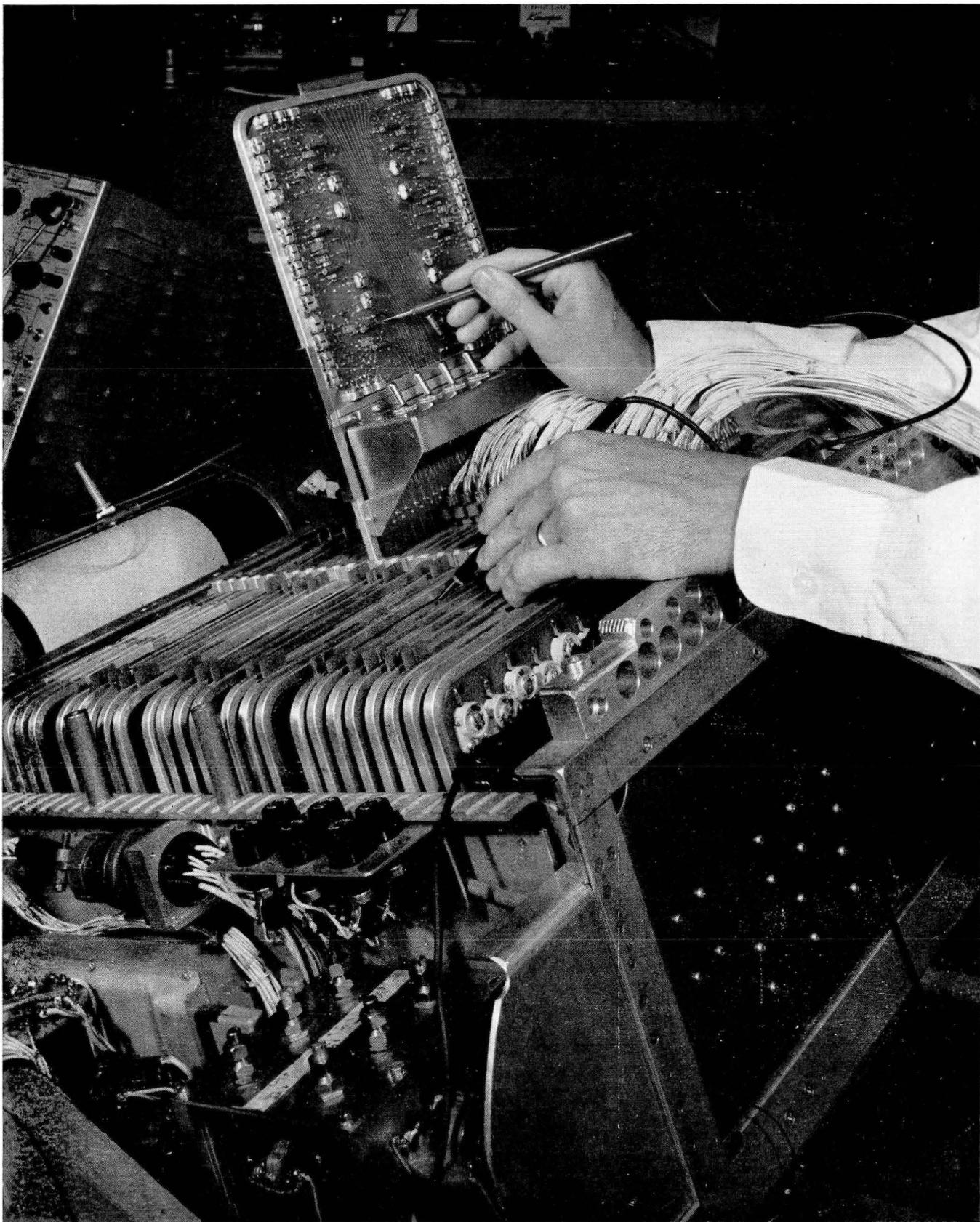


(Figure 15)

Here are two pictures of the inside of the Bendix G 15, a general purpose automatic digital computer made by the Bendix Computer Division, Los Angeles 45, Calif. The front of the computer faces the center of the page; what you see when the left side door is opened appears in Figure 14; and what you see when the right side door has been taken off for these pictures. The two doors contain all the plug-in circuit boards and the logical wiring of the computer. The top of the computer contains a pull out drawer which holds the paper tape punch and the photoelectric reader of paper tape. The bottom of the computer contains the magnetic drum memory, the power supply and the blower.

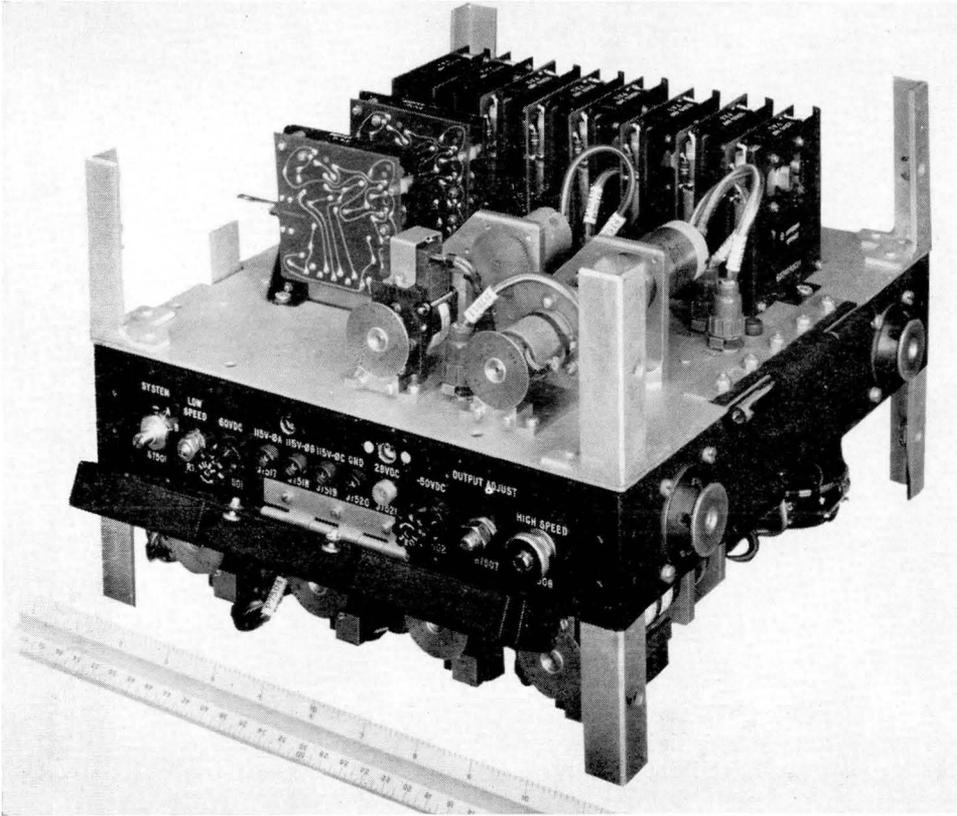


The inside of an airplane fire control computer installed in a U.S. Navy interceptor aircraft. The computer is an Aero 13 made by Westinghouse Electric Corp., Baltimore, Md. The fire control computer is mounted integrally with the radar at the rear of the assembly. (Figure 16)

