

Price 25 Cents

Aug. '50

FM-TV

RADIO COMMUNICATION

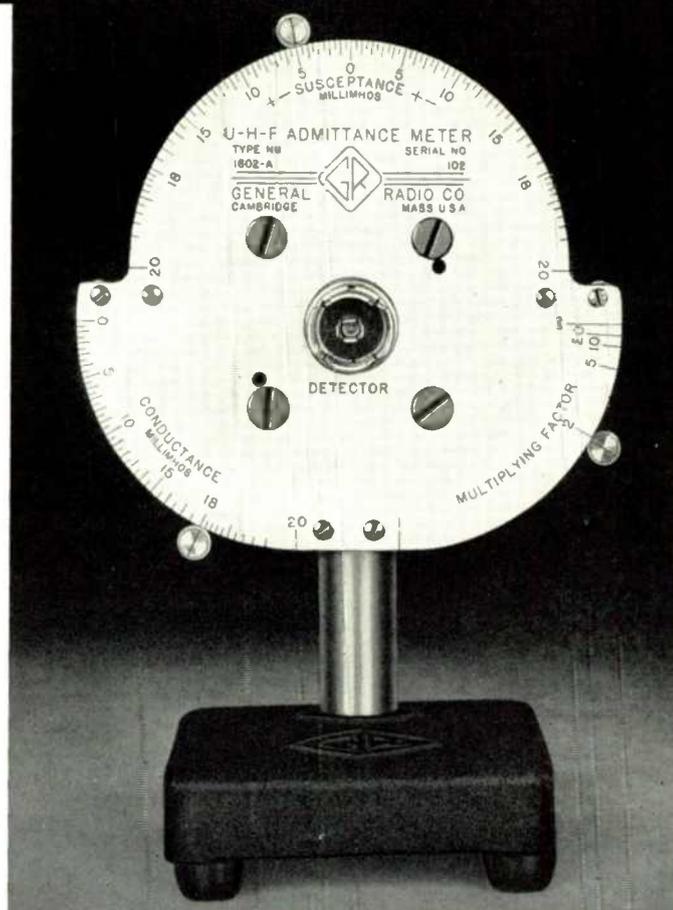
★ ★ Edited by ★ ★
Milton B. Sleeper



**THE NEWEST METHODS OF
Selling Audio Performance
ALSO FEATURED IN THIS ISSUE:
England's New TV Station
416A for FM Relay Systems**

10th Year of Service to Management and Engineering

For Impedance Measurements Between 70 and 1,000 Mc



A NEW G-R Null-Type ADMITTANCE METER

AS A NULL INSTRUMENT MEASURES Conductances and Susceptances, of either sign, from 1 millimho to 400 millimhos (1,000 ohms to 2.5 ohms).

AS A DIRECT-READING DEVICE DETERMINES Magnitude of Reflection Coefficient of coaxial systems and Magnitude of unknown Impedance and Admittance.

AS A COMPARATOR INDICATES Equality of one Admittance to another and the degree of departure of one from the other.

REPRESENTING an entirely new and unique technique in instrumentation, the new G-R Type 1602-A U-H-F Admittance Meter makes possible rapid, simple and accurate measurements of impedance in the range between the upper limit of conventional bridge circuits and the lower limit of practical slotted lines—70 to 1,000 Mc. (With an accessory Type 874-L30 Air Line, range can be extended to 50 Mc.)

Operating and design features include:

- **PRACTICAL OPERATING RANGE** of 200 micromhos to 1,000 millimhos
- **DIALS CALIBRATED** in Conductive and Susceptive components of the unknown Admittance
- **DIALS DIRECT-READING** at the operating frequency when the stub (supplied with the instrument) is set to that frequency
- **CALIBRATION** independent of frequency
- **BUILT-IN ACCURACY** independent of the calibration of an external detector or generator
- **VERY SIMPLE TO MATCH** the unknown to 50 ohms
- **METER INDICATION** shows approach toward matching
- **HIGH ACCURACY** for both Conductance and Susceptance: from 0 to 20 millimhos \pm (5% + 0.2 millimho); 20 to ∞ millimhos = $5 \sqrt{\text{SCALE MULTIPLYING FACTOR}\%}$; an unknown can be compared to an arbitrary standard with still higher accuracy
- **A SMALL, LIGHTWEIGHT, PORTABLE and COMPACT UNIT**, ideal for field use
- **ACCESSORIES SUPPLIED:** Type 874-WM 50-ohm Termination for use as Conductance standard; one Type 1602-P2 Adjustable Stub (70 to 500 Mc) and one Type 1602-P1 Adjustable Stub (150 to 1,000 Mc) for Susceptance standards; two Type 874-R20 Patch Cords for connections to generator and detector.

