

MAY 10, 1957

# electronics

## business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 5A • PRICE FIFTY CENTS



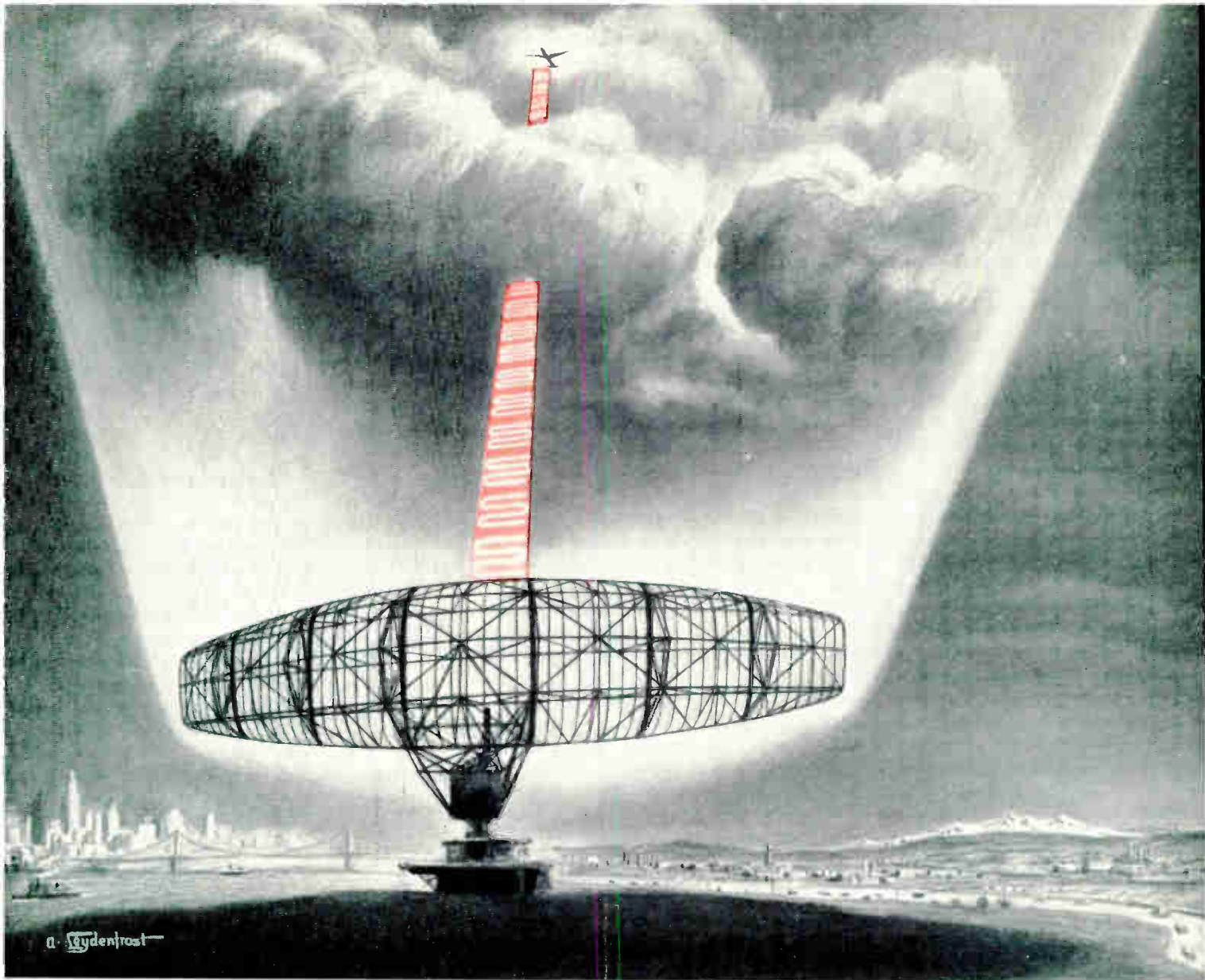
## Missile Program Races Deadline

Test-ranges pinpoint design bugs..p13



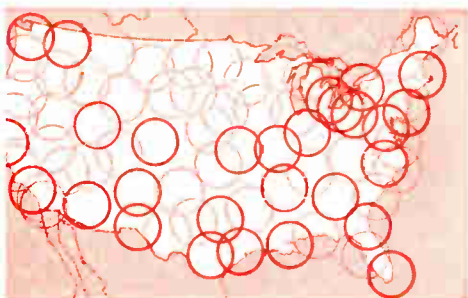
## Electronic Lighting Now?

Panels bid for consumer dollars..p20



## C.A.A. buys 23 new Raytheon "Flight-Tracker" Radars

*Long-range equipment to speed schedules, reduce "stacking" and air lane congestion; assure positive air traffic controls—create "more sky to fly in"*



Raytheon radar at 23 of the 28 heavily circled areas will be an integral part of C.A.A. control network. Light circles indicate future coverage.

The Civil Aeronautics Administration has just taken a giant step to solve aviation's biggest problem: air traffic control.

New Raytheon radars with huge 40-foot antennas will be a key part of a complex nationwide air surveillance system that follows and helps safeguard all aircraft during every stage of flight. Radar scopes that display air lane maps pinpoint plane positions at distances up to 200 miles, altitudes to 70,000 feet.

These "Flight-Tracker" radars detect and track aircraft in all kinds of weather—even see through storms. A unique indicator tells the operator when the unit needs servicing.

By making possible precise new air traffic patterns, by speeding arrivals and departures, Raytheon radar readies the air lanes for the Jet Age. Here is another instance where Raytheon's "Excellence in Electronics" clears a roadblock from America's path to air progress.

**RAYTHEON MANUFACTURING COMPANY**

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*Excellence  
in Electronics*

# electronics business edition

A McGRAW-HILL PUBLICATION • VOL. 30, NO. 5A • MAY 10, 1957

## NEWS AT A GLANCE

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**Is This Facsimile's Year?** Industry gets big push as Bell System enters commercial facsimile service field. One company sees \$3-5 million in 1957; \$75-100 million in ten years. . . . . p 15

**Production Geared to Sales.** Growing firms find simple production control, factory organization schemes help build customer good will, give executives time for long-range planning. . . . . p 17

**Marine Sales Show Upturn.** Spurt in merchant shipbuilding, especially tankers, brings biggest boom in marine electronics since war. One hundred ships on ways now will take \$7 million worth of electronics. Replacement shipping and coastal craft will sustain demand. . . . . p 19

**Homes Wired for Sound.** Home builders see built-in intercom unit as integral part of tomorrow's home. Sales were \$3-4 million in 1956. Could run \$8-10 million in 1957. . . . . p 22

**Mobiles Near \$50 Million.** Sales of vehicular two-way radio equipment hit \$46 million in 1956. Sales may reach \$50 million in 1957. Big increases are underway in Public Safety, Citizens Radio, and Special Industrial categories . . . . . p 24

**Automatic Testing Pays.** Trend in factory test equipment is to special-purpose automatic units. One firm reports five-to-one saving in test time, 90-percent saving in labor cost. Additional advantage is that semiskilled workers can perform complex testing operations. . . . . p 27

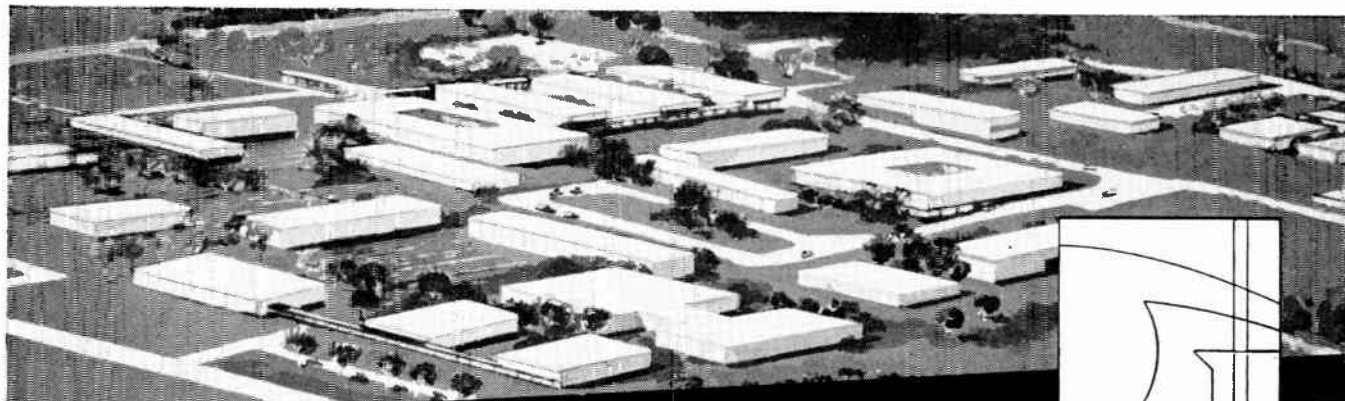
**\$2.4 Billion Defense R&D in '56.** Department of Defense spending increases 250 percent since 1954. Top recipients of R&D contracts are heavy developers of electronic equipment. Chart shows contract award pattern for three-year period. . . . . p 30

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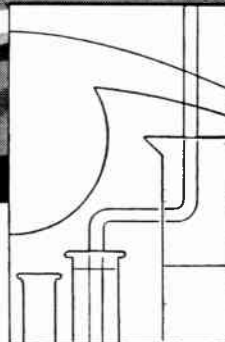
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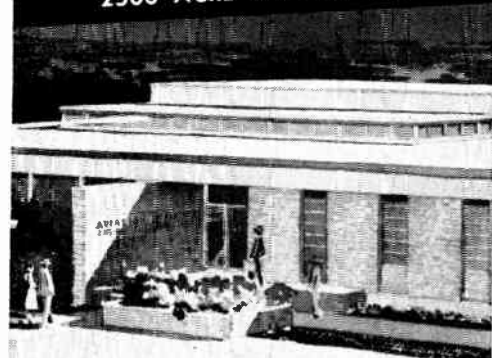
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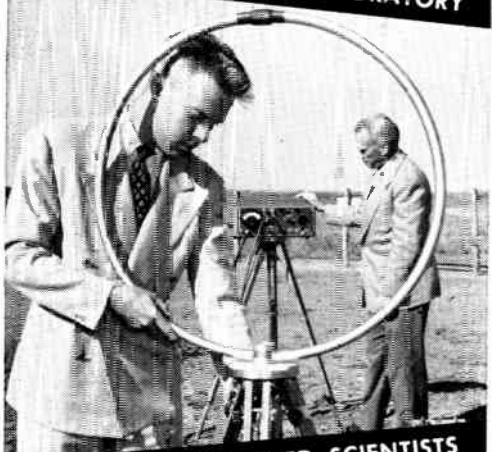
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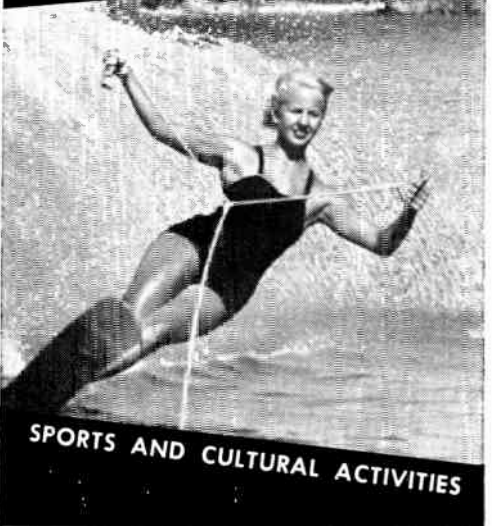
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Average Total Power Dissipation (with 36 sq. in. heat sink @ 25°C)	15	15	15	15	15	15	Watts
Power Gain	28 <sup>a</sup>	23 <sup>a</sup>	30 <sup>a</sup>	23 <sup>a</sup>	27 <sup>b</sup>	20 <sup>b</sup>	db
Frequency Cutoff	6	4	7	4	6	4	kc/s

<sup>a</sup>  $V_{cc} = -14V$ ;  $I_c = 500$  ma;  $R_L = 30 \Omega$  (choke coupled);  $R_g = 10 \Omega$

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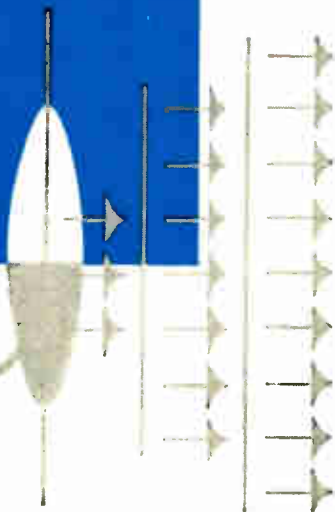
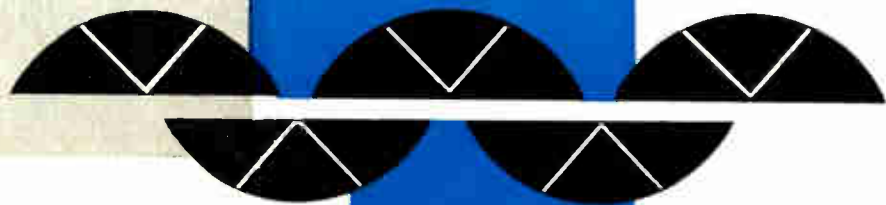
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# Computers Speed Trading

Increased activity is spur  
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ELECTRONICS figures in New York Stock Exchange program to raise \$60 billion. This figure is estimate of new equity capital needed by American corporations in next decade.

Favorable climate for stock investment is needed to do the money-raising job, says exchange president G. Keith Funston in the NYSE annual report.

The exchange is trying to create this climate by improving service to the securities industry and by keeping costs low through adopting modern facilities.

For the past year Ebasco Services has been studying applications of electronic computers and similar equipment to operations of the big exchange.

As a result, a number of computer applications are being considered. However, the study will continue another year before conclusions are reached.

Better, lower-cost service through electronics is part of overall capital-raising program recently outlined by Funston.

American Stock Exchange president, Edward T. McCormick recently disclosed that the ASE is also considering a completely electronic quotation system.

"We hope to be able to furnish instantly for every security the opening, high, low and last prices and

the current bid and offer, as well as accumulated volume for each stock to that moment," said McCormick.

Several teams of experts are studying feasibility and costs of the ASE system. One system under study would enable sixty persons to receive the information simultaneously within one second of asking.

## Defense SSB Lags

SINGLE-SIDEBAND communications equipment gets a teardrop worth of defense spending.

Ssb manufacturers who foresaw the Army, Air Force and Navy loading up on their equipment consider present spending with sober reflection.

In 1955 the Army spent \$992,000 on all types of ssb equipment. This figure edged upward in 1956 to \$1,156,000. The total that the Army expects to lay out in 1957 dips to \$980,000.

Air Force officials got excited about ssb in 1955 to the tune of \$4.9 million. In 1956 the sum was reduced to a round empty zero. The Air Force expects to purchase around \$2 million in 1957. And another \$2 million in 1958.

The Navy has its spending for ssb under classified wraps. Its one admission: Bureau of Ships paid \$500,000 for ssb research and development from 1950 to 1956.

## SHARES and PRICES

MARKET for digital computers is one of the fastest growing in the electronics industry. Sales of \$200 million are generally forecast for 1957; twice the amount sold in

1956. Nine years ago annual sales added up to a mere \$4 million.

High level sales should continue for many years. Estimates of potential market for digital computers

range from \$2.5 to \$5 billion.

Potential will be largely satisfied within 10 years. But, a healthy annual replacement market of \$400-\$500 million is expected to remain.

Typical Digital Computer Manufacturers	Recent Price	1956 Dividends	Percent Yield	Earned per Share		Traded	1956 Price Range
				1956	1955		
Bendix Aviation	58 $\frac{7}{8}$	2.40 <sup>2</sup>	4.1	5.04 <sup>1</sup>	5.66	NYSE	48 $\frac{1}{2}$ -64 $\frac{3}{8}$
Burroughs	39 $\frac{3}{4}$	1.00	2.5	2.35	1.97	NYSE	28 $\frac{1}{2}$ -46 $\frac{7}{8}$
General Precision	38 $\frac{3}{4}$	2.40	6.2	1.82	2.05	NYSE	34 $\frac{1}{2}$ -53 $\frac{1}{2}$
IBM	519	1	1	13.10	13.63	NYSE	400-550
Litton Industries	38 $\frac{1}{8}$	....	....	0.97 <sup>3</sup>	0.44	ASE	23 -32 $\frac{1}{4}$
Marchant Calculators	32 $\frac{1}{8}$	1.30 <sup>2</sup>	4.0	3.27	2.75	PCE	.....
Minneapolis-Honeywell	87	1.75	2.0	3.40	2.98	NYSE	58 -90 $\frac{1}{2}$
National Cash Register	54 $\frac{1}{2}$	1.10 <sup>2</sup>	2.0	2.62	2.33	NYSE	34 $\frac{1}{8}$ -59
Raytheon	17 $\frac{1}{8}$	....	....	0.23	0.45	NYSE	13 -19 $\frac{1}{2}$
Royal McBee	35 $\frac{1}{8}$	1.40	4.0	3.47 <sup>3</sup>	2.45	NYSE	27 $\frac{1}{2}$ -36 $\frac{1}{8}$
Sperry Rand	20 $\frac{1}{4}$	0.80	3.8	1.80 <sup>3</sup>	4	NYSE	21 $\frac{3}{4}$ -29 $\frac{1}{8}$
Underwood	28 $\frac{1}{4}$	1.10	3.9	d-10.91	2.01	NYSE	20 $\frac{7}{8}$ -44

<sup>1</sup> stock split in 1956

<sup>2</sup> plus stock

<sup>3</sup> fiscal year

<sup>4</sup> merged in 1955

# Urge New Merger Bill

ADVANCE notice of mergers should not be required of medium and small-sized companies. That is the opinion of Arthur A. Burek, merger and financial consultant. His views about the pending merger bill were placed in House Judiciary Committee hearing records.

Merger-acquisition bill H.R. 2143 calls for 60 days advance notice where combined net worth exceeds \$10 million and purchase value exceeds \$2 million. Notice would be given to Justice Department and Federal Trade Commission, which could sue to block merger.

Burek recommends advance notice be required only where combination involves \$30 million net worth or purchase price above \$7 million.

Proposed bill will impede growth of medium-size

companies in \$6 to \$25 million net worth category, says Burek. It will also harm owners of companies in \$2 to \$7 million range who want to sell.

The 60-day waiting period is likely to hurt seller's business, Burek explains. Word of merger will invariably leak out. Knowledge will help competitors. Key employees may leave. Finances may be affected.

Merger intermediaries will avoid like the plague any acquirer who has to wait 60 days, he adds. A substantial part of small to medium-size mergers start through investment bankers, brokers, finders. These intermediaries are paid only if deal is completed and often waste time if they get tied up with a slow deal.

Advance notification requirements will work less harm on large corporations, says Burek. Because of their economic strength, they will be able to make acquisitions whether or not a 60-day wait is required.

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## MERGERS, ACQUISITIONS and FINANCE

• **Cohn Electronics** is formed to provide financial and business management for electronic firms. One of its first objectives will be to purchase other electronic companies. La Motte T. Cohn, president of **Kay Lab** of San Diego, Calif., will be president and board chairman of new firm.

• **Universal Products**, Wilmington, Del., acquires **C. P. Clare Co.** of Chicago. Clare's outstanding 299 common shares are exchanged for 161,605 shares of Universal common with \$4 million market value. Carl P. Clare, president of purchased company will head subsidiary.

• **A. V. Roe Canada Ltd.** purchases Canadian instrument manufacturer, **PSC Applied Research**, from Hunting group of Canadian aviation companies. PSC is best known for its R-Theta computers, produced for the RCA's.

• **SEC** business-capital expenditures survey shows manufacturers plan 15 percent less outside financing in 1957 than in 1956. Survey also shows anticipated plant and equipment expenditures for 1957 are 10 percent above 1956. Manufacturers intend to issue \$2.4

billion of new bonds, \$1.0 billion of new stock and to borrow \$900 million from commercial banks. Equity financing is expected to increase \$300 million over last year and debt financing to decrease about \$1 billion.

• **Electro Engineering Works**, San Leandro, Calif., plans to issue \$50,000 of 5 percent preferred stock with convertible features to employees. Stock issue will end Electro's closed-company status.

• **Midwestern Instruments**, Tulsa, Okla., registers 200,000 shares of common stock with SEC. Proceeds will be used for plant additions and working capital. C. E. Unterberg, Towbin & Co. will underwrite issue.

• **Bendix Aviation** registers 288,264 shares of \$5 par common stock with SEC. Stock will be offered to officers and key personnel under company's stock option plan.

• **Rockwell Manufacturing** acquires assets of **Republic Flow Meters** of Chicago. Present management remains unchanged. Republic manufactures electronic and pneumatic instruments and process control equipment for automatic

measurement and flow control for electrical, petroleum, natural gas, steel and chemical industries.