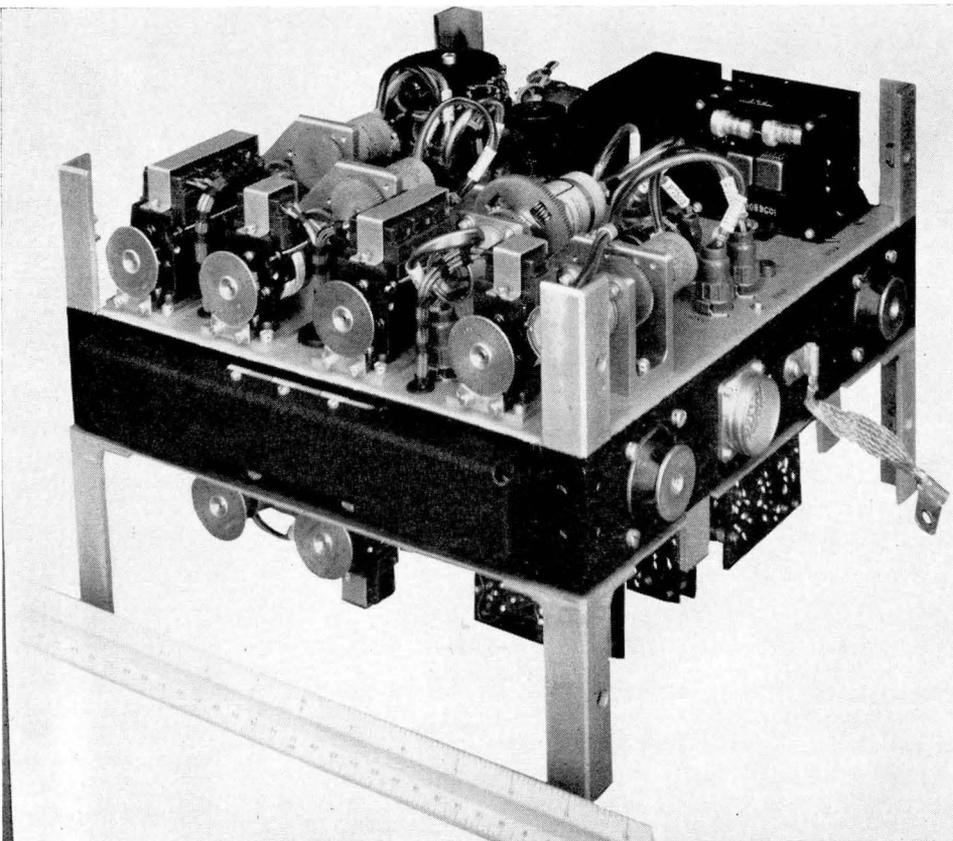


The inside of an airborne automatic digital computer of the differential analyzer type. This computer is made by Autonetics, Division of North American Aviation Inc., Downey, Calif., and it automatically and continuously processes data gathered while an airplane is in flight. It is able to perform 93 distinct integrations, generate continuous solutions of differential equations, and calculate trigonometric functions. The computer occupies 3 cubic feet, weighs 145 pounds, and uses 100 watts of power.

All vacuum tubes have been replaced by transistors. (Figure 17)

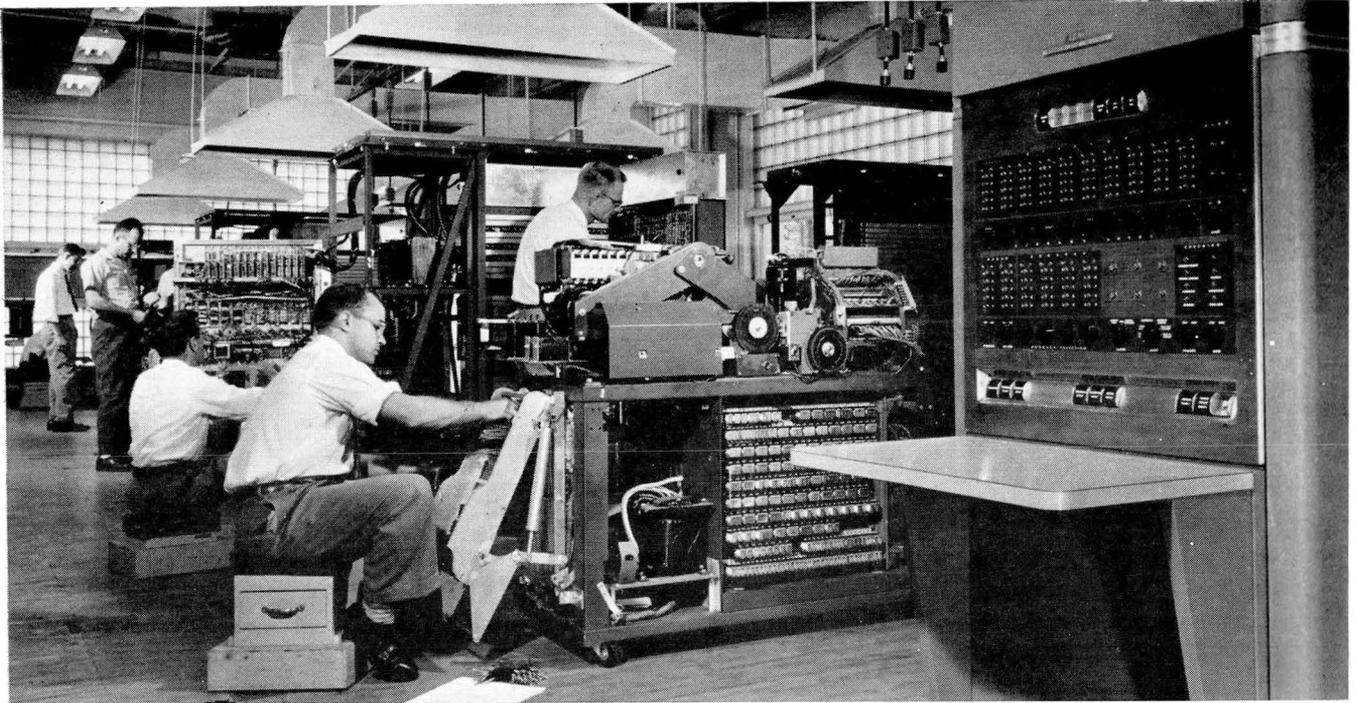


This is the upper chassis of a computer made by Westinghouse Electric Co., Air Arm Div., Baltimore, Md. It is a miniaturized analog computer less than 12 inches across, for air navigation purposes. The upper chassis shows six transistorized servo amplifiers, of the plug-in type and completely interchangeable. (Figure 18)

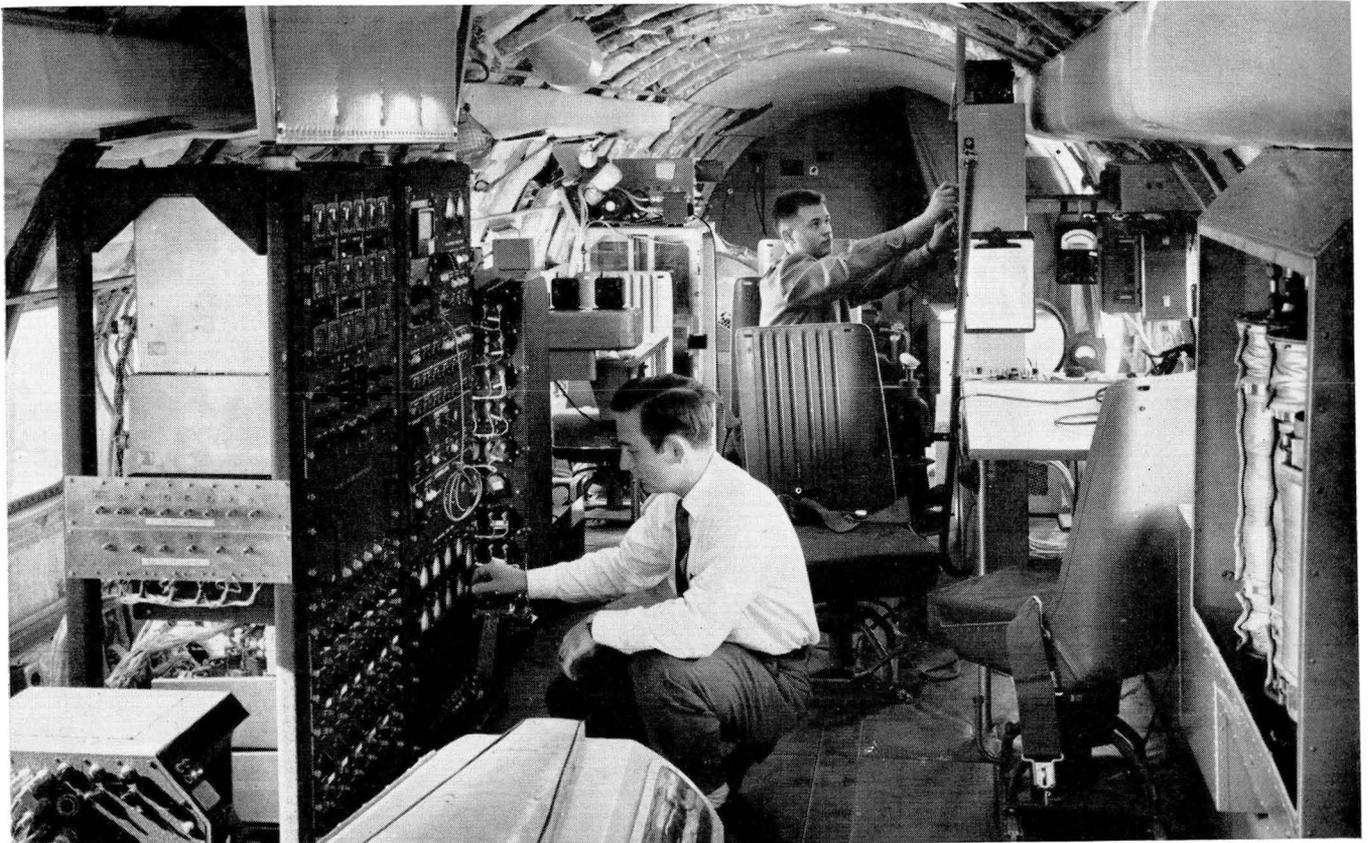


The lower chassis of the same computer, showing the arrangement of the servo motors, gear boxes, resolvers, "pot gangs," and transistorized power supply. (Figure 19)