TYPE 1602-A U-H-F ADMITTANCE METER . . . \$295.00



GENERAL RADIO COMPANY

Cambridge 39,
Massachusetts

90 West St., New York 6 920 S. Michigan Ave., Chicago 5 1000 N. Seward St., Los Angeles 38

Another successful start with **DUMONT**

WHBF-TV

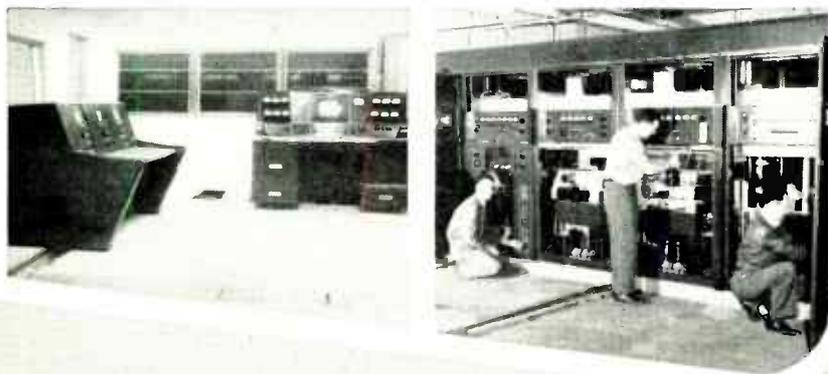
ROCK ISLAND, ILLINOIS

Channel 4

Another Television station with an eye to the future! WHBF-TV now goes on the air with Du Mont equipment assuring dependable, economical operation with all the advantages of the Du Mont "Grow As You Earn" system of equipment expansion. Air-cooled tubes, finest TV transmitter engineering and quality workmanship stand for low-operating expense characteristic of Du Mont TV transmitting equipment.

WHBF-TV operates on Channel 4 in Rock Island, Ill., covering the Quad Cities Area. We take this opportunity to congratulate WHBF-TV and welcome it to the ranks of the ever-increasing commercial TV stations of America.

Remember, it's smart business to investigate Du Mont first — and then compare.



DUMONT

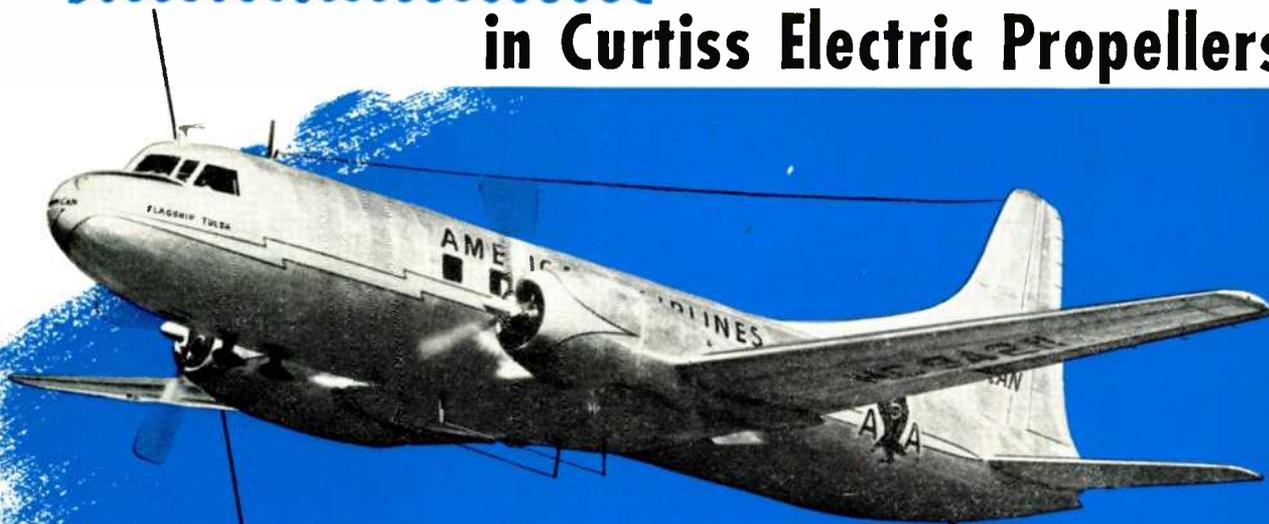
First with the Finest in Television

ALLEN B. DU MONT LABORATORIES, INC., TELEVISION TRANSMITTER DIVISION, CLIFTON, N. J.