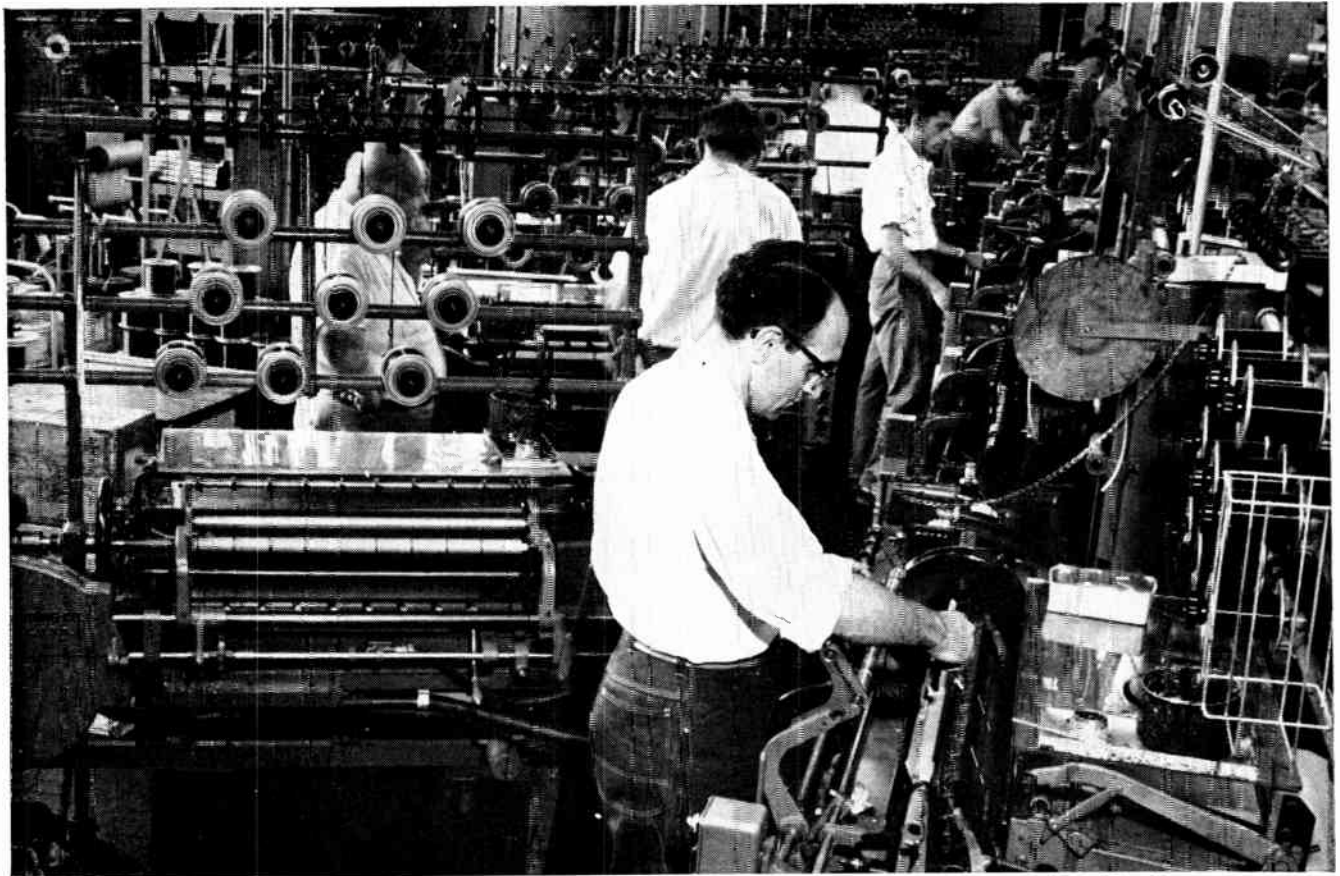
• **Fischer & Porter**, Hatboro, Pa., offers \$3.2 million of twenty-year, 54 percent convertible, sinking-fund debentures. Part of proceeds will be used to pay off \$1.6 million of outstanding loans.

• **Applied Physics** of Pasadena, Calif., is planning to issue 32,000 shares of \$1 par common at \$9.25 per share through Schwabacher & Co., San Francisco. Proceeds will be used to retire notes payable and for working capital.

• **General Precision Equipment** notes in its annual report that it is considering raising additional capital through equity capital and possibly term debt. No definite plan has been established.

• **Consolidated Electronics Industries'** stockholders approve agreement to loan **Sessions Clock** of Forestville, Conn., up to \$1 million. Agreement also provides management assistance to Sessions. Con Electron subsidiary **Forestville Industries** is granted an option to buy Sessions assets, except land and buildings.





Installation of Leeson No. 107 Coil Winders at Ford Motor Company's Ypsilanti, Michigan, plant. New Paper Miss Detector enables operator to tend two machines.

## Now FORD Motor Co. winds ignition coils on Leeson No. 107 winders

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Humidity changes can cause the

paper to curl and miss an insert. Ordinarily, if there's a paper miss, and the machine is unattended, it continues to wind. Result . . . a worthless stick plus money wasted in wire and time. So an operator must be in constant attendance on each machine.

The new Leeson Paper Miss Detector cures this . . . by automatically stopping the machine. Thus, constant machine attendance is unnecessary.

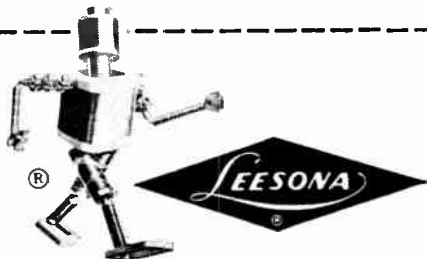
• One operator can handle two or

three machines.

- Operator's coil production increases.
- Rejection rate is reduced . . . when the machine stops at a paper miss the operator re-inserts the paper, starts the machine which continues to wind an excellent stick of coils.

For the full story on Leeson No. 107 Coil Winders, and other helpful information write or get in touch with Universal.

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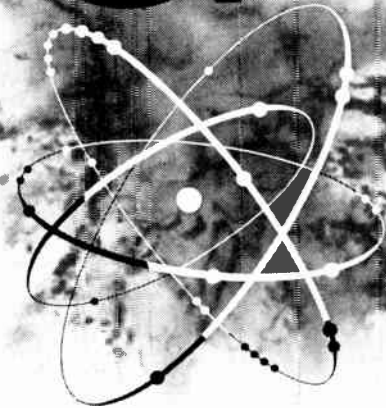
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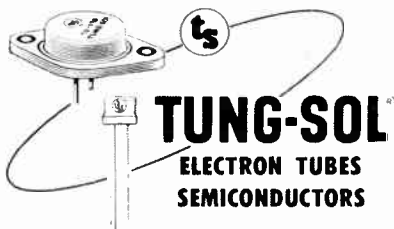
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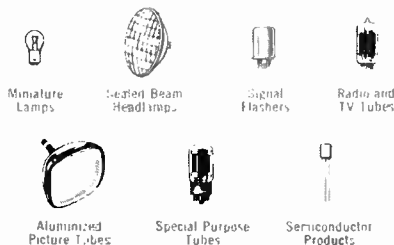


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# WASHINGTON report

FRANK NEWBURY's resignation as Assistant Secretary of Defense for Research & Engineering points up a long-simmering Pentagon squabble over policy. Dispute centered around Newbury's approach to R&D—an approach critics called ultraconservative. It was an approach reflected in Defense Dept. decisions.

Newbury's departure may herald policy changes to meet some of the criticism leveled at him. At press time, there was still no hint as to who his successor will be. And until then it is tough to spell out details on what changes to expect.

But Newbury's critics take issue with his plans to:

- Standardize weapon development to prevent duplicating projects among the services and to hold back quantity production of a new item until all possible improvements could be introduced.
- Prevent military sponsorship of basic research unless the project was clearly related to a specific military end-item.
- Reorganize R&D administration—granting stronger authority to Newbury's central Defense Dept. coordinating office to allocate funds, direct expenditures, at the expense of the military contracting agencies.

Critics say Newbury's efforts to standardize development creates an environment which stifles growth of new ideas. Another sore spot has been Newbury's practice of dealing directly with R&D contractors—over the heads of the military services responsible for the projects.

Officials claim that Newbury was "disdainful" of advice from military experts and industry consultants. One event leading to Newbury's resignation was a stormy meeting April 4 between Newbury and the Pentagon's Defense Science Board.

- Inventors working in areas affecting national security—such as atomic energy and radar—are running into a solid wall in efforts to obtain aid from the federal courts in disputes with the government.

On April 23, a federal judge in New York dismissed an inventor's suit for compensation from the government for use of an invention by which "an object may escape observation by radar." The judge's ruling was based on government claims the invention was a military and naval secret and that no trial could be held—even in secret—without endangering national security.

The judge said the inventor can bring his suit again, after "potential enemies of the U. S. have the secret involved here, or when international conditions are more settled."

- Electronics producers show more prominently than ever in the Defense Dept.'s latest roster of leading military prime contractors. Each of the top 20 companies in value of contracts awarded during January 1955-June 1956 is either an electronics producer or an aircraft manufacturer involved in electronics work to some degree.

The top 10 firms, accounting for 36 percent of prime contracts let in this period, are: North American Aviation, \$1.37 billion; General Dynamics, \$1.3 billion; United Aircraft, \$1.2 billion; GE, \$1 billion; Boeing, \$1 billion; AT&T, \$747 million; Ford, \$696.9 million; Lockheed, \$657.5 million; Douglas, \$592.8 million, and McDonnell Aircraft, \$522.4 million.



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**specify Clifton Precision Size 8 Synchros**  
 for  
**HIGHEST ACCURACY**

SYNCHRO FUNCTION	CPPC TYPE	ROTOR AS PRIMARY					STATOR AS PRIMARY					D.C. RESISTANCE		IMPEDANCE						
		Input Voltage (400~)	Input Current (Amps.)	Input Power (Watts)	Output Voltage (Volts)	Sensitivity (MV/deg.)	Phase Shift (deg. lead)	Input Voltage (400~)	Input Current (Amps.)	Input Power (Watts)	Output Voltage (Volts)	Sensitivity (MV/deg.)	Phase Shift (deg. lead)	Rotor (Ohms)	Stator (Ohms)	Z <sub>ro</sub> (Ohms)	Z <sub>so</sub> (Ohms)	Z <sub>rs</sub> (Ohms)	Max. Null Voltage (MV)	Max. Error (Min.)
Torque Transmitter	CGC-8-A-7	26	.100	.5	11.8	206	8°	—	—	—	—	—	—	37	12	54 + j260	12 + j45	80 + j20	30	7
Control Transformer	CTC-8-A-1	—	—	—	—	—	—	11.8	.090	.23	23.5	410	8.5°	143	25	220 + j740	28 + j110	246 + j60	30	7
Control Transformer	CTC-8-A-4	—	—	—	—	—	—	11.8	.029	.08	22.5	390	8°	389	64	560 + j1860	90 + j340	640 + j190	30	7
Torque Receiver	CRC-8-A-1	26	.100	.5	11.8	206	8°	—	—	—	—	—	—	37	12	54 + j260	12 + j45	80 + j20	30	30
Electrical Resolver	CSC-8-A-1	26	.039	.43	10.6	185	20°	11.8	.084	.27	23.2	400	11°	230	27	280 + j600	38 + j136	70 + j136	30	7
Electrical Resolver	CSC-8-A-4	26	.039	.43	26	454	20°	26	.038	.30	27.5	480	13°	230	150	280 + j600	200 + j660	70 + j140	30	7
Control Differential	CDC-8-A-1	—	—	—	—	—	—	11.8	.085	.21	11.8	206	9°	36	25	38 + j122	27 + j120	48 + j14	30	7
Vector Resolver	CVC-8-A-1	26	.057	.34	11.8	206	10.2°	—	—	—	—	—	—	78	27	103 + j440	8 + j30	—	30	7

**Malco** IS YOUR  
**BEST SOURCE**  
 FOR  
**SOLDERING LUGS**  
**TERMINALS**  
**PRINTED CIRCUIT**  
**HARDWARE**



**HERE'S WHY:**

- Specialized high production techniques afford lowest possible unit cost.
- Precision tooling, rigid quality control assure tolerances to critical specifications.
- Ample stocks of over 1000 different parts permit prompt delivery.
- Malco specializes in a complete line of small stampings for Radio-TV, electrical/electronic and automotive industries.
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 4023 W. Lake St., Chicago 24, Ill.  
 Want more information? Use post card on last page.

## EXECS in the news



### "From madness, system . . ."

MANY-SIDED Gulton Industries is just now consolidating a toehold in the automation business, propelled by Austrian-born president Leslie Gulton and his wife Edith. "It would be nice," says Gulton, "to bring some system into the madness of industrial controls."

"He has ambition," smiles shy, brilliant Mrs. G., "and I have none." She was a freshman at Austria's Graz University when she met Gulton. "Why study?" he asked her. "One day you'll get married and cook." With her chemistry doctorate, her prize recipe today is ceramic stew for phono pickups.

Mrs. G. worked in the labs until the night before daughter Marian was born, still runs part of the business. Laughter plays a big part in their life. They enjoy themselves, deal informally with each other and their 500 employees. Says Gulton: "Mrs. G. has the personal touch. People adore her."

Their enterprise specializes in the grey zone between chemistry (her degree) and physics (his). Original German plant was sold out to a government-backed combine in 1933, and the Gultons left Germany a jump ahead of the Gestapo. Their French factory still operates near Paris. During the war, American plant made smokescreen chemicals, later diversified into electrochemicals, then sensing devices and instruments, so into controls.

Both spend most of their time working—because they like to. "After you have everything you need," says Mrs. G., "there's nothing left but to accumulate money. Why bother? We like to have fun."

## Strictly PERSONAL

### Dividends

("Shares and Prices" Mar. 10, p 5) contained data relating to shares and prices of certain industrial instrument manufacturers. Our company was among those . . . listed. The information . . . relating to earnings per share for 1956 and 1955 represented earnings prior to our 2-for-1 stock split

of July 23, 1956. However, the market quotation given . . . was based on shares outstanding after the aforementioned split.

Also, the dividends shown for our stock are a combination of dividends paid prior and subsequent to the 2-for-1 split but not on a restated basis. The article indicates, therefore, that our dividends are in excess of those paid for that

year on the basis of shares outstanding after the split.

S. LOIDL JR.  
LEEDS & NORTHROP Co.  
PHILADELPHIA, PA.

### Ideas

We read with great interest . . . "Wanted: Electronic Ideas" (Feb. 20, p 30).

Berkeley Crystal Co. is a research organization presently working on a variety of projects in electronics and nuclear physics. It is possible that some of our work may provide the answers for which National Inventors Council is seeking.

LAWYEN EVANS JR.  
BERKELEY CRYSTAL CO.  
BERKELEY, CALIF.

### Stress and Strain

Re "Wanted: Electronic Ideas" (Feb. 20, p 30) . . .

I may not know the problem involved in this particular incident of plane stress or overstressing, but it occurs to me that a system either electronic or electric could be worked out using strain gages.

This would involve strain gages placed at positions in the plane structure known to be . . . stressed at high speeds. These strain gages . . . would be connected through an amplifier to operate a relay which in turn will drop the throttle speed to a safe condition for the plane.

CLARENCE WHITTON  
CLARK BROS. CO.  
OLEAN, N. Y.

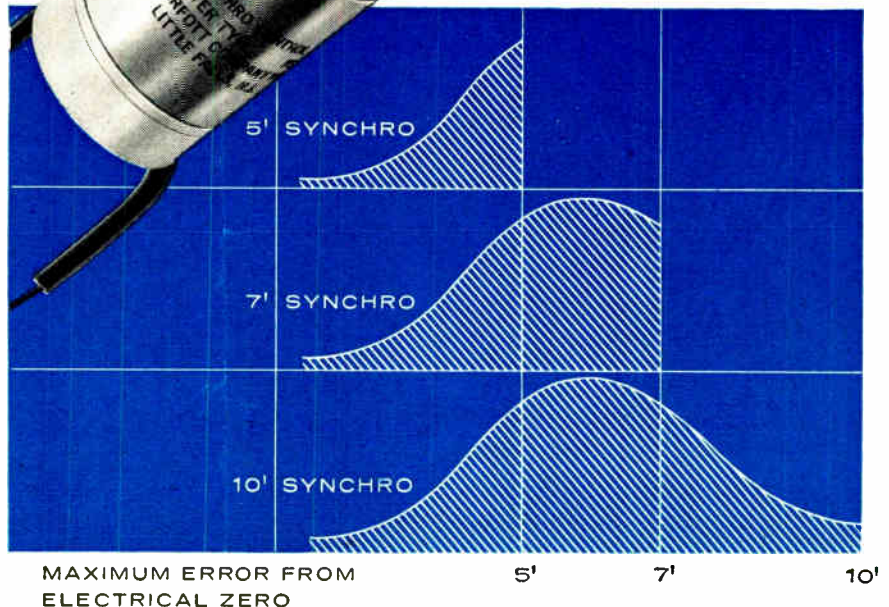
### Misplaced Sun Furnace

Re "Sun Power Takes First Steps" (Apr. 10, p 20) . . .

The solar furnace which is pictured along with the article . . . is located on the campus of Arizona State College at Tempe.

CLEMENT J. KEVANE  
ARIZONA STATE COLLEGE  
TEMPE, ARIZ.

## BUILT TO THE ACCURACY YOU REQUIRE



### Kearfott Series R900 Synchros

. . . are not selected, but are built to the specific degree of accuracy required. The accuracy of each class and the distribution of errors within each class, is a function of rigid quality control. The curves below indicate the degree of accuracy of three classes of synchros. The distribution of errors in each class is indicated in the cross-hatched area beneath each curve.

Kearfott Series R900 Synchros are characterized by high accuracy, corrosion resistance and new high temperature stability. Units available for early delivery.

#### KEARFOTT COMPONENTS INCLUDE:

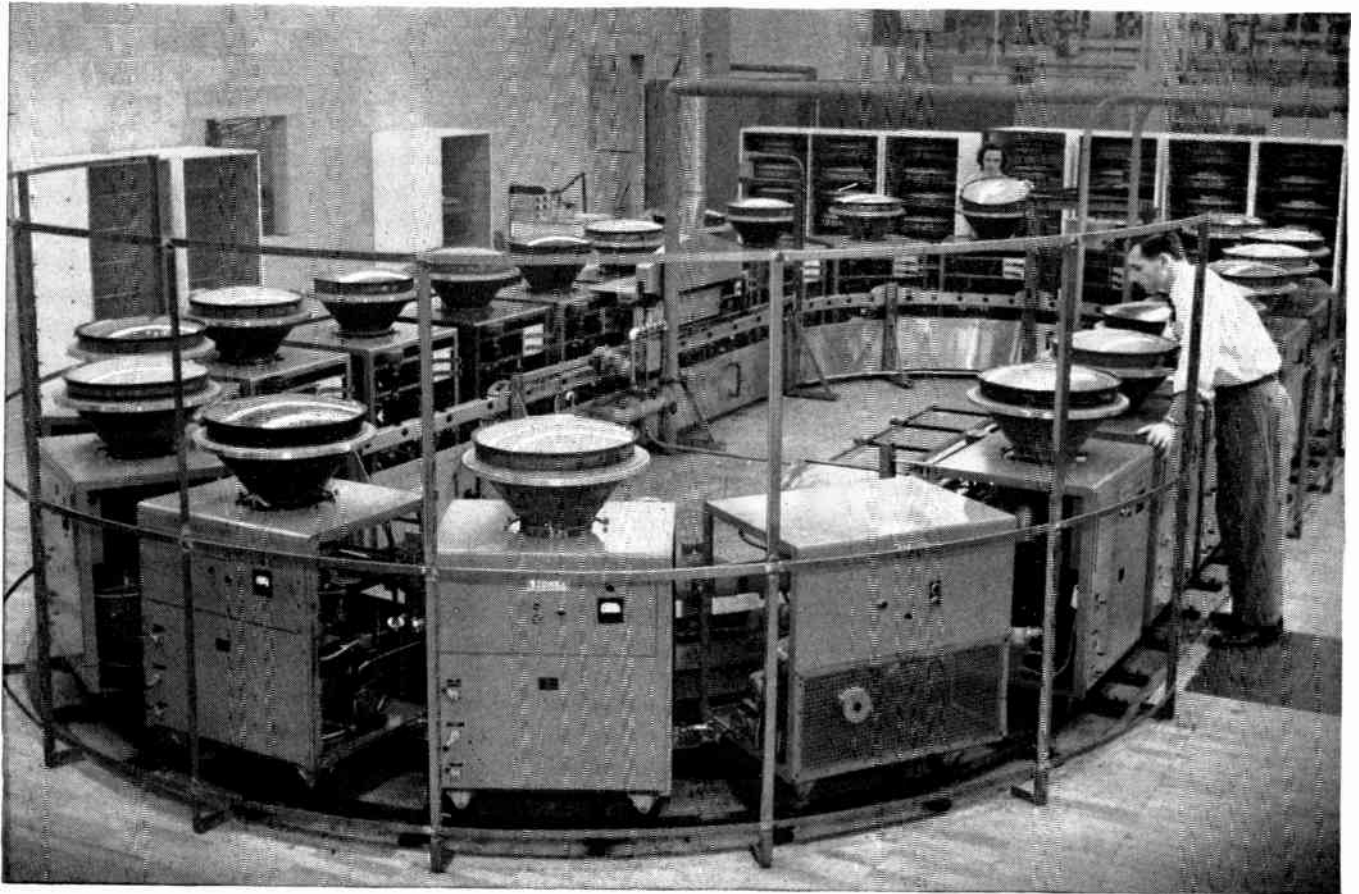
Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Indicators and other Electrical and Mechanical Components. Kearfott Systems include Directional Gyro Compass Systems, Three Gyro Stable Platform Systems and Inertial Navigational Systems.

Send for bulletin giving data of components of interest to you.



#### KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.  
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas  
West Coast Office: 253 N. Vinedo Avenue, Posadena, Calif.



