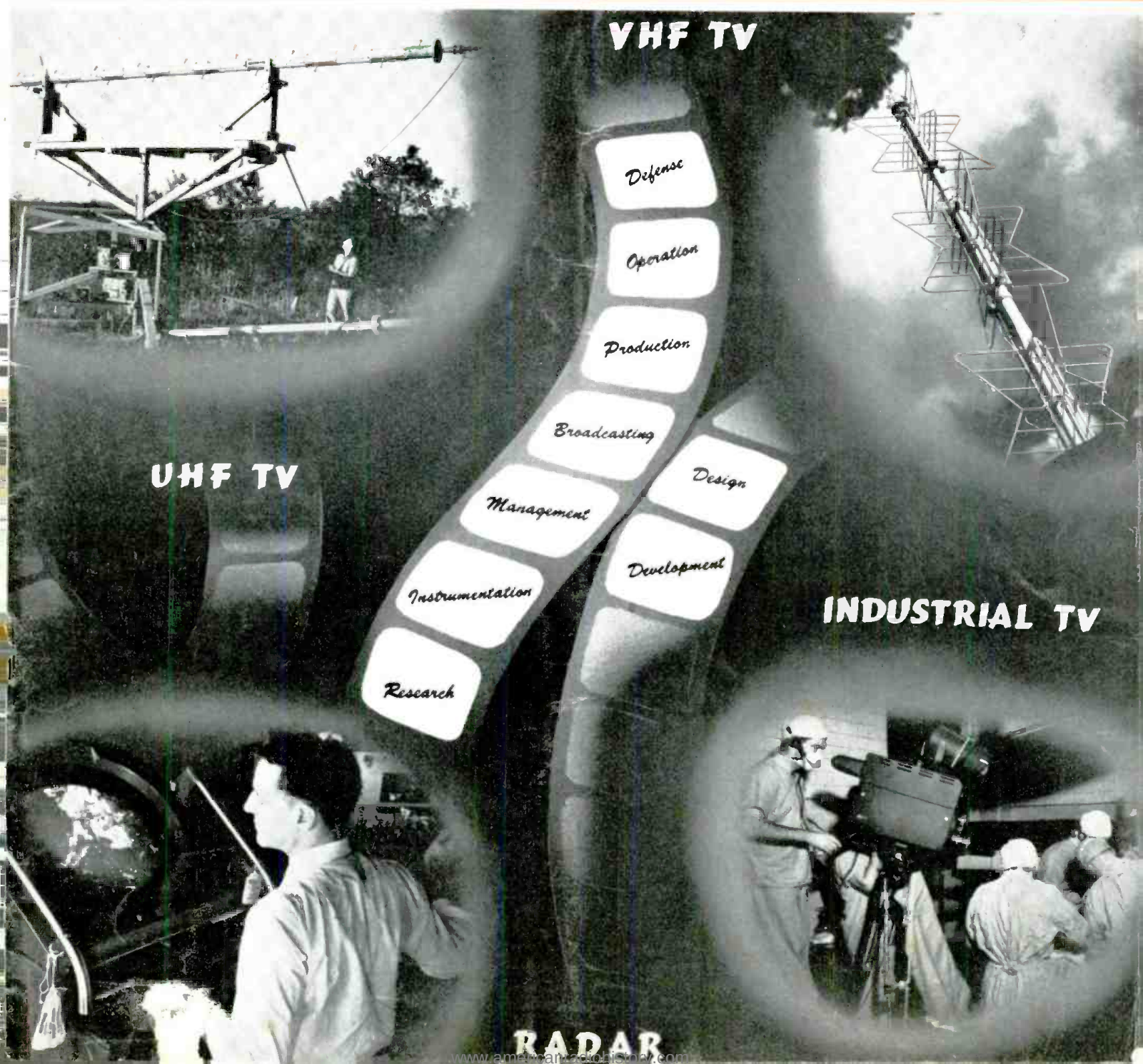
TELE-VISION ENGINEERING

DECEMBER, 1951

The News-Engineering Journal of The TV Industry



YOU DON'T BUILD
1,000
WAR PLANES
WITHOUT TESTING
ALL COMPONENTS OF
THE FIRST MODEL

Buy YOUR TRANSFORMERS
ON A "PROVE-IT-FIRST" BASIS

HEAVY DUTY FILAMENT TRANSFORMER

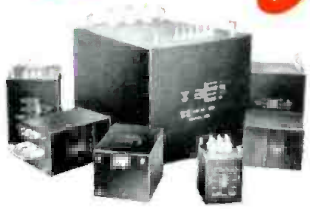


PLATE TRANSFORMER SHOWN (l to r) WITH POWER, FILAMENT, CHOKE, DRIVER, FILAMENT AND SMALLER PLATE TRANSFORMERS ALL BUILT TO MIL-T-27 SPECIFICATIONS HERMETICALLY SEALED

POWER TRANSFORMER SHOWS CONSTRUCTION BEFORE PUTTING IN STEEL CASE. BUILT TO MIL SPECIFICATIONS.

It's a good feeling, when you order a quantity of GRAMER Transformers, to know that each unit is physically and electrically in keeping with your specifications. This is usually achieved by first arranging for a production sample GRAMER Transformer (hermetically sealed to MIL-T-27 Government specifications, or one of open type construction). Such procedure permits putting your GRAMER production sample to *any* test in your electrical equipment. Precision manufacturing assures physical and electrical correctness, uniformity for easy assembly and substantial savings on your quantity orders.

James M. Blacklidge
PRESIDENT

One good Turn—or a Million

FILAMENT AUDIO TRANSFORMERS
•
FILTER REACTORS
•
ISOLATION-STEP-UP STEP-DOWN TRANSFORMERS
•
WINDINGS

GRAMER
TRANSFORMER
CORPORATION

2734 N. PULASKI ROAD • CHICAGO 39, ILLINOIS

SEND YOUR B/P SPECIFICATIONS

TELE-VISION ENGINEERING

Including Radio Engineering, Communications and Broadcast Engineering. Registered U. S. Patent Office.

Research . . . Design . . . Production . . . Instrumentation . . . Operation

VOLUME 2 **DECEMBER, 1951** **NUMBER 12**

MONTHLY FEATURES

Cover Illustration

The four key members of the TV engineering family: UHF-TV, VHF-TV, Industrial-TV and Radar. *(VHF and UHF photos courtesy RCA; Industrial-TV view, courtesy DuMont; and Radar illustration, courtesy Raytheon.)*

Editor: LEWIS WINNER

Published monthly by Bryan Davis Publishing Co., Inc., 52 Vanderbilt Avenue, New York 17, N. Y. Telephone: MUrray Hill 4-0170.

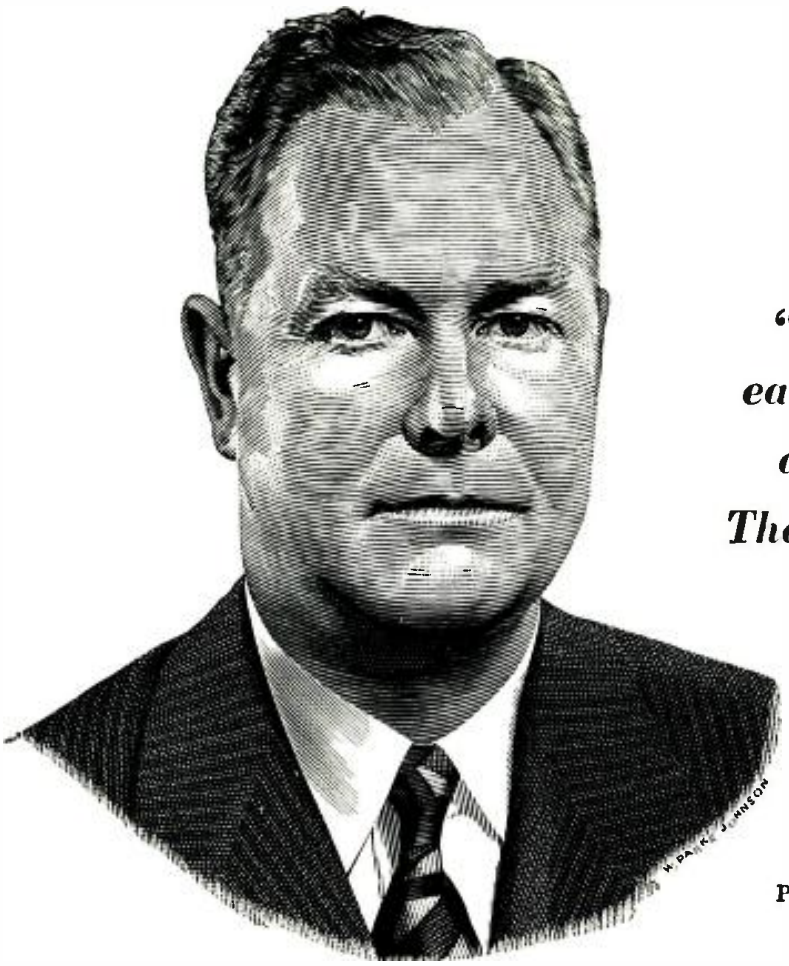
Bryan S. Davis, President. Paul S. Weil, Vice-Pres.-Gen. Mgr. Lewis Winner, Editorial Director. F. Walen, Secretary. A. Goebel, Circulation Manager.

Mid-West Representative: Stuart J. Osten, 333 N. Michigan Ave., Chicago 1, Illinois. Telephone: Dearborn 2-3507
East-Central Representative: James C. Munn, 2253 Delaware Drive, Cleveland 6, Ohio. Telephone: ERieview 1-1726.
Pacific Coast Representative: Brand & Brand, 1052 West 6th Street, Los Angeles 14, Cal. Telephone: Michigan 1732. Suite 1204, Russ Building, San Francisco 4, Cal. Telephone: SUtter 1-2251.

Reentered as second-class matter February 7, 1950 at the Post Office at New York, N. Y., under the act of March 3, 1879. Subscription Price: $3.00 per year in the United States of America and Canada; 50c per copy. $4.00 per year in foreign countries; 60c per copy.

Te Aro Book Depot: Wellington, New Zealand. McGill's Agency: Melbourne, Australia.

TELEVISION ENGINEERING is indexed in the Engineering Index.



"...Nearly nine out of each ten of our employees are...participating in The Payroll Savings Plan."

E. J. HANLEY

President, Allegheny Ludlum Steel Corporation

"Systematic Savings offer the surest means of future security and we know of no better systematic savings plan than that afforded by payroll deduction purchases of U.S. Defense Bonds. Nearly nine out of each ten of our employees are helping their country while they save by participating in this plan."

There are three easily understood reasons why 88% of Allegheny Ludlum's 14,378 employees are enrolled in the Payroll Savings Plan:

- the recognition by Mr. Hanley and his associates of the Payroll Savings Plan as a major contribution to America's Defense effort . . . an important, stabilizing factor in our national economy . . . a road to personal security for Allegheny Ludlum employees.

- Allegheny Ludlum's person-to-person canvass of employees, which put an application blank for the Payroll Savings Plan in the hands of every man and woman on the company payroll.

- the patriotism and sound sense of the Allegheny Ludlum employees who know that every dollar they invest *each month* in U.S. Defense Bonds is a double duty dollar—it helps to keep America strong . . . it builds personal security for the employee.

If employee participation in *your* Payroll Savings Plan is less than 50% . . . or if you are one of the relatively few industrial companies that does not have a Payroll Savings Plan, phone, wire or write *today* to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D.C. You will get all the assistance you may need to place your company among the thousands of companies that have 60, 70, 80%, even 88% participation in the Plan That Protects.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

TELEVISION ENGINEERING

TELE-VISION ENGINEERING

LEWIS WINNER, Editor

December, 1951

Men, Microwaves and TV*—When, on that memorable evening in September, the eyes of millions on the east coast sped across the country to the San Francisco Auditorium to see that historic telecast, the thrill enveloped not only Mr. and Mrs. America, but that sparkling family of scientists and technicians who made the miracle possible. Forty-odd months ago the link had been just a challenging idea on a slip of paper. In the late summer, the plan roared to life . . . truly a glowing tribute to those who conceived this brilliant program.

The installation was an exhausting one. Men had to work in deserts, hills and valleys, in jeeps and on foot, looking for the best routes and most suitable hilltops. Men had to dig in the blistering heat of the summer sun in the San Joaquin Valley, and fight raging winter blizzards in the Sierra. In the biting wind, men had to mount poles and install cables for alarm and other special purposes. Steep ridges had to be climbed to install intermediate stations. Towering ranges had to be scaled to prepare for other signal-stop housings.

The long trek to the Pacific coast was arduous, but not trying. For everyone knew that when this epic job was done, the results would more than compensate for the effort.

No one will forget this unmatchable exhibition of organization and teamwork, ingenuity and ability, and the stubborn determination to see a big job well done and on time.

Truly, few accomplishments have contributed so much to the pageant of progress as this sterling feat, which can be called the outstanding event of the year!

*With apologies to M. D. Walkup, general plant manager, Bell Telephone System, northern California and Nevada area.

Subscription TV—As the erp's hit new highs, the day of the freeze-end approaches, and the possibilities of many, many new stations come into sharper focus, TV appears to be destined for a bright future. But there looms one major problem . . . programming. For when programs become weak, as they have on too many occasions, viewers disappear, interest in TV wanes, and everyone up and down the line, including setmakers, transmitter manufacturers and show folk, all begin to suffer.

It has been readily admitted that TV is a devouring devil engulfing talent and energy. Films, staggered production programs, educational forums, revivals, have been offered as solutions to this omnivorous problem, and have helped considerably. Subscription TV has been suggested on many occasions as the ultimate solution.

Those in favor of box-office TV have offered very convincing arguments in its behalf. They have pointed out that only through this type of consumer prepayment will it be possible to continue offering of programs which will attract and hold viewers. Admitting that sponsors have paid enormous sums for programs, box-office TV believers state that advertisers will be unwilling to continue, and perhaps unable to continue, paying for the types of programs which will hold viewers.

According to one set manufacturer, currently sponsoring one type of subscription TV, the prepaid service would add immeasurably to the market potentials of those producing chassis, accessories and even equipment for transmitting systems.

The establishment of subscription TV on a commercial-service basis has already been proposed to the Commission. Out on the Pacific coast, KTLA has been authorized to conduct experiments with a telemeter or coin-type system, which requires coin deposits for preferred programs.

During the next twelve months, subscription TV might become quite a dominant factor in TV programming, and introduce a unique era in our way of life.

Radar and TV—At the close of World War II, the world learned of a scientific marvel that helped so much to doom the enemy . . . *radar*. Its possibilities in peacetime for air and sea traffic control were acclaimed, and soon harbors and vessels were equipped with the restless eyes of this unique medium to pierce fog and darkness. Civilian plane services also began using these roving scanners in the sky and on the land, and many others found vital uses, too, for this wonderful tool.

Today, radar has become the key not only to foolproof navigation, but the accurate control of an assortment of equipment, particularly the endless stream of land, sea and air military apparatus. Like its picture-tube ally, TV, it provides a visual, moving, instantaneous record, and offers, through the medium of radio echoes, graphic presentations of range and bearing on a 'scope screen.

As the defense program swings into high gear, radar once more has become a priority item on the research and production front. Already there have appeared striking developments, as a result of these accelerated assignments—developments which will play quite a role in not only preserving the peace, but enriching our civilian economy.

Although many of the developments are of a secret nature, there are many aspects which can be described, and should be detailed in the scientific press to stimulate further interest in the art. As a service to our readers, TELEVISION ENGINEERING will hereafter present a continuing report on radar, covering all facets of the science. To illustrate, there have been scheduled for future issues, articles on . . . the present and future of the radar antenna and servo field; opportunities for obtaining contracts and subcontracts; facilities and personnel required; design and manufacture of radar antennas; organization of production personnel; wave-guide selection; design and manufacture of servo systems. Also to be described are radar beacons, echo measurements, target control, etc. Of course, all other phases of the TV art, including the veryhighs and ultrahighs, on the research, development, production, management and broadcasting fronts, will continue to receive featured attention in TELEVISION ENGINEERING, in every issue.

It is hoped that these analyses will serve to excite new interest in this comparatively new field, and further its value in the military and consumer world.—L. W.

TVE-grams . . .

Down and Up Consumer Allotments: The availability of critical materials for consumer use in '52, scheduled to drop in the first half to the lowest point since the inauguration of the defense program, will rise considerably in the July-December period, when NPA expects the shortages of the key metals to begin to ease. . . . Notwithstanding the sharp reduction in allotments, it is hoped that the essential needs of the market will be met during the first six months, through current inventories and application of conservation practices. . . . In making up the allotment program for civilian production, about 80 categories of consumer end products were divided into two groups. In group one were included those items which are relatively essential for maintaining a standard of living. Radio and TV were included in this classification. The second group involve less essental products, such as pianos, smoking accessories, etc. . . . The allotment schedule for groups one and two, as well as passenger cars and trucks, in relation to military needs, are illustrated in the chart below.

Selenium Cell Shortage Looms: Two factors may serve to curtail selenium-stack production, according to industry reps who appeared recently before NPA. They involve the possible increased military requirements for these metallic rectifiers, and a shortage of basic materials. It was pointed out that the shortage of materials could be relieved by directing a substantial supply of commercial-grade selenium from the glass industry, where it is employed for coloring, to the refiners of high-purity grade selenium. The importance of nickel, required to insure quality selenium coating, was also discussed at the session. It was said that only 30 tons are needed annually, and every effort should be made to provide this small allocation, since nickel is an important preservative and agent in preventing rectifier failures. . . . In the meanwhile, industry is operating under a temporary allocation order which it is hoped will be lifted soon.

Barium Titanate Seen As Tube Substitute: The possibility that barium titanate may replace tubes as amplifiers, was indicated recently in a Signal Corps development report, covering the use of the material at high frequencies. Known for its excellent piezoelectric properties and its widespread use for phono pickups, the ceramic was described as having a high-dielectric constant which varied with applied *ac*, introducing amplification possibilities. It was also found that the titanate had interesting memory characteristics which might be useful in TV circuitry.

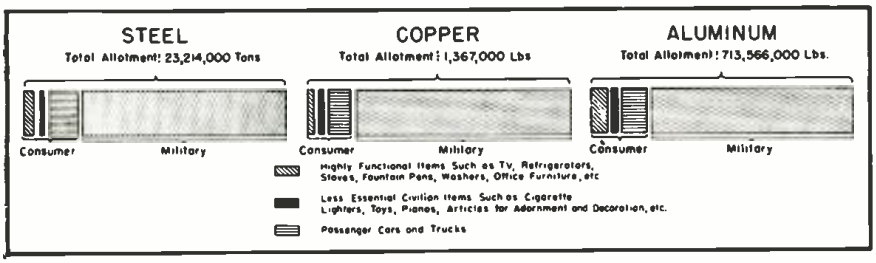
Tons of Canadian Aluminum on Way: The nation's critically-short supply of aluminum is expected to be augmented by over 22-million pounds of industry's precious metal from Canada, which is being diverted to this country by Great Britain. . . . The aluminum will become available at the rate of over 4-million pounds monthly for five months. . . . Were it not for this added supply, it would be necessary to reduce the minimum aluminum allotments for the first quarter from the present 20 per cent to 10 per cent of the base period use. . . . Unquestionably, this unique arrangement will mean the difference between survival and disaster for many small business firms, who would have found it impossible to exist on the reduced allocations originally scheduled for the first quarter.