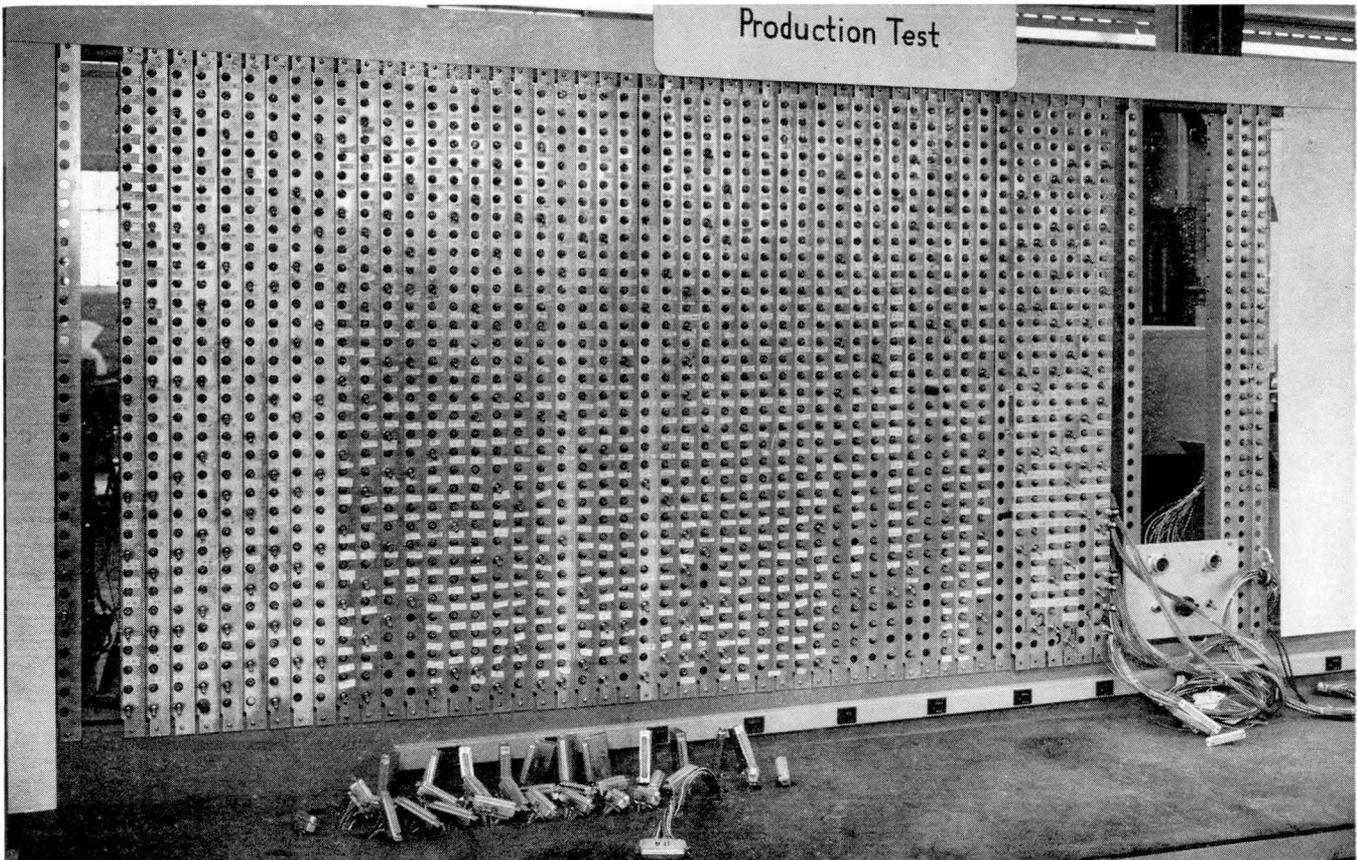
#### 4. What does Producing and Testing a Computer Look Like?



Production line of the Endicott, N.Y., plant of International Business Machines Corp., where the IBM 650 automatic digital computer is assembled. Over 500 of these computers have been delivered. (Figure 20)



A computing system test laboratory that flies in a T-29 aircraft. It tests automatic navigation systems using advanced radar, autopilot, and inertial navigation. The laboratory includes dozens of special instruments and data gathering devices so that actual performance of systems can be evaluated. Two research engineers are making final checks before the flight test by Autonetics, Division of North American Aviation, Inc., Downey, Calif. (Figure 21)