## RCA color TV tubes aluminized on Stokes high-production system

**First continuous production installation for aluminizing color TV tube face plates is now operating at RCA's Lancaster, Pa., tube plant, using Stokes automatic in-line system.**

Application to this unique tube design demonstrates the versatility of Stokes aluminizing systems. They are adaptable to all TV tube designs, for black and white and color, now being used or developed in the industry. They are engineered to provide high output and flexibility to meet changes in production rates and tube sizes.

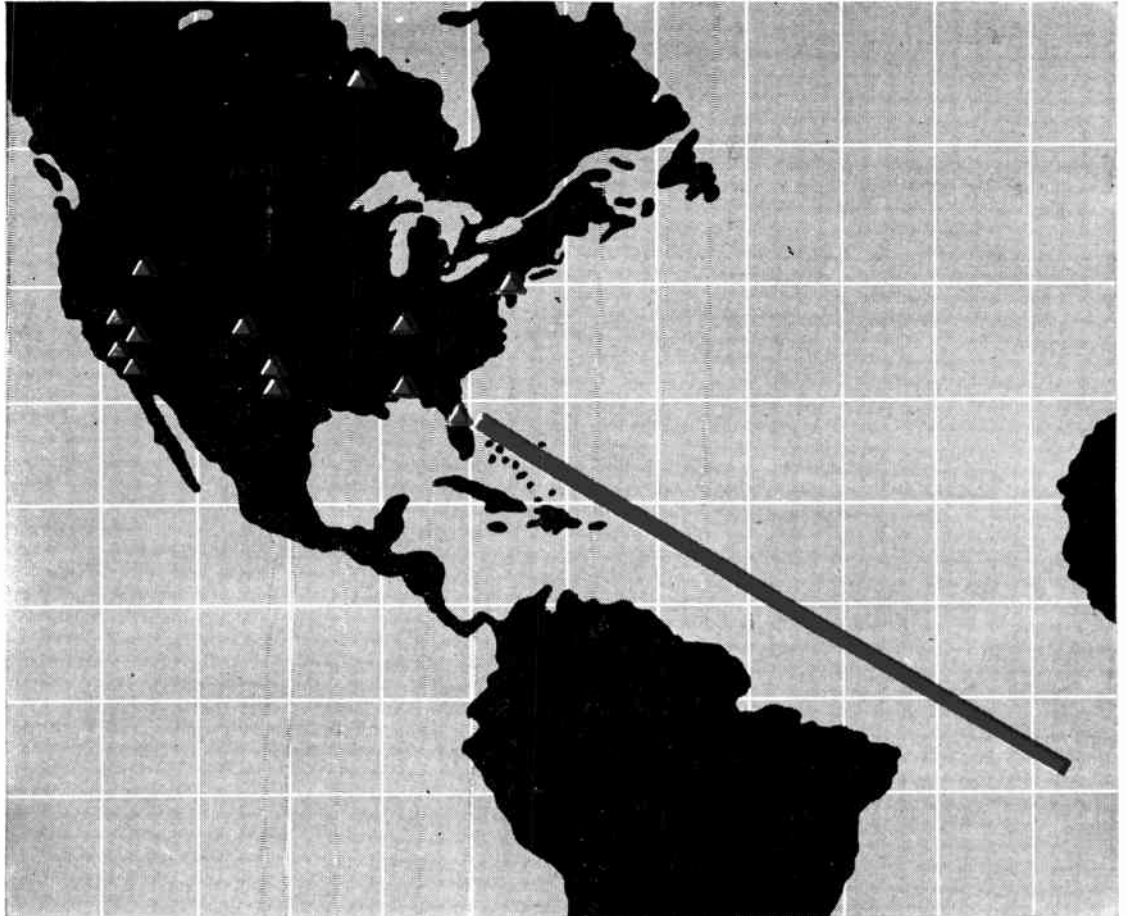
Systems can be made up of single-tube units, as shown here, or of the exclusive Stokes

twin-tube units that aluminize two tubes at a time on each cart. The combination of Stokes high-speed "Ring-Jet" vapor pumps and mechanical forepumps gives rapid evacuation, short cycles and fast production. A complete range of capacities and prices is available.

Specialists in high vacuum engineering and automatic production techniques for more than 30 years, Stokes engineers are well qualified to produce economical, efficient systems for your high vacuum production problems. Write or call Stokes today for a consultation and for literature applicable to your specific field of interest.

*High Vacuum Equipment Division*  
F. J. STOKES CORPORATION  
5517 Tabor Road, Philadelphia 20, Pa.

# STOKES



Test ranges hatch angry warbirds as . . .

## Missile Program Races Deadline

**Thirteen test ranges work last design bugs out of new missiles**

**Need top-notch radar, computers, telemeters and instruments**

**Civilian firms often contract for operation and maintenance**

ARMED FORCES are spending over \$1 billion annually on electronic equipment to develop and produce guided missiles. Of this, a large sum is earmarked for equipping and operating 13 known missile test ranges in U. S.

Hundreds of millions of dollars have been spent on telemetering receiving stations, command destruction equipment, radar tracking, computers, check-out

gear, ground handling and launching equipment, simulators and miscellaneous instrumentation.

Now, while spending for other types of missile electronics is slated to increase as missile production gets into high gear, military buying of missile test-range equipment is leveling off, may even slide some. Most of the test ranges are already equipped. Future missile test-range buying will be limited to build-up

of two ranges to test long-range ballistic missiles, repairing and updating other ranges.

Below is a listing of known missile test ranges, with details on their use and electronic equipment. For the most part, each range is operated by one service or civilian agency but used for test firings by other branches.

### Navy

- Naval Ordnance Test Station, China Lake, Calif. \$200-million base. Conducts research, design, development, limited production, testing and technical study of rockets and missiles, underwater ordnance, aircraft fire control.

- Naval Air Ordnance Test Station, Chincoteague, Va. \$6-million installation. Tests and evaluates aviation ordnance, airborne pyrotechnics, guided missiles, missile and airborne countermeasures. Conducts scientific and engineering tests.

- Naval Air Missile Test Center, Point Mugu, Calif. \$85-million base, 35 percent of plant investment for electronics. Base tests and evaluates guided missiles, trains fleet units in their use.

This electronic equipment is used: communications—uhf air-to-ground, vhf air-to-air, timing distribution, data relay links, radar (video) test communications; telemetry—fm/fm, ddm/fm, magnetic playback, airborne receiver/recorder; radar instrumentation—S-band 584/615, X-band (mobile); surveillance radars—SPS-8A, SPS-6C, APS-20, SG-LB, radar display (CIC)—plotting boards, indicators, chart recorders.

Also, auto data reduction and computers—film and oscillogram receivers, auto TDN gear (hermograph), auto-doppler counters, IBM-650, RAYDAC; c-w systems—velocimeter, tridop; optical—theodolite, CZR-1 (Bowen), mobile optical tracking units, drone camera pods (airborne); instrumental control center; frequency-interference control equipment; and common electronic test gear—oscilloscopes, meters, recorders, standards.

### Army

- White Sands Proving Ground, Las Cruces, N. M.

- Redstone Ordnance Arsenal, Huntsville, Ala. includes \$12-million test area with computation lab to develop and operate simulators, guidance and control lab to test and develop inertial guidance systems and systems analysis and reliability lab.

- Ft. Churchill, Manitoba, Canada.

### Atomic Energy Commission

- Ballistics Range, Tonopah, Nev. Located within Air Force bombing and gunnery range. Temporary \$450,000 installation scheduled to close in 1959.

Tests ballistic drops of bomb shapes, and probably missile warheads, during development. No explosives actually fired. Electronic gear includes instrumentation station, controls and communication facilities.

### National Advisory Committee for Aeronautics

- Wallops Island Pilotless Aircraft Research Field Station, Va. Has about \$3-million worth of electronic installations, notably telemetering stations and radar tracking. Fires rockets to launch instrumented models of research vehicles.

### Air Force

- Patrick Air Force Base, Cape Canaveral, Fla. Launching site for range running about 5,500 miles southeast to Ascension Island in South Atlantic. More than \$100 million in instrumentation has been installed. Range includes series of island telemetering stations: Grand Bahama, Eleuthera, San Salvador, Mayaguana, Grand Turk, Dominica, St. Lucia and offshore Brazilian islands. Joint range operators: Pan American World Airways and RCA. Over a dozen missile contractors and subsystems manufacturers use the range. Will be launching site for the Navy's Vanguard earth satellite.

**Right now, contractor can fire a missile at least 1,500 miles and get complete test data during flight. Telemetry receiving stations, tracking radar sites and command destruction equipment are completely set up that far. Up to now, most test firings have been on long-range air-breathing missiles, such as Matador, Snark, Navaho. Range is undergoing expansion to get ready for long-range ballistic missiles, Thor, Jupiter, Atlas and Titan.**

Monopulse radars for specialized tracking of high-altitude trajectories and advanced optical systems, astronomical telescopes and radars, are being set up. To extend radar and optical tracking systems for greater ranges, Convair's AZUSA c-w system and COTAR (CORrelation TRACKing And Ranging) are being installed for ballistic missile tests. COTAR's main use is to track the reentry phase at down-range sites.

- Camp Cooke Military Reservation, Lompoc, Calif. Being converted into a base to train ballistic missile units, likely to be one of earliest ICBM sites.

- Holloman Air Force Base, Alamogordo, N. M. Flight tests short-range missiles.

- Edwards Air Force Base, Muroc, Calif. Static tests rocket engines.

- Eglin Air Force Base, Valpariso, Fla.

- New \$4.5-million base is planned at Winslow, Ariz. For high-speed ballistic testing. May replace AFEC's Tonopah range.



# Is This Facsimile's Year?

Several manufacturers say yes, some say maybe

Telephone company enters service field, Western Union expands

\$5 million possible in year, \$100 million in ten

FACSIMILE is getting new attention this year from manufacturers and potential customers.

New York Telephone Co. entered commercial facsimile service field March 1, its earlier proposed rates going into effect. Company is leasing lines to customers' machines, renting machines to customers who don't want to buy their own.

- Other Bell companies are experimenting with facsimile transmission, may soon file rate schedules with regulatory commissions.

- Reynolds Metals and Western Union recently unveiled interstate facsimile network using AT&T lines and WU facsimile machines. System alternately sends voice and facsimile over same circuit.

- WU says 35 million telegrams are sent annually over fax units, and its investment in facsimile equipment is more than \$15 million. WU has 30,000 desk units, plans 6,500 more in 1957, 20,000 in five years.

Equipment makers are hopeful of selling machines to communications companies, military services, government agencies and industrial customers.

Most manufacturers feel 1957 will at least see the start of a big push in facsimile.

- Charles J. Knight of Electronics Communications, says market surface hasn't been scratched but 1957 will be the breakthrough year, with several hundred thousand units sold in the next few years.

- Elliott Crooks, vice president of Hogan Laboratories, guesses the equipment and paper market will shape up this way: \$3.5 million in 1957, \$35-50 million in five years and \$75-100 million in ten years.

- Milton Alden, president of Alden Products, says \$3.5 million may be achieved in 1958, a \$25 million plateau in five years.

Manufacturers look for two kinds of facsimile equipment markets, direct communications and high-speed instrument recording. Fax is being used for direct radar recording, flaw detection in gun barrels, oceanographic studies and visual recordings of infrared, sonar and other detection devices.

Military interest is high in all services, including

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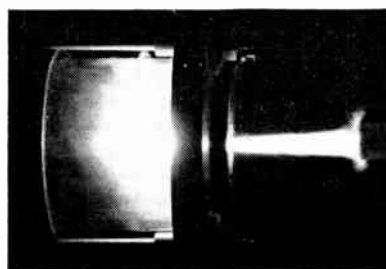
## TECHNICAL changes to watch

- European computers like Ferranti's lightweight Pegasus (upper right) show ingenuity to make up for tight R&D budgets. Harvard professor reports on technical innovations, design philosophy seen while traveling abroad. (p 42)

- Water-stabilized electric arc (lower right) develops 14,000 K temperatures for testing equipment for missiles and rockets. A longer range use: developing ion-stream propulsion systems for missiles or even space ships. (p 40)

- Silicon-carbide rectifier handles several amperes at temperatures up to 1,200 F with over 90-percent efficiency. GE Research Lab announces efficiency at 1,200 F is not significantly different from room temperature. A heat sink keeps junction temperature close to ambient. The rectifier has operated down to -100 F. Semiconductor devices made with other materials have operated up to 400-500 F.

Present silicon-carbide rectifier is a laboratory device. Other solid-state devices including transistors will depend on progress in preparation, especially purification, of highly stable but extremely stubborn silicon carbide.



Strategic Air Command and Army Signal Corps. Several projects are underway.

Aircraft firms are transmitting engineering data between plants as far apart as California and Florida.

Portable pushbutton office duplicating machines are being marketed which provide fax photo plates to run on an offset duplicator.

- Facsimile equipment is used by TVA to transmit daily power load requirements from control points to generating plants.

Potential customers for private facsimile networks include mail-order houses, insurance firms, credit agencies, department stores, publishers, banks, hotels, airlines, railroads, truckers, pipelines, power, oil, tire, rubber, metal and paint companies, and police organizations.

Several firms see facsimile as a supplement to leased telephone and telegraph lines, hope to lower price of a transmitter-recorder unit to \$3,000 in two years.

## Bar Some Translators

SUDDEN growth of tv translator stations causes FCC to take a second look. Commission proposes to restrict new translators to areas which have no commercial tv station competition, put them off the air when regular tv stations go on the air in the same area.

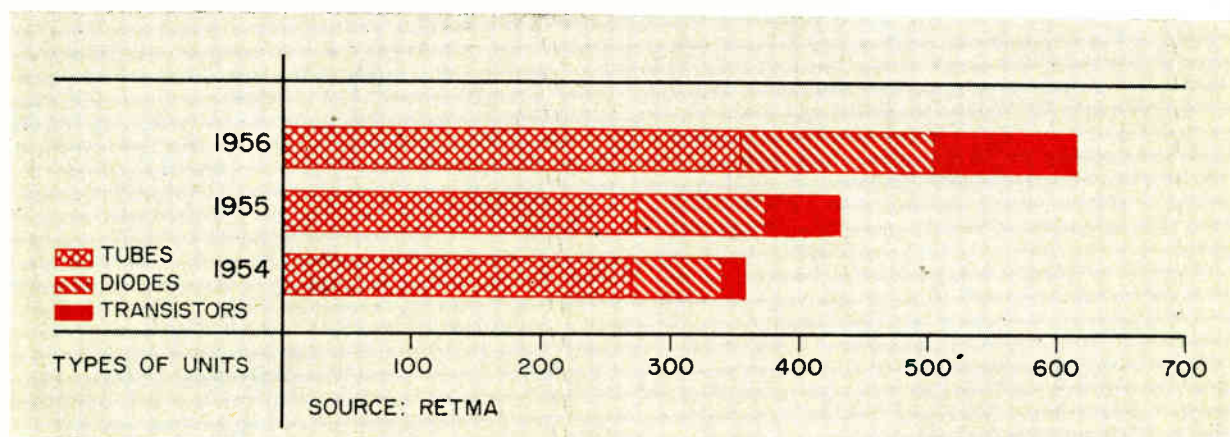
Translators, authorized about a year ago to expand tv coverage, have increased some 400 percent in past four months. Total authorized now is over 40. More than 50 applications are pending.

Thus far most interested in pulling a broadcast signal out of the air, translating it to uhf and re-broadcasting it on low power have been city governments, service organizations not interested in profit.

Restriction move, most observers feel, will have little effect on translator growth. Most areas that have translators or will have them are too remote or too small for commercial tv stations.

Comments on the proposal are due June 3.

## PRODUCTION and SALES



## Tube, Transistor and Diode Types Multiply

TOTAL RETMA type registrations of tubes, diodes and transistors increased 70 percent between 1954 and 1956. Registrations in three categories totaled 360 in 1954, compared with 619 in 1956.

In 1956 type registrations comprised 354 tubes, 153 diodes and 112 transistors. In 1954 breakdown was: 272 tubes, 70 diodes and 18 transistors.

Tubes represented 76 percent of 1954 total; diodes 19 percent and transistors 5 percent. By 1956 tube proportion declined to 57 percent. Diodes jumped to 25 percent and transistors to 18 percent.

- Tv receiver production in January 1957 totaled 450,000 units, compared with 588,000 in January 1956. About 15 percent of January 1957 production contained uhf tuners. Sales to consumers in January 1957 of 611,000 sets were below 614,000 sets sold in preceding January.

- Picture tube sales in first month of this year totaled 761,000 units worth \$13.6 million, which compares with 892,000 tubes worth \$17.0 million sold in January 1956.

- Receiving tube sales in January

1957 amounted to 37.6 million tubes worth \$31.1 million, while 40.1 million tubes worth \$31.1 million were sold a year ago January.

- Radio receiver production and retail sales in January were up from the same month last year. Production, including 522,000 automobile receivers, totaled 1,086,000 sets compared with 1,079,000 sets produced in January 1956.

- Electrical appliance tv, radio set and electronic part wholesaler inventories in January were 10 percent above preceding January.

# Production Geared to Sales

- Deliveries aided by combined control
- Team gives top executive more time
- Increased business follows better service

HERE ARE two questions of growing concern to growing concerns: How do you make delivery promises good? How do you develop a management team in a one-man company?

Component Manufacturing Service, Inc., was two to four months behind delivery dates for molded-on plastic connectors. First corrective step was to develop combined controls for sales and production. Then, foremen training and responsibility realignments backed up the controls.

Within two months delivery promises were met. Within a year, Component's business tripled; it's now in the \$1-million bracket.

At New England Transformer, a Production Order Book helps delivery dates. The book has three classifications:

Order accepted, all raw materials on hand.

Order accepted, raw materials partially on hand and ordered.

Orders delayed, reasons.

Using this book, production manager Leon Freeman plans and balances production. The book does more than keep him ahead of orders. It quickly shows hills and valleys in customer requirements.

How does a small electronics firm plan for increased business? A job-lot production-control system tells how much business is on hand. To this, add customers' predicted future requirements. These factors help company executives determine needed additional employees, machinery, working capital and space.

Says Randy Barker, president of Component: "In our case, we set up a larger night shift and planned to more than double our plant space."

Over at Rode, Inc., President Robert Alfred faced a common problem: lack of time. He solved it by replacing his one-man system with a management team.

Production responsibility and authority was placed in the hands of a man already doing the job, but previously without title or definite job scope. The person interviewing salesmen and actually purchasing was named purchasing agent-office manager. Alfred's chief inspector took over quality control.

Then the setup was wholesomely different. In

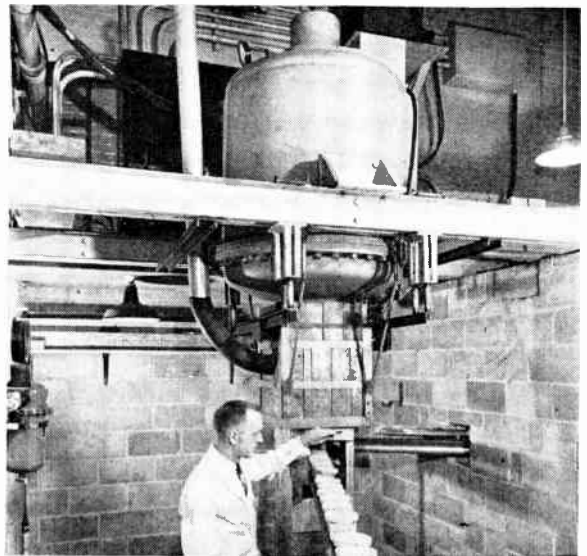
addition to having clear-cut duties, each individual had more opportunity to show his abilities. Perhaps most important, President Alfred had time for top-level matters.

Simply forming a team usually isn't enough. To score well, a team needs training. Industrial consultant Harvey C. Krentzman talks about this phase of growing successfully.

"A management team should meet periodically. Each member should have continuing advice. Problems and situations change. So do methods of solving them."

A mistake most small firms make, says Krentzman, is to "form a management team, instruct it, and then forget it. That is almost worse than having no team at all."