Rubber Plastics Developed: A new class of rubber-resin blends, directly usable in low-cost injection molding and extrusion-processing methods, has been developed. According to the developers of the resin, the material should be excellent for television tube masks, since it has excellent electrical characteristics, and is easy to form on low-cost tooling. Other uses suggested were for wire spools and as coatings where oil and water resistance are necessary.

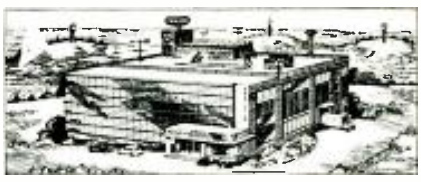
Atomized Magnesium Powder: Magnesium alloys now can be formed by a metallic-powder compressing process which consists of mixing atomized magnesium powder with powder of the alloying metals and extruding the powdered mixture, resulting in extremely high-strength material and providing new compositions not obtainable by the conventional melting and casting process.

Compatible Color TV Field Tests: During the next few months in New York, Philadelphia, Chicago, Syracuse and Washington, the NTSC color signal will be aired for evaluation purposes. According to the specifications issued by the committee, the color-subcarrier frequency will be 3.898125-mc, ±.001 per cent, and the maximum rate of change is not expected to exceed 1/3 cycles per second. The horizontal scanning frequency will be 2/495 times the color subcarrier frequency, corresponding to 15,750 cps. The bandwidth assigned to the modulated subcarrier will extend to at least 1 mc at 6-db attenuation below the color subcarrier frequency, and to at least .4 mc at 6-db attenuation above the color subcarrier frequency. The power of the aural signal transmitters will be not less than 50 per cent, nor more than 150 per cent of the peak power of the visual signal transmitters. . . . Those expected to participate in the test are G.E., DuMont, RCA, Hazeltine and Philco.

The allotment schedule of steel, copper and aluminum for the first quarter of '52, the dotted area covering allocations for the military, which will be quite substantial not only for the first three months, but up until about July.



The antenna lab being constructed by Workshop Associates in Natick, Mass., which will not only provide facilities for the study of antenna characteristics, but for the design and production of the various models to be probed.



TVE-grams . . . Personals

New Posts: *C. J. Luten* has been appointed editor of *Sylvania News*, succeeding *Robert A. Penfield* who has been promoted and named advertising and sales promotion supervisor. . . . *Max Baume* has been appointed manager of the sound department of the Hudson Radio and Television Corp. . . . *Robert T. Pennoyer*, formerly manager of the G. E. Buffalo tube works, has been named manager of the newly-established tube department advanced manufacturing section at Schenectady. *Harry R. Hemmings*, formerly purchasing supervisor for picture tubes at the G. E. Electronics Park plant, has succeeded Pennoyer. . . . *Dr. Gaylord P. Harnwell*, chairman, department of physics, University of Pennsylvania, has been appointed chairman of the committee on ordnance of the research and development board, Department of Defense. . . . *William Carlin* has been appointed manufacturing manager of the picture tube division of the Allen B. DuMont Labs, succeeding *Frank Beldowski*. . . . *Leigh A. Brite*, formerly chief electronics engineer of the USAF security service, Brooks Field, Texas, has been appointed director of research and development for the Transmitter Equipment Manufacturing Co., Inc. . . . *Dr. J. W. McRae*, Bell Telephone Labs, has been named chairman of a group on transitors which has been organized by the research and development board of the Department of Defense, to establish sound policies for the development and functional application of transitors by the armed services. Others named to the board were: *E. Finley Carter*, Sylvania; *Dr. E. W. Engstrom*, RCA Labs; *Dr. I. A. Getting*, Raytheon; *Dr. A. G. Hill*, MIT; and *G. F. Metcalf*, G. E. Military service members are: *Colonel Cary J. King*, office, Chief Signal Office; *Colonel George F. Moynahan*, office of the Assistant Chief of Staff, Department of the Army; *James M. Bridges*, Bureau of Ordnance; *Charles L. Stec*, Bureau of Ships; *H. J. Noble*, Wright Air Development Center, Dayton; and *Dr. E. W. Samson*, Air Force Cambridge Research Center. . . . *H. K. Pritchard* has been named manager of general purpose transformer sales; *J. P. Coughlin* has been appointed manager of aircraft and electronic transformer sales; and *A. E. Royce* has been named manager of lighting component sales of the G. E. specialty transformer and ballast department. . . . *George I. Long*, formerly assistant vice president of Wells Fargo Bank and Union Trust Co. of San Francisco, has been elected vice president and general manager of Ampex Electric Corp. Long will headquarter at Redwood City, Calif. . . . *Leo G. Sands*, formerly director of public relations and advertising for Bendix Radio, has been appointed general sales manager at Bogue Electric Manufacturing Co. . . . *LeRoy Schenck, W. C. Hendrickson, Howard Fairbanks, Myers and Young, Frank Wedless* and *Mel Foster*, have been named reps for the National Video Corp. . . . *Patrick E. Sullivan* has been appointed assistant manager of the Buffalo tube works of G. E. . . . *Harold S. Stamm* has been appointed manager of advertising and sales promotion of the RCA tube department. . . . *William J. Morlock* has been named general manager for commercial equipment activities of G. E.'s commercial and government equipment department. . . . *H. A. Williams* has been appointed manager of the electronic components division of the Stackpole Carbon Company, St. Marys, Pa. . . . *Dr. Lan Jen Chu* is now director of research for The Gabriel Company, Cleveland. Dr. Chu is associate professor of electrical engineering at MIT. . . . *Dr. Irving Wolff* has been named director of research for the RCA Laboratories Division. *Dr. D. H. Ewing* is now director of research services at the lab. Other promotions on the lab staff were: *E. W. Herold*, director of radio tube research lab; *G. H. Brown*, director of systems research laboratory; and *R. S. Holmes*, director of contract research lab. . . . *H. Brainard Fancher* and *Clare C. Lasher* have been appointed manager of engineering and manager of manufacturing, respectively, for commercial equipment products of the G. E. commercial and government equipment department. . . . *Arthur Richenthal* has been elected secretary of Standard Coil Products Co., Inc. . . . *Carl E. Scholz* has been elected vice president and chief engineer of the American Cable and Radio Corp. . . . *Larry LeKashman*, former advertising and sales promotion manager of the tube department of RCA, has been appointed vice president of Electro-Voice, Buchanan, Mich. . . . . *A. K. Veff* is now sales manager of the electronic components division of the Stackpole Carbon Company, St. Marys, Pa. *W. E. Gerber* has been appointed assistant to the sales manager. . . . *John Giltner Twist* has been appointed sales manager of the capacitor division of Sangamo Electric Co., located at Marion, Illinois. Twist has served as assistant sales manager of the division during the past five years. . . . *Louis Martin* has been named to a newly created post of general sales manager of Standard Coil Products Co. Inc., Chicago, Los Angeles and Bangor, Michigan. Martin was formerly with General Instrument Corp., where he was general sales manager of the Elizabeth and Sickles divisions.

Harold S. Stamm

L. A. Brite

H. A. Williams

John G. Twist

Louis Martin

H. B. Fancher

C. J. Luten

Arthur Richenthal

George I. Long

Dr. Lan Jen Chu

UHF and VHF STATION

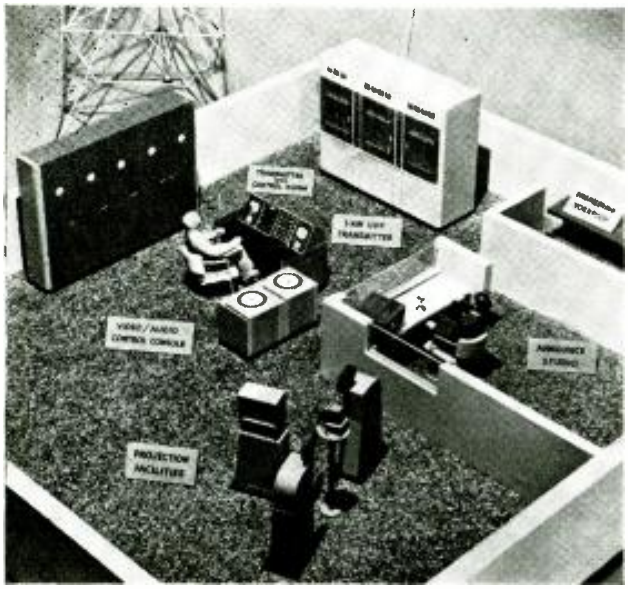
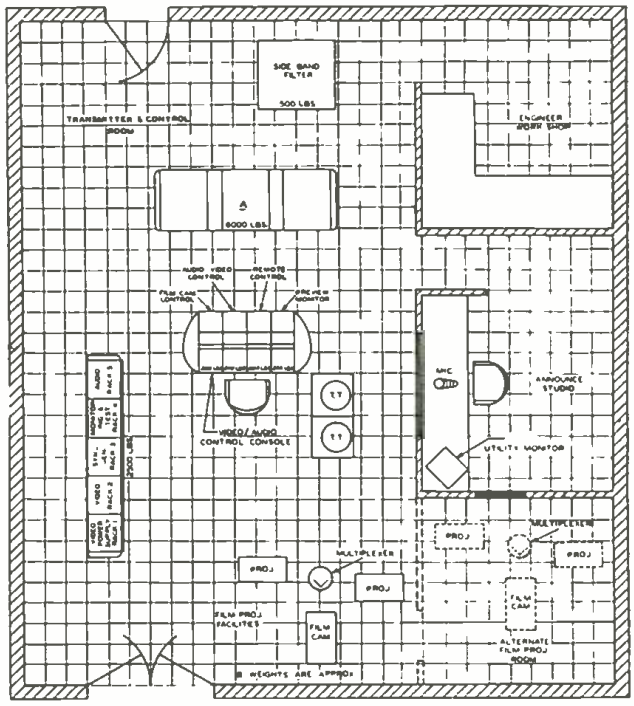


Figure 2 (right)
Floor plan for 1-kw uhf station showing the approximate size and location of major components in a total area of about 900 square feet.
A RCA TTU-1B 1-kw transmitter.

Figure 1 (left)
Model layout of a basic-buy station employing a 1-kw uhf transmitter. With the film facilities and announce-booth provided, network, film, slides, spots and remotes are possible.



THE PLANNING OF A TV station has been found to involve the consideration of many unusual factors, since unlike AM or FM systems, featuring audio only, there is the additional problem of video and its allied requirements. Accordingly, many broadcasters entering TV have felt the need for a careful evaluation of not only the pure technical aspects, but the program operational phases which might be handled with a minimum investment in equipment and technical manpower. Of course, the simplest and most inexpensive type of television station to equip would be one that would use network programs entirely. However, in such a station there would be no means for presenting essential local advertising material. Thus, the simple and practical station is one which could present local film programs interspersed with network, or one using film alone (dependent upon the station's location with respect to network facilities).

To provide adequate programming facilities for this type of operation, there has been designed and produced a fundamental equipment package.

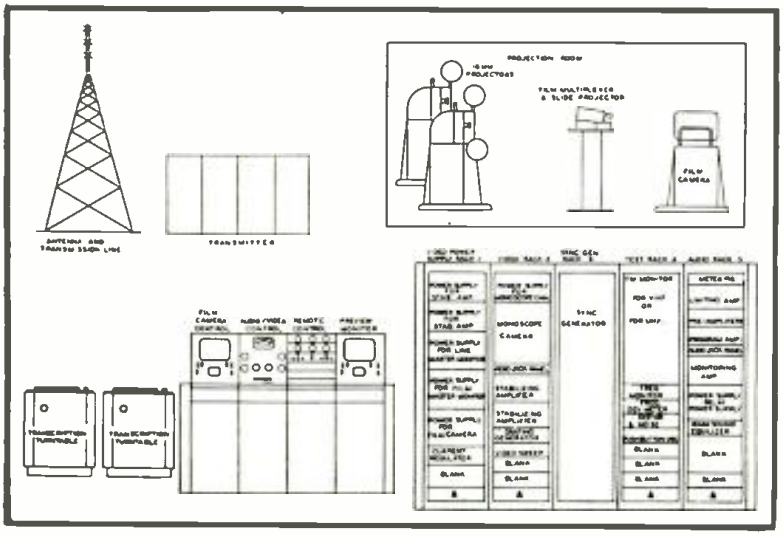
With the minimum equipment supplied in this package five different types of programs may be broadcast: (1) Network by coax cable; (2) remote signals; (3) local film program from 16-mm projectors; (4) local slide projection animated program, and (5) test pattern from a monoscope.

The advertising or commercial function can be of local or network origin.

The equipment package consists of a film camera chain,[1] master monitor,[2] two 16-mm film projectors,[3] a slide projector, multiplexer, monoscope camera,[4] studio synchronizing generator,[5] audio-video switching console,[6] two stabilizing amplifiers, two turntables, microphones, transmitter, antenna, audio equipment, and miscellaneous accessories such as power supplies.

The transmitter furnished in the package will, of course, depend upon the individual station's power and frequency requirements (*uhf* or *vhf*). All other equipment items in the package with the possible exception of antenna and transmission line remain the same for any TV station, regardless of power.

Figure 3
Block diagram (in one foot squares) of basic-buy package which provides the equipment necessary to start operation with minimum investment.
A = RCA 57D.



Station Layouts

The building or *plant* space required

Basic Equipment Layouts

by L. E. ANDERSON and W. O. HADLOCK

Engineering Products Dept., R.C.A.

Plans, Featuring Use of Centralized-Control Consoles for One-Man Operation, Designed for TV Stations Planning to Start Operation Without Live Talent Studios.

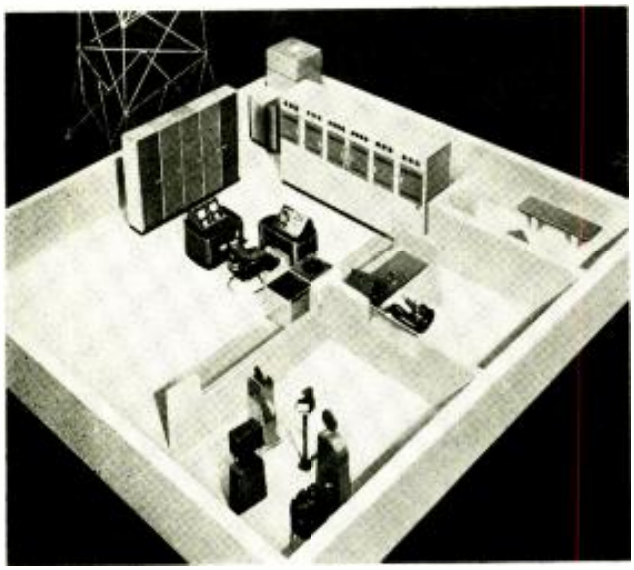


Figure 4
Model layout of 10-kw basic-buy station: uhf or vhf. In this set-up, the console is separated to form a U arrangement, with monitors at left, and the audio-video sections in center, and turntables at right.

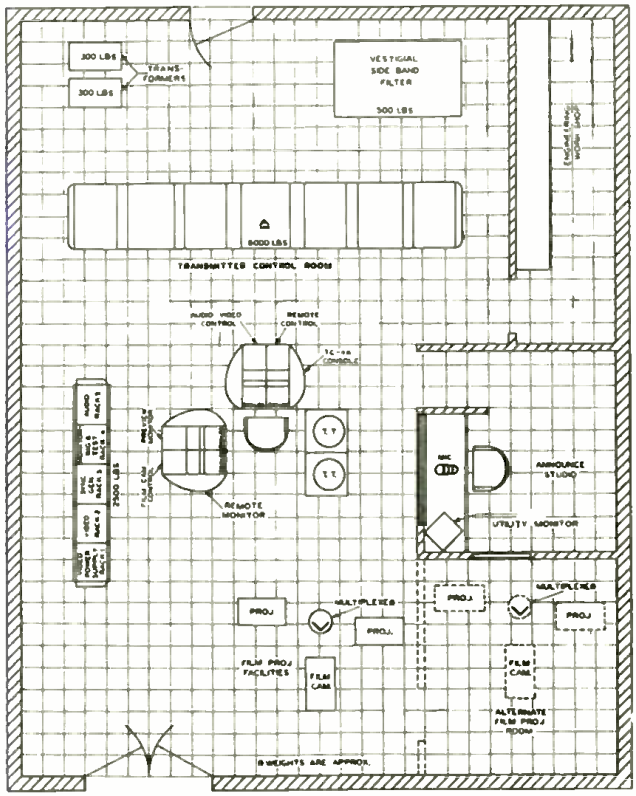


Figure 5 (right)
Floor plan of 10-kw uhf layout showing the alternate U console arrangement and location of components. All equipment is located in a space of approximatelyy 1100 square feet: each square represents approximately one foot.

A = RCA TTU-10A transmitter.

to accommodate the station equipment will vary with such factors as: the size and power of the transmitter; particular arrangement of individual units; space or clearance planned between equipment units; number of rooms desired, and plans for future expansion.

Because of these variables in planning, considerable latitude in TV station arrangement is expected, ranging from very compact to roomy layouts.

1 Kw (UHF) Layout

A model layout and companion floor plan of a *basic* station employing a 1-kw *uhf* transmitter appears in Figures 1 and 2. For cities where only *uhf* channels are available, this arrangement with a *uhf* antenna will provide powers up to 20 kw erp.

This arrangement of equipment occupies a space of 900 square feet and provides network, film, spot and station break facilities. In this particular set-up, the *in-line* control console is centrally located in front of the transmitter, with equipment racks at left, turntables, and announce studio at right, and film facilities at the rear. Many broadcasters may prefer to enclose the film projectors, multiplexer and film camera in a separate room. This can be done without increasing the space requirements and is recommended from an operational standpoint.

Broadcasters planning to increase *uhf* power at a later date with 10-kw *add-on* amplifiers should plan to allow more space, or decrease the size of the announce studio and engineering workshop. Another possible arrangement would be to locate the announce booth in one corner of the film room if a single combination room is desired, the announce booth being equipped with a utility monitor[7] and located so that *visual cue* can be given from the control console position.

[1]RCA TK-20. [2]RCA TM-5A. [3]RCA TP-16.
[4]RCA TK-11B. [5]RCA TG-1A. [6]RCA TC-4A.

[7]RCA TM-2B.