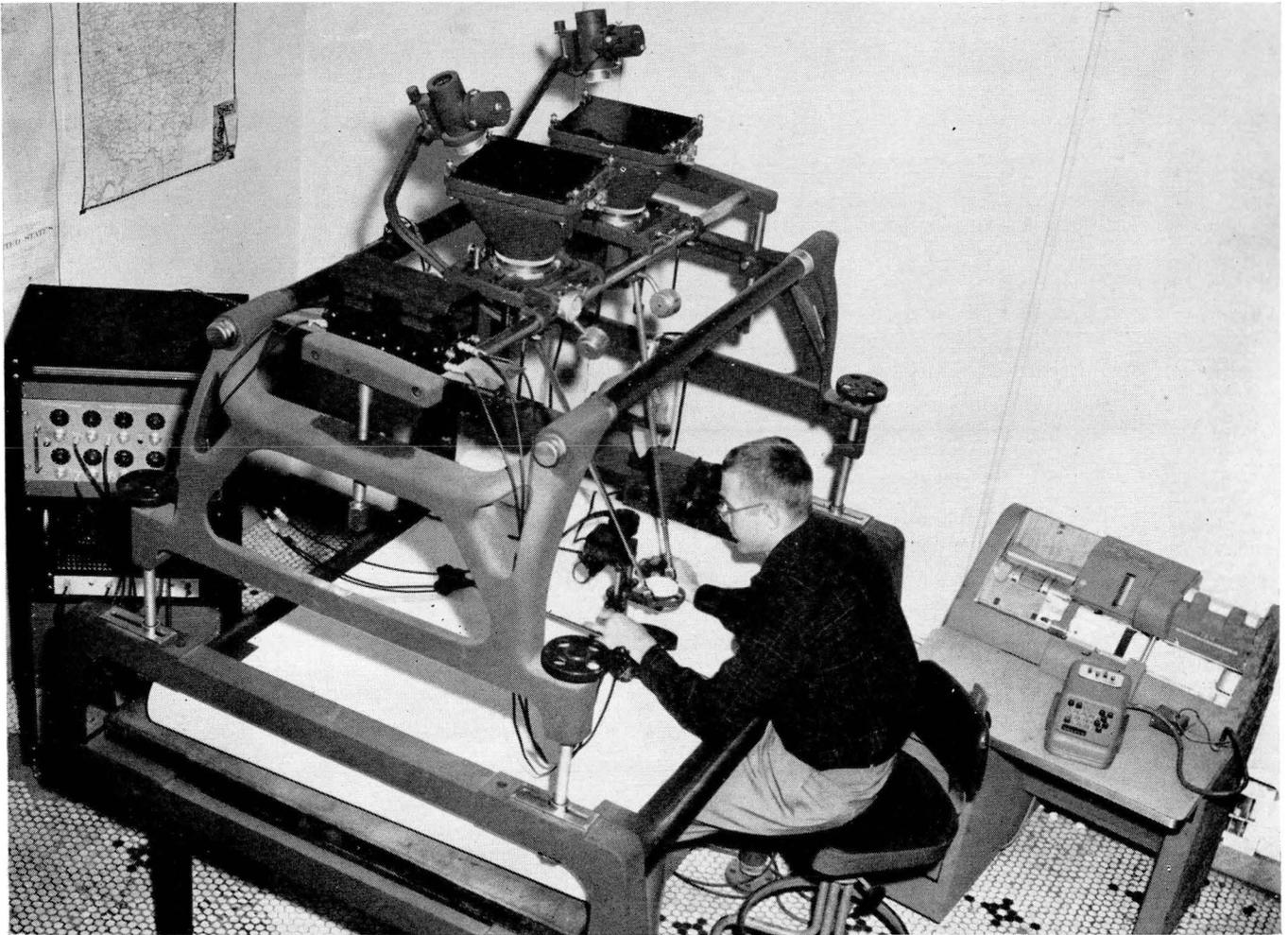


This piece of equipment checks the wiring of the digital differential analyzer made by Litton Industries, Beverly Hills, Calif. The 33 plugs at the bottom of the picture resting on the bench connect with the machine. The apparatus detects and locates open and shorted circuits which may occur in over 2000 soldered connections in the computer. (Figure 22)

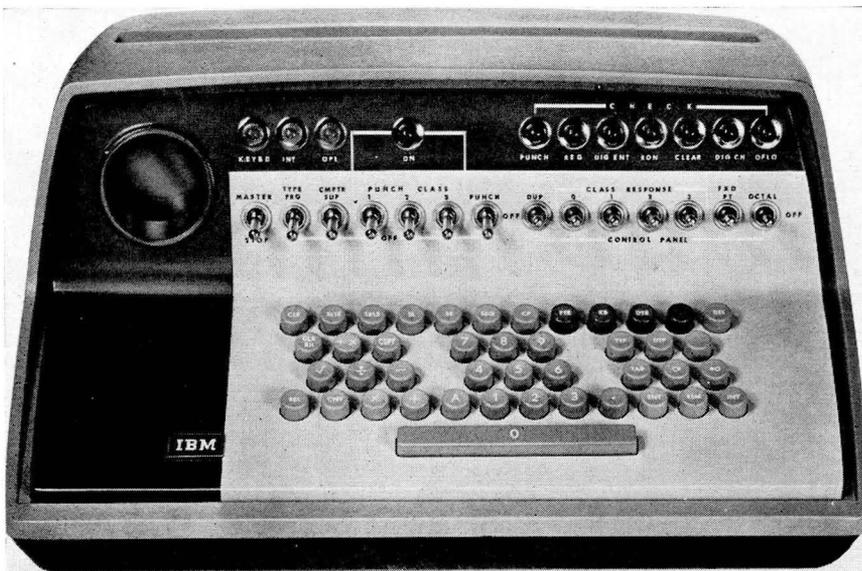


Here is a Litton digital differential analyzer on the bench and being checked. (Figure 23)

## 5. What does Input to a Computer Look Like?

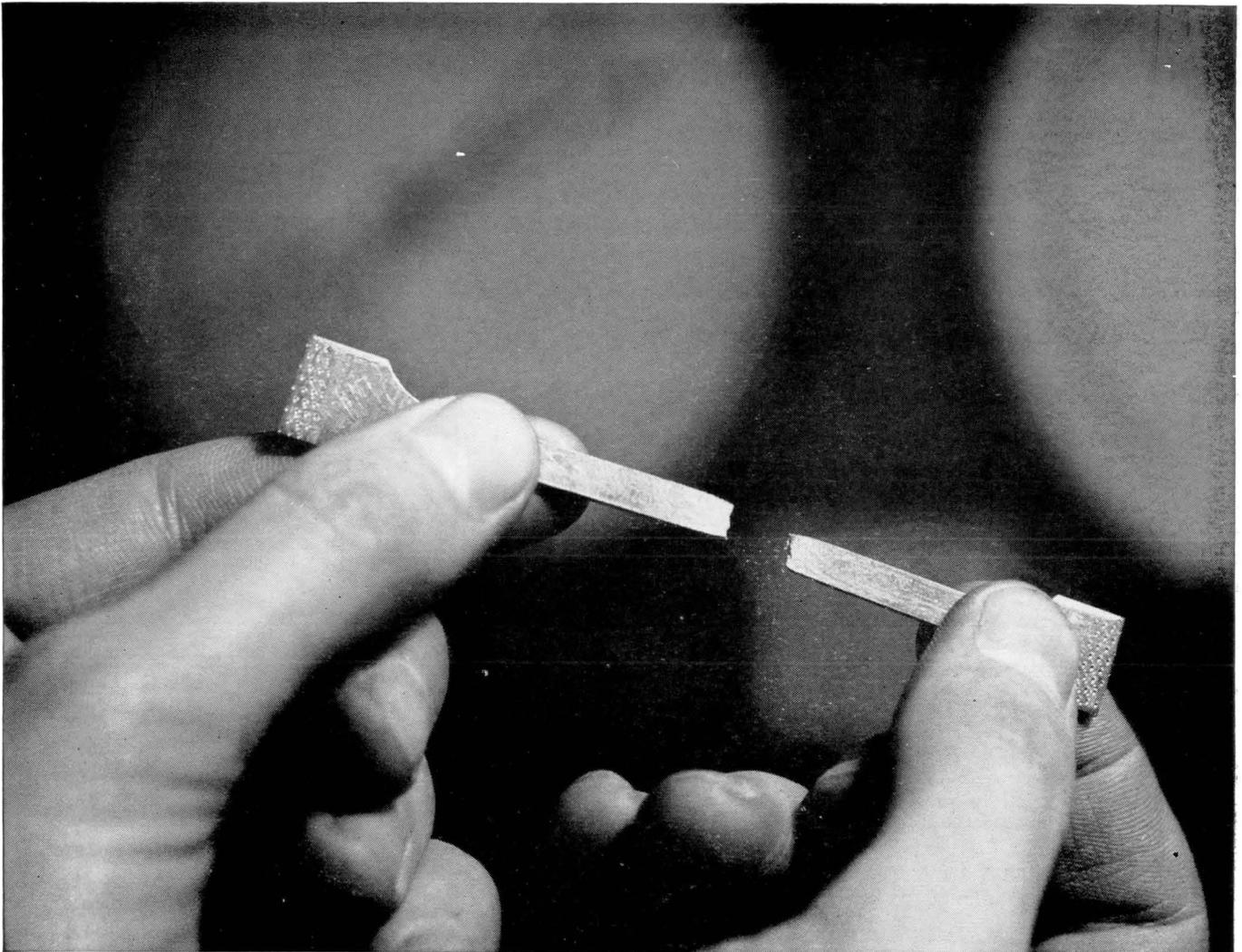


This is an automatic data input system used with a Kelsh Photogrammetric plotter. It speeds up the recording of horizontal and vertical measurement readings needed by highway engineers. This equipment was developed in a research program for the Ohio State Department of Highways, Columbus, Ohio, by Battelle Memorial Institute. The photogrammetric plotter, a standard highway engineering tool, is used to make many measurements from aerial photographs that formerly had to be made in the field by survey crews. The data recording device (left), when used with the plotter, makes it possible to automatically record measurements on punch cards in the IBM punch card unit (right). The cards are immediately available for computation of quantities of cut and fill earth work. (Figure 24)



This is the input keyboard of the Type 610 Auto-Point Computer made by International Business Machines Corp. It enables a mathematician to solve a problem manually, and at the same time prepare a program tape so that all similar problems can be rerun automatically. Data can also be entered via this keyboard into tape for future use. (Figure 25)

[Please turn to page 28]



*Elongation test of sample heelpiece metal typifies quality control measures that leave nothing to chance at Automatic Electric.*

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## a distortion-proof heelpiece