August 1950—formerly FM, and FM RADIO-ELECTRONICS

For Vital Control Circuits

in Curtiss Electric Propellers



American Airlines' Convair Flagship equipped with CURTISS ELECTRIC propellers

IT'S BENDIX-SCINTILLA ELECTRICAL CONNECTORS

... THE FINEST MONEY CAN BUY



CHECK THESE ADVANTAGES

- Moisture-proof
- Radio Quiet
- Single-piece Inserts
- Vibration-proof
- Lightweight
- High Insulation Resistance
- Easy Assembly and Disassembly
- Fewer Parts than any other Connector
- No additional solder required



Unfailing dependability is the standard set by Curtiss propellers and American Air Lines in their selection of equipment.

Bendix-Scintilla is therefore the logical choice for the electrical connectors in the Curtiss Electric propellers on American Flagships.

In fact, wherever circuits must be arranged to connect and disconnect with ease and certainty Bendix-Scintilla is the choice.

Remember whenever there is no compromise with quality—it pays to specify Bendix-Scintilla electrical connectors—the *finest* money can buy.

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23235 Woodward Avenue, Ferndale, Michigan
7829 W. Greenfield Avenue, West Allis 14, Wisconsin

**BENDIX
SCINTILLA**

SCINTILLA MAGNETO DIVISION OF
SIDNEY, NEW YORK



Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York



Formerly, *FM MAGAZINE*, and *FM RADIO-ELECTRONICS*

VOL. 10 AUGUST, 1950 NO. 8

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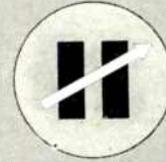
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The Sign of
Quality



Established
in 1910

HAMMARLUND PERFECTED SELECTIVE CALLING

Selective calling can be added to your system to provide privacy equal to a private-line telephone. Only Hammarlund Selective Calling has all these advantages:

1. Push button operation provides simple, instantaneous private connection between headquarters and any desired remote station. Less than one second to complete a call.
2. Push button zone or group calling also, if desired.
3. Speaker is silent unless your station is called. No noise or chatter to distract or annoy.
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5. Indicator light remains lit at remote station if call is not answered.
6. Entire system under exclusive control of dispatcher.
7. Signalling by bell, horn, or blinker light if desired.
8. Any serviceman can install. Requires no modification of your present equipment.
9. Widely used by large and up-to-date radio systems.

Hammarlund Multi-Gate systems are available for remote supervisory controls, telemetering, and fault alarms for micro-wave relays.

Write for descriptive literature and quotations.

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THE HAMMARLUND MFG. CO. INC.

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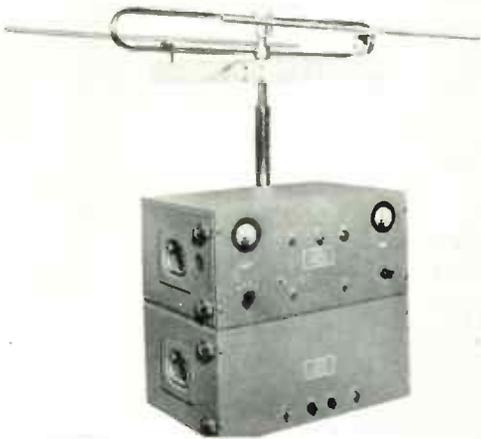


CIRCULATION AUDITED BY
HENRY R. SYKES,
CERTIFIED PUBLIC ACCOUNTANT
SYKES, GIDDINGS & JOHNSON
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RADIO ENGINEERING LABS., Inc.

PIONEERS IN THE CORRECT USE OF ARMSTRONG FREQUENCY MODULATION



50-WATT FM REMOTE PICKUP LINK Most Versatile Adjunct to AM, FM, TV Facilities

Chief Engineers like the REL 695. It cuts the time for setting up remotes, and eliminates the complications involved in the use of wire lines.

Sales Managers like the REL 695. It opens new opportunities to sell remotes where there are no lines, or where microphones must follow program movement. Also, the fine audio quality helps to assure contract renewals.

General Managers like the REL 695. It slashes expense on remotes by eliminating all line charges. This economy shows up on monthly and annual operating statements.

In Emergencies everyone likes the REL 695. If the studio-transmitter line fails, FCC Rules permit the use of the REL 695 as an emergency link to keep the station on the air. Any 3rd class permittee may operate the equipment.