10 Kw Layout, UHF or VHF

In Figures 4 and 5 appear a layout and floor plan for a 10-kw *vhf* transmitter and associated components which result in a slightly larger room. While the Figure 4 view shows the use of a 10-kw *vhf* transmitter, the over-all layout size is equally suitable for accommodating a 10-kw *uhf* transmitter which is approximately 30″ longer. This can be accomplished, as shown in the floor plan of Figure 5, by use of a slightly different space arrangement for the engineering workshop.

In either case, all items are accommodated in an over-all space of approximately 1,100 square feet. The sideband filter and diplexer can be located directly behind the transmitter as shown in the floor plan, or at the left behind the transmitter. The 10-kw

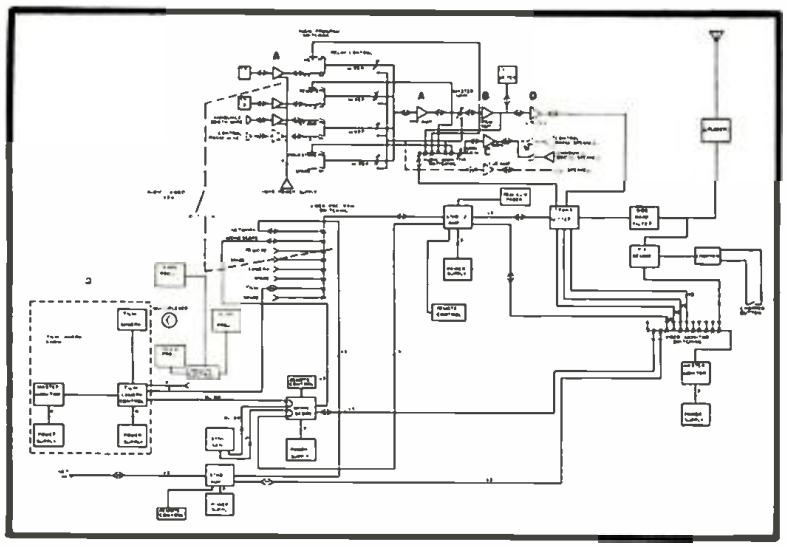


Figure 6

Simplified schematic diagram showing operation and system arrangement of basic-buy equipment.

A = Preamp. turntable and microphone.
B = Program amplifier for network and microphone circuits.
C = Monitoring amplifier.
D = Limiting amplifier.

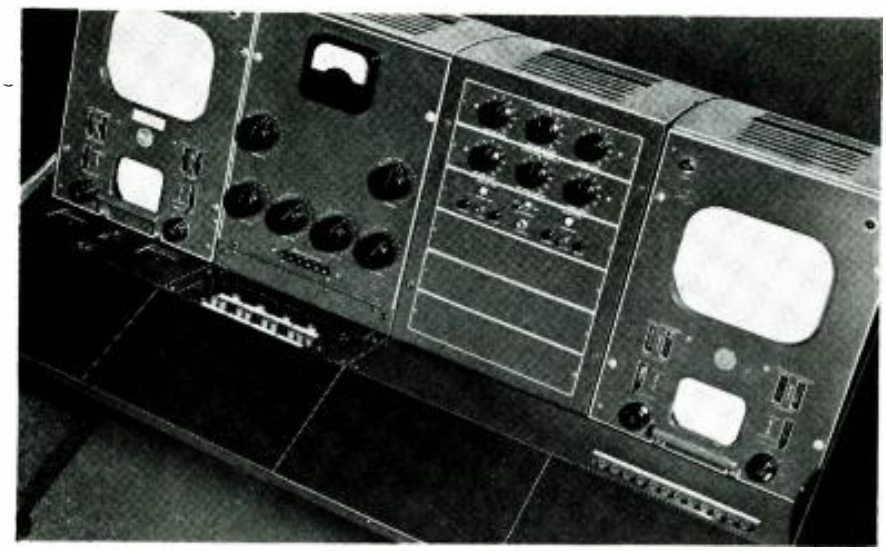
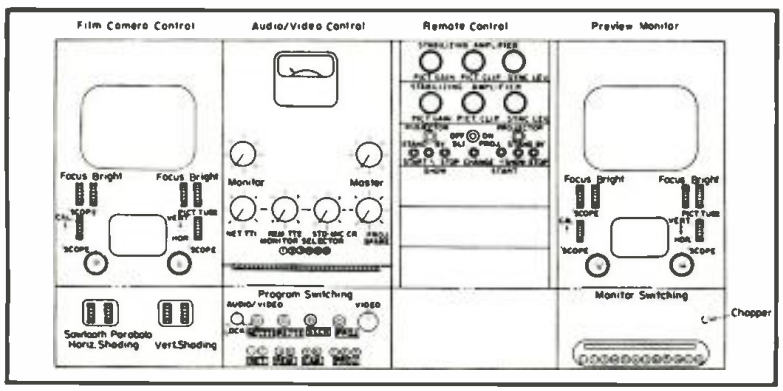


Figure 7

Closeup view of the four console sections and associated control panels which are located on turrets and on sloping dish surfaces.

Figure 8

Detailed layout showing the location of console sections as well as controls, meters and switches provided.



transmitter employed in this arrangement can provide power up to 100 kw erp. by utilizing a high-gain antenna.

Film facilities are provided for station breaks and spots during network hours. Although not shown in the layout, the announce booth may be located separately or combined with the film room as described in the 1-kw *uhf* layout.

Another variation from the 1-kw *uhf* layout is the block *U* arrangement of the control console and turntables. In this setup, the operator would face the audio video console[6] and transmitter. Monitors and equipment racks are accessible at the left and turntables at the right.

Centralized Control Console

Smooth performance is made possible to a large extent by the proper grouping of important controls to make them easily accessible to the operator; using the audio-video switching console[5] (which consists of two standard console sections) plus one film camera control and one master monitor[2] mounted in standard console sections. These four console sections arranged *in-line* (with the audio-video switching console sections in the center) form a unified console. This console, when coupled with a film camera control, forms a nucleus of a complete television station operation, and may be used by small and large stations.

Film Camera Control Section

The section at the extreme left of the console, required to house the film camera control unit, features, in the upper part of the console section, a master monitor[2] which has a ten-inch picture tube and a five-inch *cro* tube. In the lower portion of the housing is the film camera control chassis. It supplies the blanking and driving signals to the film camera and reproduces a picture generated by the film camera. Controls for the adjustment of picture levels and shading are located on the sloping desk panel of this console section. The film camera control is located at the left end of the audio-video console for convenience of operation. However, the unit may be removed from this position if desired, and placed at another location without disturbing the functions of the remainder of this switching console.

Video Control

The video pushbuttons on the audio-video console provide a means of selecting any one of eight signals, such as film, studio, monoscope, remotes or network for transmission. In addition, by using the *lock-in* switch on the left side

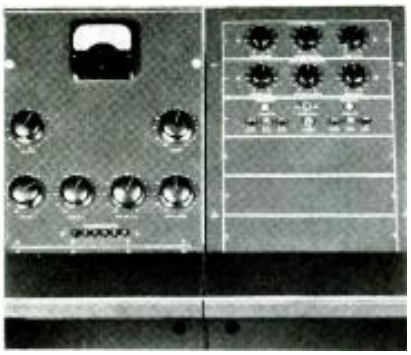


Figure 9
Closeup of audio-video and remote-control panels.

of the panel, certain audio and video signals may be switched simultaneously by means of the video pushbuttons. When switching from local to remote or network signal, contacts on the switches provide automatic removal of local synchronizing signal.

On the right side of the switching panel is a remote *clip-fade* control. By means of this control, the signal may be faded to black, at which time an instantaneous switch may be made to a new signal, and then the new signal faded up.

Remote Control Section

Another section of the console houses all the remote controls that are necessary to provide operation of those equipments that are necessary for simple basic programming.

In two panels (at top) are control stabilizing amplifiers. One of these amplifiers is for network or remote signals and the second is for controlling any signal to the transmitter. The second stabilizing amplifier is also used for mixing the *sync* and video signals since some form of local signal is necessary for advertising purposes.

The third panel in this control is a projector switching control. Three groups of pushbuttons and tally lights are located on this panel, the groups at either end composed of three buttons and a separate lamp are identical while one pushbutton and toggle switch are located in the center. The center toggle switch is for turning the power on a slide projector. The pushbutton directly under the switch has a tally light built in and may be used to switch slides in the slide projector.

The tally light, at the top of the panel at either end, indicates when control has been transferred from the film projector to this remote operating position. The pushbutton, on the left of the group, is used to start the projector and has a built-in tally light to indicate

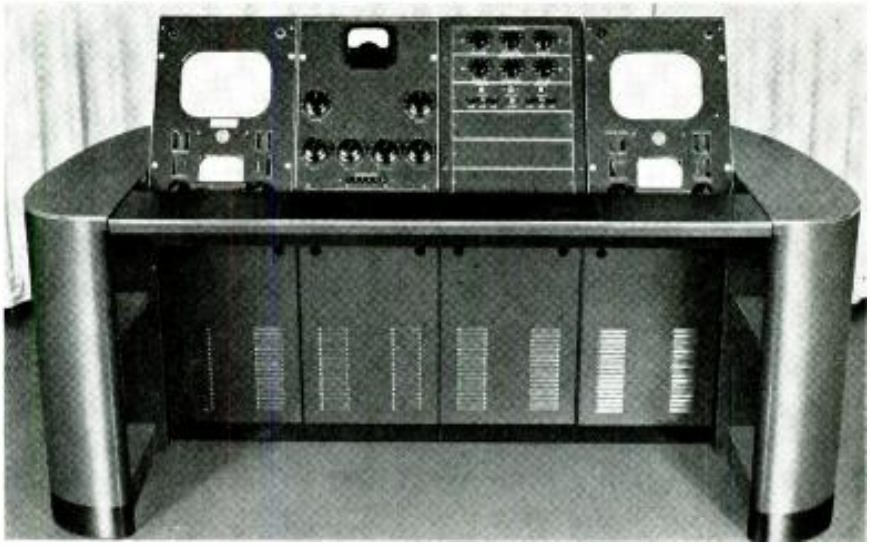


Figure 10
View of over-all basic-buy console, complete with finished end sections, as normally used in the TV station.

that the machine is running. The center button of the group, with built-in talley light, is for transferring sound and picture from one machine to the other, when two film projectors are used. The third button is for stopping the projector, and does not have a built-in light.

Another group of buttons at the other end of the panel is identical and performs the same functions for a second projector.

A pushbutton for chopper control is also provided to select a calibrating signal for indicating percentage of picture modulation to the transmitter.

One-Man Operation

The streamlined arrangements have been found to permit operation by one man. All of the necessary controls for programming are centralized in the 4-section console except the audio and video jack panels which are located in nearby equipment racks.

Even with the addition of one or two film camera controls, it would also be

(*Continued on page* 30)

Item	*Quantity*	*Description*
1	2	Studio Cameras, Control Units and Power Supplies[7A]
2	2	Studio Camera Pedestals[8] and Friction Heads[9]
3	1	Microphone on Boom Stand[10]
4	1	Studio-Video Switching Equipment[11]
5	1	*On-Air* Master Monitor[2]
6	1	Audio Consolette[12]
7	2	Turntables[13]
8	1	Studio Sync Generator[14]
9	2	Racks containing power supplies, distribution amplifiers, video and audio jacks, etc.

[7A]RCA TK-11A. [8]RCA TD-1A. [9]RCA MI-26205. [10]RCA KS-4A or MI-26574. [11]RCA TS-11A. [12]RCA BC-2B. [13]RCA 70-D. [14]RCA TG-1A.

Major items of equipment needed for single studio

Figure 11
Model layout showing a typical single live-talent studio which can be added to basic-buy station at later date.

Technique for

Research Report* Discloses How Radar Area of Target Models Can be Measured Through Use of Model, Introduced Into Field of Electromagnetic Horn, Which Causes Unbalance of Previously Balanced Hybrid Junction in Antenna Feed, the Amount of Unbalance Being a Function of Model's Radar Area. Unbalanced Signal From the Hybrid Junction is Amplified by Receiver and Applied to Polar Recorder, Which in Turn Utilizes This Signal and Syncro Information from Model Rotator, to Provide Polar Plot of Radar Area of Model.

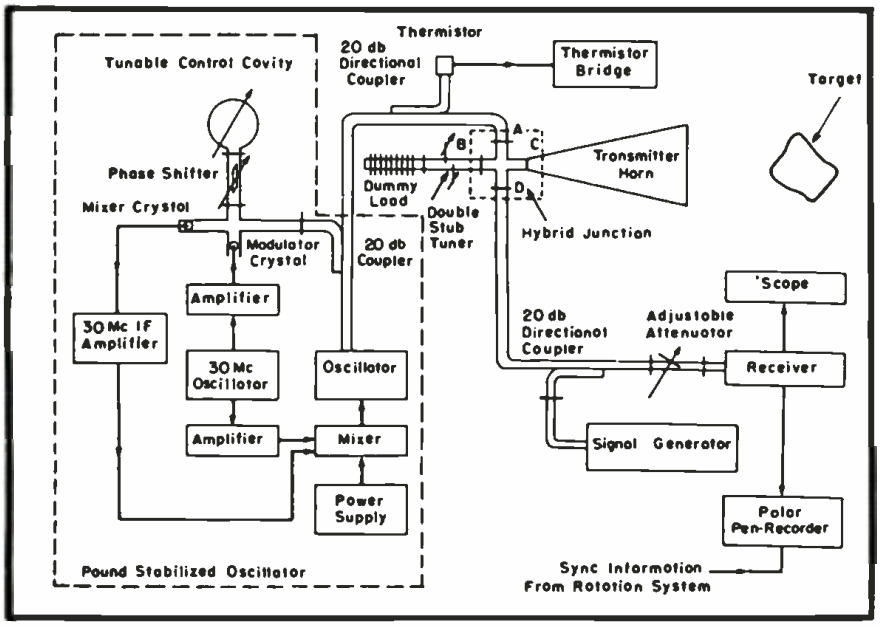
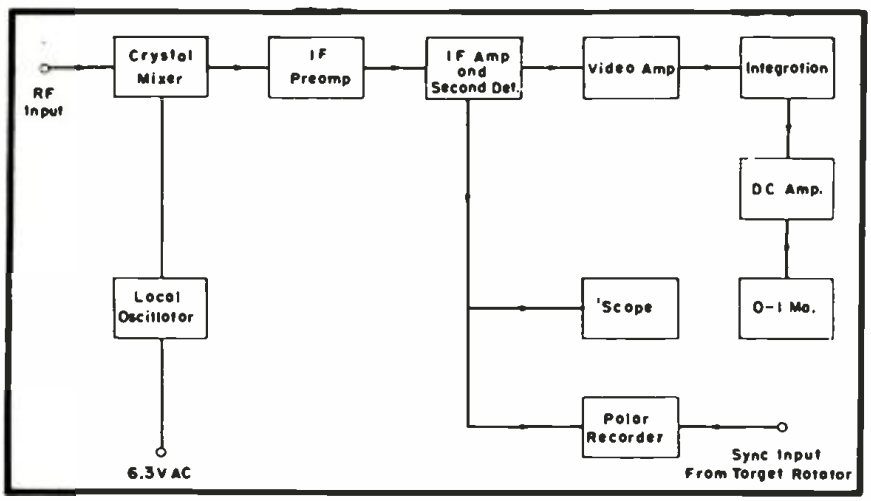


Figure 1
Block diagram of radar-measurement system which features use of a stabilized cw oscillator of the Pound type.

Figure 2
Elements of the radar-measuring receiving system.



IN THE MEASUREMENT of radar reflections, the dynamic technique has been found to be particularly fruitful. However, the approach does introduce problems, especially when many types of targets are involved and quantitative information is sought. The complications are usually prompted by the availability of the target, the magnitude of the measuring system, and the difficulty of controlling the many variables which prevail in field operation. Where there is no need for a knowledge of the fluctuations (or modulation) of the radar return from the target, caused solely by the dynamic operation of the target (such as vibration of parts of an aircraft, propeller modulation, or longitudinal rotation of a missile), models may be used quite effectively. For, in such a controlled system, it is possible to determine the fine-structure scattering-pattern of the target. In addition, the effect on the radar properties of the target caused by propellers, stabilizing fins, or other components of the target structure can be determined by measurement with and without the target component under investigation. Accordingly, it is possible to use *dissection techniques* to explore the mechanisms of radar reflection. Recently such a model system was set up at the Chesapeake Bay Annex of NRL in a mobile repair unit, operating in the 9,800-mc band, to study the potentials of the technique. The system followed the general pattern evolved by Sinclair[1] at the Ohio State University Research Foundation. Several refinements, however, were incorporated to improve stability and accuracy.

System Operation

In a review of the system in a special report,* it was revealed that a stabilized *cw* oscillator of the *Pound* type[2] was used, with output feeding to one arm (*A*: Figure 1) of a magic-tee hybrid junction, the power dividing equally between a pair of arms (*B* and *C*: Figure 1). The power in arm *C*, fed to an antenna, serves to illuminate the target. Power returned from the target enters the hybrid junction on arm *C* and divides equally between arms *B* and *D*. Power in arm *D* then feeds the receiver, whose output drives the pen of a polar recorder. The transmitted power is monitored by a therm-

*NRL Report 380; work on the problem is continuing.

[1]Sinclair, G., *Theory of Models of Electromagnetic Systems*, IRE Proceedings; November, 1948.

[2]Sinclair, G., Ohio State University Research Foundation, *Report 302-3*; July, 1947.

Measurement of RADAR Characteristics of Targets

by RALPH G. PETERS

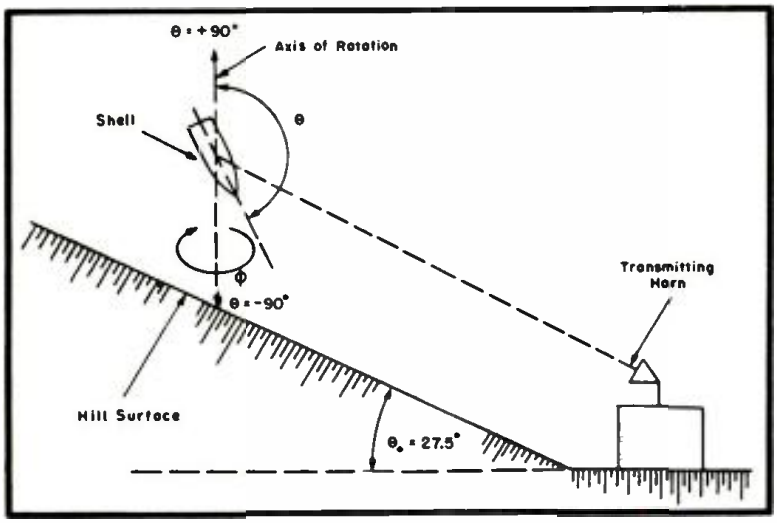


Figure 3
Geometry of measuring setup, which illustrates that the true elevation angle (θ) of the shell is a function of the azimuth angle φ.