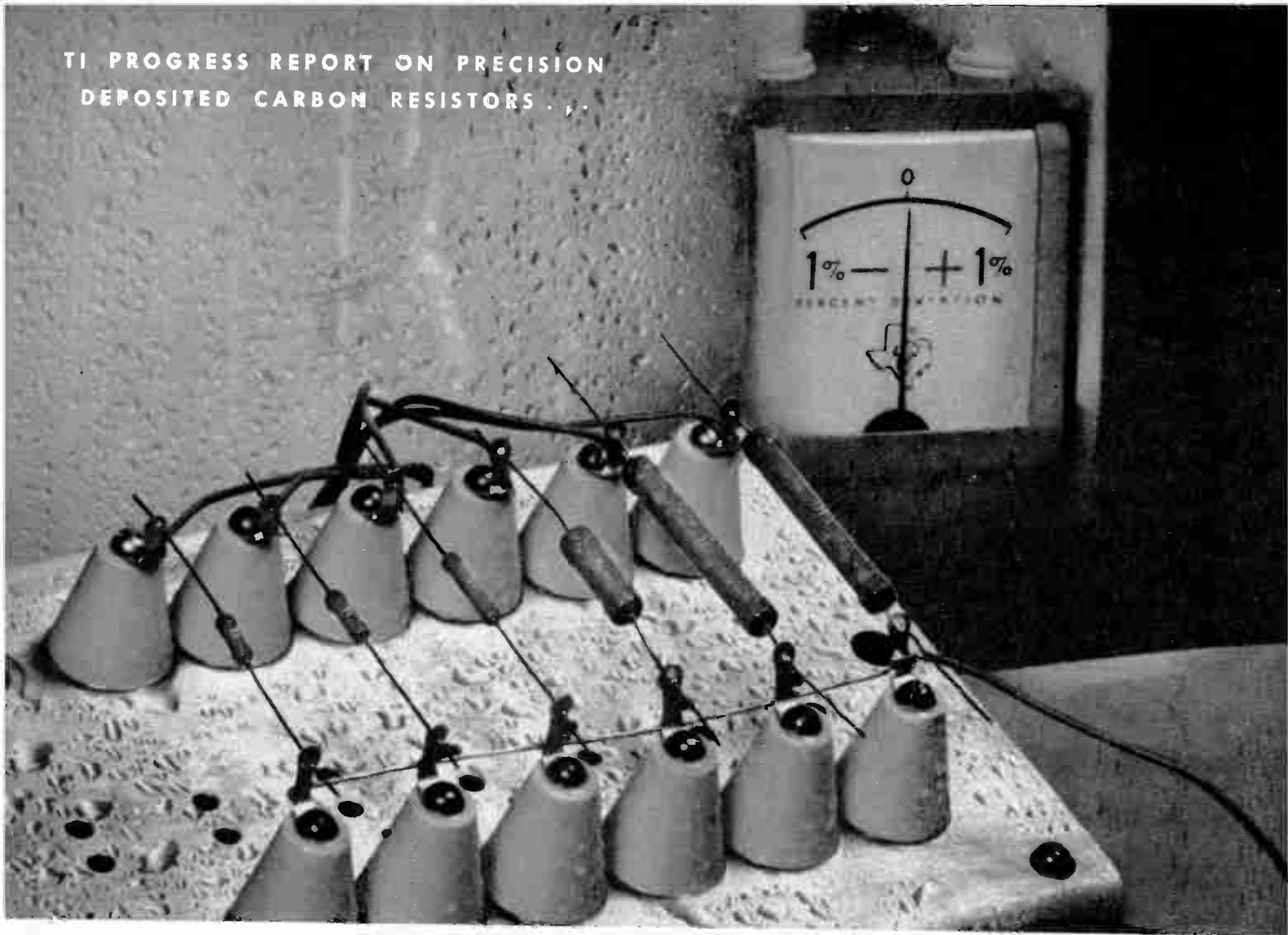
Effectiveness of individuals is gaged by specific measurements. Two examples: relationship of direct labor costs to weekly billings is a yardstick used on production. Percent of rejects tells how well quality control is doing.



## Make Mine Rare

Swift studies meat preservation with a million-electron-volt GE electron-beam generator. Irradiation effectively sterilizes meat, retarding spoilage

TI PROGRESS REPORT ON PRECISION  
DEPOSITED CARBON RESISTORS . . .



## TI MIL-Line Precision Resistors

# HOLD TOLERANCE...EVEN WHEN DRIPPING WET!

Soaking wet, dried out, or 'shook up' — TI MIL-Line deposited carbon resistors still far exceed MIL-R 10509B . . . emerge from one acceptance test after another — by major electronics manufacturers — with performance records that have not been equalled. *It's the seal that makes the difference* . . . an exclusive Texas Instruments process that snugly wraps these precision resistors in tough jackets of a special coating with high dielectric strength.

For ease in design, production, and maintenance

. . . for improving the reliability and saleability of your products, the moisture resistance of TI deposited carbon MIL-Line resistors is just *one* field-proven factor. You also get a choice of 1, 2, or 5% tolerances . . . high stability over wide temperature ranges and under full load . . . low negative temperature coefficients . . . negligible voltage coefficient and noise levels . . . long shelf-life . . . wide selection of sizes and resistance values . . . reasonable prices . . . and, if desired, reel-type packaging for automation.



Here is a typical TI reel pack designed to speed production. TI precision deposited carbon resistors are mass produced and packaged in five sizes from 1/2 watt to 2 watts with resistance values from 25 ohms to 30 megohms.

For complete data, write for  
Bulletin DL-C 539.



**TEXAS INSTRUMENTS**  
INCORPORATED  
6000 LEMMON AVENUE DALLAS 9, TEXAS

# Marine Sales Show Upturn

**\$7 million seen for 100 ships planned or building**

**New tankers, replacement shipping will sustain demand**

**Radio, radar, gyros and navigational gear will benefit**

MANUFACTURERS of electronic equipment for merchant ships are enjoying their biggest sales boom since the war. The market looks good for several years.

The boom comes from the sudden spurt in merchant shipbuilding, particularly of tankers.

There are well over 100 ocean-going ships either building or definitely contracted that will require \$7 million dollars worth of electronics. Average ship has \$60,000 to \$70,000 dollars worth of electronics.

In addition, off-shore oil developments and inland waterway shipments have created a big demand for smaller ships that use much of the same equipment. Foreign shipyards are jammed with shipbuilding that often uses U. S. electronic equipment.

Outlook is for shipbuilding, both domestic and foreign, to stay active through the 1960's, possibly longer.

Activity arises from demand for more tanker tonnage, and ship replacement programs being started by major shipping companies as war-built fleets became obsolete.

Here is the electronic equipment used on ships:

- By law, most ocean-going ships and some smaller ones carry radio transmitters and receivers. These are often sold as a console that includes 300-watt low-frequency transmitter, 250-watt high-frequency transmitter, auto-alarm (automatic keyer to transmit SOS signals), battery-operated emergency transmitter, low-frequency receiver, high-frequency receiver and power supply. Price of this equipment is around \$7,000.

- Gyroscope compasses are standard equipment for major ships. They consist of a master gyro, up to eight repeater compasses, course recorder and gyro steering system. Price runs around \$24,000.

- Loran is optional equipment, but the trend is to install it on ocean-going ships. Price is about \$5,000.

- Most merchant ships are now equipped with radar. The radar set used on merchant ships runs about \$10,000.

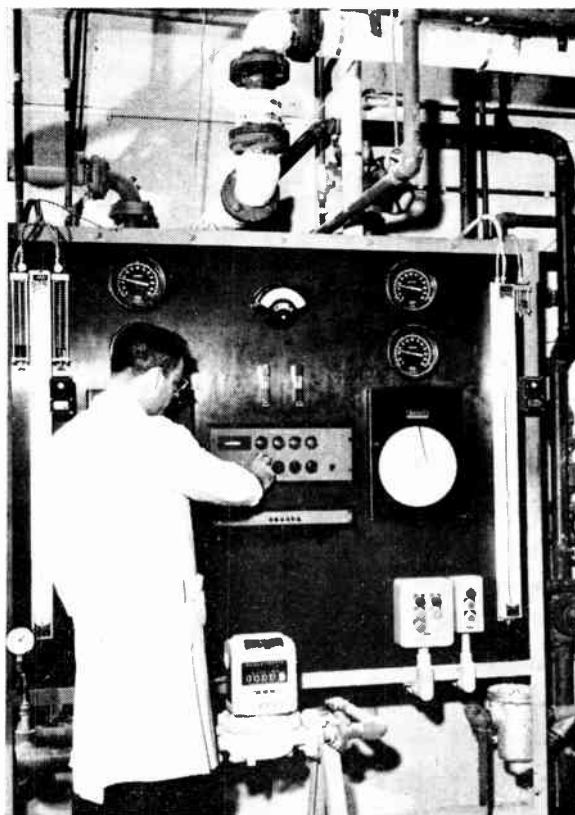
- Many ships are equipped with direction finders. Prices run from \$2,500 to \$4,000.

- Depth sounders range from \$6,000 to \$9,000.

- Most ocean-going and some smaller ships are required to carry portable lifeboat radiotelegraph transmitter and receiver. Price: under \$1,000.

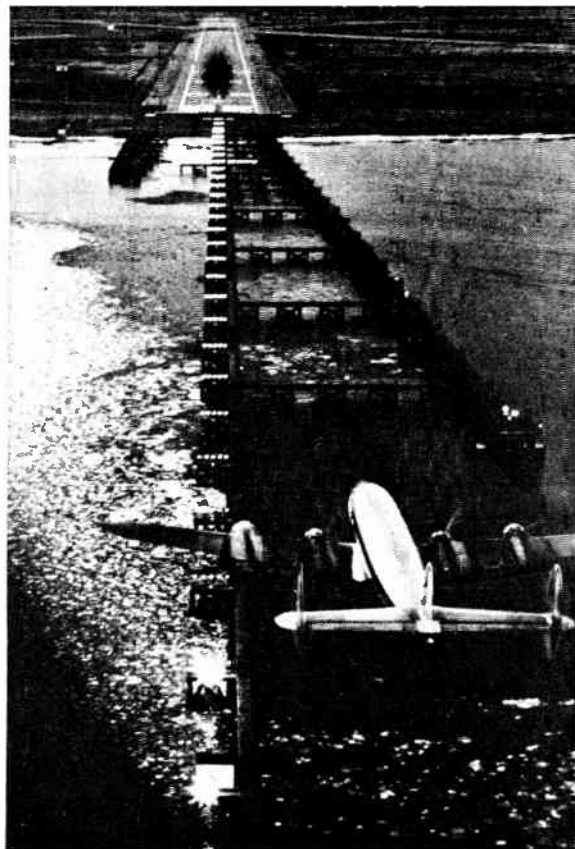
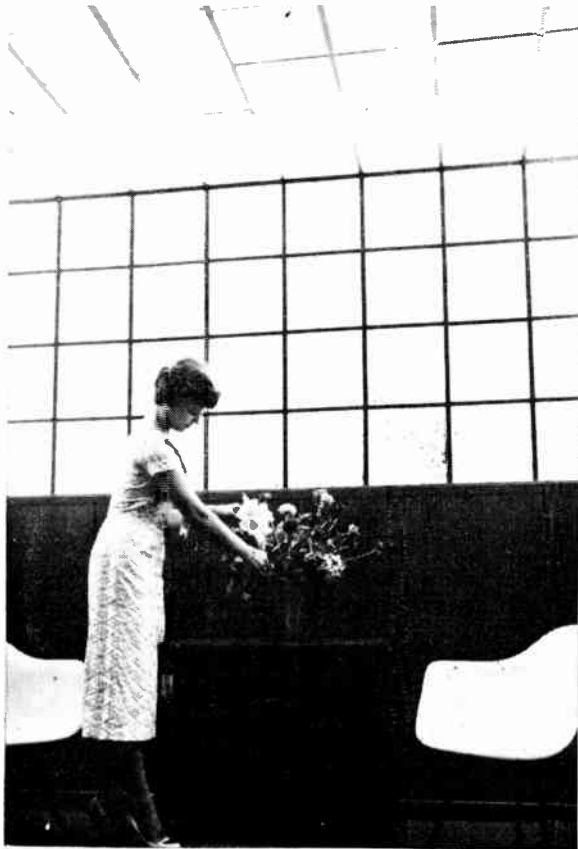
- Some ships carry extra equipment such as ship-to-ship and ship-to-shore radiotelephone gear.

With close to 1,000 ocean-going ships operating in the U. S. merchant fleet, repairs, spare parts and replacements for electronic equipment will help boost the market in the shipping field.



## Chemical Traffic Cop

Combination of electronic instruments is used by Relais Company to control flow of acids, carbonates and salts. Technician is setting Potter Aeronautical's 13-tube automatic totalizer to shut off flow at desired volume



**Panels for home, lamps for airports herald . . .**

# New Field: Electronic Lighting

**Manufacturers entering electroluminescence market**

**CAA considers \$1.3 million airport flash**

**More stage and studio lighting uses thyatron dimmers**

LIGHTING engineers chide electronics people for disowning arc and fluorescent lamps. But there are new lights more truly electronic.

Front runner for a universal market is electroluminescence (EL). It promises a good outlet for transistor and electron-tube oscillator power supplies.

Westinghouse formed an EL commercial team in February after nine years of development. It still faces problems, but hopes to be selling in two years.

EL cells are plates of phosphor embedded in dielectric, sandwiched between conductors. Electricity frequency and type of phosphor determine color, voltage controls brightness.

Efficiency is still too low for general use. Theoretically, EL cells will work 10 times better than incandescent lamps, twice as efficiently as fluorescent. Nothing wears out. Panel-type lighting is shadowless.

Ultimate aim is operation on 60-cycle current. But electronic oscillators would not even then be knocked out, thinks George B. Saviers, the firm's EL commercial engineering head. They'd still be needed for color shifting, architectural drama, display effects, suiting moods of future homeowners, varicolored signal and warning devices.

Immediate application of EL may be simple, fail-proof instrument panel lighting. Sylvania has been putting out electroluminescent dial faces for three years.

Several firms are investigating electroluminescence for flat color tv tubes and other imaging devices. Light amplification with phosphors is presumed to be the key. Computer firms are researching circuits for exciting phosphors and photoconductors for memory storage.

Electronic aids are already well established in many lighting markets: electronic flash approach sys-

tems (EFAS) for airports, stroboscopic equipment for photography and testing, photoelectric outdoor lighting controls and dimmers for studio and theater stage lights.

The CAA may spend \$1.3 million through fiscal 1960 on 32 EFAS installations. Sylvania and Westinghouse are making five installations.

EFAS has been installed by CAA at Andrews Air Force Base and ARDC will install a system at Dow Air Force Base. Both are test projects. ARDC reports that Military Air Transport Service is interested.

In EFAS, timed capacitor surges send a brilliant light flashing along a series of lamps leading to the runway. It helps pilots leaving overcast get their wheels on the ground.

Century Lighting says it has installed 50 thyatron stage dimmer systems in the past five years. Each has 12 to 100 dimmers at \$700 each. Kliegl Brothers figures about 10 percent of theatrical and tv studio lighting is electronic. Magnetic amplifier dimmers appeared last year.

Since 1952, GE has sold 1,000 dimmers designed for fluorescent light groupings. Price is \$145 less tubes.

Lighting fluorescent lamps by an external radio-frequency field is old hat, but Sylvania now has an r-f lamp with its own power supply.

Induction coil heats a disk to incandescence, giving high-intensity stable beam without optics. Movie-makers, who helped develop it for film printing, are expected to be customers. Other anticipated uses: color tv tube processing, radar display, infrared spectroscopy.

## Silicon Cells Lead

EFFICIENT conversion of sunlight into electrical energy is not following a straight line. Military and industrial researchers are taking several paths.

Photovoltaic cells made of silicon are in the lead today. These were announced three years ago by Bell Labs as part of its work in solid-state physics.

They can produce enough power for certain rural telephone repeaters and other relatively low-power needs. But something better than silicon might broaden uses.

Silicon cells now convert 10 percent of usable sunlight into electricity. Top theoretical efficiency is 22 percent.

Indium phosphide, gallium arsenide, cadmium telluride, selenium, aluminum antimonide and cadmium selenide are among other useful semiconductors. Selenium stacks are being made, but their efficiency is only a few percent.

A Texas Instruments investigator suggests stacking several types of semiconductor materials.

---

## Technical DIGEST

- Combined interferometer and bidirectional counter for accurate dimensional measurements is manufactured by Link Aviation, Inc. It uses phototube and electronic counter to count light fringes resulting from movement of sensing spindle. Instrument is readable within 0.000001 inch.

- Magnetically polarized ferrites such as ferroxdure and magnetized ferroxcube show promise for waveguide applications up to 30,000 mc, as result of research by Philips. Plates and other shaped pieces of material are placed inside wave guide in controlled magnetic field to give directional isolators.

- Aluminum-clad steel is proving to be useful in the manufacture of electrodes in high-reliability tubes. It gives advantage of dark

surface without giving off loose particles during mounting, sealing, exhausting and operation. Raytheon finds such particles a serious problem on grids.

- Strips of metal foil called chaff, ejected at timed intervals from missile, permit radar tracking during entire 100,000-ft high flight. Technique, reported by NOL, makes possible missile propellant and flight testing without loss of costly telemetering units.

- Rural open-wire telephone lines can carry up to four times as many conversations per wire. It's done by adding the Bell System's fully transistorized PI carrier at central office and remote points. Printed-wiring boards give compact packaging. Operation is from single new-type storage battery.

- Latest refinement in electronic readers gives two scans for letter

badly out of alignment. First scan notes limits of letter or character, divides it in two for centering subsequent reading scan. Technique is used in ERA machine developed by The Solartron Electronic Group Ltd.

- Chromachron color palette designed by KRON-TV engineers gives total of 91 color mixtures. Each is numbered and related to an accompanying 20-segment gray scale. Palette tells how color picture will reproduce in black and white so best possible monochrome picture is transmitted when program originates in color.

- Coating tungsten or platinum filament wire with quartz permits operation in Pirani vacuum gages at much higher temperatures, gives better long-term accuracy. Quartz coating, only 0.002 inch thick, stops oxidation that formerly limited wire temperature.

# Homes Wired for Sound?

- Built-in intercom system may be integral part of tomorrow's home
- Present home-intercom market is only \$3-4 million a year
- But home builders are becoming enthusiastic

THERE WILL be lots of backtalk, electronic style, in the future homes of America. It won't be unwelcome either, if the home-intercom manufacturers have their way.

It is a relatively untapped market; estimated sales were only \$3-4 million during 1956. Manufacturers feel their product can be combined with a-m/f-m radio, fire and burglar alarms to benefit householders and produce profits.

John A. Deapen, Jr., electronics division manager of Roberts Manufacturing, Cleburne, Texas, says: "Industry placed intercoms in 3 percent of the 1,200,000 homes built last year and in 1957 we expect it to increase to 10 percent of all new home construction. Expectations are that home construc-

tion will be behind the '56 figure, but there will be a sizable market for intercoms."

Construction executives attending a National Association of Home Builders show in Chicago were enthusiastic about the added sales push an installed intercom gives their homes.

Intercom manufacturers say they have sets ranging in price from \$89.50 to \$500, but note that their best-selling units average about \$130.

Putting low-cost intercommunication equipment into the home is a relatively new enterprise. Only a few years ago manufacturers began merchandizing a simple circuit addition to permit a radio's audio amplifier to be used as an intercom. Since then, the field of radio-intercom built-ins with extension speakers throughout the house has mushroomed. There are at least a score of manufacturers.

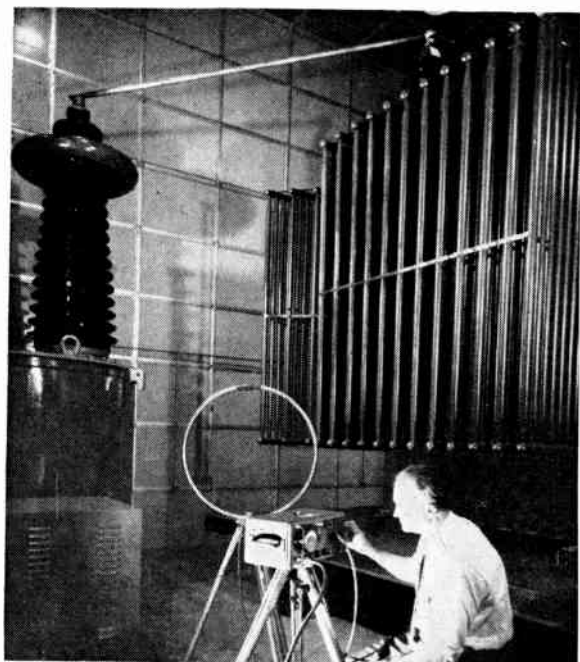
At least one manufacturer is doing research on transistorization of his product, and developing printed circuits for inclusion in the future. High-fidelity intercoms are being studied by most firms.

Heat dissipation is no problem for built-in's, provided the carpenters do not box in the units too closely. Many manufacturers feel an intercom system is a good do-it-yourself project for the homeowner.

Uses for a built-in home-intercom system include baby-sitting, door-watching and fire-warning. By leaving room loudspeaker-microphones on all night feeding into the master bedroom loudspeaker, the slightest movement in any room is amplified. Heat-actuated switches can be connected to each room loudspeaker-microphone to buzz when room heat reaches 140 F.

Most home builders feel intercom systems are best suited for new homes in the \$15,000-and-over class. Selling established homeowners will be a harder task.

A successful builder and former president of both the National Association of Home Builders and the National Association of Real Estate Boards, Robert P. Gerholz, looks at the intercom this way: "We started about 12 years ago with flush wall radios, no extension speakers. Now in some 400 houses we've built recently, we have treated the intercom like lumber or any other product. We cost out the intercom and handle our profit the same way."



## Taking Out the Buzz

Radiation from a power transformer is measured with a Bruel and Kjaer frequency analyzer in the Westinghouse transformer division's new test center. Tests are conducted in a shielded room to develop insulation with higher resistance to corona. Reducing radiation curtails interference with communications, radio and tv and defends against homing hostile missiles





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We are proud to further expand our facilities in the West with the opening of our eighth office in Tucson, Arizona. Neely Enterprises' growing family of offices offer the finest and most complete service to answer the increasing need for instrumentation in the electronics industry.