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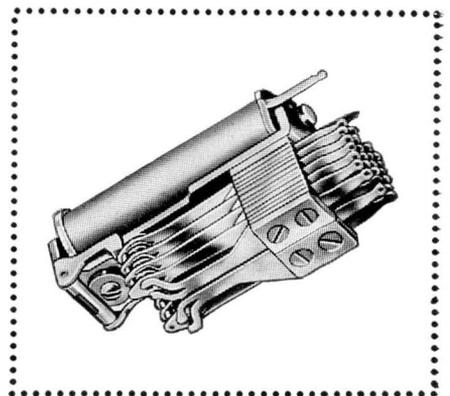
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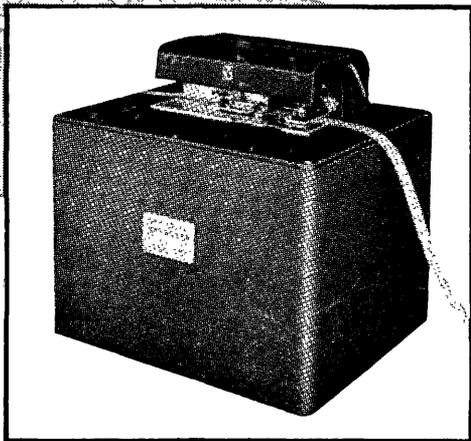
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# FERRANTI

## HIGH SPEED TAPE READER

... handles punched tape data  
at electronic speeds



The Ferranti High Speed Tape Reader accelerates to full speed within 5 milliseconds and stops within 3 milliseconds. It has been in use at leading computer installations for over two years and has achieved a sound reputation for simplicity and reliability in regular operation.

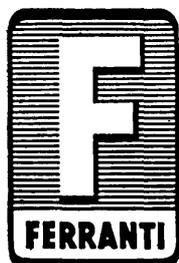
**FAST** (1) Mark II model reads at speeds up to 200 characters per second, and stops the tape from full speed within a character position — within .03 inch. The tape is accelerated to full speed again in 5 milliseconds and the following character is ready for reading within 6 milliseconds of rest position.

(2) Mark IIA model reads at speeds up to 400 characters per second, and stops within .1 inch.

**VERSATILE** Both models read either 5 level, 6 level or 7 level tape by simple adjustment of an external lever.

**SIMPLE** The tape is easily inserted without complicated threading. Lap or butt splices are taken without any difficulty. The same tape may be passed thousands of times without appreciable tape wear. The optical system has no lenses or mirrors to get out of alignment. Friction drive is independent of sprocket hole spacing.

**LARGE OUTPUT** Amplifiers are included for each channel, including a special squaring circuit for the sprocket hole signal. Output swing between hole and blank is greater than 20 volts.



Dimensions: 9" x 11½" x 11¼" Weight: 37 lbs.

For use with long lengths of tape up to 1000 feet, spooling equipment operating up to 40 inches per second for take-up or supply is available separately.

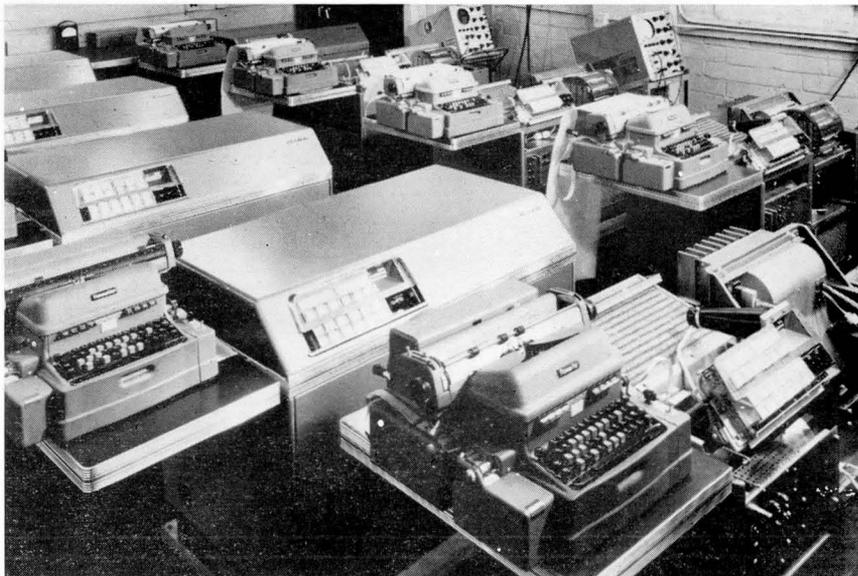
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30 Rockefeller Plaza New York 20, N. Y.

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- Booth, Andrew D., "Use of a Computer For Certain Operations of Classification," 6/4 (Apr.), 18
- Boundary value problems, "The Solution of Boundary Value Problems on a Reac Analog Computer," by M. Yanowitch, 6/2 (Feb.), 26



Above is a view of the assembling of a small-size yet powerful automatic electronic digital computer, the Royal Precision LGP-30, at the plant of Librascope, Glendale, Calif., subsidiary of General Precision Equipment Corp., who have joined with Royal McBee Corp., Port Chester, N.Y., to market the LGP-30.

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sures Resulting From a Break in High Pressure-High Temperature Water Lines," "Simulation of Temperature Transients Resulting From Compartment Ventilation Failure," "Brake Drum Temperature Distribution," Berkeley Ease analog. B. L. Jones, Senior Design Supervisor, Atomic Power Research Department, Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia.

"Pipe Stress Analysis," "Spectroscopy Analysis," "Gyro Sea Test Results," "Transistor Reliability Study," Univac 1, Capt. A. L. Rosenstein, Industrial Engineering Officer, New York Naval Shipyard, Naval Base, Brooklyn 1, New York.

"N. A. Hydrostatic Curves," "Section Modulus Tables," and "Weight and Moment Summaries," IBM 650, Warren C. Galle, Section Head, Engineering Computation Section, Portsmouth Naval Shipyard, Portsmouth, New Hampshire.

"Tank Capacities," IBM 604, Joe D. Smith, Assistant Engineer, Avondale Marine Ways, Inc., P.O. Box 1030, New Orleans, Louisiana.

"Wave Spectrum of 125 M.P.H. Winds," "Wave Forces of 125 M.P.H. Winds on Drilling Structures," "Force Analysis of Space Structures With 15 Redundant Elements," "Determining of Section Moduli of Plate and Angle Combinations," and "Development of S/A of Plate and Angle Combinations," IBM 604, M. J. Wood, Engineer, Design Department or J. R. Fahey, Manager, Machine Department, Higgins, Inc., P.O. Box 8001, New Orleans, Louisiana.

The above does not include all of the shipyards which are using high speed automatic computers. A few of the users did not answer the questionnaire while some who listed problems they are solving did not indicate that they will release information about them.