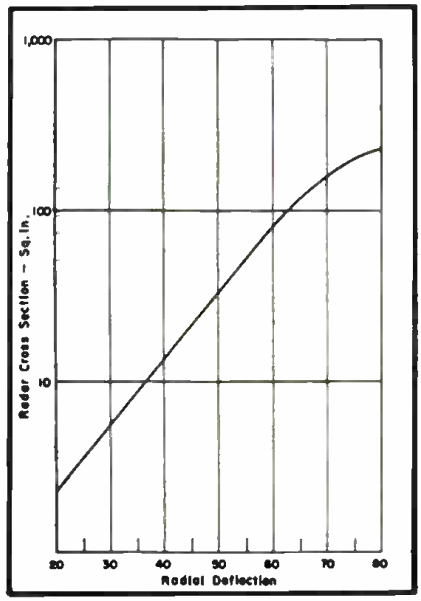


Figure 4
Plot illustrating radar area versus deflection for the range of the radar area in which the spheres lie.

istor bridge through a directional coupler. The input-output characteristic of the receiver was noted as being calibrated by the signal generator, which inserts a known signal into the receiver line through another directional coupler. For monitoring the operation of the receiver, a 'scope was used, and the angular position of the recorder chart kept in step with the target rotation through a synchro drive.

The magic-tee hybrid junction was disclosed as a key item in the system. Analyzing the division of transmitted power equally between arms *B* and *C*, the report noted that this is true only if arms *B* and *C* present identical impedances to the junction. In practice, it was said, some dissymmetry exists. Thus, its magnitude is determined by the mechanical and electrical asymmetry of the junction. Accordingly, some transmitted power, however minute, must leak directly into the receiver arm, *D*. The allowable leakage into this arm can be determined by the smallest signal which it is desired to receive and measure.

In the system tested, the hybrid junction was balanced to about −120 db. To achieve this balance, extreme care was taken in the construction of the hybrid junction to insure both electrical and mechanical stability and symmetry. The junction was machined from *invar* to reduce instability caused by the thermal expansion and contraction of the joint. Final balance was obtained by adjustment of a two-stub tuner mounted on arm *B* of the hybrid junction. The probes of the tuner were made of quartz rod, 0.180" in diameter, and adjusted by a threaded barrel having 64 threads per inch. Quartz was selected because of its low value of thermal coefficient of expansion. The waveguide supporting the stubs was also made of *invar*.

Antenna

The first antenna system used was described as a horn 32" long, constructed of brass, with a 10"-square aperture and polystyrene lens to correct the phase front. The half-power beamwidth was 7° in the *E*-plane and 9° in the *H*-plane. This system was found to be unsatisfactory since its impedance changed so rapidly with temperature that the hybrid junction would remain in balance for a period of only a few minutes. An improvement was noted when the correcting lens was removed from the horn or when the horn was wrapped with thermal insulation. To reduce temperature sensitivity, a horn 80" long with a 10"-square aperture was constructed of *invar*. This time the half-power beamwidth was 7.5° in the *E*-plane and 10° in the *H*-plane. Currently, this horn does not employ any additional phase correction, but a strip lens of *invar* is being considered. This horn has been found superior to the first model, since the hybrid junction remains balanced for periods of about one-half hour.

It would be advantageous to use a horn of larger aperture, with consequent increase in gain and decrease in beamwidth, the report declared. However, the consideration of uniform phase of the incident field across the target plane indicates a relatively small horn. The 10" dimension was thus believed to be a reasonable compromise between these two requirements.

Transmitter

A 2K39 klystron, incorporating the Pound system of frequency stabilization, was included in the transmitter.

[To Be Concluded in January]

[3]Pound, R. V., *An Improved Frequency Stabilization System for Microwave Oscillators*, MIT Rad. Lab., No. 837; October, 1945.

Convection Gas-Heating Technique Developed for 29-Foot Diameter Circular Screen Baker and 27½-Foot Exhaust Ovens, Provide Proper Control of Temperature in Each of Eight Zones Without Need for Separating Baffles Between Zones. Method Also Serves to Eliminate Need for Indexed Forward Travel and Difficulties Inherent in Stop and Start Operation. . . . Procedure Found to Provide Production-Line Speed of More Than 96 Tubes Per Hour.

Convection Ovens in TV-TUBE PRODUCTION

by N. E. BERTL

Heating Process Engineer

A. M. Stock, Inc.

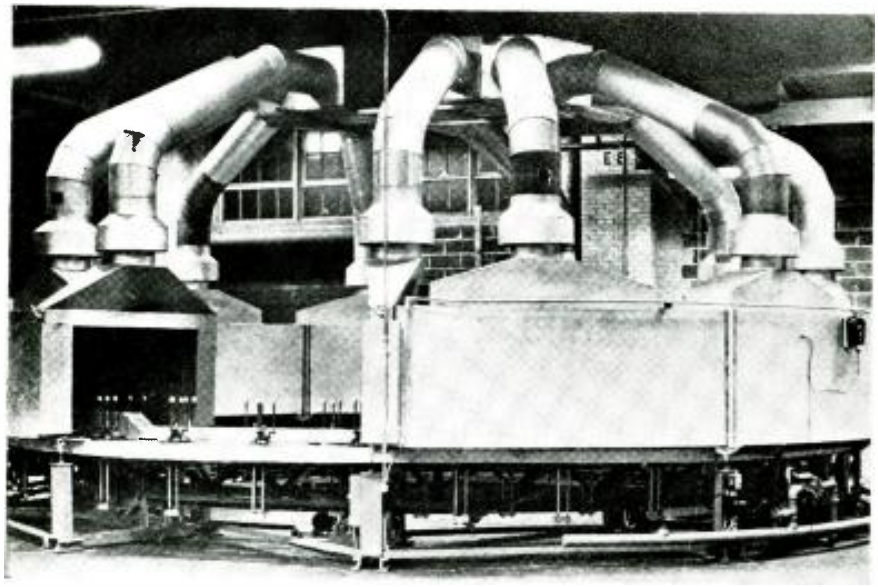
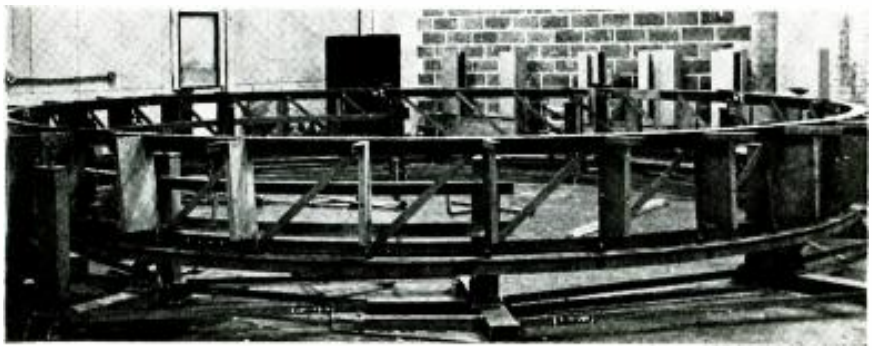


Figure 1
Overall view of screen baking oven, with capacity of 96 tubes per hour, in two concentric rings.

Figure 2
Construction of bolted turret which rides without center bearing on inverted casters. Note flange plate at each tube station for carrying the rotating and the exhausting (or purging) apparatus.



To KEEP PACE with the ever-increasing demands for sets with larger and larger viewing screens, many mass-production techniques have been evolved. One process which has been found to contribute substantially to such accelerated production has featured the use of continuous gas-heated convection ovens. Recently, this equipment reached its highest state of evolution in the fabrication of a 29′ diameter circular screen baker and three 27½′ diameter exhaust ovens.*

Convection-Gas Features

Through the careful application of convection gas heating it has been found possible to provide the proper control of temperature in each of eight zones without the necessity of any separating baffles between zones. The procedure has also served to eliminate any necessity for indexed forward travel and the consequent difficulties and com-

*Currently being installed at the FTR plant in Clifton, N. J. C. H. Trutner, Trutner Engineering Company, Jersey City, N. J., developed the entire system and constructed the ovens.

*The screen baker (just completed) and its three exhauster ovens (under construction) represent improvements over a predecessor screen baker and two exhauster ovens which have been running for a year and a half. The continuous convection oven processing at FTR was the original means of supplanting batch-type baking and exhausting employed during the early picture-tube making days.

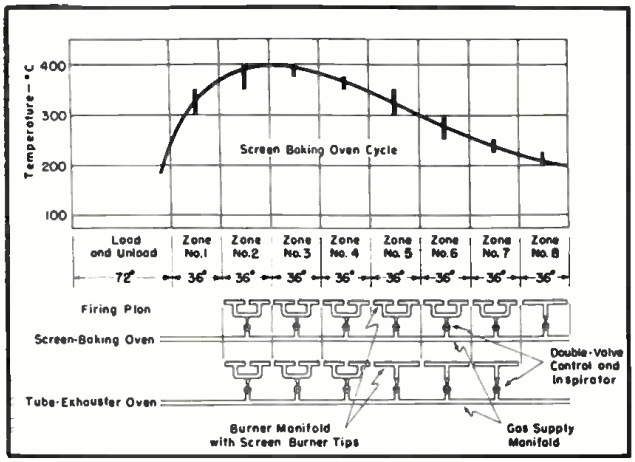


Figure 3 (right)

Typical insulated-oven cross-section, showing method of secondary aeration around burner tips and damper control of combustion products to force (or prevent) lateral spread of heat. Note position of supersensitive type mercury bulb of temperature control in relation to oven roof and screen portion of tube.

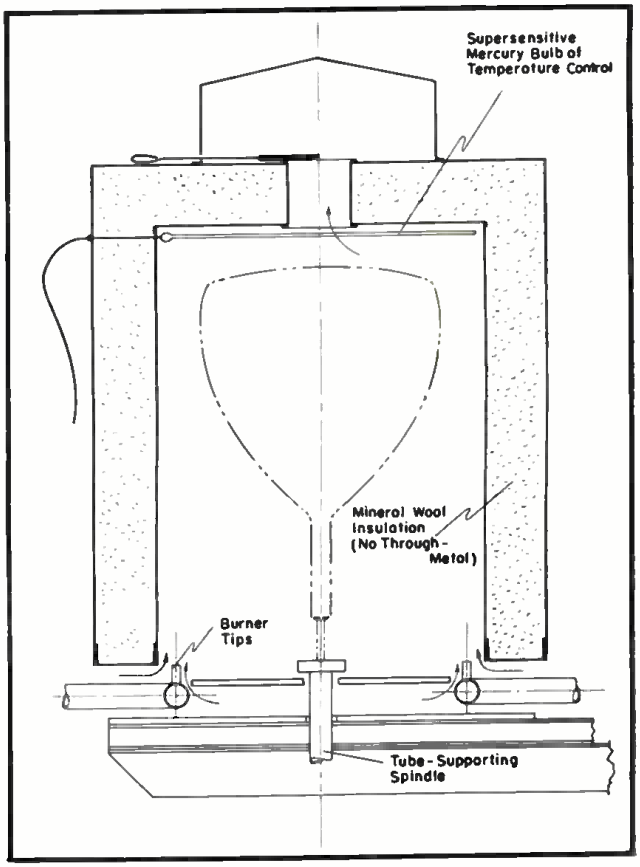


Figure 4 (above)

Required temperature cycle in screen baking oven with zone temperature limits; vertical black bars. Also illustrated is the burner manifolding plan for both baker and exhauster ovens showing location of inspirators and temperature controls.

plexities inherent in stop-and-start operation.

The design has resulted in a marked decrease in shrinkage and a production-line speed of more than 96 tubes per hour.

Mechanical Details

The radius of the circular paths taken by the tubes through each of the four newest ovens is 12′. In each case the rotating *turret* is a fabricated structure of steel, made in sections, which can be handled by two men and bolted together on location. This circular structure rides upon inverted caster-type wheels, so that it requires no center bearing. Thus, circular ovens can be located in the plant in the most convenient positions, even if it is necessary for roof-supporting columns to rise from the floor within the oven circle. In the predecessor ovens a central bearing was used. Further, the current designs provide much smoother rotation, firmer bottom support, and less power for rotation. The casters and the general design of the turret may be seen in Figure 2.

Tube-Carrying Stations

At each tube-carrying station, of which there are 64 in the screen baker and 32 in each of the exhauster ovens, a spindle (which carries the tube supporting arms) has been fitted with a sprocket and chain so that it rotates at about 4 to 6 *rpm* as the turret turns slowly. The rate of rotation of the turret for the screen baker is such that the 64 spindles deliver about 96 tubes per hour; 1½ revolutions per hour or 40 minutes per revolution.

Self-Contained Heads

In the exhauster ovens, to assure smooth simple rotation of the turret, each of the 32 heads has been supplied with its own diffusion pump, its own mechanical backer pump (for preliminary exhausting and relieving the back-pressure on the diffusion pump at the end of the exhaust cycle), and its own induction coils (for heating up the tube gun parts and setting off the getter during the outgassing phase).

Contact Tracks

Electric current to operate the mechanical and diffusion pumps at each exhaust port, and high frequency current for the induction coils, are supplied by contact tracks.

Production speed from each exhauster oven will be 25 tubes per hour; each has been designed to carry 32 heads so that the turrets of these ovens will turn at speeds of one revolution in 77 minutes.

To effect a reduction in shrinkage in the screen baker there has been provided retraction of the stainless tube which reaches up inside the bulb and supplies hot purging air[1] inside the tube during the baking cycle. These tubes retract in the 72° loading zone and eliminate accidents due to striking glass bulb necks on the stainless steel tubes while loading.

Shrinkage Reduction Factors

The greatest factor in reducing shrinkage has been found to be the careful balance of temperatures between the purging air which flows up inside of the tube and the combustion products which surround the tube in each heating zone. This has been accomplished by bringing the purging air from the blowers through long leads in the heated zone to a hollow duct (travelling with the turret) which forms the wall between the two rows of heads in the screen baking oven. In Figure 1 is illustrated how the 64 spindles in the screen baker are arranged in two concentric rows, the rows being staggered and separated from one another by the purging air duct. Thanks to this construction, it has been estimated that the purging air will not differ from the combustion products, at any point, by more than 5° or 10° *C*, whereas pre-

[1] Air forced through a system to scavenge gases, etc.

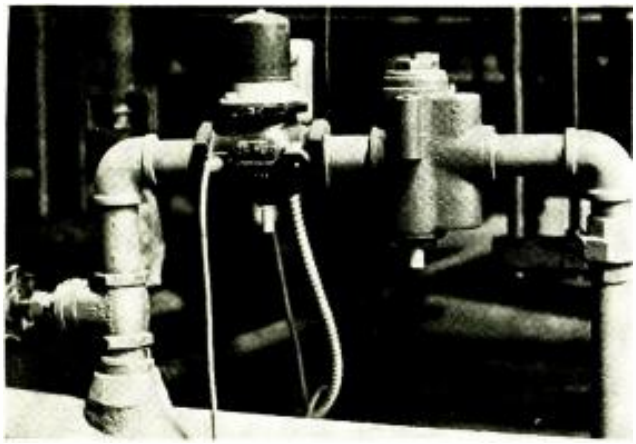


Figure 5

One of the double-valve mechanical controls (mercury-bulb actuated) used for zone temperature regulation, along with the solenoid valve for its safety pilot, and its air-gas inspirator.

vious tube bakers may have had differentials (judging from shrinkage experience) of upward of 100°.

By this type of mechanical construction all of the difficulties with in-line trolley or car type ovens, and the difficulties with circular ovens which used plate valves and a single set of exhauster pumps, have been found to be eliminated: Unusually high vacuum can be developed in the exhauster ovens; trolley or car return is not involved; stop-start indexing is eliminated; and great savings are made by boosting production speed.

Also, this type of construction has been found to permit easier control over the thermal characteristics of the bottom of the oven and simplify the combustion engineering.

The Combustion Engineering and the Control Method

The zone dividing technique is illustrated in Figure 3; each of the ovens has been divided into nine zones, with eight actual oven zones of 36° each and a loading and unloading zone of 72°. In the case of the screen baking oven, zones two through eight (seven in all) are fired. In the case of the exhauster ovens, zones two through seven (six in all) are fired. Figure 4 shows the temperature curve desired, and attained, in the screen baking oven and the method of manifolding the burners in both the screen baker and the exhausters. Split manifolding has been found to permit even more precise manipulation of zoning, if ever required, by merely increasing the number of inspirators[2] and temperature controls.

Screen Burner Tips

All seven of the continuous convection ovens at FTR (the new baker and its three exhausters, as well as the original baker and its two exhausters) are fired with nichrome screen burner tips[3] mounted on pipe manifolds bent to match the oven curvature on both sides. Each supply manifold is fed with gas at 20 ounces pressure so that a one-pipe system is possible. Inspirators develop the proper air-gas mixture for combustion. And even though this mixture pressure does not exceed ½" equivalent water column, the screen burner tips have been found to offer a turndown ratio of as much as 8-to-1.

Temperature Controls

With the use of such a simplified combustion system where the gas is compressed to relatively low pressures (20 ounces) and atmospheric air is inspirated, it is desirable to use direct-acting throttling gas controls which seek a precise adjustment as called for by the mercury bulb, and hold it without frequent or sudden cycling. Selected for this purpose were temperature controls[4] with double-valve construction and the positive (and sensitive) action of the mercury expansion principle.

Turbos Gas Compressor

A turbo gas compressor occupying less than 6 square feet of floor space and requiring only a two-*hp* motor were found to be adequate for the gas compression requirements for one screen baking and one exhauster oven. Since the gas is carburated at individual inspirators no safety protection equipment involving fire checks was found to be necessary.

Figure 3 reveals how the burner tips and burner manifolds[5] are located below the bottom of the oven sidewalls and at a point which liberally clears both the inside of the oven wall and the turret top-plate. Secondary air streams up through these spaces on either side of the burner manifolds and keeps them cool. This has been found to lengthen burner life. Also, the air-gas mixture in the manifold does not heat up and expand so as to reduce burner capacity or change the back pressure on the inspirators and alter the mixing ratio.

Combustion Product Flues

Figure 3 also illustrates how the combustion products flow straight up along the oven walls, cross over under the burner roof and are exhausted up a circular flue centrally in the oven. Each of these flues carries a damper, and there are several flues in each of the fired heating zones. This has been found to be a particularly important installation factor; that is, there is no travel of combustion products along the length of the oven, except as intentionally forced by damper settings. This means that the temperature-control system can easily maintain different temperatures in different zones without having an adjustment of one seriously affect its neighbors.

Mercury Bulb Elements

The mercury bulb elements of the temperature controls[4] are of the long super-sensitive type (30" long by $\frac{3}{16}$" in diameter), and are just under the oven roof. Thus, they reflect and control, both the combustion-product temperature and the roof temperature at the points of importance, just above the face of the TV tube where the phosphor screen is located.