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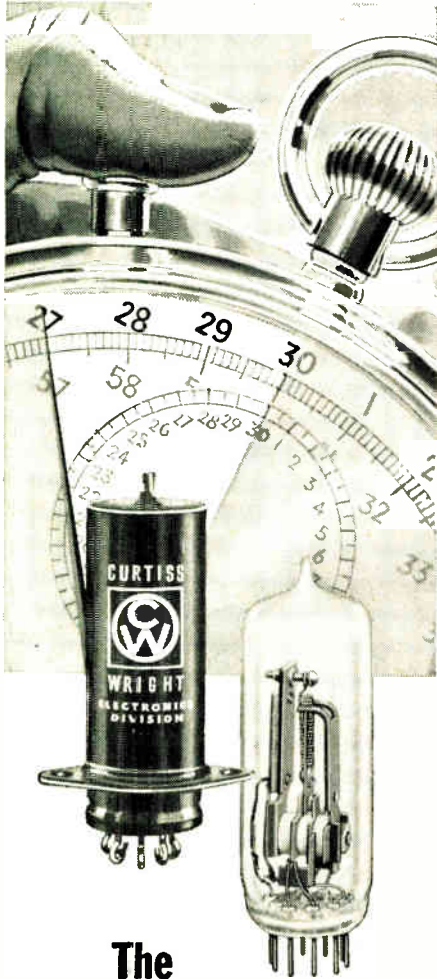


## NEELY ENTERPRISES

*electronic manufacturer's representatives*

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## The Curtiss-Wright "SNAPPER"

**NEW CONCEPT... ADVANCED DESIGN  
IN THERMAL TIME DELAY RELAYS**

- Eliminates chatter with snap action
- Single-pole, double throw contacts
- Wide ambient range (-65°C +100°C)
- For military, commercial and industrial applications
- Metal envelope (7 or 9 pin) miniature or (8 pin) octal
- Glass envelope in 9 pin miniature
- Preset time delays in metal from 3 to 90 seconds, glass from 5 to 60 seconds

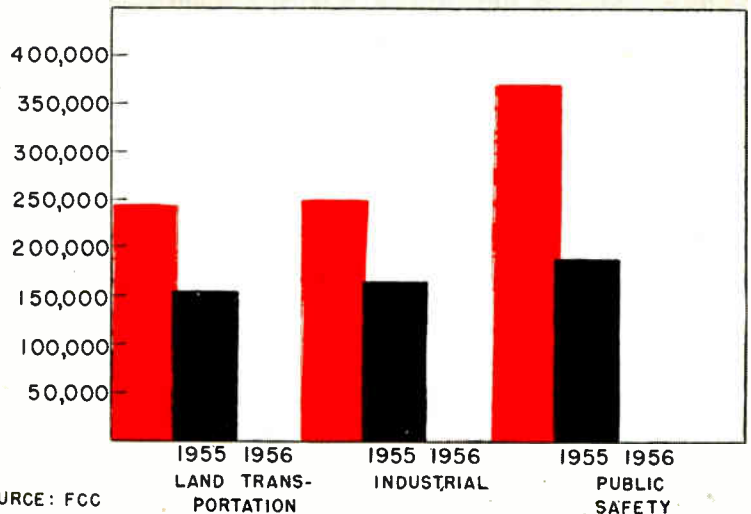
Write to Thermal Devices Department  
for latest data sheets



Want more information? Use post card on last page.

24

### MOBILE TRANSMITTER AUTHORIZATIONS



Public safety sets pace as ...

## Mobiles Hit \$50 Million

New systems multiply rapidly

Police, taxis, utilities big users

Truck and industrial sales going up

MOBILE RADIO has come a long way on land since the Detroit police set up station KOP in 1920. 1956 new equipment sales are estimated at \$46 million, including railroad, and are expected to hit \$50 million in 1957.

The estimate is not ironclad because some producers don't disclose sales. But Motorola sees 1957 as another good year and GE, in a recent report, says its sales multiplied five times in five years.

This optimism is reflected in the latest FCC tabulations of station authorizations, for the period from mid-June, 1955, to the end of 1956. Public-safety stations went from 18,400 to 22,000 and land transportation 20,000 to 31,500, with most of the increase in citizens radio, a band that includes transportation and other uses.

During 1955, mobile transmitter authorizations for transportation, industry and public safety jumped from 510,000 to 871,000. Probably 60 percent were actually on the air. Figuring variables, the breakdown of sets in use is approximately: police, 30 percent; other public services, 10 percent; taxis and utility companies, 15 to 20 percent each; industry, 10 percent; petroleum and mobile citizens band operators, five percent each; railroads, three percent, and all others, one or two percent each.

Manufacturers say sales in local trucking are catching on well, although there is virtually no market in long-distance hauling. Large truck rental firms are offering radio service to customers who want to speed pickups and delivery.

The special industrial classes are booming, but older markets such as taxis and forestry are near saturation. Citizens Radio is running into channel interference in such cities as Chicago, New York, Los Angeles and St. Louis. Mobile users are working out time-sharing agreements as well as seeking additional channels.

## 4-Speed Phonos Enter Market

PHONOGRAPH manufacturers who have dropped three-speed machines say consumer is buying four-speeds even though cost is slightly higher.

Fourth speed, 16 $\frac{2}{3}$  rpm, which augments old 78 rpm and newer 33 $\frac{1}{3}$  and 45, appeared in multispeed phonographs in late 1950.

Sales of so-called talking books, featuring Bible reading and world literature on 16 $\frac{2}{3}$  rpm disks are increasing. Planetary reduction unit which sells for \$1.95 can be attached to 33 $\frac{1}{3}$ -rpm machines for conversion to 16 $\frac{2}{3}$ .

A 16 $\frac{2}{3}$ -rpm record, with finer grooves requiring a finer stylus and lighter arm than those found on conventional four-speed phonographs, has been made by Columbia Records under contract for Chrysler Corp. Designed for music, the records are played on a specially built phonograph for use in automobiles.

## Studio Cameras 25% of Market

"ONE HAS to be terribly careful not to be gored and then crushed by the monsters," said Noel Coward of his experience with studio tv cameras.

\$16 million worth of cameras are now roaming U.S. tv studios. These cameras, using image-orthicon tubes, represent one quarter of the whole tv camera market.

Camera makers expect to sell a total of \$22 million worth of broadcast cameras during the next ten years. The present market is in the neighborhood of \$1 million a year. Sales of replacement image-orthicon tubes are over \$6 million a year.

Studio camera sales should go above the present market level when present tv station license applicants get on the air.

Another stimulant to increased sales is that new lighter-weight, smaller studio cameras will be on the market soon. These will use semiconductors in the camera chain.

*When speed is measured in  
mach numbers the new*

# WALTHAM VERTICAL GYRO

*operates faster,  
more accurately*

Enables fire control systems  
to "think" more clearly



The high reliability characteristics of the Waltham vertical gyro make it the logical choice of the systems manufacturer. Especially significant is the faster erection rate, for normal operational use or for a super-fast initial or in-flight erection cycle. Equally important is the longer operating life...and lower maintenance costs. Shock-resistant, vibration-resistant, hermetically sealed, this unit meets all military environmental conditions.

### PERFORMANCE

**VERTICAL REPEATABILITY:** To within 10 minutes of arc cone.

**INITIAL-ERECTION (Super-Fast):** From any standing position at any temperature from  $-55^{\circ}\text{C}$  to  $+71^{\circ}\text{C}$  to within  $\pm 30$  minutes of arc of Vertical within 25 seconds after application of power.

**IN-FLIGHT ERECTION (Super-Fast):** Roll  $180^{\circ}/\text{minute}$  minimum. Pitch  $200^{\circ}/\text{minute}$  minimum.

**NORMAL ERECTION:**  $5^{\circ}/\text{minute}$   $\pm 1^{\circ}/\text{minute}$ .

**FREE DRIFT:** Roll,  $0.3^{\circ}/\text{minute}$  for any Pitch angle from  $+60^{\circ}$  to  $-60^{\circ}$ . Pitch,  $0.3^{\circ}/\text{minute}$  for any roll angle.

**OPERATING LIFE:** 1000 hours minimum.

**SHELF LIFE:** 5 years.

Send today for engineering specifications and drawings. Facilities are also available to manufacture precision mechanical and electro-mechanical assemblies to your specifications.

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**WALTHAM WATCH COMPANY**  
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# electronics Editor Bill MacDonald Probes the Industry's Technical and Business Status

Despite 30 years of experience, despite a staff of 22 full-time editors, despite the parade of stories, feature-length technical articles, releases, reports and statistics that cross his desk...

*"Mac" spends nearly a third of his time in the field, as shown below,\* with an executive on one side and an engineer on the other.*

That's why 46,000 important people in electronics pay to receive **electronics** 37 times a year.

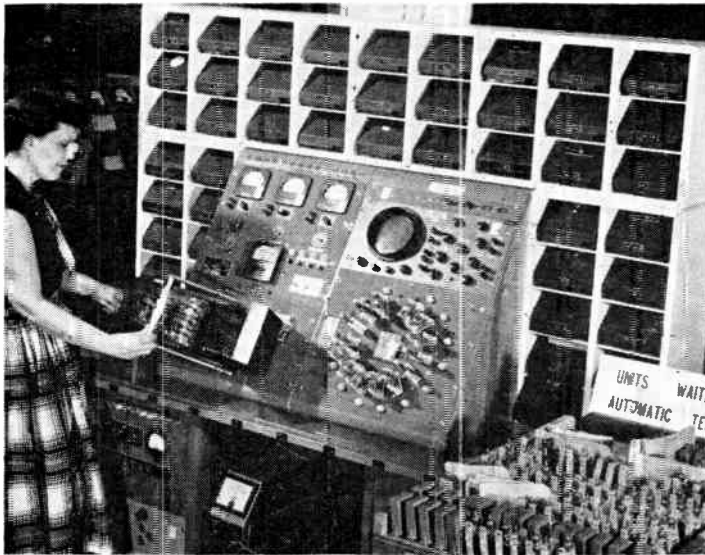
And that's why advertisers buy the 37-time schedule (12 Technical Editions published on the 1st of each month, 24 Business Editions on the 10th and 20th of each month, *plus* the mid-year Buyers' Guide).

\*"Mac" is flanked by Fairchild Camera & Instrument Corp. Executive Vice President Richard Hodgson (right) and Research Associate Charles Pappe (left). Equipment in the background is an Automatic Voice Data Link.



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Plug-in chassis checker proves . . .

## Automatic Testing Pays

Equipment reduces test time 5 to 1  
Semiskilled labor relieves skilled  
Major advantages: uniformity, reliability

AUTOMATIC equipment for production testing, costing \$1 million, is paying off in Westinghouse's Baltimore Air Arm division. Increased production, labor efficiency and product quality as well as reduced cost are immediate benefits.

Substantial future business is expected from manufacture and sale of test equipment for military use in the field.

Plans for the next five or ten years are directed toward production flexibility. "We look forward to the day," division manager S. W. Herwald says, "when we can take a bill of material of any device to be built and punch cards related to this bill of material and come up with complete manufacture and test of the apparatus within a minimum number of manhours."

Devoted entirely to products and facilities for national defense, Air Arm's products fall into five basic categories: fighter armament systems, computers, missile systems, automatic flight control systems and aircraft defense systems.

Formerly, testing alone consumed 30 percent of the total hours needed to produce a system.

"In many cases labor savings of 90 percent have been realized with the new test equipment. Total test time has been reduced by a factor of five to one," says Hank Leone, test department head.

Better utilization of manpower is achieved. Primary objective of automatic test gear is transfer of responsibility for decisions, judgment and mechanical skills from the operator to the machine. As a result semiskilled labor performs complex testing.

"Cost saving is not the prime benefit to come from the test equipment," R. K. McDevitt, manager of manufacturing, says. "Uniform equipment, reliability and adequate maintenance by semiskilled personnel in the field are the major assets."

ELECTRONICS *business edition* — May 10, 1957

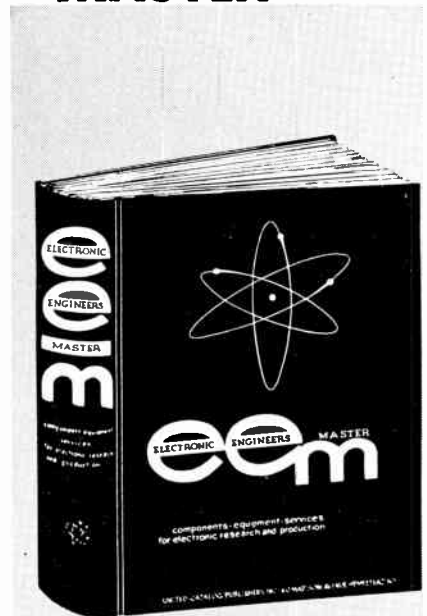
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Units go for heat bath as . . .

## Thermistor Uses Grow

1957 volume \$5 million

Industrial uses increase

Transistors aid thermistor sales

THERMISTORS are gaining popularity as heat compensators in circuits and in temperature-sensing and recording instruments. One source estimates total volume at around \$5 million annually, twice that of 1955.

Thermistors, semiconductor devices whose resistance changes in proportion to heat absorbed, have been used in commercial quantities since the early 1940's.

Leslie K. Gulton, chairman of Gulton Industries, sees a bright future for thermistors in industrial and consumer products. Present applications include: controlling temperatures in processing operations, monitoring engine coolants, setting off fire alarms, turning off the oven when the roast is done, measuring temperature in aircraft, missiles and even human beings.

Thermistors are used as microwave power detectors in waveguides and as heat-compensators in bridge circuits, tuned circuits and regulated power supplies. Increasing use of transistor circuits, in which thermistors can offset heat effects, also helps sales.

Prices for standard types of thermistors are \$1 to \$10. Various oxide blends give temperature ranges from  $-75^{\circ}\text{C}$  to  $500^{\circ}\text{C}$  and sensitivities as high as  $1/1,000$  degree.

## Selenium Gets Priority

THE GOVERNMENT is allowing increased exports of selenium, with priorities for the military needs of our allies.

A supplemental export quota of 10,000 pounds of selenium commodities for the first quarter of 1957 was set in February, in addition

to the 10,000 pounds previously announced for this period. The Department of Commerce says an improved domestic supply of selenium makes this possible.

The quota for the second quarter is 30,000 pounds. First consideration is being given applications

identifying a military end use.

Export applications for the 10,000-pound supplemental first quarter quota were accepted for Belgium, Japan, West Germany, Sweden and U. K. Such applications had generally been denied before this.

An open-end export quota has been established for selenium-bearing scrap materials. This means applications to export this commodity no longer must be supported by evidence that it is unsalable in the U. S., nor contain a certification that it is being exported under toll or conversion agreement.

Commodities under the new quotas include selenium powder; ferroselenium; selenium metal, except selenium-bearing scrap materials; selenious acid; selenium salts of organic compounds; selenium salts and compounds, including selenium dioxide; and selenium-containing pigments.

## Bank Asks

### Computer Bids

ATLANTA'S \$370-million First National Bank is asking 11 computer-makers to bid on a million-dollar system tailored to fit bank book-keeping requirements.

The bank, 69th largest in the U. S., figures it can rent a system "with a production cost as high as \$1 million." It plans to spend \$200,000 to convert from present methods to the system it selects. "We expect to make our research available to other banks upon request," adds controller W. F. Pike.

Atlanta First National wants a system capable of serving 100,000 accounts, with daily handling of 220,000 items, updating 190,000 items and changing 68,500 accounts. It wants an open-end system to allow for unlimited expansion.

Invited to bid: Alvac Corp., Burroughs' Electrodata division, Datamatic, GE, IBM, Laboratory for Electronics, National Cash Register Corp., RCA, Remington Rand Univac, Teleregister and Underwood.



*Stupakoff*

## METALLIZED ALUMINA ASSEMBLIES

*fit your production needs PRECISELY!*

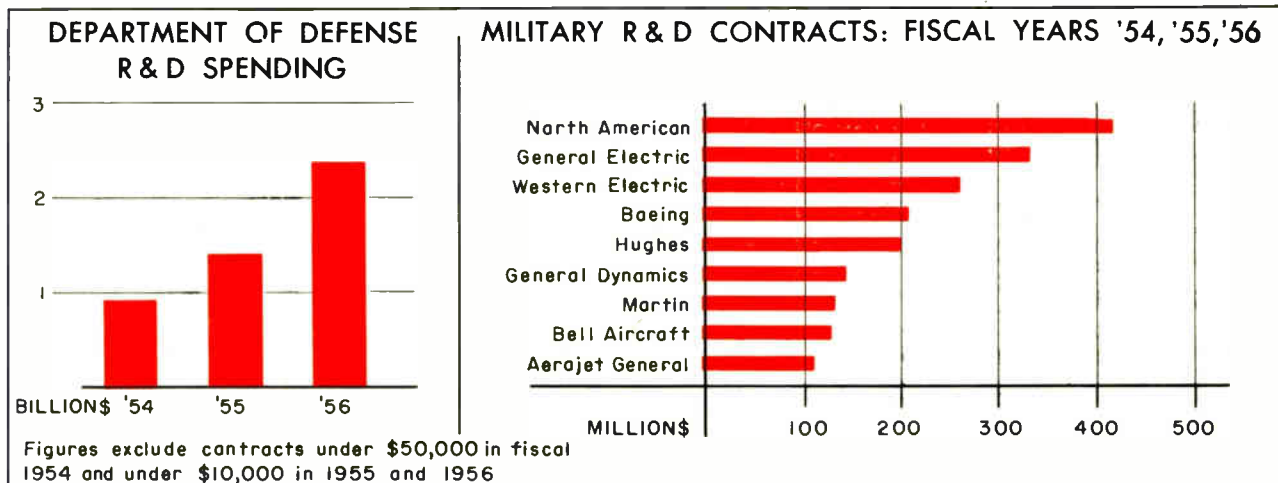
Accurate workmanship and high-strength bonds are the two most-wanted characteristics of metallized ceramic products. Through years of intensive research and development, Stupakoff has perfected the techniques by which these characteristics are obtained. Close control of chemical reactions, metallic deposits, firing atmosphere and temperature, and certain other operations assures strong, tight ceramic-to-metal bonding. Skillful workmanship and modern manufacturing equipment and processes guarantee the accuracy and dependable uniformity of the

products.

Representative examples of Stupakoff Metallized Ceramics are shown above. They are held to tolerances as close as  $\pm .005$  in. and made for assembly by either hard or soft soldering as required. Strict torque requirements can be met if necessary. Many parts are copper plated to reduce oxidation.

We invite you to make use of Stupakoff's engineering facilities to develop metallized ceramic parts that are precisely right for *your* assemblies!

**STUPAKOFF** DIVISION OF  
**The CARBORUNDUM Company**  
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Bringing new weapons out of the wood adds up to . . .

# \$2.4 Billion Defense R&D in '56

Spending up 250% since 1954

\$4.8 billion spent in 3 years

239 firms garner \$4 billion

DEPARTMENT of Defense research and development contracts, which amount to 85 percent of all Federal funds spent for R & D, show an increase for fiscal 1956 over 1954 of more than 250 percent.

Top recipients are heavy developers of electronic equipment.

Of 300 top prime research contractors, 239 are

commercial firms and 61 are educational and non-profit. The commercial firms received over \$4 billion in the three-year period 1954-1956.

MIT, top noncommercial contractor for 1954-1956 period with over \$61 million in contracts, falls 17th in combined commercial and noncommercial listing.

Second in noncommercial list is California Institute of Technology with more than \$50.5 million.

Prime research contractors place much R & D work with subcontractors. One large firm expects to subcontract 39 to 43 percent of recent Army Ordnance research contracts.

## MILITARY electronics

- Hawk ground-to-air missile, designed to augment Nike anti-aircraft batteries with striking power against low-flying enemy craft, "is in process of being put in production," says Defense Secretary Wilson. Raytheon is prime contractor.

- Jet stream research program—Project Arowa—by Navy will use AN/APN-67, automatic electronic navigator, developed by Ryan and Navy's Bureau of Aeronautics.

APN-67 is also being used in Navy's Project Magnet, which measures direction and intensity of earth's magnetic field and Expedition Deepfreeze, in connection with Polar explorations during the IGY.

- Sperry flight control instruments and recording equipment are being used in testing and sailing operations of Navy's experimental submarine *Albacore*. "Six atomic submarines of the *Albacore* class will be built during 1957," says Rear Admiral A. G. Mumma, Bureau of Ships chief.

- Lightweight precision gyro compass system is announced by Sperry. Called C-11 Gyrosyn, 21-pound, all-transistorized system utilizing nonfloated gyros, is said to experience random drift rates under severe stress and vibration of not greater than 0.5 degree per hour.

## CONTRACTS awarded

Autonetics has orders totaling \$4.34 million for NADAR, electromechanical magnetic tape recorder-reproducer system.

Navy's Bureau of Aeronautics will install NADAR valued at \$540,000 in carrier and shore-based, all-weather aircraft for pilot evaluation and training.

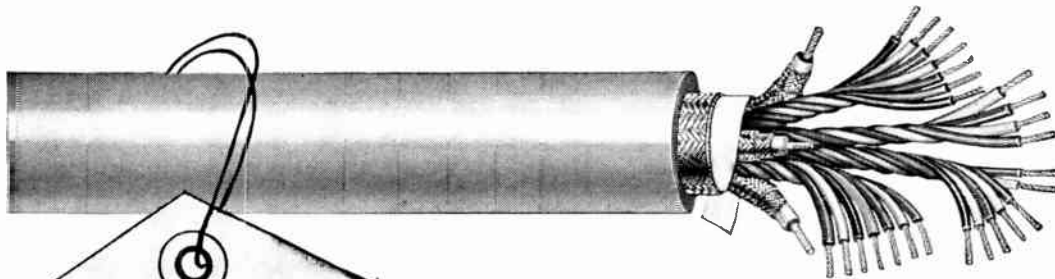
USAF's \$3.8 million order includes NADAR II kits for recorders and reproducers previously delivered to the AF.

Minneapolis-Honeywell will supply an undisclosed number of MB-5 electronic automatic flight-control systems for USAF's F-101B Voo-



If it's worth engineers' time...