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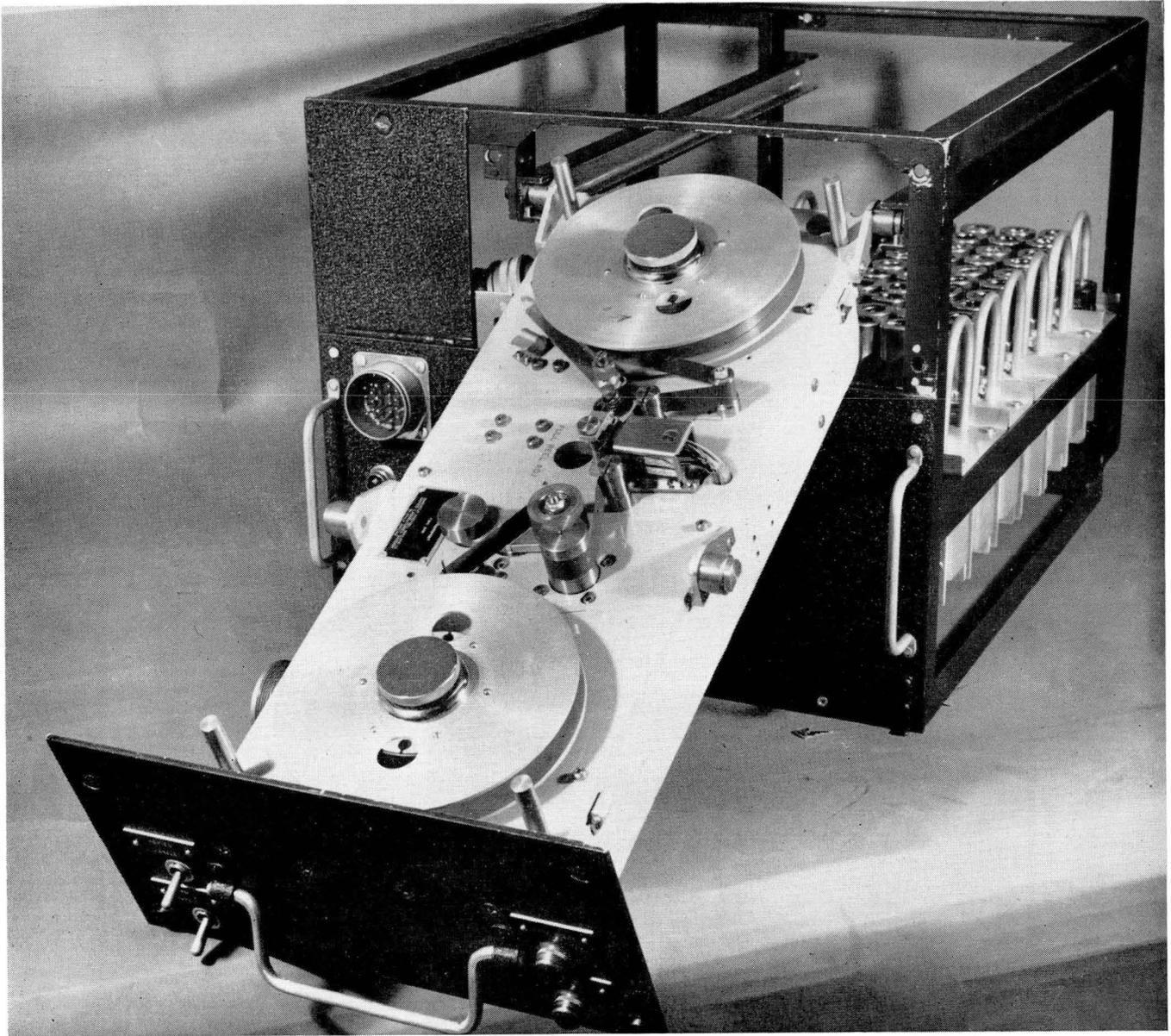
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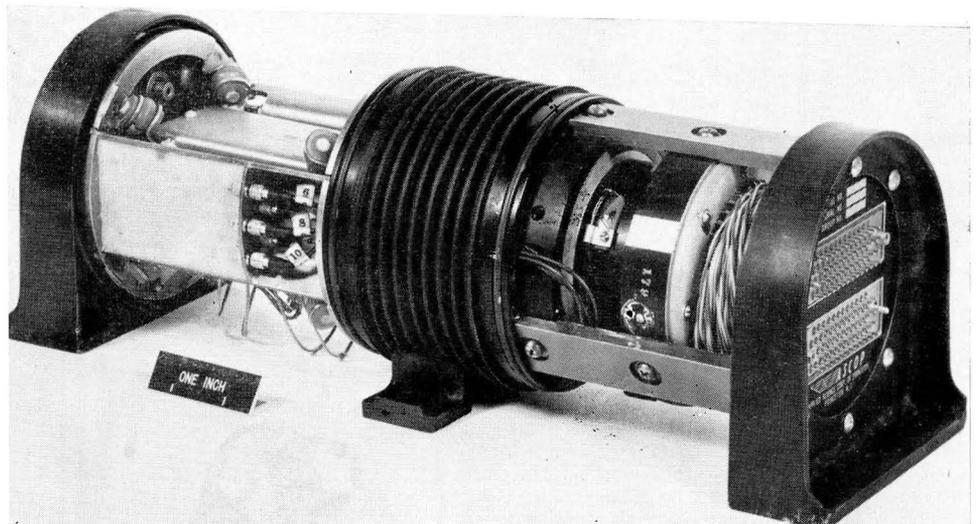
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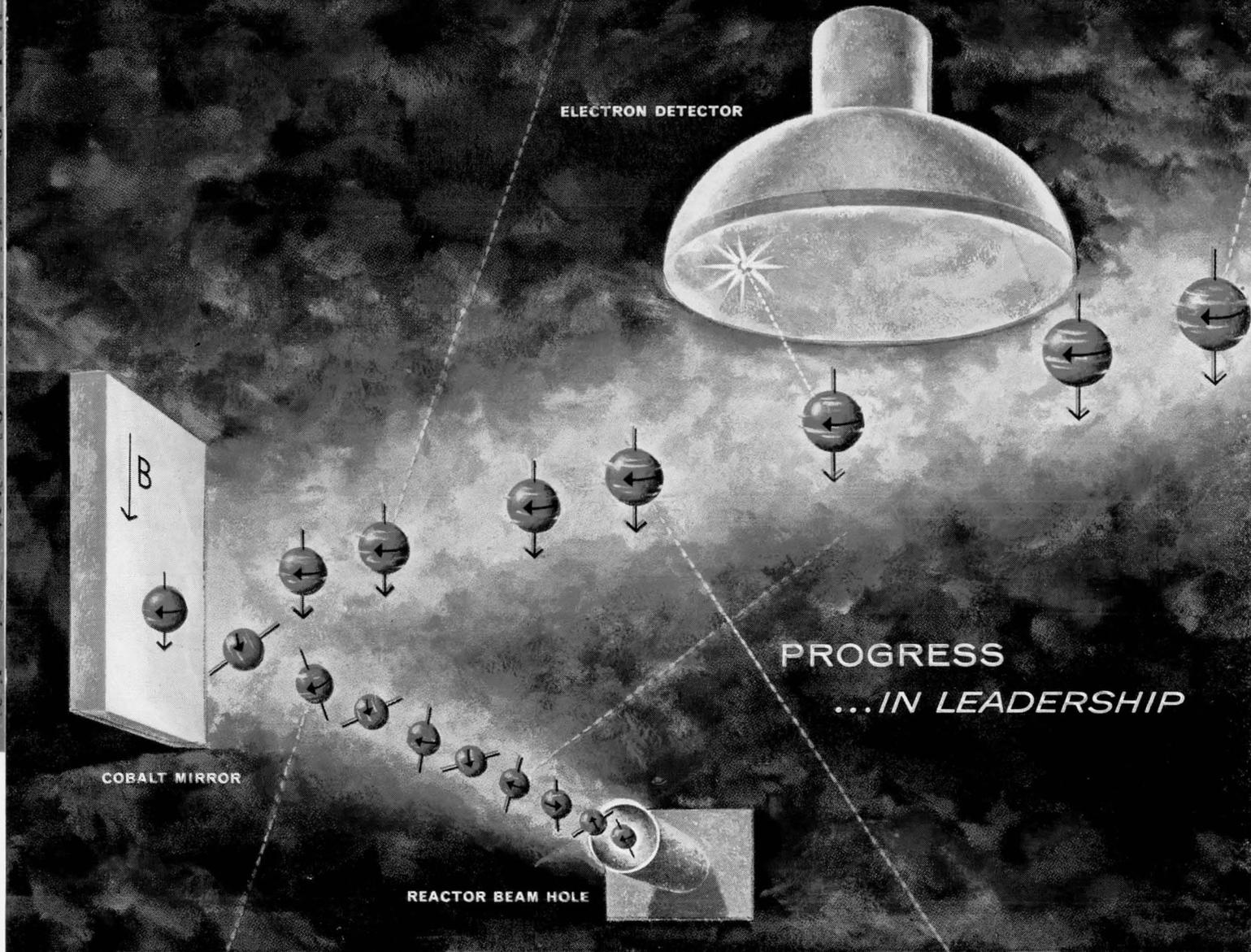


This is an airborne digital input recorder made by General Precision Laboratories, Pleasantville, N.Y. It will record on one-half inch wide magnetic tape a great quantity of data accurately. The digital form of the recorded data is compatible with International Business Machines Corp. computers Type 650, 704, or 705. In a typical application, the data from ten hours of recording of information in an airplane can be inserted into a computer in six minutes. (Figure 26)

(At right)

This device installed in an aircraft or missile takes in data from very sensitive gauges that report pressure, or strain, or temperature, and other kinds of transducers giving electrical signals in the range from zero to 15 or 30 millivolts. It is called the Low-Level Multi-coder and is made by Applied Science Corporation of Princeton, N.J. (Figure 27)





**measuring  
the free decay  
of polarized  
neutrons**

*Argonne*  
NATIONAL LABORATORY  
Operated by the University of Chicago under a  
contract with the United States Atomic Energy Commission

**inquiries invited**

A fundamental test of the various theories of beta decay which have been inspired by recent parity experiments is obtained from the quantitative measurement of the spatial asymmetry of the beta particles emitted in the decay of free polarized neutrons.