The mechanics of heating at 400° *C* (752° *F*) is accomplished both by scrubbing with hot combustion products and by radiation down from the oven roof in the black-heat range. No

[2]Device which causes a flow of gas out of a tapered orifice to pick up (inspirate) the primary air required for proper combustion of that gas. [3]Fieser.

[4]Partlow 61A, 63A and 613A. [5]Piping which, in this application, supplies gas and the primary air included in it.

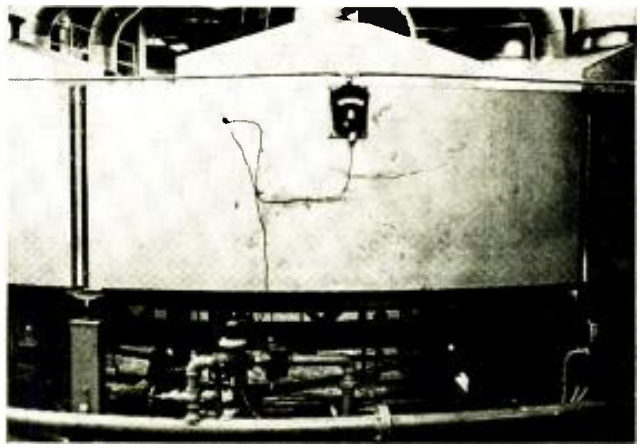


Figure 6

Indicating thermometer (one used for each zone) which, independently of the control instrument for that zone, actuates the proper warning light at the loading zone to advise of any variation in zone temperature from the stated process level.

convection oven can operate without the aid of wall and roof radiation, and no radiant oven can operate without the aid of convected hot gases.

In any event, no measurable variation of temperature across the top of the ovens has been found at the FTR installation. There has been provided, quite intentionally, a differential of 50° C between the top and the bottom of the oven, to compensate for the radical variations in the cross sectional thickness of the glass in large cathode-ray tubes.

The oven wall itself is five inches thick and composed of mineral wool insulation between internal sheets of stainless steel (internally) and heavy gauge steel (externally). The design is such that there is no through-metal from the oven supporting channel to the flues, and, therefore, no opportunity for short-circuiting of heat around the insulation.

Increased Burner Tips

Because of the circular construction of the ovens and the consequently greater heat losses from the outside wall of the oven, there are proportionately more burner tips on the outer burner manifolds than on the inner burner manifolds.

Each burner manifold (nine on each side of each exhauster oven, and 13 on each side of the screen baker, as illustrated in Figure 4) has been designed to carry its own inspirator to supply air gas mixture to the burner tips. The gas is manufactured gas supplied at 20 ounces pressure. The inspirators are differently, and carefully, sized to supply the proper amount of gas to each zone at the center of its satisfactory operating range. This allows for adjustment of inputs to each firing zone in both directions from the design condition (a common error in oven design being to allow for changes in inspirator-capacity in only one direction).

Ahead of each inspirator is a double-valve, high-pressure mechanical control,[6] with a temperature range of 50° to 550° C, and a mercury bulb installed just under the roof of the oven in that zone as illustrated in Figure 3. This type of control has been found to assure temperature precision within one-half of one per cent of scale range; 2° or 3° C. A close-up of one of these controls appears in Figure 5, showing its relationship to the solenoid valve of the safety pilot system, and the inspirator corresponding to that control.

In addition to the double-valve control, each zone has been fitted with an indicating thermometer[7] mounted on the side of the oven, as illustrated in Figure 6. To prevent any possibility of high ambient temperatures around the mechanism, the instrument has been spaced out from the oven wall on a transite panel. The mercury bulb of this indicating instrument has been located parallel to and directly beside the mercury bulb for its corresponding control instrument.

Indicating Thermometer Value

The purpose of the indicating thermometers is twofold: to give an accurate visual check of the temperature in each zone and to actuate a signal light system. The instrument[7] contains two microswitches which can be adjusted to bracket the control temperature over a spread of 5% of scale range (25° C). Both microswitches are connected to a red light on the control panel at the loading station. Such a light is provided for each fired oven section. Thus, if the temperature of any zone should rise or fall more than 10° above or below the control point, the red light flashes on. In normal operation all lights are off.

Every precaution has been taken at the FTR installation to maintain the exact temperature cycle specified through the oven; Figure 4 shows one of the cycles involved.

Safety Pilots in Fired Zones

As an added refinement a safety pilot has been installed in each fired zone, to actuate a normally-closed solenoid valve between the temperature control and the inspirator; Figure 5. This protects the system, zone by zone, against accidental outage.

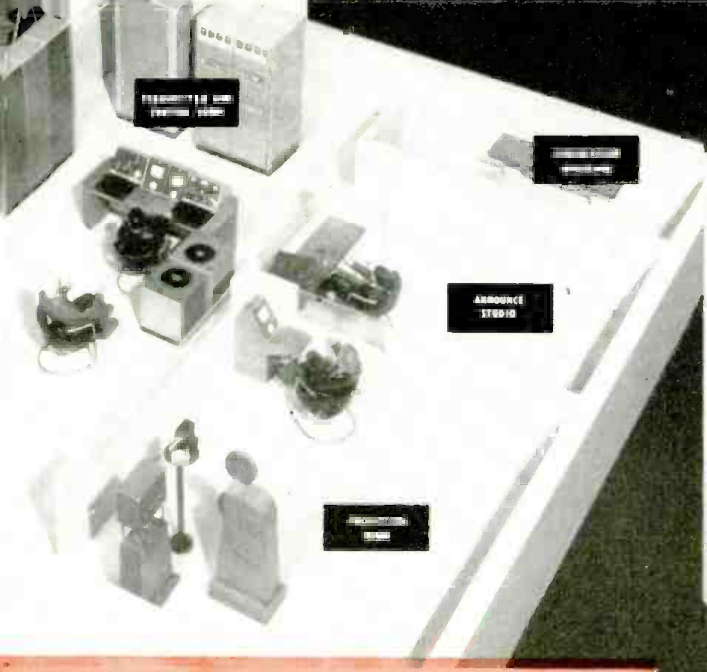
The control system for the oven could have been developed on a two-position basis with electrically operated instruments (in which case the electrical instruments shown in Figure 6 could have been hooked up to do the whole job, and the mechanical controls shown in Figure 5 rendered unnecessary). However, by using the extra mechanical double-valve controls, throttling action has been obtained and the gas input held in direct proportion to the zone load at all times.

The internal width of the screen baker is 50″, and the internal width of the exhauster ovens is 30″, so that tubes up to 28″ can be accommodated. Total tunnel length for the screen baker is 67½′ (53′ equipped for firing), and total tunnel length for the exhauster ovens is 50′ (45′ equipped for firing). In each case the oven is 36″ high internally, so that the face of the TV tube is about four to five inches below the oven roof.

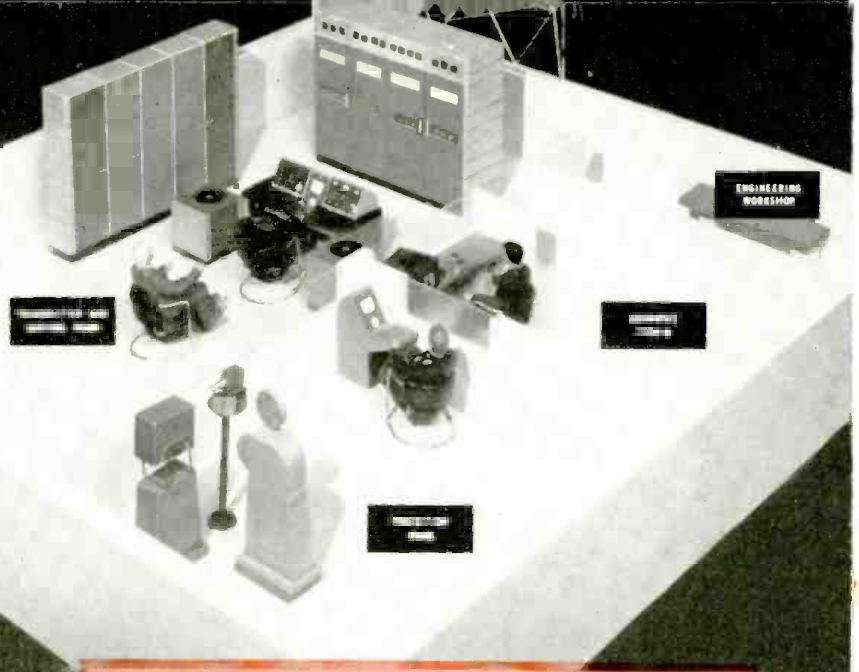
Circular-Oven Advantages

The continuously moving circular oven system has been found to afford striking savings in direct-labor costs, and provide superior results not only over the original batch system with individual heating bells and cycles for each tube, but over other in-line, or circular indexing oven equipment.

[6]Partlow 60. [7]Partlow LSS, formerly known as LBB.



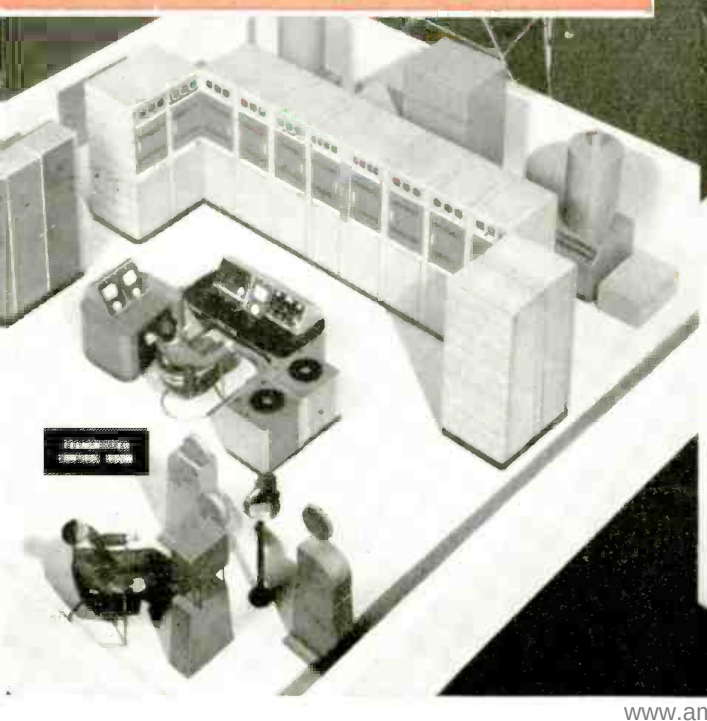
500 watts VHF (ERP range, ½ to 2 kw) This is a control-room set-up—complete with an RCA 500-watt transmitter, announce booth, and film facilities. The arrangement, and an RCA 5-bay Super Turnstile Antenna, provides up to 2 kw ERP*—gets you on the air for minimum outlay.



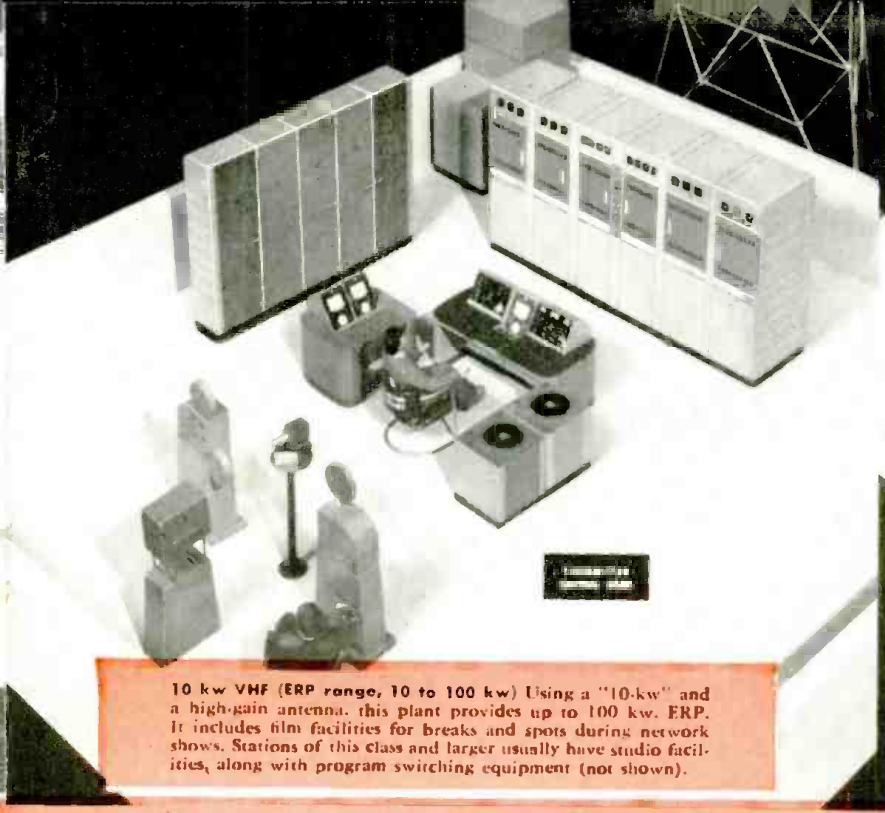
2 kw VHF (ERP range, 2 to 20 kw) Similar to 500-watt plant, but uses an RCA 2-kw transmitter. The ideal set-up for getting up to 20 kw (ERP) for a small investment. "In line" racks at left of control console are: monitoring, audio, and video equipments, sync generator, and power supplies.

"Tailored" transmitter plants

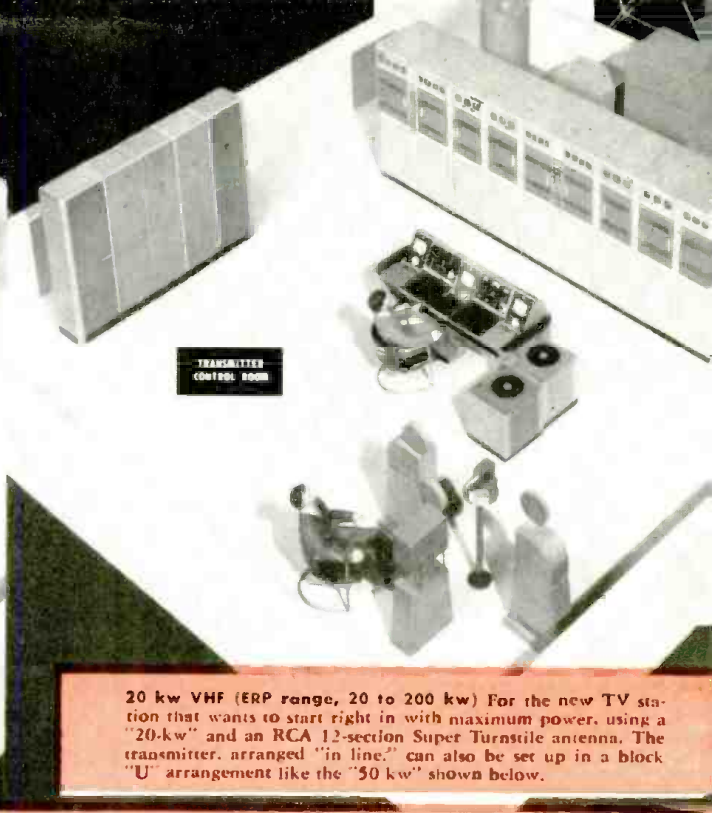
50 kw VHF (ERP range, 50 to 200 kw) Block "U" set-up for RCA's "50-kw." This arrangement is well suited for local building situations—or where physical limitations call for an antenna of medium gain and high ERP. Note film camera control and preview monitor next to operator for his convenience.



1 kw UHF (ERP range, 1 to 20 kw) For areas where UHF channels will be assigned, the "1 kw" and UHF antenna make it practical to start with a minimum investment. It offers interesting possibilities for areas up to 150,000 people—could prove popular in communities up to 1 million. Note network, film projection spots, station break facilities.



10 kw VHF (ERP range, 10 to 100 kw) Using a "10-kw" and a high-gain antenna, this plant provides up to 100 kw. ERP. It includes film facilities for breaks and spots during network shows. Stations of this class and larger usually have studio facilities, along with program switching equipment (not shown).



20 kw VHF (ERP range, 20 to 200 kw) For the new TV station that wants to start right in with maximum power, using a "20-kw" and an RCA 12-section Super Turnstile antenna. The transmitter, arranged "in line," can also be set up in a block "U" arrangement like the "50 kw" shown below.

... for any TV power up to 200 Kw!*

10-kw UHF (ERP range, 10 to 200 kw) Using an RCA "10-kw UHF" type TTU-10A and a TFU-24B high-gain antenna, this set-up offers the next logical step above the "1-kw" range. Or, you can start with 1 kw now—and increase power later simply by adding RCA matching amplifiers and associated equipment.

These models represent seven typical TV transmitter room arrangements for various power classes—from 500 watts to 200 kw, ERP*. They include the film equipment required for spot, station breaks, and network operation. They show the basic or minimum facilities you need to go "on the air" for a given power. The set-ups are worked out in accordance with tried-and-proved operating procedure and provide a handy means for estimating your space requirements. There is ample leeway to meet the particular needs of every station.

Your RCA Broadcast Sales Representative is ready to give you planning help like this—throughout your station! By all means, call him.

*Effective radiated power

RCA

RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.

Applications of

View of production line at plant producing chassis featuring components and allied equipment treated with glycerine agents. (Courtesy Westinghouse)

GLYCERINE has become a familiar material to those concerned with the development and improvement of TV equipment. Like their predecessors in the communications industry, TV engineers have learned that this versatile chemical can provide the answer to many problems and is often a means for improving an important process or component material.

Glycerine's characteristics have permitted its application, under various conditions, as a humectant or hygroscopic agent to prevent excessive drying and brittleness, as a plasticizer and softener, as a *bodying* agent and suspending medium for insoluble substances, as a pressure or heat transmitting medium, or as a solvent, antifreeze, lubricant, or penetrant.

Chemically, glycerine is an alcohol with three hydroxyl groups. It is capable of entering into a number of reactions which yield a variety of compounds useful to the television industry. Among the most important of its reactions are those leading to the synthesis of alkyd resins and ester gums.

One of the chief applications of glycerine in TV is in the manufacture of electrolytics. Over the years, scores of patents have specified glycerine as an effective non-volatile solvent and fluid component for the electrolyte in these parts. In the manufacturing method commonly employed, two sheets of aluminum, separated by cloth or paper impregnated with electrolyte paste, are formed into a roll and the whole unit is covered with impervious protective materials. Successive layers of foil-electrolyte-foil within the unit are separated by an insulating sheet of waxed paper. The nonconductor is a film of aluminum oxide anodically formed on the surface of the foil. A glycerine paste functions as the electrolytic conductor between this oxide film and the adjacent sheet of aluminum.