...it's worth engineered cable



## Belden

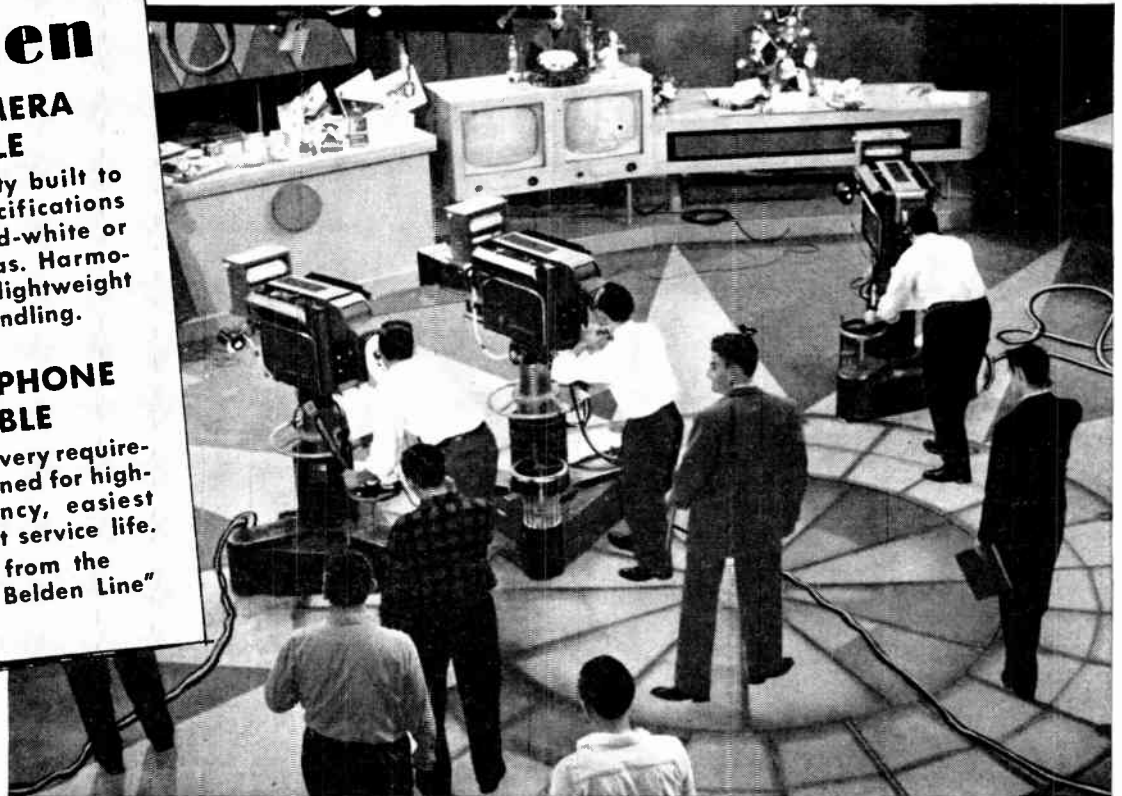
### TV CAMERA CABLE

Belden quality built to exacting specifications for black-and-white or color cameras. Harmonizing color—lightweight for easier handling.

### MICROPHONE CABLE

A type for every requirement, designed for highest efficiency, easiest use, longest service life.

"Items from the Complete Belden Line"



# Belden

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SINCE 1902  
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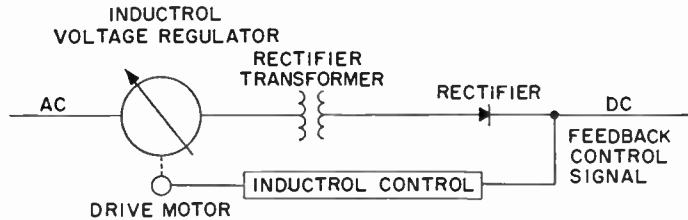
# VOLTAGE REGULATION IDEA FILE

by C. A. Neumann



## ENGINEERING DESIGN IDEA: A.C. Controls D.C.

General Electric Inductrols\*, a-c induction voltage regulators, control d-c voltage or current. Here's how:



Inductrols compensate for a-c line variations, rectifier aging effects, regulation as d-c load current varies, hold voltage (or current) to  $\pm 1\%$ .

**DESIGN BENEFITS:** Inductrol's drift-free controls always keep voltage settings at desired level. Cost is low.

## RADAR APPLICATION IDEA:

New England radar manufacturer uses three single-phase Inductrols to give precise phase-angle control, hold voltage to  $\pm 1\%$ . A three-phase, motor-operated, manually-controlled Inductrol is used for tube warm-up. Power can be increased by raising voltage from 0 to 600 in either two seconds or 30 seconds.

**DESIGN BENEFITS:** Easy-to-install Inductrol introduces no waveform distortion into electronic systems.

## COMPUTER APPLICATION IDEA:

Massachusetts computer manufacturer got line stability and proper tube warm-up by using both voltage stabilizer and voltage regulator. One Inductrol now does both jobs.

**DESIGN BENEFITS:** Inductrol voltage regulators have an excellent space factor, require little maintenance. They neither affect, nor are affected by, system power factor.

## HEAT TEST IDEA:

Boston electronics firm uses battery of infrared quartz lamps to simulate missile in-flight heat conditions. Lamps, energized suddenly on this 208-volt circuit produced rapid heat, but lack of warm-up time caused expensive lamp mortality. A complicated and expensive wiring-switching arrangement was considered, discarded in favor of 3-phase automatic Inductrol voltage regulator.

**DESIGN BENEFITS:** Inductrol voltage regulators have no brushes to maintain or replace; are rugged, designed for long life; are extremely accurate and reliable.

**FOR MORE INFORMATION** write Section 425-8, General Electric Company, Schenectady 5, N. Y.

\*Trade mark of General Electric Company for Induction Voltage Regulators.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

doo under a \$15,516,675 contract with AMC.

Magnavox announces a total of \$17½ million in government contracts this year for airborne communications systems, weather and navigational radar systems, radio direction finders and sonar devices.

Texas Instruments has a \$2,101,256 contract with Navy's Bureau of Aeronautics for AN/APS-45A radar sets, manufacturing drawings, design data and publications.

Transitron will deliver signal generators amounting to \$2,257,863 to the Navy during 1957 and 1958.

Aeronautical Systems will provide Army Signal Supply Agency with services, facilities and materials to conduct study in guided missiles and missile range instrumentation. Total: \$262,020.

Summers Gyroscope is contracted by AMC for directional gyroscopic indicators, type C5C, amounting to \$1,934,152.

Minneapolis-Honeywell has a \$415,312 contract with AMC for MA-2 low-altitude bombing systems.

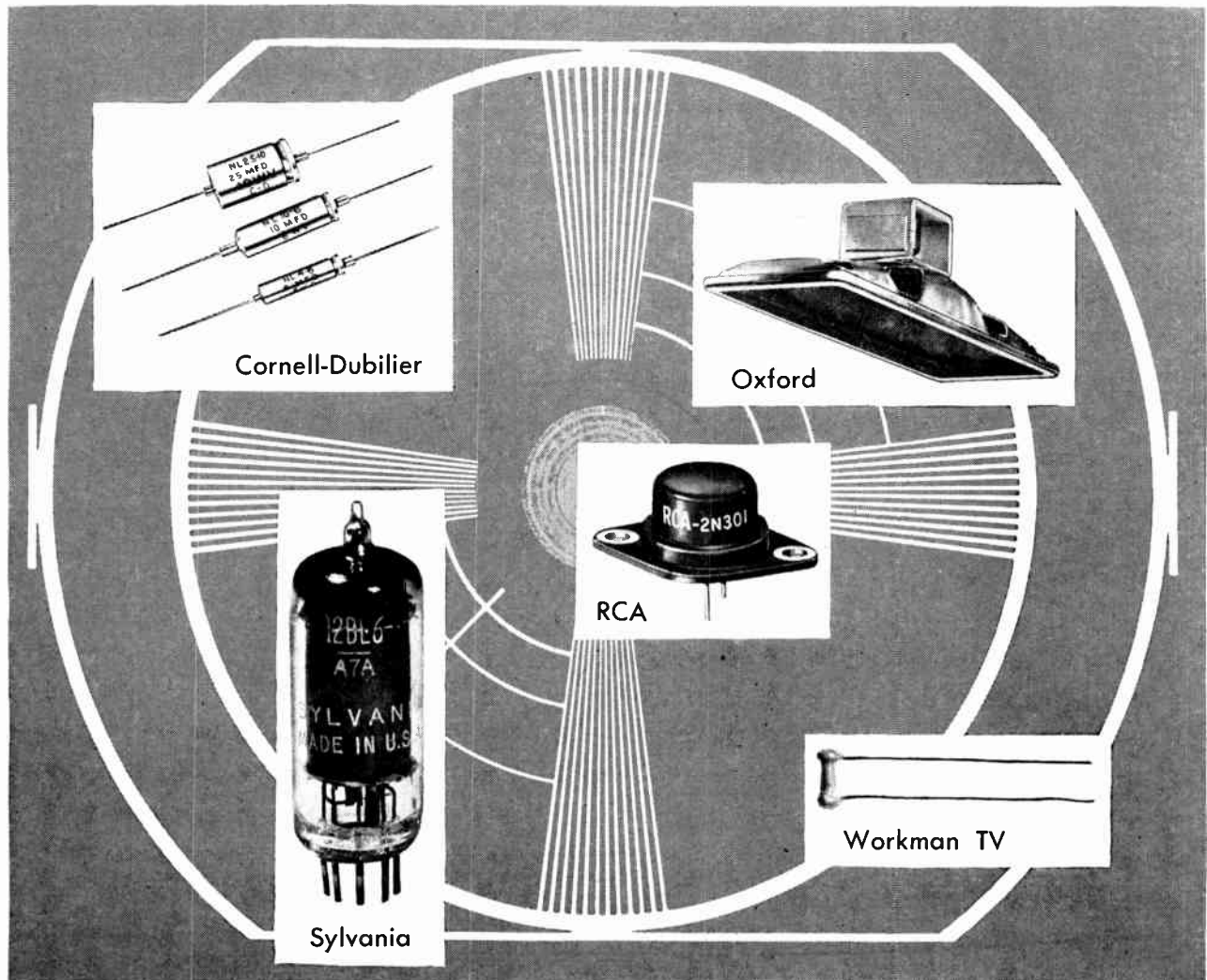
GE has two new AMC contracts: \$7,437,458 for research, development and testing of radar sets; \$1 million for automatic flight-control systems, type AN/ASW-10, for F-105B and F-105C aircraft.

Burroughs gets AMC contract for electronic data processing and transmitting equipment slated for SAGE, valued at \$1,828,149. Burroughs' sales for SAGE program during past 12 months exceed \$23 million.

Hughes will produce weapons-control systems and support equipment for Convair's F-102A (which also carries Hughes' air-to-air Falcon) under \$14,195,373 contract with AMC.

Another AMC contract for \$1,291,319 covers research and development work on more advanced version of armament-control system.

# Radio-Tv Spur New Products



## Small size, low cost help assemblers as . . . Firms Reveal New Components

IN DESIGNING components for entertainment electronic apparatus, packaging and cost are two important considerations. A rectangular speaker 2½ by 10 inches has been developed by Oxford Electric (P1) for radio and tv use. The 2N301 and 2N301A power transistors are announced by RCA (P2) for a-f output stages of auto radios.

Variable resistors that snap into place on printed-circuit panels in tv sets are offered by Chicago Telephone Supply (P3). Sylvania (P4) announces the 12BL6, a sharp-cutoff pentode for use as an r-f or i-f amplifier in automobile receivers where plate and screen voltages are supplied directly from the battery. Workman Tv (P5) announces availability of their miniature resistors for transistorized radios.

## Announce More New Products

L-BAND dummy loads announced by WacLine (P6) are rated at 1,500 watts average and 5 megawatts peak power. . . . Tensitron (P7) announces an instrument for measur-

ing tape tension that is expected to be helpful to the designer of tape recording and play-back equipment. . . . Designed for telemetering applications, Panoramic Radio Products (P8) frequency calibrator

furnishes 7 equally spaced frequencies per channel.

Hysteresis motors announced by Syntorque (P9) for servo applications are available in single or dual speed types and with single or poly-phase winding. . . . Genisco (P10) offers improved accelerometers for aircraft, missile and fire-control applications that are said to meet the requirements of MIL-E-5400 and MIL-E-5272A. . . . Using 250,000-ohm input summing resistors, Belock's (P11) transistorized servo amplifier has a gain greater than 80 db and requires no preamplifier or power amplifier components.

Hybrid T's are available from Microwave Development Labs (P12) for frequencies between

**For more information contact manufacturers listed p 36  
or circle numbers on READER SERVICE CARD (facing back cover)**

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**Catalog #3002 (Vinyl)**—Possesses the broadest possible range of temperature applications in the vinyl field (90° C to -50° C). Fungus and flame proof; high chemical, abrasion resistance.

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In addition, other types of tubing are available for specific purposes. For full technical information, call the "Electrical Desk" at your nearest 3M branch office. \*Reg. T. M.



11 ARGYLE TERRACE, IRVINGTON II, N. J.

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2,700 and 36,000 mc. . . . **Polarad (P13)** announces a sweep generator covering 1,000 to 15,000 mc at 60 cps. . . . Alpha surface contamination can be measured by a portable survey instrument offered by **Nuclear-Chicago (P14)**.

Infrared-sensitive lead sulfide photoconductors for detection and guidance systems are offered by **Electronics Corporation of America (P15)**. . . . Stable local oscillators, available from **Pitometer Log (P16)** for use in moving-target indicating radars, are tunable from 1,200 to 1,350 mc. . . . Lightweight electrical connectors for military and industrial applications by **Pyle-National (P17)** are said to withstand adverse environmental conditions.

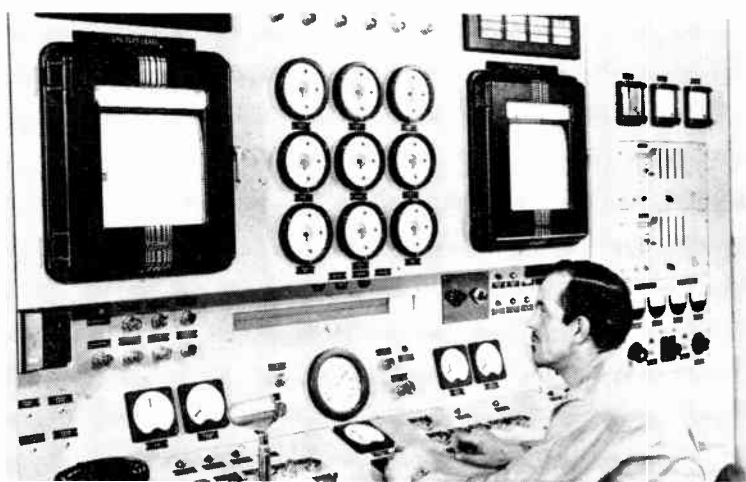
**Federal Telephone and Radio (P18)** announces a 3-D flux meter which measures strength of a magnetic field along each of its three rectangular axes. . . . Reels for 1/2 to 2-inch tape are available from **Standard Record Mfg. (P19)** for use in data-processing equipment. . . . Sine-cosine and square-law function potentiometers are offered in standard and subminiature sizes by **Ace Electronics (P20)**.

Designed primarily for industrial applications, **Kenyon Transformer's**

(P21) a-c line-voltage regulators use a 2-stage magnetic amplifier. . . . **Beckman Instruments (P22)** announces a portable transformation ratio meter for production-line testing of control mechanisms in guided missiles, radar and aircraft. . . . Peak power output of 15 kw is claimed for **Levinthal Electronic Products' (P23)** uhf klystron transmitter for the 375 to 570-mc frequency range.

All-ceramic klystron tubes are announced by **Polarad (P24)** for operation at 1,600 to 6,500 mc. . . . **CBC Electronics (P25)** is marketing a cathode interface-resistance test set which uses the Wagner two-frequency method. Speeds of 7,200 and 1,200 rpm are available with **Western Gear's (P26)** 400-cycle, 200-volt, 3-phase constant torque motor for military applications. . . . **Perkin-Elmer (P27)** announces an improved auto-zoom lens with a speed of f/3.5 for vidicon tv camera tubes.

Two ultrasonic transducers are offered by **Acoustica (P28)** for use in high-temperature environments. . . . An audio amplifier tube, the **Genalex KT88**, is introduced by **British Industries (P29)**. . . . **Mack Electronics' (P30)** harmonic wave analyzer has been designed for measuring amplitude of signals and



## Utilities Next?

Atomic power people hope this will be a common sight soon. Pile operator views console controlling the experimental boiling water reactor at Argonne National Laboratory. It's on-stream and producing electricity. Square panels are log and linear flux-level indicators

May 10, 1957 — ELECTRONICS business edition

harmonics from 10 to 500 kc.

A 10-ampere 4-pole relay developed by Allied Control (P31) is said to meet requirements of MIL-R-5757B, MIL-R-6106A and MIL-R-25018. . . . Called Deltaply 85 capacitors, a line offered by Dearborn Electronics Laboratories (P32) are said to have a small uniform capacitance change with temperature.

Called Hipermag, a magnetic core available from Westinghouse (P33) is for magnetic amplifier reactors, transducers and other magnetic devices. . . . Film-type glass resistors in values from 10 ohms to 4.2 megohms are announced by Corning Glass (P34) for high-temperature applications. . . . North Hills Electric (P35) has developed a current stabilizer which controls current in 1-ma steps from 1 to 600 ma at voltages from zero to 3,000 volts d-c.

Square-wave generators offered by D. C. Brocker Labs (P36) have a center frequency of 1 kc and a rise time of 0.4 microsecond. . . . Shock-mounted quartz crystals introduced by Bulova Watch (P37) for operation in the frequency range of 16 to 350 kc are designed for missile and aircraft applications. . . . An epoxy-encapsulated push-pull magnetic deflection yoke announced by Syntronic Instruments (P38) fits 3-inch diameter neck cathode-ray tubes.

F-R Machine (P39) is producing directional couplers for the frequency range 2,600 to 75,000 mc. . . . Transistorized building-block type logical circuits have been developed by Computer Control Company (P40) for asynchronous digital computing, data handling, and logical analysis. . . . Telemetering f-m to voltage converters developed by Epsco (P41) are said to make corrections unnecessary for component aging, thermal drift and gain variations.

ADC Electronics' (P42) automatic high-potential tester is said to speed up production line insulation testing of connectors, transformers, coils, relays. . . . Balanced

# Shot in the Dark!

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Manhattan at 10 P.M. This is how the city looks to a passive infrared detection system. The brightest spots reveal the areas of greatest activity . . . the brightness of each spot on the map below is a function of its temperature.

Recently declassified, this photograph was taken in 1951 (using panchromatic film) with equipment manufactured by Servo Corporation of America. At that time, Servo Corporation had already solved the problems of wide area infrared detection.

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### DIVISION OF PLANNING AND ECONOMIC DEVELOPMENT

Virginia Department of Conservation and Development  
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microwave mixers for operation between 7,800 and 8,200 mc are available from Sage Laboratories (P43) with assured input vswr of 1.25:1. . . . Wire-wound resistors as small as  $\frac{1}{8}$  inch in diameter are offered by Daven (P44) for missile and aircraft applications.

Vibrators  $1\frac{1}{2}$  inches high and  $\frac{3}{4}$  inch in diameter have been developed by Mallory (P45) for missiles, beacons and airborne equipment. . . . Four types of *pn-p* silicon transistors (2N327, 2N328, 2N329 and 2N330) are available in packages suitable for automatic assembly from Raytheon (P46). . . . Production of a  $1\frac{1}{2}$ -inch square panel meters, designed for mounting in edge-lighted panels, is announced by International Instrument (P47).