For these measurements, neutrons with identical spin directions were selected from a neutron beam from Argonne's CP-5 research reactor by reflection from a magnetized cobalt mirror. This technique for obtaining polarized neutrons was conceived and developed by Argonne scientists.

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Mechanical Engineers*

## 6. What does Output from a Computer Look Like?



A digital printer, made by Radiation Inc., Melbourne, Fla., which produces 180 lines of printing per second, each line containing 12 numeric characters. The paper issuing from the machine is electrosensitive, marked by current passing through it. Each numeric digit consists of a selection out of an array of 30 points, 5 wide by 6 high. The speed of over 2000 characters per second is only about 500 times faster than a human being. (Figure 28)

MATHEMATICIANS 1 TO 5 YEARS' EXPERIENCE  
INTERESTED IN

**HOW MATHEMATICAL  
ANALYSIS  
CUTS LEAD TIME  
IN AIRBORNE  
REACTOR DEVELOPMENT  
AT GENERAL ELECTRIC**

$$\text{div } \vec{F}(\vec{r}, \vec{n}) + \Sigma(\vec{r}, \vec{n}) F(\vec{r}, \vec{n}) = \int_{\vec{r}'} N(\vec{r}, \vec{r}') \sigma(\vec{r}, \vec{r}') F(\vec{r}', \vec{n}') d\vec{r}' + S(\vec{r}, \vec{n})$$

Mathematical methods are some of the strongest supports for General Electric's Aircraft Nuclear Propulsion Program. Management estimates that the mathematician's insight can cut the time required to bring a power plant from preliminary design to product stage as much as two years!

As this program to create nuclear power systems for aircraft progresses, problems become more complex, and the time element more pressing. The result is greater reliance on numerical analysis. This has opened positions for mathematicians in assignments involving:

- Thermodynamics ● Air Cycle Analysis
- Shield Physics ● Reactor Analysis
- Nuclear Instrumentation ● Numerical Analysis
- General Mathematical Analysis ● Metallurgy
- Theoretical Physics

**Is Nuclear Experience Necessary?**

No — not for a majority of current openings at General Electric's Aircraft Nuclear Propulsion Dept. In-plant seminars and a Master's Degree Program, on full tuition refund basis, provide essential nuclear theory and technology. A FEW POSITIONS REQUIRE A SPECIALIST'S KNOWLEDGE OF NUCLEONICS.

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Cincinnati, Ohio, known as an engineering center and a fine place to live. Excellent housing available. Fine schools. A few positions in Idaho Falls, Idaho.

PUBLICATION OF TECHNICAL PAPERS IS ENCOURAGED

Please write in confidence to Mr. J. R. Rosselot. You will receive a prompt reply and a copy of "Aircraft Nuclear Propulsion" by Dr. M. C. Leverett, Manager ANP Development Laboratory.

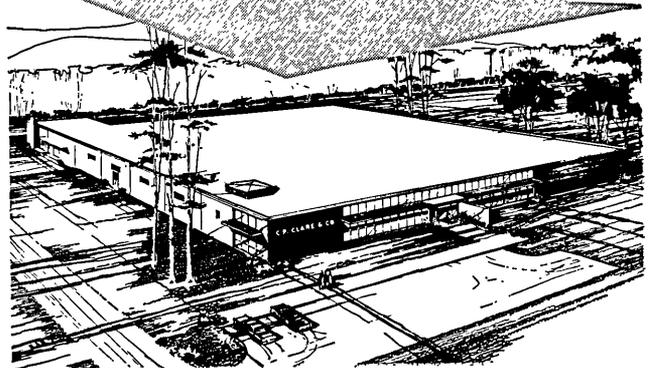
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P.O. Box 132, Cincinnati 15, Ohio

COMPUTERS and AUTOMATION for December, 1957

**Another NEW  
CLARE PLANT  
to give you relays  
of unequalled  
quality**



New C. P. Clare & Co. plant at Fairview, N. C. will expand manufacturing facilities which have been under way in Fairview for two years.

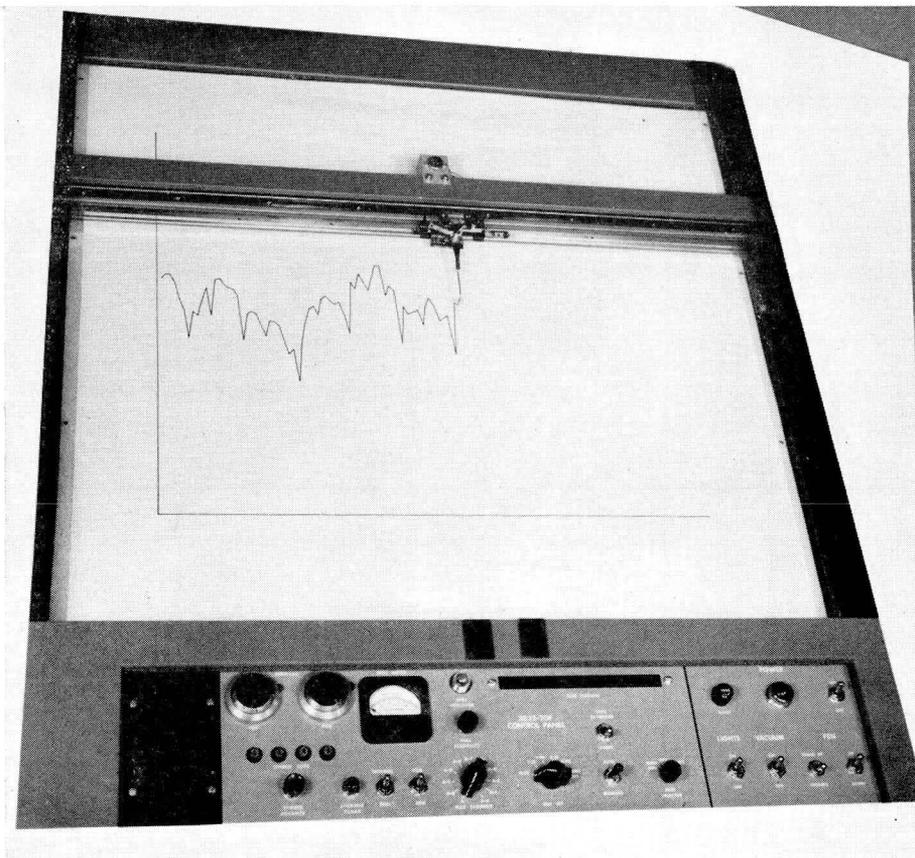
● Before midyear 1958 CLARE will be serving customers from a new factory at Fairview, N. C. — a facility that will match the manufacturing advantages of our Chicago plant, itself only five years old.

This CLARE expansion is made necessary by the tremendous growth of the electronics industry and the increasing demand for precise components, including relays whose life can be measured in billions of operations.

Facilities of virtually clinical cleanliness are required for this kind of precision. That's why CLARE plants in both Chicago and Fairview maintain complete control of the temperature, humidity and cleanliness of the air . . . immaculate walls and floors . . . powerful, yet shadowless lights, for assembly of small parts.

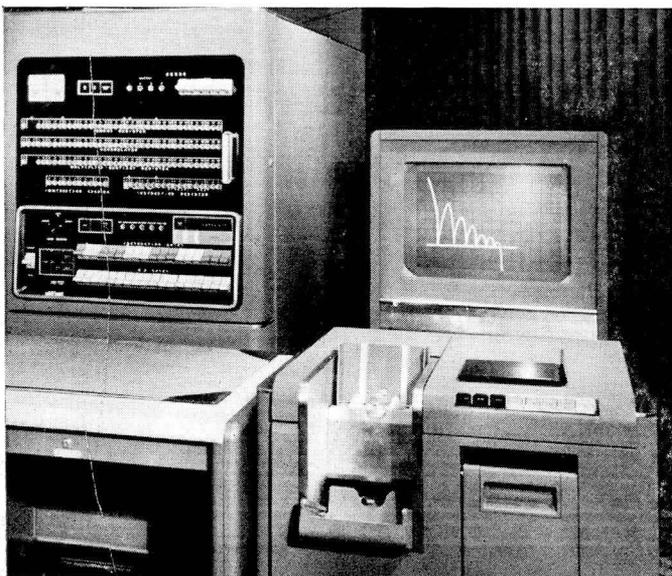
If yours is a product whose long life, reliable performance and freedom from maintenance depends on relays, it will pay you to know ALL about CLARE relays. C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: C. P. Clare Canada Ltd., 2700 Jane Street, Toronto 15, Ontario. Cable Address: CLARELAY.