Improvements in capacitors and modifications to meet new or more specialized requirements have extended the use of glycerine. In one case, the production of an electrolyte for capacitors and electrolytic rectifiers has called for the use of a mixture of glycerine, acetic acid and ammonium hydroxide. This combination has been found to provide a neutral, nonaqueous electrolyte of relatively high fluidity. In another instance, a solution of ammonium pentaborate in glycerine has served as the electrolyte in an especially durable capacitor with low power-factor change at low temperatures.

Glycerine has also entered extensively into many of the compounds required in soldering operations. It is widely used as a solvent and bodying agent in soldering fluids and washes. Its presence lowers the surface tension of these solutions and permits the flux to wet the metal surfaces more thoroughly, thereby facilitating the soldering job. In one widely-used solution, the following ingredients are used: Zinc chloride (15 per cent); glycerine (25 per cent); and water (60 per cent). This preparation has been found to be satisfactory for use on copper, brass, steel, terne plate, tinned steel, Monel metal and others.

Glycerine has also been adopted as a component of soldering pastes, compounds which combine solder and flux in one preparation. One recently-developed preparation of this kind uses a mixture of ammonium chloride, zinc chloride and glycerine with pulverized solder.

Many kinds of soldering fluxes have been found to benefit from the inclusion of glycerine. In a new type of noncorrosive flux developed for soft soldering and tinning all metals except aluminum, the product is made by heating a mixture of glycerine and ammonium chloride. Other popular fluxes include those based on rosin, which combine the speed of an active acid flux with the protective effect afforded by a rosin residue. As an example, a flux of rosin, aniline hydrochloride, and glycerine has been found to release sufficient hydrochloric acid by decomposition to speed fluxing action and at the same time to be comparatively noncorrosive. Another special flux contains a resin made from glycerine which forms an electrical insulation over the part after it has been soldered.

Glycerine has also served as an aid in the production of insulated electrical conductors. Fiber coverings on wire are often treated with glycerine to keep them flexible and to prevent shrinkage after they are overlayed with asphalt or other moisture-proof material. Another interesting application is a process for applying latex coating to single or multiple-strand wire. The wire is drawn through a viscous stream of uncured latex which is surrounded by a concentric stream of heated glycerine. The glycerine has been found to transmit pressure of the walls of the die and confine the latex to a definite diameter. At the same time, it lubricates the passage of the coated wire and acts as a coagulating and curing agent for the latex. As the coating solidifies, the filament is withdrawn from the glycerine

Versatile Chemical Not Only Used in the Fabrication of Variety of Components Including Capacitors and Induction Cores, But as an Aid in the Manufacturing of Soldering Washes, Fluxes and Pastes, Insulation, Selenium and Mica Coatings, Potted Circuits, Plastic Gaskets and Finishes.

GLYCERINE in TV

by MILTON A. LESSER

in the form of a coated section of wire.

Glycerine has been found to be a useful adjunct in specialized processes in TV. It has helped, for example, to remove one of the kinks in the manufacture of selenium-coated dry-contact rectifiers and light sensitive devices. Selenium coatings are generally achieved on nickel-plated iron parts by dipping in molten selenium. Unless proper precautions are taken, the resultant film often shrinks and acquires a spongy character which causes short circuits. As a means of avoiding this the plates are spun to remove the excess while the selenium is still molten, and then the coated plates are immersed for three minutes in hot glycerine containing a small amount of sodium hydroxide. The selenium partially anneals during this period, and at the same time redeposits, leaving a surface of continuous crystalline structure which has a higher electrical conductivity than the original amorphous layer.

Glycerine has been found helpful in mica applications, when it is desired to obtain mica insulating films of essentially one-layer thickness. In making insulation for use in magnetic cores, strip material is coated with glycerine to act as an adhesive for the flake mica, which is applied by air-blowing. The strip is then wound on a rotating mandrel and heated to volatilize and remove the glycerine.

As a plasticizing agent for various types of plastics glycerine has had many applications. It has been extensively used in the production of molded articles, such as gaskets and other parts, based on polyvinyl alcohol. It has a similar application, plus a stabilizing function, in the production of phenol-formaldehyde resins which are useful as binders for electrical coils and other products.

An interesting example of glycerine's utility was provided when workers at the Bureau of Standards developed a casting resin for potting components of electronic circuits. This composition, known as *NBS casting resin*, hardens to a rigid solid around circuit elements without adverse effect on circuit operation. After gelation, exposed surfaces are flooded with glycerine to promote the formation of a hard surface. The gelled resin is then cured in an immersion of glycerine. By rigidly embedding electronic circuits or even complete plug-in sub-assemblies, the NBS compound has been found to serve as an excellent insulation, plus protection against rough handling and deteriorating atmospheric conditions.

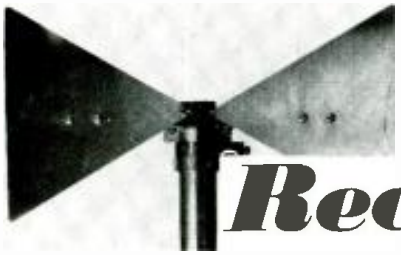
Modified glycerine-litharge cements are used in the production of special induction cores for tuned intermediate transformers. The cement is made by mixing two parts of finely pulverized iron powder and one part of litharge with sufficient glycerine to make a paste. The paste is poured or injected into the transformer housing and the coils and capacitors are then placed in the correct position to obtain the desired characteristics. A complex chemical reaction takes place between the ingredients, and the composition sets in a few hours without embrittlement. No change of volume occurs on hardening, so that the space relationship of the coil is maintained without distortion.

Alkyd resins are products of reactions of polyhydric alcohols with polybasic acids. Resulting resins are seldom used as such, but are modified with various other ingredients such as vegetable oils to provide products with properties suitable to specific applications. Phthalic anhydride is the most common acid used in alkyd manufacture, and glycerine is by far the most important alcohol. Nearly a third of all the glycerine produced in this country goes into the manufacture of alkyd resins and related ester gums (reaction products of glycerine and resin). In '50, 70-million pounds of glycerine were consumed in these products.

As noted by Combs,[1] the alkyds as a class are probably the most versatile of today's synthetic resins. They find use in molding, casting, and laminating, and in coatings for hundreds of household and industrial applications. In protective and decorative finishes, their largest fields, alkyds have been found to be outstanding for their adhesion, durability, toughness, and moisture and solvent resistance. They are compatible with other synthetics, including some styrene and silicone resins, and blends for baking and air-drying compositions are practically limitless. Early in the history of radio, manufacturers found that they could greatly speed their production of cabinets and obtain superior finishes on them by using alkyd-based coatings. During the war, government specifications for paints and enamels, including those for communications equipment, were widely based on alkyd resins. A high proportion of the finishes now used on TV cabinets and parts are similarly benefitted.

[*To Be Concluded in January*]

[1]Combs, J. B.: *Org. Finish (Guidebook Issue)*, 10:35; April, 1949.

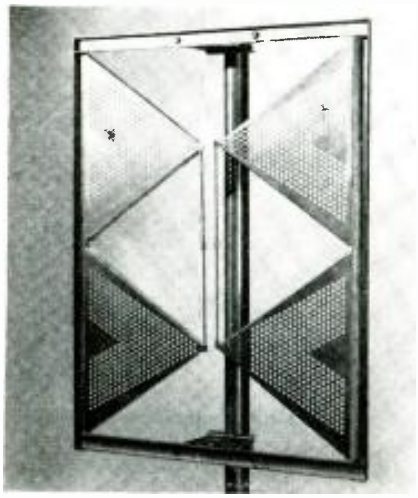


(Above)
Fan dipole.

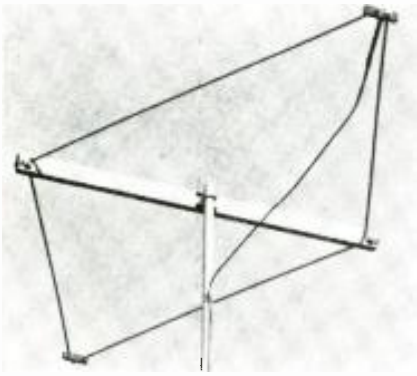
ULTRAHIGH Receiving Antennas

by BERT M. ELY

*Features of UHF Antennas Tested During Field Studies in Washington and Stratford, near Bridgeport, Conn.**

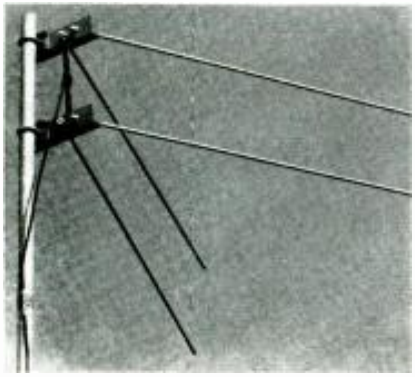


(Above)
Two-stacked fan dipole.



(Above)
Rhombic antenna.

(Below)
Stacked V antenna.



ON THE ULTRAHIGHS, tests[1] have indicated that several types of antennas might be used for receiving.

Most *vhf* antennas have been found to be unsatisfactory at *uhf*, except in medium and high signal strength areas which are free from reflection problems. Generally the *vhf* antennas have been found to have a low gain varying from approximately 10 db below a resonant dipole to 3 db above that of a resonant dipole when they are oriented for maximum response. Directivity has also been found to be poor in both the horizontal and vertical planes. This has been due to the many lobes present and the fact that the major lobe does not usually fall on the axis of the antenna.

Bandwidth of the *vhf* types have been found to be generally adequate, with the gain falling off somewhat toward the high end of the band. A major disadvantage is that the main lobes shift direction with frequency, requiring separate orientation for stations operating on widely separated channels.

Fan Dipole

The fan dipole has been found to be one of the simplest of all *uhf* antennas. The antenna is constructed of two triangles of metal, supported by a suitable insulator. Both triangles lie in the same plane, and the transmission line is attached to each apex. This type has been found to show some gain over a half-wave dipole.

Its directivity pattern indicates that it has a slight front-to-back ratio, unusual for a dipole antenna. The reduction in response in one direction is caused by the metal mast and mounting support.

The bandwidth of the triangular-shaped dipoles has been found to be excellent.

Stacked Fan Dipoles

The simple fan dipole can be stacked vertically. When properly phased, the gain of the two-stack fan dipole has been found to be 8.5 db at 850 mc. A four-stack fan dipole showed a gain of about 10.25 db at 850 mc.

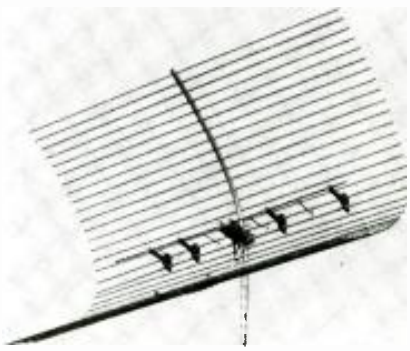
This stacking was found to result in an increase of vertical directivity.

The bandwidth, while good, was found to be not quite as uniform as that of the single fan dipole. This was found to be mainly due to some fre-

*Based on report prepared by RCA engineers and RCA Service Co., technicians who designed and tested the antennas.

(Left)
Corner reflector.

(Below)
Parabolic reflector.



quency selectivity in the individual transmission lines used for phasing the dipoles.

Rhombic Antennas

Rhombic antennas have been built and used very successfully during *uhf* field tests. In all applications the rhombics were adjusted for uni-directional operation and usually terminated at the far end with a suitable resistor. The gains were found to be high (up to 11+ db at 850 mc), indicating that it is well suited for fringe area operation.

The directivity was also found to be very good, the major forward lobe being quite narrow in the horizontal direction, decreasing in width with increasing frequency. While some minor side and back lobes are present, these should give no trouble except in very severe cases of reflections or multi-path reception.

Stacked Rhombics

Two or more of these rhombics can be stacked vertically, one above the other. When two of these antennas are stacked 12' apart, an increase in gain of about 2 db across the entire band was noted.

This stacking was also found to increase the vertical directivity.

Stacked V

Two *V*-type antennas, stacked one above the other, using the same rods as a standard dipole made for channel 2, and thus containing about the same amount of metal as a simple *vhf* dipole and reflector, were found to be very efficient. Tests revealed that this is a relatively high-gain antenna for use in medium and weak signal areas. It was also found that its gain increased with frequency, a highly desirable feature required to overcome both propagation and transmission line losses which increase with frequency.

The bandwidth of this antenna was found to be excellent, covering more than the required frequency spectrum.

Sheet Reflector Types

Sheet reflector-type antennas, wherein one or more dipoles are arranged in front of a large metallic sheet, have been in use for some time in such applications as radar and microwave transmission.

Although they can take many forms, three experimental types were tried. One featured dipoles arranged ahead of a flat sheet; another had five colinear dipoles at the focus of a parabolic sheet; and the third was a modified fan dipole in front of a corner reflector.

TELEVISION ENGINEERING INDEX, 1951

JANUARY

TVE-grams (*The '50 Record . . . Predictions for '51 . . . The NPA Orders . . . Government Clearing House for Technical Data . . . Pulse Counter . . . Televised Microscopy . . . Production Line Improvements . . . Trends.*)
Mass Production Component and Circuit Die Stamping ..... *Ralph G. Peters*
Perspective Distortion in TV Pictures *Edward C. Lloyd*
TV Audio Systems Engineering... *R. A. Isberg*
Video Relay Switching..... *C. R. Monro*
Human Aspects of Engineering Quality into a Product ..... *Carl L. Gartner*

FEBRUARY

TVE-grams (*Small Business Orders . . . DO Digits . . . Production Stepup Plans . . . IRE Measurement Conference . . . RF Capacitor . . . Thermal Shunts . . . Noise Figure Standards . . . Trends.*)
TV Receiving Antenna Research, Design and Production ..... *Ralph G. Peters*
17-Inch Metal-Shell Rectangular Production
TV Maintenance Procedures.. *John B. Ledbetter*
TV Pulse Techniques..... *C. J. Auditore*
Video Relay Switching..... *C. R. Monro*
Perspective Distortion in TV Pictures *Edward C. Lloyd*
Discontinuity Tuning Charts for Resonant Coax Lines ..... *J. Gregg Stephenson*

MARCH

TVE-grams (*Metal Conservation Programs . . . Green Light for Repairs . . . Subminiaturization in Action . . . High Power at Ultrahighs*)
VHF/UHF Insulation Production and Application Techniques ..... *Ralph G. Peters*
Determining Amplifier Sensitivity with Noise Diode ..... *Bert Ely*
Tricks in Tape Recording *Herbert G. Eidson, Jr.*
Hardware's Contributions to the Streamlined Chassis ..... *E. M. Jeffrey*
A Proposed Numbered Frequency Band Subdivision Plan ..... *Chester W. Young*
Characteristic Impedance of Shielded Coils ..... *Charles Susskind*

APRIL

TVE-grams (*The Ultrahigh Proposal . . . TV Recording . . . 90° Deflection Picture Tubes . . . UHF Tuner Designs . . . Portable TV Cameras . . . Accelerated Testing Techniques . . . High Speed 'Scope . . . The Empire State Story . . . Personals at the IRE Convention.*)
Expediting TV Receiver Noise Calculations *David A. Miller and E. A. Slusser*
Selenium Rectifiers for TV Applications *Rufus P. Turner*
TV Maintenance Practices... *John B. Ledbetter*
Mechanized Production and Unitized Construction ..... *Ralph G. Peters*
Speed of Response of the Cathode-Coupled Clipper..... *Philip F. Ordung and Herbert L. Krauss*

MAY

TVE-grams (*Defense Production News . . . Tube Fabrication Developments . . . Subminiature Design Trends . . . Filter Paper for Miniature Capacitors . . . Glass Soldering . . . Random Noise in Theatre TV . . . The Gray Scale in Video Systems.*)
Design Features of 30-Inch TV Receivers *Ricardo Muniz*
Horizontal Deflection System Requirements *John Narrace*
New Trends in Component Design *Ralph G. Peters*
Engineering a Super-Gain TV Antenna *M. E. Hiehle*
Cathode-Coupled Clipper Response Speed *Philip F. Ordung and Herbert L. Krauss*

JUNE

TVE-grams (*Military and Civilian Production Blueprint . . . The Controlled Materials Plan . . . Highlights of the NTSC Report . . . TV Recording Techniques . . . RF Dielectric Standards . . . New Materials*)
The Cosine Deflection Yoke..... *John Pell*
Component Miniaturization Techniques *Ralph G. Peters*
Application of Polarity Diplexing to Microwave Relay Systems..... *C. A. Rosencrans*
TV Maintenance and Safety Measures *John B. Ledbetter*
Super-Gain TV Antenna Engineering *M. E. Hiehle*
Cathode-Coupled Clipper Response Speed *Philip F. Ordung and Herbert L. Krauss*

JULY

TVE-grams (*Trade-Practice Conference Report . . . Critical Material Schedules . . . Steel and Iron Scrap Drive . . . Automatic Antenna Matching . . . Improved Audio Room Design . . . Accelerated Fabrication Techniques of Miniature Equipment*)
TV Video Switching..... *John M. Brush*
UHF RF Amplifier Design . . . *Ralph G. Peters*
Determining Capacity in Circuits by Frequency-Shift Method.. *Eugene A. Slusser*
TV Field Equipment Maintenance *John B. Ledbetter*
Silicones in TV..... Maurice C. Hommel

AUGUST

TVE-grams (*Receiver Production Progress Report . . . Production Pools . . . Microwave Instrumentation . . . Printed Circuitry . . . Colorimetry . . . Safety Precautions in TV Projection Rooms*)
Highlight Controls in Video Amplifiers *Ralph H. Cook*
Blue TV Lamp Design Report.... *R. D. Chipp*
Liquid Resin Curing in Component Manufacture ..... *Ralph G. Peters*
Automatic Synchronizing Generator for TV ..... *Calvin Ellis*

SEPTEMBER

TVE-grams (*Small-Business Activity . . . The Mica Situation . . . Picture Tone Reproduction in TV Recording . . . Fluorescent Lamp Interference . . . Heater-Hum Reduction in Low-Level Amplifiers . . . Low-Lead Picture-Tube Glass Design*)
Producing and Interpreting the Pulse Cross ..... *Donald M. Launer*
Metallized Glass Components for TV *H. S. Craumer*
Oscillating Color Sequence in Color TV *Ralph G. Peters*
Ethoxyline Plastics in the TV Industry *Elliot N. Dorman*
Automatic TV Sync Generator.... *Calvin Ellis*

OCTOBER

TVE-grams (*Metals, Allocations and Production . . . Conservation and Substitution . . . Materials for TV Broadcasters . . . Mobile TV Caravan . . . Color System Developments . . . Colored Solder . . . On the Calendar*)
Report on the First IRE UHF Symposium *Bert Ely*
Ultrahigh Transmitter and Receiver Design and Application ..... *Ralph G. Peters*
Fringe-Area Performance Predictions *Eugene A. Slusser*
Polyethylene in TV.... *Arthur J. Falconer, Jr.*
Powder Metal IF Cores..... *John P. Tucker*

NOVEMBER

TVE-grams (*The Military Impact . . . Material Substitution . . . Aluminum Production for '52 . . . Reflectometer for TV-Radar Component Tests . . . Magnetic Amplifiers . . . TV University Degrees*)
TV Picture Tubes With Iron Envelopes *C. S. Szegho and R. G. Pohl*
TV Studio Air Conditioning.. *W. W. Kennedy*
UHF Transmission-Line Problems. *Bert M. Ely*
The 45-Kw TV Station at Holme Moss, England..... *F. D. Bolt and O. E. Todd*
Ultrahigh Instrumentation..... *Ralph G. Peters*
Producing and Interpreting the Pulse-Cross *Donald M. Launer*
Fringe-Area Performance Predictions *E. A. Slusser*

DECEMBER

TVE-grams (*Down and Up Consumer Allotments . . . Selenium Cell Shortage Looms . . . Tons of Canadian Aluminum on Way . . . Rubber Plastics Developed . . . Barium Titanate Seen as Tube Substitute . . . Atomized Magnesium Powder . . . Compatible Color TV Field Tests.*)
UHF and VHF Station Basic Equipment Layouts.. *L. E. Anderson and W. O. Hadlock*
Technique for Measurement of Radar Characteristics of Targets.... *Ralph G. Peters*
Convection Ovens in TV Tube Production *N. E. Bertl*
Application of Glycerine in TV *Milton A. Lesser*
Ultrahigh Receiving Antennas.... *Bert M. Ely*
Annual Index to TELEVISION ENGINEERING, January-December, 1951.