### New Product Makers

- P 1: Oxford Electric, 3911 S. Michigan Ave., Chicago, Ill.
- P 2: RCA Semiconductor Div., Sumnerville, N. J.
- P 3: Chicago Telephone Supply, Elkhart, Ind.
- P 4: Sylvania, 1740 Broadway, New York, N. Y.
- P 5: Workman Tv, 309 Queens Anne Rd., Teaneck, N. J.
- P 6: WaeLine, Inc., 30 S. St. Clair St., Dayton 2, Ohio
- P 7: Transitron, Inc., Harvard, Mass.
- P 8: Panoramic Radio Products 10 S. 2nd Ave., Mt. Vernon, N. Y.
- P 8: Panoramic Radio Products, 10 S. 2nd Ave., I. N. Y.
- P10: Genisco, 2233 Federal Ave., Los Angeles 64, Calif.
- P11: Belock Instrument, 111-01 4th Ave., College Point, N. Y.
- P12: Microwave Development Labs., 92 Broad St., Wellesley 57, Mass.
- P13: Polarad Electronics, 42-20 34 St., Long Island City 1, N. Y.
- P14: Nuclear-Chicago, 223 W. Erie St., Chicago 10, Ill.
- P15: Electronics Corp. of America, 1 Memorial Drive, Cambridge 32, Mass.
- P16: Pionmeter Log, 237 Lafayette St., New York 12, N. Y.
- P17: Pyle-National, 1331 N. Kostner Ave., Chicago 51, Ill.
- P18: Federal Telephone & Radio, 100 Kingsland Rd., Clifton, N. J.
- P19: Standard Record Mfg., 70 N. San Gabriel Blvd., Pasadena, Calif.
- P20: Ace Electronics Associates, Somerville, Mass.
- P21: Kenyon Transformer, 840 Barry St., New York 59, N. Y.
- P22: Beckman Instruments, 2500 Fullerton Rd., Fullerton, Calif.
- P23: Leventhal Electronic Products, 2760 Fair Oaks Ave., Redwood City, Calif.
- P24: Polarad Electronics, 43-20 34th St., Long Island City, N. Y.
- P25: CFC Electronics, 2601 N. Howard St., Philadelphia 33, Pa.
- P26: Western Gear, Lynwood, Calif.
- P27: Perkin-Elmer, Norwalk, Conn.
- P28: Acoustica Associates, Glenwood Landing, N. Y.
- P29: British Industries, 80 Shore Rd., Port Washington, N. Y.
- P30: Mack Electronics Div., 1120 S. 2 St., Plainfield, N. J.
- P31: Allied Control, 2 B. End Ave., New York 21, N. Y.
- P32: Dearborn Electronics Labs., 1421 Wells St., Chicago, Ill.
- P33: Westinghouse Electric, Box 2275, Pittsburgh 30, Pa.
- P34: Corning Glass, Corning, N. Y.
- P35: North Hills Electric, 402 Sagamore Ave., Mineola, N. Y.
- P36: D. C. Brocker Laboratories, P. O. Box 967, Sunnyvale, Calif.
- P37: Bulova Watch, Woodside 77, N. Y.
- P38: Syntronic Instruments, 170 Industrial Rd., Addison, Ill.
- P39: F-B Machine Works, 26-12 Borough Pl., Woodside 77, N. Y.
- P40: Computer Control Co., Wellesley, Mass.
- P41: Epso, 588 Commonwealth Ave., Boston 15, Mass.
- P42: AIC Electronics, 6765 Paramount Blvd., N. Long Beach, Calif.
- P43: Sage Laboratories, 30 Guinan St., Waltham, Mass.
- P44: Daven Co., 550 W. Mt. Pleasant Ave., Livingston, N. J.
- P45: P. R. Mallory & Co., 3029 E. Washington St., Indianapolis 6, Ind.
- P46: Raytheon, 55 Chapel St., Newton 58, Mass.
- P47: International Instruments, P. O. Box 2954, New Haven 15, Conn.

# FCC Takes Uhf Action

**Will scrap allocations table**

**Action slow in coming**

**Congressional concern forces move**

BECAUSE of furor over uhf television's future, industry tugging at the Federal Communications Commission, this agency moves to grant stations without a table of allocations. Drastic move in policy, it will please some, dismay others. It may aid uhf.

Ever since FCC lifted its freeze on new station assignments over three years ago, one question has plagued it: What to do about uhf?

Practically every expert in the broadcasting industry who has testified before FCC or congressional committees investigating the problem has agreed that there are not enough vhf channels to go around, that tv's future depends on uhf.

However, experience appears to indicate that uhf stations can not coexist in the same town with vhf. They have a strong tendency to go broke.

FCC began to practice what it calls "selective deintermixture." This means the agency takes up station channel allocation applications one by one or in small bunches, and decides to make this market

all uhf, that market temporarily all vhf, another market half-and-half.

After nine months of laboring over pending cases, FCC has found it possible to make just a handful of city-by-city determinations. Most of these decisions have been tentative.

Meanwhile, Congress—particularly the Senate Interstate and Foreign Commerce communications subcommittee—has been prodding FCC to "do something."

FCC's tentative decisions seem to favor vhf for large cities, uhf for smaller ones. The agency is reported to be considering Evansville, Ind.; Fresno, Calif., and Peoria, Ill. all uhf markets.

New Orleans, which was scheduled to be made predominantly uhf, comes out of the FCC as more vhf. Boston, St. Louis, Miami, Seattle and Indianapolis get new vhf's.

According to Chairman George McConaughy, the Commission makes this latest move to alleviate the uhf situation until more is learned about uhf and its competitive position in vhf markets. A number of industry studies are in the works on this problem. But they aren't scheduled for completion until late 1957 or 1958.

## FCC actions

- Permits AT&T to revise tariffs on off-the-air pickup and relay channels for tv programs but at the same time will launch investigation into reasonableness of new tariffs.

- FCC is being studied by House Interstate and Foreign Commerce Committee. Administration practices is target.

- Amends Conelrad rules. In June words "all clear" will be eliminated from messages authorizing radio stations to return to normal operation.

- Adds television channel 6 to Miami, Fla., channel 4 to Charleston, S. C., channel 13 to Norfolk - Portsmouth - Newport News, Va. area, channel 10 to Duluth, Minn.-Superior, Wis. area.

- Gives its Network Study Committee authority to hold hearings and issue subpoenas. Move gives teeth to Committee.

- Announces that in granting a broadcasting station c-p, it will no longer worry about what this might do in terms of survival for stations already broadcasting. This reverses a policy of 15-years standing.

- Amends broadcast rules to reflect policies and procedures for considering a-m broadcast applications in line with new U. S.-Mexico broadcasting agreement.

- Grants c-p to Skyline Broadcasting for radio station in Littleton, Colo.

- Grants c-p to West Central Broadcasting for uhf tv station in LaSalle, Ill. to operate as satellite of WEEK-TV, Peoria, Ill.

## STATION moves and plans

KFTV, Omaha, Neb., plans to go on the air in September. It will be affiliated with ABC television network.

WNEW, New York, N. Y., goes to DuMont Broadcasting for a whopping \$7.5 million. Former part-owner and station manager Richard D. Buckley stays in charge.

WPPH-TV, Wilmington Del., will move its transmitter (channel 12) from five miles northeast of Wilmington to a point 26 miles eastward, nearer Philadelphia. Antenna height will go from 623 to 900 feet.

WHIE, Griffin, Ga., is sold by Gateway Broadcasters to Telrad for \$100,000.

KTXL-TV, San Angelo, Texas, management control passes from B. P. Bludworth and A. D. Rust to



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Roy H. Simmons and Angelo Broadcasting-Television.

WLPO, La Salle, Ill., is increasing power, installing directional antenna and new transmitter.

KVOO-TV, Tulsa, Okla., buys color studio equipment for origination of film and slides.

KTWO-TV, Casper, Wyo., begins operation affiliated with both ABC and NBC.

KIRT, Mission, Tex., goes on the air.

WGBI-TV, Scranton, Pa., is changing its call letters to WDAU-TV.

WFGA-TV, Jacksonville, Fla., is constructing new 28,000-sq ft tv studio. It will have complete color facilities.

Intercontinental Broadcasting System is name of new network being formed for western radio and tv stations. Frank Oxarart, president, claims outlets in San Francisco, Los Angeles, Las Vegas, Oklahoma City, Honolulu, San Bernardino.

WMSA, Massena, N. Y., is installing a new transmitter.

KCBQ, San Diego, Calif., is installing a new transmitter.

WYZL, Atlanta, Ga., is installing a new transmitter.

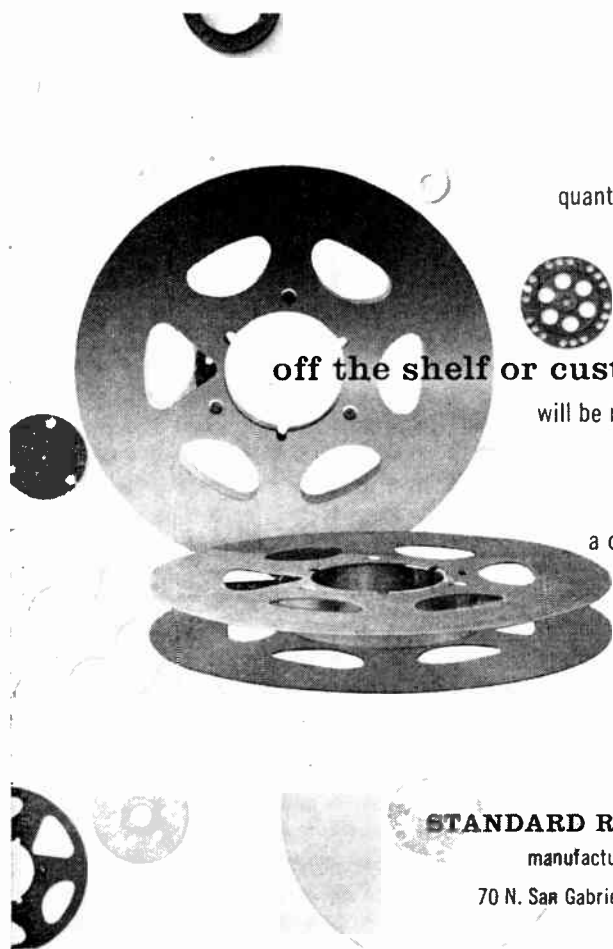
WTTW, Chicago, Ill., plans upping its power from 56,000 to 278,000 watts. The channel 11 educational outlet wants to reach out an additional 10-15 miles.

WHTN-TV, Huntington, W. Va., affiliates with CBS-TV network.

KIMA-TV, Yakima, Wash., has its third satellite station in KBAS-TV, Ephrata, Wash. Other two are KEPR-TV, Pasco, Wash., and KLEW-TV, Lewiston, Idaho.

WKNK, Muskegon, Mich., is sold to Muskegon Broadcasting by Nicholas and Gladys Kuris for \$150,000.

WKJG, WKJG-TV, Fort Wayne, Ind., is sold by Northeastern Indiana Broadcasting to WKJG, Inc. for \$1,925,000.



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# Size Sells Hearing Aids

Transistors add new customers  
\$80 million 1956 sales estimate  
One company pushes all-in-ear aid

SUBMINIATURIZATION is pushing hearing aid sales towards \$100 million a year. It is opening a vast new market among people who declined bulky aids because they drew attention to deafness or were inconvenient to wear.

Leland Rosemond, head of Otariion, estimates 1956 industry sales at 250,000 to 300,000 aids worth \$80 million. Market in pretransistor 1952 was \$30 to \$35 million.

Dyna-Empire, a receiver and microphone manufacturer, is turning out 7,500 aid units weekly. A. J. Mellon, Jr., sales manager, figures the nationwide consumption at no less than 450,000 a year, including replacements. From 1.5 to 1.75 million people now wear aids.

Mellen says subminiaturization has turned a stable market into an expanding one. He and Rosemond see a 15 to 20-percent sales spurt in 1957. Moving aids to the head, Mellen thinks, added 20 to 30 percent to the industry's gross in the past 15 to 20 months.

Some subminiature hearing aids fit all in the ear. A new Sonotone model packs 87 components into 0.30 cubic inch and weighs 0.58 ounce. This is accomplished with transistors weighing 0.005 ounce and a mercury battery of 0.04 ounce. The device will correct to 25 db.

## 27,000 Use Radio Paging

EIGHTY-FIVE one-way radio-paging services operating in 34 states use approximately 150 transmitters (500-watt maximum) and more than 27,000 receivers.

Two frequencies, 35.58 and 43.58 mc are allotted to a city.

New York City's paging services

both transmit from the Empire State building. Their combined subscribers total more than 1,300.

Within a 40-mile radius subscriber may hold receiver to his ear, press a button and hear subscribers being paged by their code numbers.

Numbers are called in numerical order. On hearing his number, subscriber calls home, office or answering service.

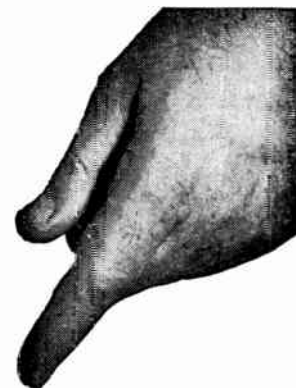
At one paging service each subscriber's code number is recorded on a 1½-in tape block which an operator puts into, or removes from, a groove on a slowly revolving wheel. The numbers are picked up by tape-recorder playback head.

Many paging services make tape recordings every time there is an addition or cancellation of numbers being paged.

One three-tube paging receiver measures 2½ to 3½ inches and weighs 7 ounces. A two-tube model measures 6¼ by 1½ inches, weighs 5½ ounces.



Subscribers' code numbers are permanently recorded on tape block which Aircall operator puts into, or removes from, circular groove on roulette-like wheel



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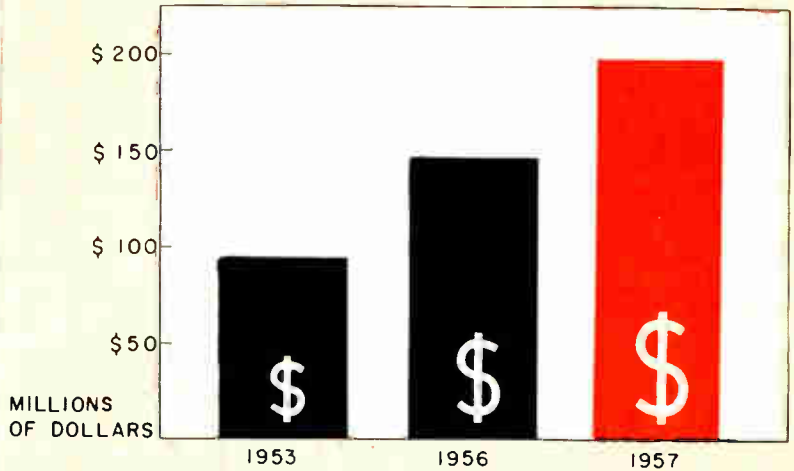
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## INVESTMENT CASTING SALES



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Growing use in electronics helps . . .

## Casters See Increase

Trade out to surpass '56 record

Investment casting improves products

Electronics could buy \$10 million

INVESTMENT casters expect 1957 to be fatter than 1956, partly because of increasing electronics patronage. Usual investment casting procedure is forming a wax pattern in a master mold, pouring the "investment" or production mold and disposing of the wax. The investment is destroyed after the part is cooled and poured. Such casting was known to Renaissance jewelers, but didn't become industrially prominent until the 1930's.

K. W. Thompson, Investment Casting Institute president, reports 1956 sales of \$148 million, 1957 expectations of \$175 to \$200 million. Casters will add 27 percent more plant space this year.

Jet engine blades overshadow every other use. Electronics consumes about one-tenth of the remainder, estimates W. I. Matthes, a director of the Institute. This will be about \$10 million in 1957.

In 1954, the Institute found 75 percent of casting manufacturers producing electronics parts. Electronics was seen as the greatest potential market by 66 percent.

The heavier the casting, the more difficult it is to maintain precision, so investment casting is primarily a small parts method. The limit for aluminum is generally two pounds. Most runs for electronics are under 1,000 parts.

## Arc Produces Jet Stream

WATER-STABILIZED electric arcs promise to aid R&D of missiles and rockets, environmental testing of electronic gear that goes into them.

Work by University of Chicago for GE's aerosciences lab has pro-

duced temperatures of 14,000 K and can sustain them over useful periods. Sun's surface is 6,000 K.

New device should put firmer footing under development of:

- Electronic equipment that can

operate reliably under temperature extremes.

- Heat transfer shields and heat sinks to protect sensitive apparatus.
- New alloys capable of sustained heat-transfer.
- Ion-stream propulsion systems.

Stabilization of electric arc is key to higher temperatures and production of high-velocity ionic jets. Unstabilized arcs spread out with current increase. Stabilizing device whirls water vapor around arc at constant pressure. Increase in current density brings higher temperature limited only by the amount of current available.

Dissociated atomic vapor or ion streams present rocket-drive possibilities because of velocity of such streams. Directing and focusing ion streams will require electronic techniques and equipment.

## Student Hiring Climbs

ELECTRONICS FIRMS are easing their need for men by hiring for the summer. They find engineering students form an excellent summer manpower mine.

The mine's not exactly untapped. Today nearly 100 percent more companies are hiring MIT students for summer work than three years ago, the institution reports. For the first time, even freshmen are being sought.

Yet, this vital fact remains: only in the field of students wanting summer work is there a men-over-jobs surplus.

Many companies, trying to cut costs, seek workers to free engineers of lower-echelon clerical duties. Students often perform such chores.

Firms hiring technical students for the summer pay well, MIT reports. Typical monthly salaries: freshmen, \$300; sophomores, \$340; juniors, \$385; seniors going to graduate school, \$425; graduate students, \$460-\$500.

Firms report favorable results with summer technical employes. And students themselves like the few-months blending of experience with theory.

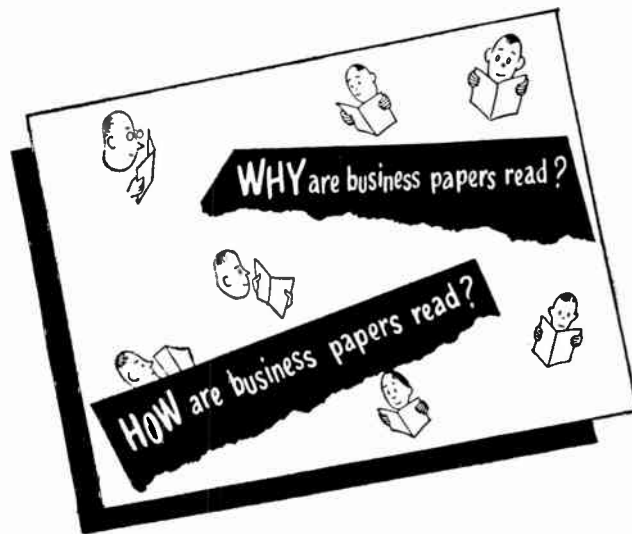
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# Computers Abroad Rate High

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**U.S. firms set up centers overseas**

U. S. COMPUTER makers are finding growing markets in Western Europe. But our computer engineers can pick up a few ideas from European-made computers, too.

These were among impressions gained by a Harvard University assistant professor during a three-month tour overseas. Robert C. Minnick teaches applied mathematics in Harvard's computation laboratory. He visited 32 computer establishments in 12 countries, but did not go to Russia.

European computer research is typically clever.

"But certainly the United States is ahead technically," says Minnick. "And perhaps we lead in design philosophy. However, I believe this country can gain by studying some research Europeans are doing."

A few overseas computers have poor reliability, but some are every bit as reliable as ours. As for engineering brains, France and Sweden each have two really top men, good as any in this country.

As for size, most of Europe's computers are reasonably small. The largest are made in Britain and Sweden. These compare to U.S. medium ones. Both nations, though, have a few with more capacity than commercially available medium computers.

Europe's economic condition, much more restrictive than ours, has a marked influence on computer production and research.

"Computer users in the U.S. don't have to build computers," says Minnick. "They can go buy them. But in Europe many users are often forced to make their own and, at the same time, do much of their own research. Thus, Europe's future computer strength may lie in its novel ideas."

More of Minnick's observations: Most European research is noncommercial. Government-backed efforts are common. Engineers? There's a critical shortage over there, too.

From a technical aspect, four things impressed Minnick:

The microprogram matrix and logic scheme used in the EDSAC II computer at Cambridge University, England.

An electroluminescent display device for plotting output in a digital computer at the University of Manchester.

A variable-reluctance magnetic-tape-recording scheme. Also at Manchester.

A novel function generator using 35-mm film, developed by Contraves in Zurich, Switzerland.

Computers are being produced commercially, mainly, in Britain and France. In the other nations, it's usually a case of one company turning out one computer of a kind.

## Developments ABROAD

• Russia may be turning to tv to bolster her propagand in satellite states. First station in Rumania was scheduled to begin operation last month. Previously 2,000 tv sets were shipped from USSR to Rumania, which may have 50,000 by 1960 including some from East Germany. Significant is sale of sets to "cultural houses" not private individuals. Observers say Communist propagandists are acquiring a new means of spreading selected material.

• In Algeria, where tv sound is broadcast in French and Arabic and sets can be switched from one language to the other, relay stations are being built around Oran to pick

up and rebroadcast programs from Algiers. Oran has been promised the broadcasts in Fall. Some 3,000 sets began receiving regular telecasts in Algiers last December, says Department of Commerce. Radio-diffusion Television Francaise broadcasts from temporary facilities while work goes ahead on a tv center.

• Australia's sixth tv station—Melbourne's third—opened recently with what is called the largest studio outside U.S. and Britain. It's operated by General Television Corp. Pty. Ltd. Melbourne expects to see her four and a half broadcast hours increased. Sydney also has three stations.

## EXPORTS and IMPORTS

Tokyo's International Trade Fair (May 5-19) will have RCA's first Far East color tv demonstrations. The \$1 million exhibit includes color tv studio facilities, two camera chains, lighting and testing apparatus, film transmitting facilities and two mobile units.

West German relays made to specifications of Elgin National Watch electronics division will join Elgin's industrial line. Said to be non-competing imports, the new relays will be sold under Elgin's name. They include telephone, power control and stepping types.

New Zealand is getting microwave radiotelephone link between Hamil-

ton and Pamerston North. Equipment is supplied by Standard Telephone and Cables. Completed projects include trunk network linking Auckland with Wellington and installation of coaxial cable between Auckland and Hamilton.

Sweden's Royal Board of Telecommunications places \$140,000 order with Marconi for twelve 5-kw f-m vhf transmitters for November delivery. Last year Norway placed similar order for 11 transmitters.