**CLARE RELAYS**  
FIRST in the industrial field



An electronically controlled maker of graphs, called the Dataplotter, made by Electronic Associates, Long Branch, N.J. It makes possible fast, automatic graphing of the information that can pour out of an electronic business computer. It will pick up the location of a point from a punched card, or punched paper tape, or magnetic tape; store the information in a memory device; pick up the location of a second point from a second source; refer to its memory for the location of the first point; and draw a continuous line between the two points. It requires 1 and  $\frac{2}{3}$  seconds for this process; and then will repeat the process over and over again. For example, this machine will make a cross sectional graph of a mile of highway in 20 minutes.

(Figure 29)



The visual display of the International Business Machines' Type 740 Output Recorder. Here, pictured on the face of a 21-inch cathode ray tube, are curves automatically traced showing the theoretical path of a bouncing ball as calculated by a big computer. (Figure 30)



A machine which types a purchase order or other basic record, and at the same time punches paper tape or cards — a combined input-output machine. This is the Flexowriter, made by Friden Calculating Machine Co., San Leandro, Calif. (Figure 31)

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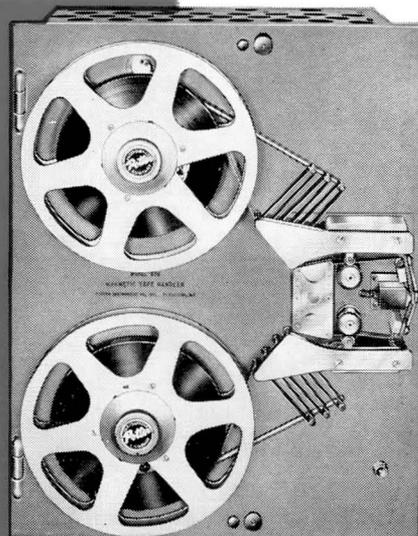
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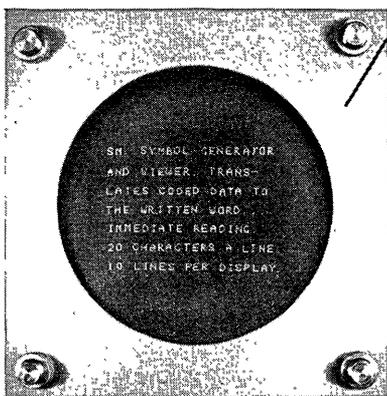
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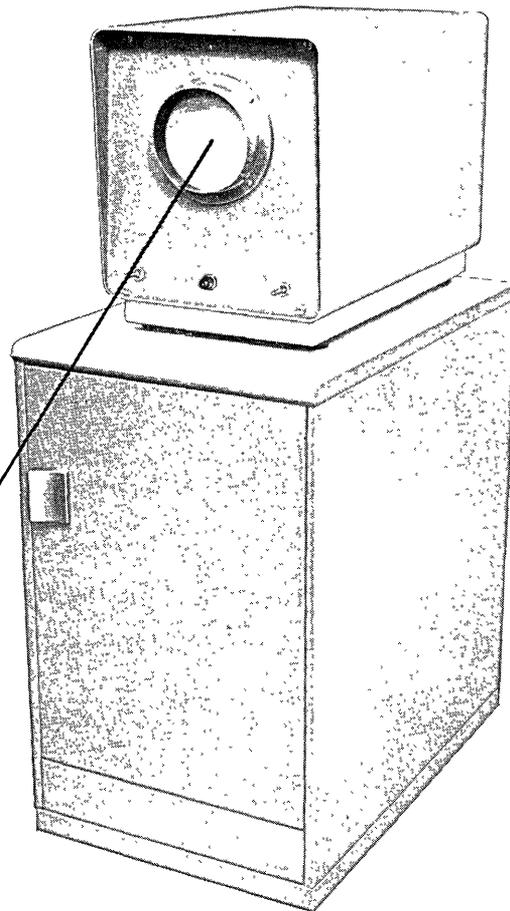
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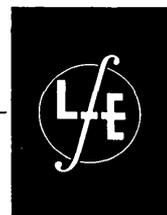
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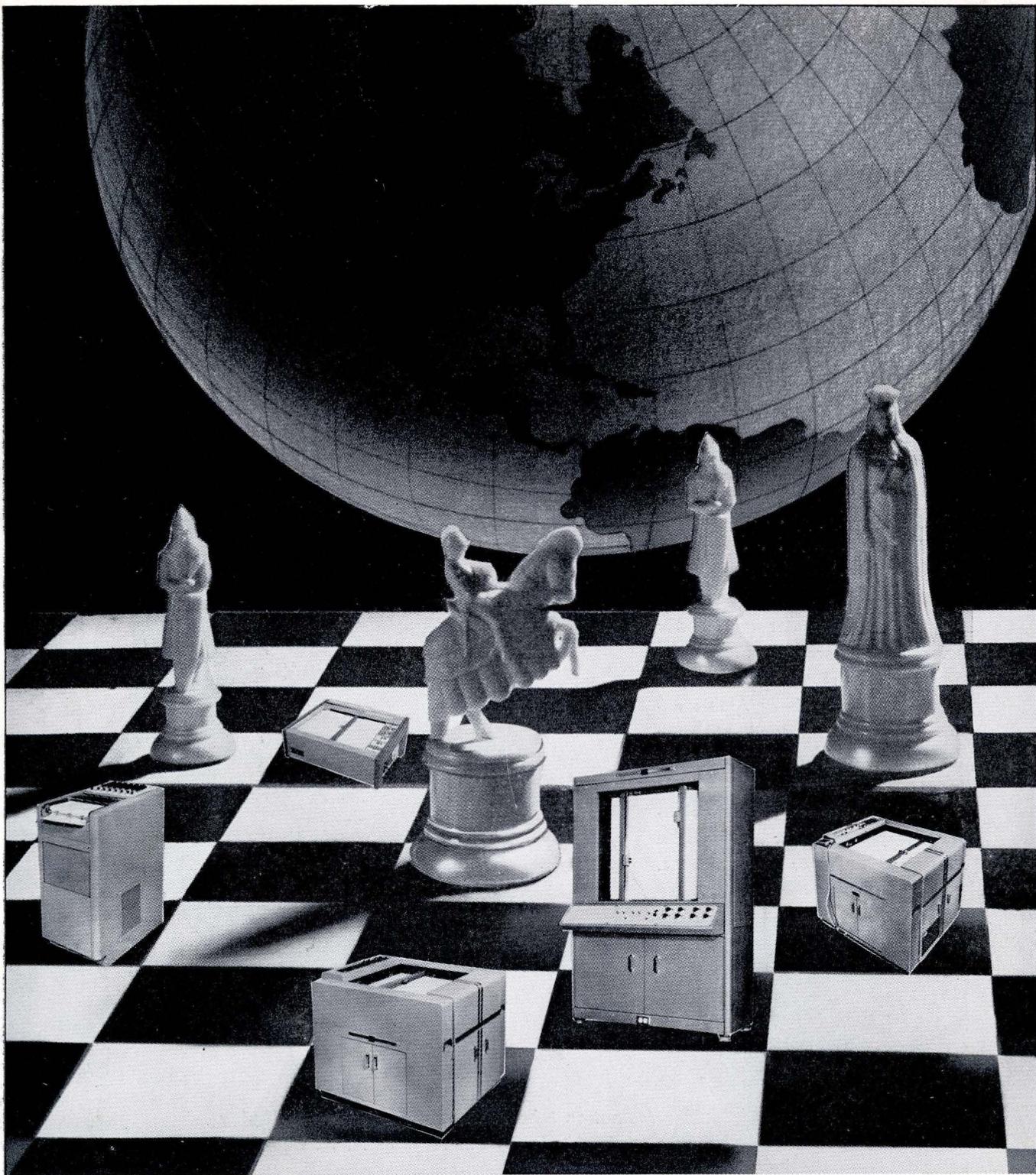
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