CUMULATIVE INDEX
Alphabetically Arranged
For Authors and Subjects

A

B

M

N

O

P

Q

R

S

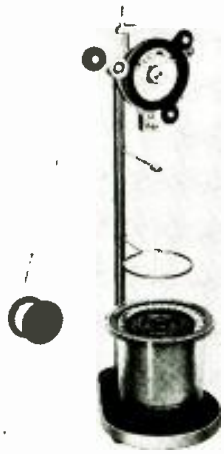
(*Continued on page 30*)

Production Aids

Dereeling Tension

A TENSION, engineered to handle very fine wire in automatic winding equipment as well as manually controlled machines, has been introduced. Sizes of wire handled are no. 30 to 50 on spools up to 3" diameter.

Model can be used in multiple or single winding, and can be mounted side by side on a common support for multiple winding. Space required in such an arrangement is only ¼" per head. Patented anti-kink ring is said to prevent wire tangling or knotting. Spool cup is transparent plastic to allow operator to observe wire supply. *T-100; Geo. Stevens Mfg. Co., Inc., Pulaski Road at Peterson, Chicago 30, Ill.*



Stevens Dereeling Tension

Carbon Soldered to Metal Process

A CARBON-TO-METAL SOLDERING PROCESS which can be used for contacts, small brushes, friction devices and many other purposes, has been developed.

Method is said to permit welding carbon contacts directly to metal arms; carbon brushes can be soldered to phosphor bronze or beryllium copper leaf springs, thus eliminating brush holders and shunts and simplifying equipment design. *Stackpole Carbon Co., St. Marys, Pa.*

Selflocking Anchor Nuts

SELFLOCKING ANCHOR NUTS of all spring-steel have been produced.

Nut consists of a flanged anchoring portion integral with a thin-walled drawn shell, which is tapped throughout its length, crimped and heat treated.

Nut is claimed to permit use in high temperature applications up to 700°, and is not adversely affected by lubricants or solvents. Available in the solid-anchor floating-anchor and gang-channel type of the ¼" size.—*Kaynar Manufacturing Co., Los Angeles, Calif.*

Mechanical Switch

A MECHANICAL SWITCH, which works on the teeter-totter principle with selective circuits, preventing both circuits from being operative at the same time, has been introduced. Single cord receptacle is claimed to eliminate harness assemblies; all wiring connections are made internally.—*Lektro Lok; Simonds Machine Co., Inc., Southbridge, Mass.*

Binding Post

A BINDING POST, which incorporates a quick disconnect principle, with a spring-loaded action and stainless steel locking jaws, has been announced.

Teflon insulation throughout is said to provide low dielectric loss, no moisture absorbance, no carbon tracking, and the maintenance of mechanical properties in the binding post temperature application range of 67° F to +149° F. Color coded removable rubber caps can be provided for identification and personnel protection. Unit is silver plated to the base, which is a chessman type for easy soldering.—*Model K952; Kings Electronics Co., Inc., 40 Marbledale Rd., Tuckahoe, N. Y.*

Kings Electronics Binding Post

Nylon Plug Base

A NYLON PLUG BASE for capacitors of the type CE50 series, fitting a standard medium octal socket, has been developed. Suitable for use in capacitors made under JAN-C-62 specifications.

Base is said to have a melting point in excess of 425° F. Slight resiliency of the material is claimed to eliminate danger of base cutting cathode tabs and also results in a better seal to the metal can.—*Model 1800; Industrial Devices, Inc., 22 State Rd., Edgewater, N. J.*

Solder Pot for Tinning Formvar and Long Leads

A THERMOSTATICALLY-CONTROLLED SOLDER POT that features a crucible 4⅛" deep by 1¾" diameter, for tinning formvar wire and long leads, has been developed.

Crucible is tapered down at 45°. Available in 4 temperature ranges: maximum, 1200° *F*, minimum, 800° *F*; 1000° *F* maximum, 700° *F* minimum; 800° *F* maximum, 500° *F* minimum; and 600° *F* maximum, 400° *F* minimum. *Models 41, 42, 43, 44; Dee Electric Co., 1101 N. Paulina St., Chicago 22, Ill.*

Stainless Steel Fastenings

STAINLESS STEEL FASTENINGS for cap screws, machine screws, sheet metal and wood set screws, nuts, washers, etc., have been produced. Included are small screws in class 3; 0/80-1/72-2/64 up to 1", with AN drilled heads. Special screw machine products are also available.—*Star Stainless Screw Co., 190 Union Ave., Paterson 2, N. J.*

Instruments

Pulse-Train Calibrator

A CALIBRATOR for the generation of pulse trains, has been developed. Includes plugin type construction, and an added selection of pulses available from rotary switches.

Calibrator has 17 different pulse rates available at the output connections, and may be used as a secondary frequency standard, as a master timing oscillator for pulse equipment, for the generation of timing signals for oscillographic recording, and the detection of jitter in delayed signals.

Simultaneous outputs having the following pulse spacings are available: 10, 100, 1,000, 10,000, and 100,000 microseconds. Additionally, a selection of one of the following pulse spacings is available: 20, 50, 200, 500, 2,000, 5,000, 20,000, 50,000 and 200,000 microseconds.—*Model D-1; Rutherford Electronics Co., 3707 South Robertson Blvd., Culvert City, Calif.*

Rutherford Electronics Calibrator

Audio Oscillator

AN AUDIO OSCILLATOR with only two-frequencies, 400 and 1,000 cycles, and useful as a modulating source for high-frequency oscillators, has been introduced.

Unit is said to provide a 0.2-watt output, with less than 3% distortion, and is adequate for bridge measurement work and many other fixed-frequency applications. Own power supply is built in.

Iron-core tuning inductance has an isolated output coupling coil, thus allowing a 117N7GT diode-pentode, used as a voltage doubler, to work directly off the *ac* line.—*1214-A; General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.*

G-R Audio Oscillator

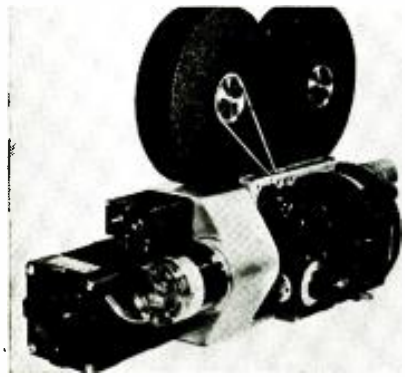
Broadcast News

Camera Drive System

A DRIVE SYSTEM for synchronized motion picture camera operation has been announced. System is said to operate a series of motion picture cameras, taking their pictures at the same time to close tolerance.

Maximum possible deviation of shutter position in this system, which utilizes circular rotating camera shutters, is claimed to be less than 1°, which at 12 frames per second is equivalent to an accuracy of 23° microseconds. As frame frequency increases, the angular accuracy remains essentially unchanged while the time accuracy decreases.

System has been applied to a 35-mm motion picture camera which uses interchangeable magazines having capacities of 400' and 1000' of film; is not only limited to one camera type, but is equally applicable for use with a number of motion picture, scientific, and ribbon-frame cameras, and motion picture and process projectors.—*Servo-Sync Camera Drive System; J. A. Maurer, Inc., Photographic Instrumentation Division, 37-01 31st St., Long Island City 1, N. Y.*



Maurer Servo-Sync Camera Drive System

Power Amplifiers

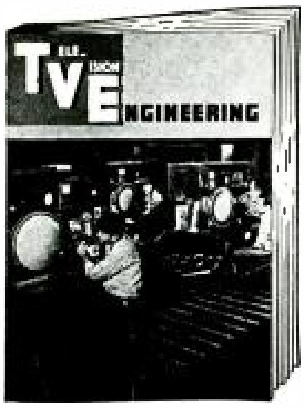
AMPLIFIERS TO PERMIT stations to boost power on low and high bands have been developed.

Available is a 35-kw amplifier for low-channel transmitters and a 20-kw amplifier for high channel use to permit stations to produce the proposed maximum powers of 100 kw for low-channel operation and 200 kw for high-channel stations.

Amplifiers have been designed to operate with all current makes of 5-kw transmitters.—*Type TF-3-A; G. E. broadcast equipment division.*

G.E. 35-kw Low-Channel Amplifier Setup.

Group Subscription Plan



You Save Half of the Subscription Price if Four or More Orders, Including Your Own, Are Properly Entered on This Form

TELEVISION ENGINEERING

52 Vanderbilt Avenue, New York 17, N. Y.

Two years (24 issues) at the rate of $3.00 each. This rate applies only on 4 or more subscriptions when occupations are given.) Regular cost is $3.00 for one year.

USE COUPON BELOW

Name ....
Address ....
City .... Zone .... State ....
Occupation .... Title ....
Department in which employed
☐ Operation ☐ Production ☐ Research
Employed by ....
Nature of Business ....
(State if TV Manufacturer, TV Broadcast Station, etc.)

Name ....
Address ....
City .... Zone .... State ....
Occupation .... Title ....
Department in which employed
☐ Operation ☐ Production ☐ Research
Employed by ....
Nature of Business ....
(State if TV Manufacturer, TV Broadcast Station, etc.)

Name ....
Address ....
City .... Zone .... State ....
Occupation .... Title ....
Department in which employed
☐ Operation ☐ Production ☐ Research
Employed by ....
Nature of Business ....
(State if TV Manufacturer, TV Broadcast Station, etc.)

Name ....
Address ....
City .... Zone .... State ....
Occupation .... Title ....
Department in which employed
☐ Operation ☐ Production ☐ Research
Employed by ....
Nature of Business ....
(State if TV Manufacturer, TV Broadcast Station, etc.)

Business or professional classifications are required to complete our records. Each subscriber should write one of the following classifications in space indicated. Use separate sheet of paper for additional names.

CHIEF ENGINEER — ENGINEER — EXECUTIVE
PURCHASING AGENT — DEPARTMENT MANAGER

State your classification if not listed.

This Group Sent in by—
Name ....
Address ....

Industry Literature

Ferroxcube Corp. of America, 50 E. 41st St., New York 17, N. Y., has released a 12-page bulletin, *FC-5100,* entitled *Introduction to the Application of Ferroxcube,* which features data on the use of ferromagnetic ferrites as magnetic cores. Also discussed are the effects of copper, eddy current, hysteresis, and residual losses in magnetic materials as they pertain to inductor design.

American Platinum Works, 231 New Jersey Railroad Ave., Newark, N. J., has published a 48-page pocket-size manual, *Complete Guide to Successful Silver Brazing,* describing low-temperature brazing, brazing alloys, joint design, preformed brazing shapes, plymetals, fluxing, heating methods, cleaning and inspection. Reference charts are included.

John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y., has published a second edition of *Broadcast Operator's Handbook,* by Harold E. Ennes, WIRE. Book covers day-to-day broadcast operating practice in control rooms, the master control, remote control, and the transmitter. One chapter covers meeting emergencies in the control room and maintenance of studio equipment. Book features AM and FM. Contains 440 pages, and is priced at $5.40.

Dawe Instruments, Ltd., 130 Uxbridge Rd., Hanwell, London W7, England, has released a 6-page brochure describing instruments for resistors, capacitors, inductors, *af* oscillators and *dc* sources, meters and indicators, and speed-measuring equipment.

General Electric Co., Schenectady 5, N. Y., has published an 80-page catalog, *GEC-1016,* summarizing all of their testing and measuring equipment for laboratory and production-line use.

Cannon Electric Advertising Dept., P.O. Box 75, Lincoln Heights Station, Los Angeles 31, Calif., has released a 32-page handbook, *SAM-1, Using the AN-M Connector,* describing connectors for aircraft, radar, instrument and general applications.

Hudson Radio and TV Corp., 48 W. 48th St., New York 19, N. Y., has prepared a *Jan-Cross-Reference Guide,* showing joint Army and Navy components and their commercial equivalents, and commercial-to-commercial equivalents.

South River Metal Products Co., Inc., South River, N. J., has released a catalog on antenna mounts and accessories. Included are a chimney-mount antenna base, two-piece chimney mount for high masts, adjustable wall brackets, pipe mounts, and other types of mount brackets and hardware.

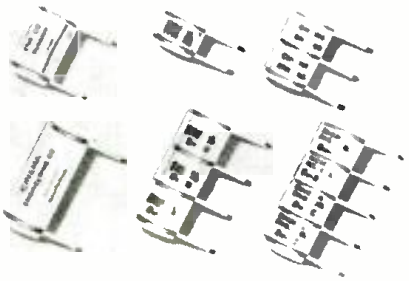
Clarostat Mfg. Co., Inc., Dover, New Hampshire, has released a catalog, *No. 51,* listing carbon and wire-wound controls, attachable shafts and switches, rotary switches, constant-impedance controls and sound-system attenuators, tube-type resistors and ballasts, line-voltage regulators, fixed and adjustable power resistors, power rheostats, glass-insulated flexible resistors, TV beam benders, and the Clarostat power resistor decade box.

TV Parts & Accessory Review

BW Resistors

BW RESISTORS with soldered lugs, in a range from single section chapron-wound to a 4-section resistors, and multi-pi windings, have been announced.

Resistance values are one ohm to one megohm. Wattage ratings vary from ¼ to 1 watt. Available in a variety of resistance wire alloys and impregation treatments. *BW-1B; Cinema Engineering Co., Burbank, Cal.*



Cinema Engineering Resistors

Tubular Ceramic Capacitors

TUBULAR CERAMIC CAPACITORS with a 6000-volt rating have been announced.

Available in eleven capacitance values from 4.7 to 47 mfd. *SI-T1; Aerovox Corp., New Bedford, Mass.*

* * *

Cathode Followers

A SERIES OF CATHODE FOLLOWERS, designed to terminate piezoelectric pickups and other high impedance devices into standard electronic equipment, is now available.

Models feature high input impedance, low input capacitance, wide frequency response, low noise level, high overload.

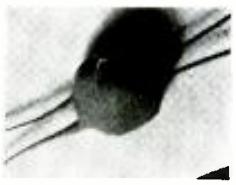
An *ac* model has a frequency response of 1 to 200,000 cps; input impedance, 60 megohms; input capacitance, 5 mmfd; output impedance of 1000 ohms; gain, 0.99; noise level, under 0.5 millivolt; overloading, 60 volts. Input and output blocking capacitors provided. Tubes: 1-6AK5 and 6X4. *F103 and F105 (battery operated), and F407, ac; Gulton Manufacturing Corp., Metuchen, N. J.*

Miniature Pulse Transformers

MINIATURE PULSE TRANSFORMERS, 7/16" x 7/16" x 3/8", with weight less than 0.1 ounce, designed for low-power application, have been announced.

Transformers have been built in a range from 0.2 microsecond to over 5 microseconds pulse widths, when used as a blocking oscillator. Two, three and four winding units with and without centertaps are obtainable to fit particular circuitry requirements. Features are said to be fast rise time, with a minimum decay. Standard frequency response is from 100 kc to 30 mc, which can be shifted to a higher or lower frequency range as may be required. Transformers may be built of class *H* materials for continuous operation at 200° C.

Transformers can be used in airborne radar, and other coded pulse sources.—*Samuel Fung, General Manager, PCA Electronics, Inc., 6368 DeLongpre Ave., Hollywood 28, Calif.*



PCA Miniature Pulse Transformers

Ceramic Disc Capacitors

TWO LINES OF CERAMIC DISC capacitors have been announced.

One line of temperature-compensation disc capacitors, which are said to have a capacity range of 475 mmfd on the DI-6 N1400 material down to .3 mmfd on the DI-1 size, with tolerances of ±5% or greater, conform to RTMA class 1 ceramic capacitors. Rated for working voltage at 500 volts *dc* and flash tested at 1500 volts *dc*.

Another line features hi-Q disc capacitors which are said to permit a much wider temperature compensating range, and relatively higher dielectric constants. *Q*, a minimum of 250 at 1 mc, is somewhat lower than the class 1 ceramics.—*Electrical Reactance Corp., Engineering Dept., Olean, N. Y.*

ERC Ceramic Capacitors

Octal-Type 9-Pin Connector and Plug

AN OCTAL-TYPE 9-PIN CONNECTOR AND PLUG for use with *uhf* converters or wherever a small connector is needed, has been developed.

Connector is claimed to have long leakage paths providing good breakdown rating, and *top connected contacts* which use the minimum of critical material.

Featured are leads attached directly to the contact; no projecting solder terminals; 100% molded insulation around each contact and lead; each lead with individual strain relief; and wire tip crimped.—*200 FEC connector, 100 C plug; Alden Products Co., Brockton, Mass.*

Annual Index

(Continued from page 25)

U

V

W

Y

Station Layouts

(Continued from page 9)

possible for one person to handle both network and film programs. However, many stations will prefer to use two operators, and two are easily accommodated with the proposed arrangements.

Application Flexibility

The console or any section of it may be used for various purposes at locations remote from the transmitter. For example, the preview monitor and audio console could be used in a studio control room or remote position along with the other video equipment.

Similarly, the remote control section could be used in a studio control room or master control.

Some applications of the switching console are: Small station operation (no studio) with all equipment at transmitter site; larger station operation with the console and film equipment at the transmitter location or master control for *off-hour* use when the studios are in rehearsal or shut down; large station operation, except that the transmitter is remote from the studios.