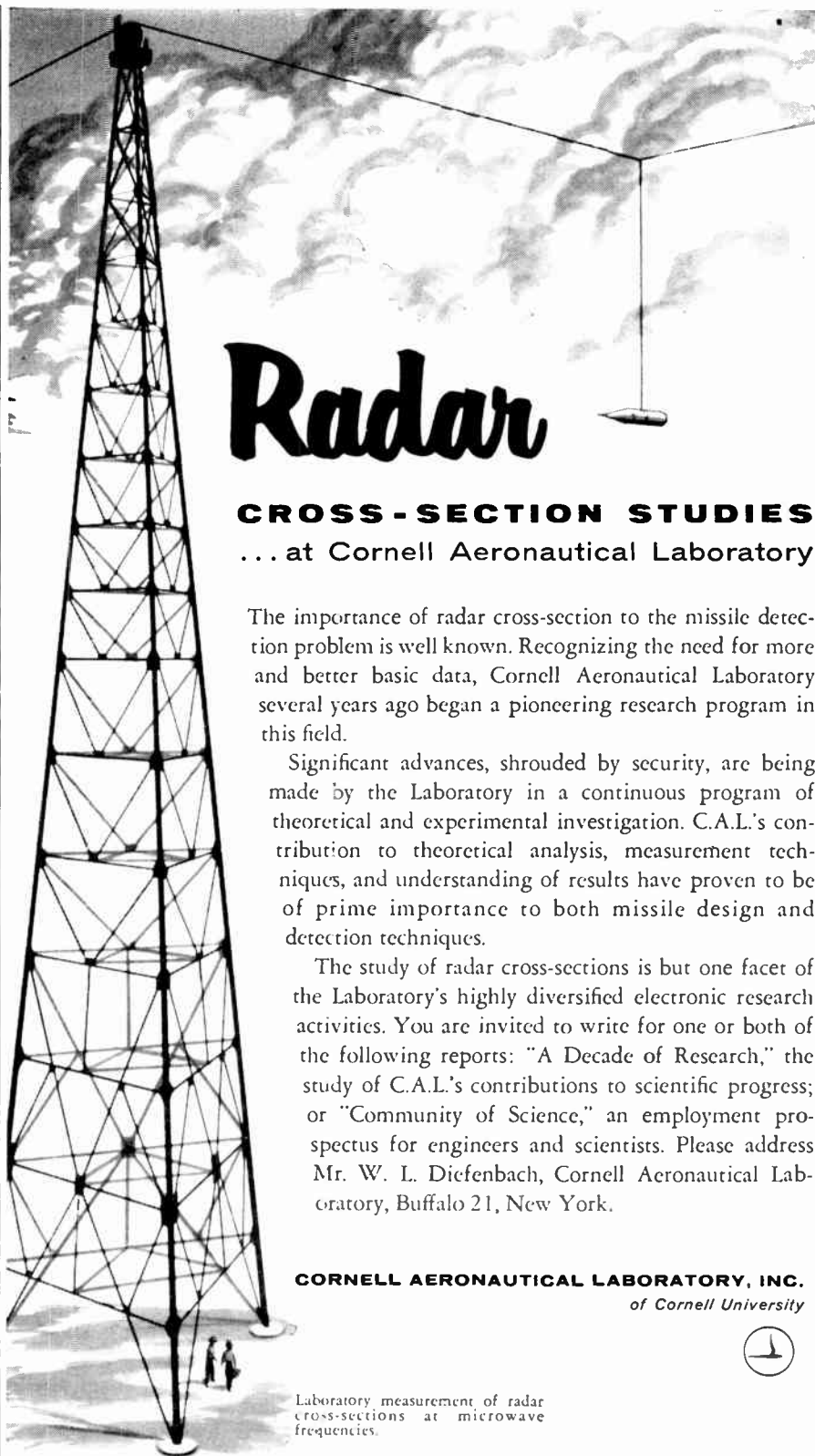
Poland is reported investing \$5.75 million this year in tv stations and relay links scheduled to operate by December. Big projects include stations in Kattowice and Posen, studio in Lodz, transmitter in Warsaw and Warsaw-Lodz relay system. Polish Communications Ministry estimates 8,000 sets now registered, says setmaking will expand to supply most of need.

**Australian** x-ray and medical equipment maker Medical Equipment Services Pty., Ltd. plans expansion, seeks U. S. firms to buy manufacturing end of business in association with another Australian firm. Plans stem from Southeast Asia survey which has already prompted Australian makers of x-ray and allied products to form Australian Medical Export Co. Data available from Department of Commerce.

**British** fighter-bombers will get U. S. low-altitude bombing system under \$750,000 contract with Minneapolis-Honeywell's aeronautical division. State Department grants license and approval to start immediate delivery of an undisclosed number of systems, which allow jets to skim towards targets at tree-top level, lob bomb from tight turn and escape blast area.

Swiss firm Thorens S. A. of Ste Croix expects to compete in world hi-fi market with new unit retailing in Switzerland for \$240, including a 15-watt amplifier priced at \$90.

**French** firm Etablissements Serpo, 7 rue Chaudrier, La Rochelle, Charente-Maritime, seeks agency for radio sets and accessories.



# Radar

## CROSS-SECTION STUDIES


... at Cornell Aeronautical Laboratory

The importance of radar cross-section to the missile detection problem is well known. Recognizing the need for more and better basic data, Cornell Aeronautical Laboratory several years ago began a pioneering research program in this field.

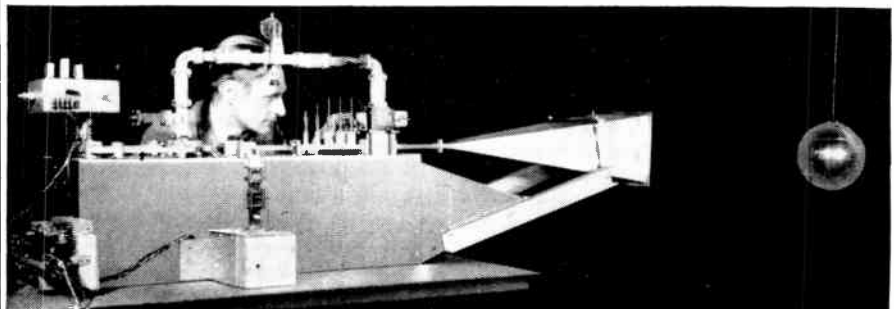
Significant advances, shrouded by security, are being made by the Laboratory in a continuous program of theoretical and experimental investigation. C.A.L.'s contribution to theoretical analysis, measurement techniques, and understanding of results have proven to be of prime importance to both missile design and detection techniques.

The study of radar cross-sections is but one facet of the Laboratory's highly diversified electronic research activities. You are invited to write for one or both of the following reports: "A Decade of Research," the study of C.A.L.'s contributions to scientific progress; or "Community of Science," an employment prospectus for engineers and scientists. Please address Mr. W. L. Diefenbach, Cornell Aeronautical Laboratory, Buffalo 21, New York.

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# PLANTS and PEOPLE



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## Hoffman Opens Research Lab

SEMICONDUCTOR plant opened only two years ago in Evanston, Ill., by Hoffman Laboratories has already burst its seams, will shortly outgrow new benches recently fitted.

Hoffman Labs, industrial research and production division of West Coast's Hoffman Electronics, just opened a two-story 10,000-sq ft addition. Upstairs will go R&D, downstairs production. Hoffman also bought 104,000 sq ft of ground down the street. A 100,000-sq ft two-story plant will start up on new site in a month or so.

Evanston facilities develop and produce silicon products, employ 250 people. Projected new plant will put 500 more to work. George Kneipfer is plant production manager, doubles in brass as director of sales. V-p M. E. Paradise (with visiting firemen in picture) is responsible for the Evanston semiconductor division.

In other moves at Hoffman Labs Los Angeles headquarters:

Manager of military requirements Tom C. Clark moves into new job as director of military sales. Clark will supervise both sales and sales support activities.

Vice president Carlton Was-  
mansdorff sheds administrative

duties onto new chief engineer Richard A. Maher. Wasmansdorff takes on special job running R&D on new ground and shipboard systems.

Former Hughes Aircraft promotion man E. Philo Davis moves in to manage advertising and sales promotion for the Laboratories.

## ACF Groups Join

COUNTERMEASURES, instrumentation, missile products and nuclear reactors are being lumped together in ACF Industries' Nuclear Prod-

## Business MEETINGS

May 15-17: 33d Annual RETMA Convention, Sheraton Hotel, Chicago.

May 20-23: 1957 Electronics Parts Distributors Show, Conrad-Hilton, Chicago.

June 6-7: Conference on Production Techniques, Willard Hotel, Washington, D. C.

ucts-ERCO division. Two parts brought together are ACF's 7-year-old nuclear-energy division and what was Engineering & Research Corp., acquired by ACF in 1954.

President of NP-E division is Marshall G. Holloway, atom scientist who left MIT's Lincoln Labs to join ACF. Company's reactor activities will remain under guidance of Harold Etherington, who has worked closely with principal customer AEC. Holloway is expected to concern himself chiefly with electronics and systems design, his principal interests at Lincoln Labs. Headquarters of new division is in Washington, D.C.

## Westinghouse Goes Hi-Fi

SHARE in the now-stabilizing hi-fi market is aim of Westinghouse Electric, currently forming a high-fidelity, radio-phonograph department within its radio-tv division. Manager of new department is R. H. G. Mathews, former director of Magnavox's hi-fi division.

Meanwhile, company's research laboratories are setting up a physics project lab to speed up product engineering on developments emerging from basic research programs. Moving up to head the lab is former executive assistant A. E. Anderson.

## CEC Buys Neighbor

BUSINESS marriages sometimes seem to follow social patterns, attract neighbors into two-ings.

Consolidated Electrodynamics Corp. is now taking over the 130 employees, 27,200-sq ft plant and operations of William Miller Instruments Inc., CEC's next-door neighbor in Pasadena.

Miller makes recording and data-handling gear, caught CEC's eye with multichannel photographic recorder for crt display systems. Now known as Miller division of CEC, it will be directed by CEC v-p William D. Nesbit.

Manager is former Miller executive vice president Edwin M. Graham. Paul L. Ashway, former v-p



Edited by DON FINK

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and plant manager, is director of manufacturing.

## Shifts at GE

HEAVY military electronic equipment operations at General Electric are spreading out from Syracuse into Utica, N. Y. HMEE pushed its brother, light military electronics, out of 100,000 sq ft of floor space, absorbed 400 LMEE workers.

At the same time, GE's broadcasting operations and its interests in printing house Maqua Co. were transferred to apparatus sales division. J. Milton Lang, former tube department chief, becomes general manager of broadcast station operations and president of Maqua.

## General Dynamics Expands

GENERAL DYNAMICS is pushing its corporate expansion on several fronts. First 44,000-sq ft building of the John Jay Hopkins Laboratory is now going up on a 300-acre site near San Diego. The four buildings of the big laboratory complex will give the corporation's General Atomic division some 185,000 sq ft of floor space, plus a reactor building whose size has not yet been determined. Cost of the whole development will be near \$10 million.

The Stromberg-Carlson division is also embarking on an expansion program in San Diego. Production facilities will be increased by 25,000 sq ft during this year.

## IRC Hires Two Sales Managers

PHILADELPHIA'S International Resistance Co., quietly reshaping its sales organization, has appointed two new sales managers.

Sales chief of IRC's Hycor division in Sylmar, Calif., is Robert L. Colfax. Colfax was formerly on the staff of Indiana rep Vernon C. MacNabb, who handles IRC products in the Midwest.

Otho C. Lindsey was hired away from Erie Resistor, where he was a

research engineer. He takes over management of sales for Circuit Instruments Inc., IRC subsidiary in St. Petersburg, Fla. Lindsey was on the faculty of Carnegie Tech before his present appointment.

## New England Scenery Changes

INSTRUMENT manufacturer Harvey-Wells Electronics, Southbridge, Mass., dissolves as an independent entity on the New England scene. Meanwhile a new R&D firm springs up in Boston.

Sixteen-year-old Harvey-Wells becomes part of the family of old-timer Whittin Machine Works, Whitinsville, Mass. Old management crew stays in operating jobs.

Boston's new research outfit is Electronic Systems Inc., with MIT-man Robert W. Maglathin as president; Harvardmen Everett H. King and John B. Levin are vice presidents.

## Computermakers Tighten Lines

COMING BATTLE for the computer market takes shape as the computer-makers tighten up their sales and distribution organizations. Logistics Research has a new marketing director, Andrew T. Fischer, hired away from his job as sales manager for RCA's computer division.

Another Bizmac man, Frederick G. Miller, leaves RCA to become manager of field-service operations for Datamatic. Miller is no stranger to the Boston region, having worked with Harvard's computer patriarch Howard Aiken in the development of the relay and drum calculators Mark II and III.

IBM has established an eastern regional headquarters for its data-processing division, with Charles Benton Jr. as manager. Boston district manager Charles G. Ruykhaber becomes manager of marketing services for the region and Cincinnati district manager Robert H. Howe takes over in Boston.

Robert G. Dec, Electrodata's central region manager, becomes

Want more information? Use post card on last page.



general sales manager for this Burroughs division and engineer J. F. Kalbach moves up as field engineering manager.

## Plant Briefs

CARRIER subsidiary Colorado Research Corp., growing out of two small offices in Denver, will build electronics research lab on 10-acre site in Broomfield Heights, Colo.

Reeves Instrument, Long Island subsidiary of Dynamics Corp. of America, is moving into \$500,000 research and production facility at its Roosevelt Field, L. I., plant. Lab will develop miniature and subminiature gyros for aircraft.

Component maker Radio Kematal Industries is building 20,000-sq ft engineering and production plant on 10-acre site in Des Plaines, Ill. \$600,000 plant, to be finished in August, can be expanded to four times present size.

## Executive Moves

MAGNAVOX sets up West Coast office for government and industrial division. J. J. Slattery moves out from Ft. Wayne to run it. Howard B. Allen is upped to executive assistant to G&I vice president.

Former Zenith Radio man Francis A. Meyers leaves a vice-presidency of Chicago's Remco Inc. to go home. He'll manage midwestern distribution for Zenith's hearing aids. New manager of hearing-aid division is appliance-sales expert Joseph J. Sullivan.

Datamatic Corp. gets new sales v-p as John E. Johnson takes over the job.

General manager Bernard Levine of Norden-Ketay's precision components division becomes a v-p, keeping former responsibilities.

Davis R. Dewey II takes over as president of Baird-Atomic, moving Walter S. Baird up to board chairman.

Camden, N. J., component maker Radio Condenser Co. has a new controller as John M. Kellie comes in to take over job.

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# Reps Boom, Areas Shrink

TREND in manufacturers' representative business is toward larger sales organizations serving smaller territories, says Clarostat sales manager F. J. Chamberlain. "Not so long ago, most rep organizations were one- to two-man teams. Today the most successful reps have . . . sizable staffs with impressive office facilities."

Chamberlain sees greater profits resulting from concentrated efforts on smaller areas and elimination of nonproductive travel time. Distributor and manufacturer are both served more efficiently, and "the rep is better remunerated for his more intensive efforts."

Red Bank, N. J., rep Harry Miller and Koessler Sales of Los Angeles, are handling Magnecord line of Tulsa's Midwestern Instruments.

Fischer & Porter, Hatboro, Pa., now markets the electronic tank gages of Gilbert & Barker Mfg., West Springfield, Mass. F&P will

manufacture receiving and transmitting devices for use with Gilbarco's sensing systems.

San Marino, Calif., rep G. S. Marshall is moving into a 7,500-sq ft headquarters building to house sales and service facilities. Marshall has taken on precision components line of Tech Laboratories, Palisades Park, N. J. Marshall also copped Helipot salesman George E. Meadows, put him to work selling components in southern California.

New sales rep in Southwest: Frank Malley & Associates, Albuquerque, N. M. Malley was formerly industrial sales manager for New York's Fisher Radio Corp.

Reporting boom in industrial and oil development, Electronic Service Supply Co. Ltd., Calgary, Alta., western Canada distributor of radiotelephone, sound and communications gear, opens a branch in Regina, Saskatchewan.

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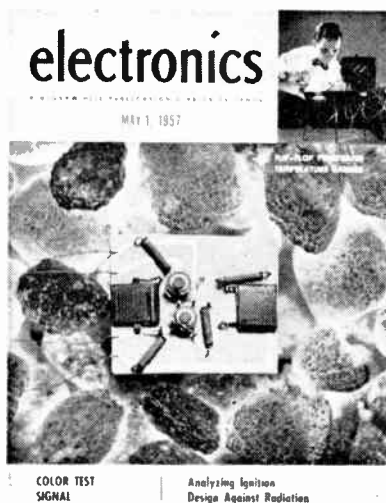
CLASSIFIED ADVERTISING  
F. J. Eberle, Business Mgr.

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EMPLOYMENT OPPORTUNITIES..... 47

## In our May 1 TECHNICAL edition, don't miss . . .

- Temperature indicating instrument in missile telemetering system that employs chopper-type d-c amplifier. Described by J. Porter of Portronics, Inc., amplifier has voltage gain of 1,000 with 5-volt d-c output and linearity within 2 percent over full output range. Stability is within 2 percent up to 10 g vibration at 1,000 cps or over temperature range from -40 to 85 C.

- Economical tv receiver made possible by using single miniature tube for sync clipping, generating age voltage. Described by Spracklen and Stroh of Zenith Radio Corp. and Wood of General Electric Co., the 6BU8, gives a high degree of noise immunity to both these sections. It contains common cathode, grid and screen with separate plates and number three grids.



- Handy data sheet. Engineers who get confused with temperature conversion from F to C or vice versa should tear out a page from the May 1 issue of ELECTRONICS.

It gives Fahrenheit equivalent of each Centigrade value from absolute zero to 799 C in steps of 1 deg C.

- Low-cost organ explained by George and Cutler of Organ Designer & Builder and Pacific Mercury Television Corp., respectively. Number of tone oscillators is reduced from 61 to 16 by sharing oscillator for three adjacent keys and reducing keyboard range one octave.

- Present and future applications of voltage-tuned magnetron for f-m. Tube is discussed by Bristol and Griffin of General Electric Co. It is stacked metal-ceramic miniature magnetron operating in the 2-kmc to 4-kmc range, has average output power capabilities up to ten watts.

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On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts

are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

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Each New Product item in ELECTRONICS has a number (P1, P2, etc.). Circle the corresponding number in section B of the Reader Service Card (below).

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See Fractional Page Diagram on Other Side of This Page!

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### SECTION A

2	7	10	18	25	31	35	38B	43	46T	4th Cover
3	8	11	23	27	32	36	40	44	2nd Cover	
4	9	12	24	29	34	38T	41T	45	3rd Cover	

### SECTION B

CIRCLE FOR NEW PRODUCTS HERE

P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
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P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

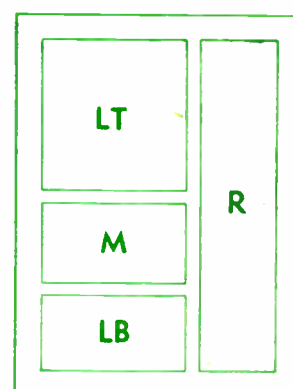
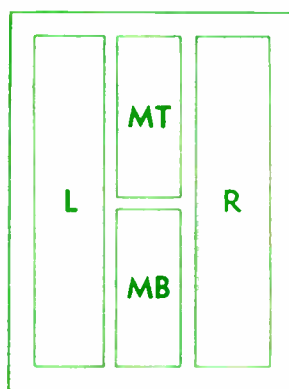
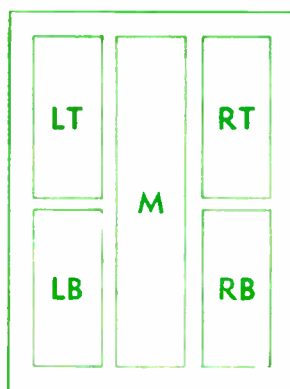
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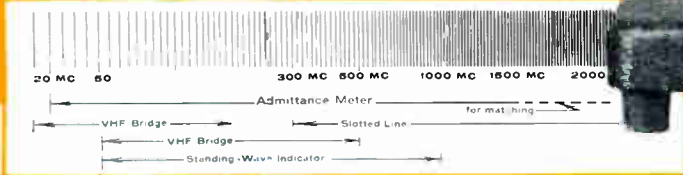
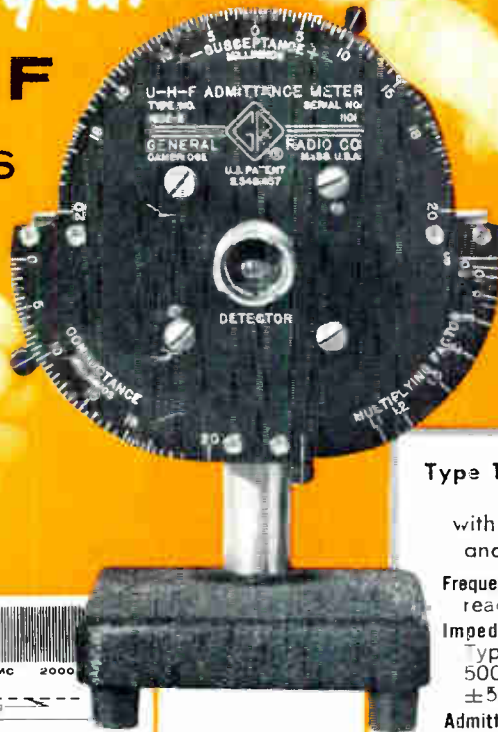
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- LT—Left Top
- LB—Left Bottom
- M—Middle
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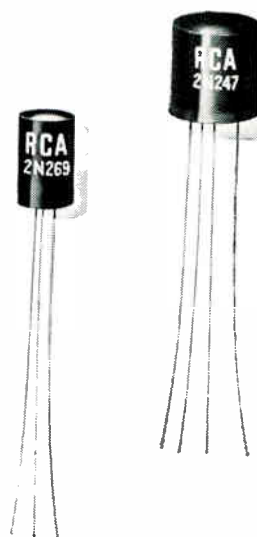
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