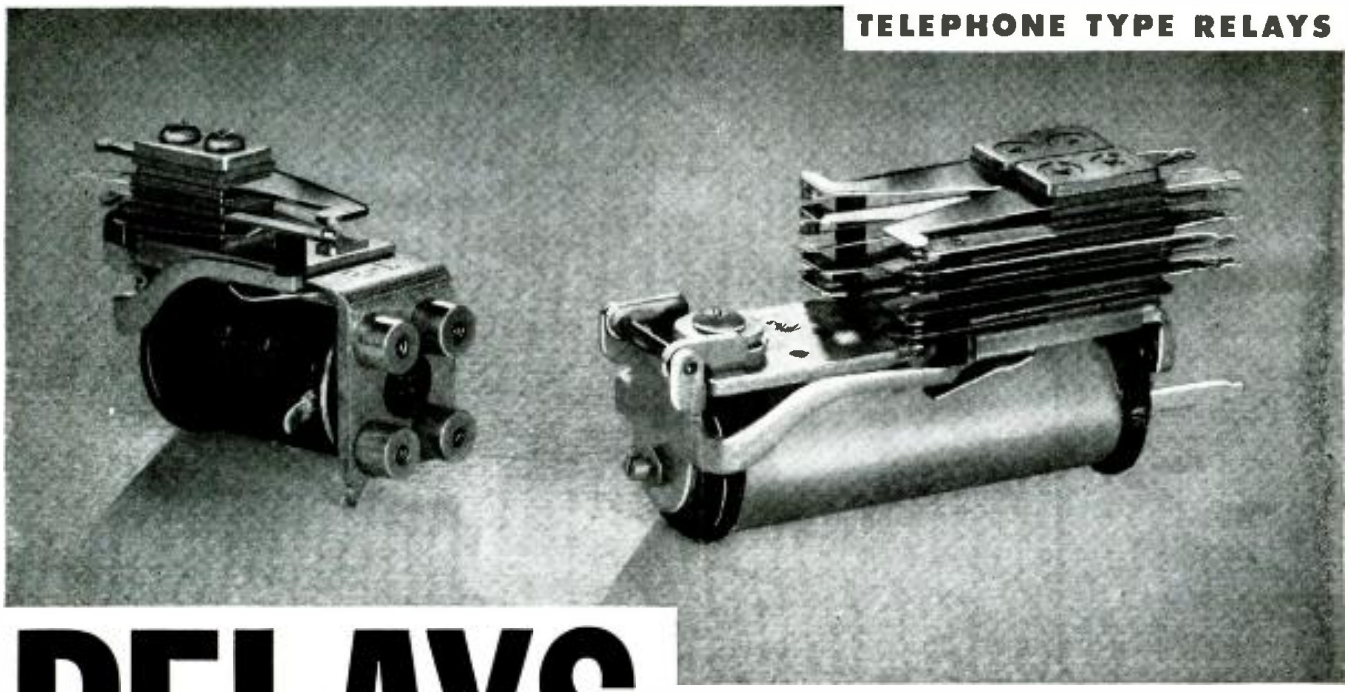
ADVERTISERS IN THIS ISSUE

TELEVISION ENGINEERING

DECEMBER, 1951

Briefly Speaking . . .

THE CRITICAL SHORTAGE of engineers, with which we are now faced and which may become more acute during the next few years, has prompted many to make every effort to alleviate the situation. In one such program, announced by G. E., a rotating-assignment training plan has been introduced. Engineers will be assigned to tube plants in various cities, and oriented in not only manufacturing techniques, but management and research. This approach appears to follow the patterns outlined by several of the industry's leading industrialists and educators, who have pointed out that industry must strive to see that the best possible use is made of the supply of engineers now available. . . . Electro-Physics Co., Box 136, G. P. O., New York City, has announced the formation of an instrument-optics division, which is now accepting orders for the manufacture of lenses of any curvature in diameters from 3 to 75mm (0.1" to 3"), and U. S. Government specifications case-hardened lenses, prisms, filters, optical flats, and laminated combinations of any of these. . . . Voice of America has announced a need (New York City and overseas) for experienced electronic engineers and technicians. Applications (standard form *57*) should be sent to: U. S. Department of State, Personnel Branch, 1790 Broadway, 16th Floor, New York 19, N. Y. . . . The Cincinnati section of the IRE has announced that its Spring technical conference will be held at Cincinnati on April 19, '52. . . . The radio chain Emissoras Unidas in Brazil has recently purchased three complete TV stations and a microwave link, valued at $2.100.000, from International G. E. Two of the TV stations will be installed at Sao Paulo, and one at Rio de Janeiro. This will make a total of three stations at Sao Paulo and two at Rio. . . . A predoctoral fellowship in EE, providing an annual grant of $2.700, has been established by RCA in the college of engineering at NYU. The award will be known as the *David Sarnoff Fellowship at New York University*. . . . A fifteen-week course at the University of New Hampshire, entitled *Quality Control by Statistical Methods*, has been undertaken by a group of Clarostat engineers and production men headed by William Mucher. Sessions are directed by Professor William Keckline of the university's college of technology. . . . John D. Ryder, professor and head of the EE department of the University of Illinois, and Ernst Weber, professor and head of the EE department of the Polytechnic Institute of Brooklyn, have been elected IRE directors for '52-'54. Regional directors elected for '52-'53 were: Region 1, Glenn H. Browning, president of Browning Labs; region 3, Irving G. Wolff, director of the RCA radio tube research lab; region 5, Alois W. Graf, patent lawyer, Chicago, Ill.; region 7, Karl Spangenburg, professor of EE, Stanford University. . . . The Annual Industrial Relations Award was awarded to IRC recently for the development and maintenance of effective employee-employer relations. . . . The California business of Andrew Corp. will now be handled by Andrew California Corp., Simi, Calif.



RELAYS

This list represents only a small part of more than a million relays in our stock—one of the world's largest. All relays are standard, brand new in original packing, and fully guaranteed by Relay Sales.
Send us your relay requirements. If the items are in stock we can make immediate delivery at substantial savings in cost to you.

SHORT TELEPHONE RELAYS

STK. NO.	VOLTAGE	OHMAGE	CONTACTS	UNIT PRICE
R-635	12 VDC	100	1C&1B	$1.35
R-308	12 VDC	100	2C @ 4 Amps	1.85
R-343	12 VDC	100	1C	2.00
R-826	12 VDC	150	2C, 1B	1.55
R-770	24 VDC	150	1A 10 Amps	1.45
R-368	8 12 VDC	200	1B	1.40
R-771	24 VDC	200	1A/10 Amps	1.45
R-603	18 24 VDC	400	2A	1.55
R-575	24 VDC	500	2C	2.40
R-764	48 VDC	1000	1C&2A	2.00
R-417	5.5 ma	5800	2C	2.50
R-563	60 120 VDC	7500	1A	2 3.10
R-213	5 8 VAC 60 Cy		2A	2.50
R-801	115 VAC		NONE	1.45
R-589	12 VDC	125	2A	1.30
R-113	12 VDC	150	4A	1.55
R-689	12, 24 VDC	255	1C	1.55
R-799	24 VDC	500	NONE	1.00
R-115	24 VDC	500	1C	1.70
R-110	24 32 VDC	3500	1C	2/3.45
R-121	150 VDC	5000	2A&1C	2.05
R-122	150 VDC	5000	2C Octal Base	2.50
R-634	150/250 VDC	6000	1A&1B	2.45
R-369	8/12 VDC	150	2A, 2B	1.60
R-908	6 VDC	15	4A @ 4 Amps	1.50
R-800	12 VDC	150	2C&1A	1.55
R-537	12, 24 VDC	150	2C&1B	2.00
R-750	24 VDC	400	1A	1.60
R-367	10 16 VDC	195	2C	2.50
R-335	20 30 VDC	700	2A, 1C	2.00
R-366	30 120 VDC	4850	1C	2.50

STANDARD TELEPHONE RELAYS

STK. NO.	VOLTAGE	OHMAGE	CONTACTS	UNIT PRICE
R-806	115 VAC	900	1A	$2.05
R-161	6 VDC	10	2B&1A	1.10
R-873	6 VDC	12	3C-3A MICALEX	3.00
R-305	12 VDC	50	2A Split Cerm.	1.35
R-360	24 VDC	200	1C	1.50
R-484	24 VDC	200	2A, 1C	1.35
R-337	24 48 VDC	1200	1A, 2B Split	2.65
R-101	24 VDC	1300	2A	2.50
R-868	30, 162 VDC	3300	1C	1.90
R-365	52 162 VDC	3300	4C	3.95
R-518	85 125 VDC	6500	1C	3.60
R-918	52 228 VDC	6500	1C	3.60
R-852	52 228 VDC	6500	1C, 1A	3.00
R-341	75 228 VDC	6500	4C @ 4 Amps	3.65
R-633	180 350 VDC	10,000	1C @ 5 Amps	2.90
R-344	72/300 VDC	11,300	3A, 1B	2.45
R-332	100/350 VDC	40,000	2A	3.50
R-664	110 VAC		2B&1A OCT.SOCKET	2.45
R-667	6 VDC	.75	1B 10AMP. 1A/3AMP.	1.45
R-632	6 VDC	12	5A&1C	3.25
R-154	6 12 VDC	200	1A	1.50
R-517	12 VDC	250	2A	1.50
R-116	85 VDC	3000	1B	3.05
R-631	100/125 VDC	3300	2A	1.90
R-545	110 250 VDC	7000	1C	2.40
R-124	300 VDC	12,000	1A	1.55
R-511	24 VDC	200	W MICRO N.O.	3.05
R-160	6 VDC	12	3C&3A	3.00
R-851	52/228 VDC	6500	1C, 1A	3.00
R-591	6 VDC	40	1B&1C	1.35
R-155	12 VDC	100	4A&4B	1.45
R-520	200 300 VDC	14,000	2C	3.45
R-159	6 VDC	50	2A	1.35
R-158	6 VDC	50	4A Cerm.	1.85
R-381	6 8 VDC	100	1A Split	2.50
R-382	6/12 VDC	200	1B Split	2.50
R-153	12 VDC	200	1C&1A	1.55
R-304	12 VDC	200	4A Split Cerm.	2.50
R-383	6 12 VDC	500	1A Split	2.50
R-385	6 12 VDC	500	1B Split	2.50
R-384	6 12 VDC	500	3A Split	3.00
R-576	12 VDC	200	2A	2.50
R-316	24 VDC	200	1C	1.50

OTHER RELAY TYPES IN STOCK

- Keying Relays
- Rotary Relays
- Contactors
- Midget Relays
- Voltage Regulators
- Differential Relays
- Sealed Relays
- Special Relays

Relay Sales

Manufacturers and Distributors:
Write for the new Relay Sales Catalog.

Telephone
SEeley 8-4146

833 W. CHICAGO AVE., DEPT. R-5, CHICAGO 22, ILL.

You won't find today's most widely used military capacitors listed in JAN!

Joint Army and Navy component specifications were never meant to limit engineering progress—and, with Sprague, they most certainly haven't!

. . . Sprague subminiature capacitors have pioneered size and weight reductions plus high-temperature operation that would have been impossible with conventional capacitors. You'll not find these unique, hermetically-sealed capacitors listed in the current issue of Joint Army-Navy specification JAN-C-25. In every case, however, they have been fully approved for use. The reason is simple: In effect, Sprague subminiature capacitors are *super*-JAN types. They greatly exceed the already high minimum quality limits established by JAN specifications.

As the long-time leader in capacitor development, Sprague clearly recognizes that its engineering obligation extends far beyond conventional standards—*so markedly so that much of today's tremendous production of Sprague components for military use is based on types for which no JAN specifications yet exist!*

Thus, to equipment manufacturers faced with the problems of reducing size and weight or of paving the way to higher temperature operation, Sprague offers help along many lines—from the subminiature capacitors shown here to Vitamin Q☆ photo-flash capacitors to Ceroc☆ 250°C. ceramic-Teflon insulated magnet wire and many others.

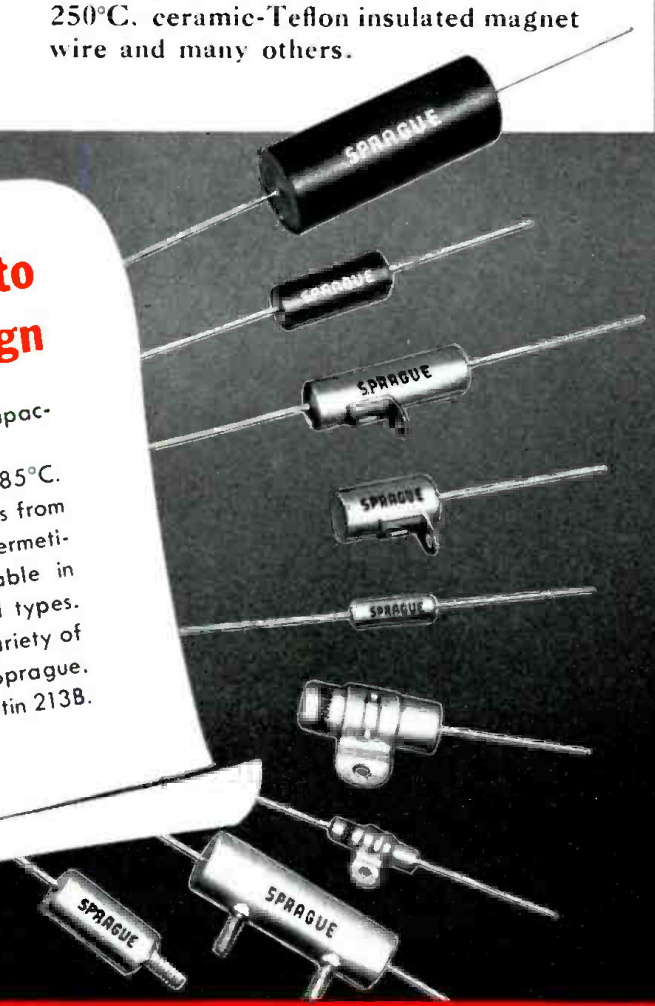
. . . opening new horizons to critical equipment design

You can do miniaturization jobs with these capacitors that were hitherto impossible!

Conservatively rated in designs for either 85°C. or 125°C. operation and with voltage ratings from 100 to 1000 volts, Sprague subminiature hermetically-sealed paper capacitors are available in physical sizes materially smaller than JAN types. Rigid mounting is greatly simplified by a variety of new mounting designs—also pioneered by Sprague.

For complete information write for Bulletin 213B.

☆Trademark



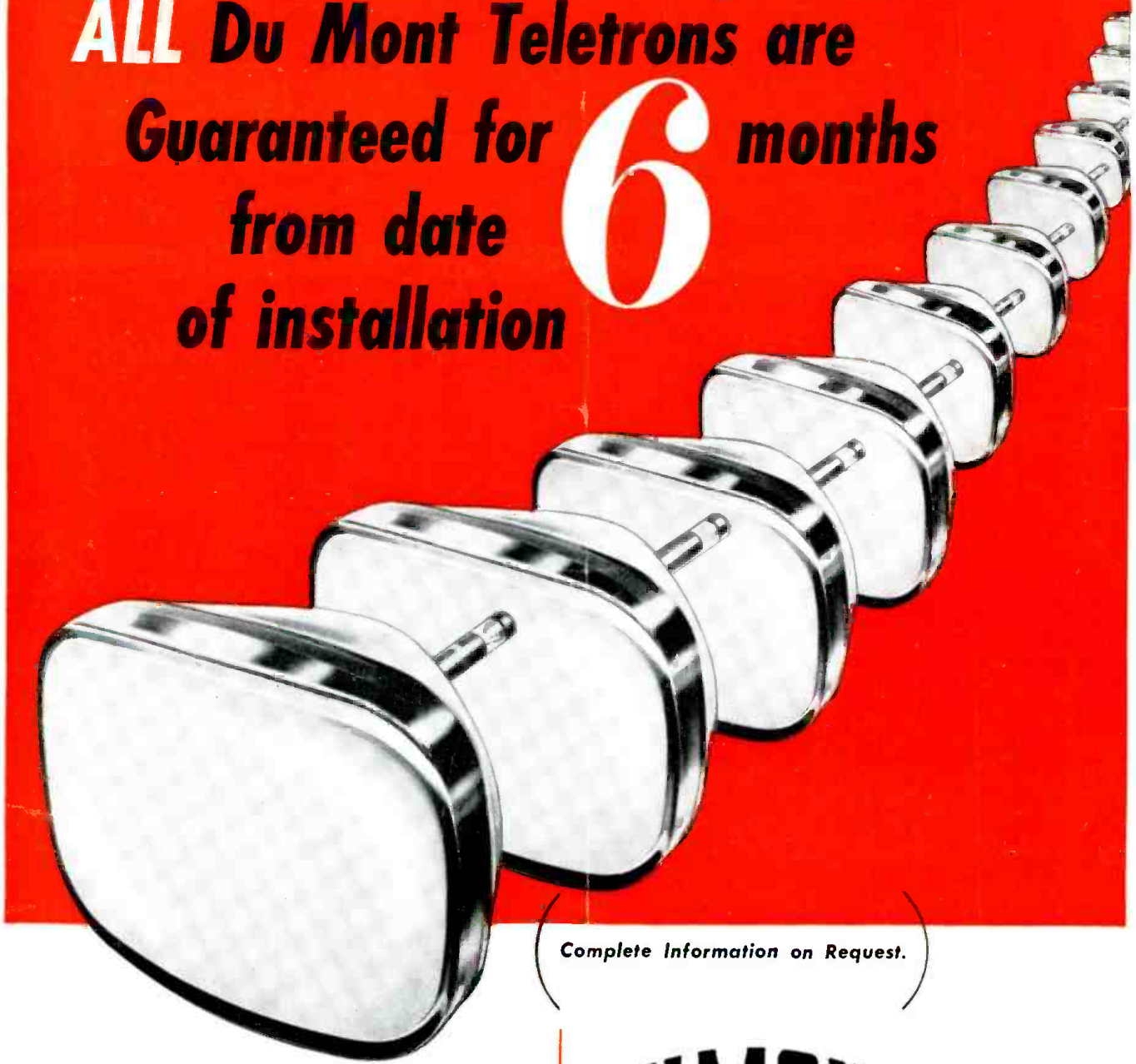
SPRAGUE

PIONEERS IN ELECTRIC AND ELECTRONIC DEVELOPMENT

SPRAGUE ELECTRIC COMPANY • NORTH ADAMS, MASSACHUSETTS

NOW, Mr. Manufacturer...

ALL Du Mont Teletrons are Guaranteed for 6 months from date of installation



Complete Information on Request.

Now Du Mont assures you of six months' protection from the day your receiver is installed in the customer's home, and insures still greater customer-confidence for your brand name. Du Mont offers the best guarantee protection today.

DUMONT

*Teletrons**

CATHODE-RAY TUBE DIVISION ALLEN B. DU MONT LABORATORIES, INC., CLIFTON, N. J. *Trade-mark