Latest additions to the list of users are:

- | | |
|--------------------------|------------------------|
| WHLD Niagara Falls, N.Y. | WAPA San Juan, P.R. |
| WORA Mayaguez, P.R. | WSM Nashville, Tenn. |
| CJSH-FM Hamilton, Ont. | CMQ-TV Havana, Cuba |
| WKAQ San Juan, P.R. | WCEC Rocky Mount, N.C. |

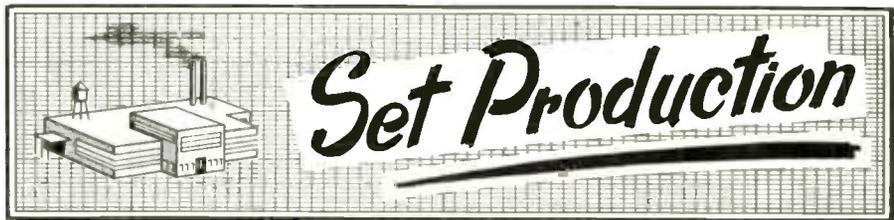
For complete specifications and prices, address:

Engineers and Manufacturers of Broadcast, Communication, and Associated Equipment since 1920

RADIO ENGINEERING LABORATORIES, Inc.

TEL.: STILLWELL 6-2101 TELETYPE: N. Y. 42816

36-40 37th Street, Long Island City 1, N. Y.



WITH new production problems facing the manufacturers, the monthly records charted in the Production Barometer below may be very different in the second half of 1950. The Barometer only shows May figures, but RTMA released the June data just as we were going to press:

| | MAY | JUNE |
|----------|---------|---------|
| AM | 813,651 | 952,749 |
| TV | 376,227 | 388,952 |
| FM | 86,405 | 101,707 |

The TV drop from an all-time high last March seems quite reasonable, but the increase in AM and FM sets is difficult to explain.

To those who think that FM is dead, the June figure must come as a distinct shock, for this was the biggest FM month since January '49. Moreover, it was 2½ times June of last year.

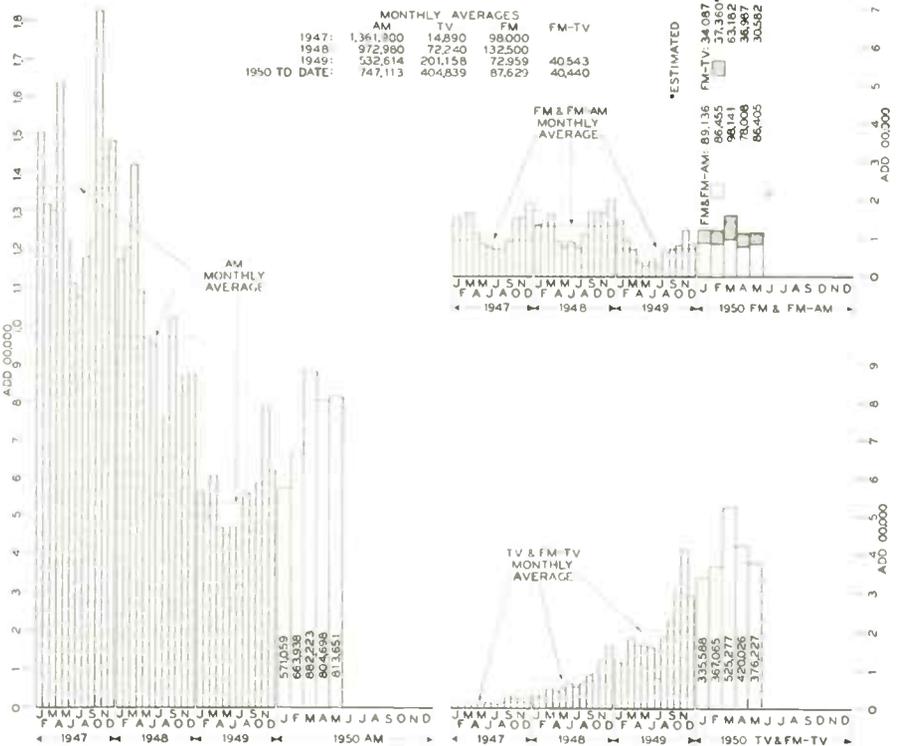
AM stumped the experts, too, by running up its largest monthly total since September, 1948. The reason? So far we haven't heard any explanation. The demand for automobile sets is up, but that is merely a contributing factor. Opinions have been expressed freely all this year that TV is making serious inroads into audio broadcast listening time, but production figures certainly don't confirm that view.

At the same time, average TV set production for the first 6 months is exactly double that of last year, which is as much of an increase as would be healthy for the industry.

All of which makes this open season for those who have the temerity to explain anything that's happened in this industry. As for the future—it would be unwise to discount the judgment of Bernard Baruch. If his opinions prevail, there will be a cut in civilian radio production, probably before the end of the year.

It's not so long ago that receiving tube manufacturers were complaining that there was too much production machinery in this Country. The investment was so high and sales so low that there was little if any profit. That, too, has changed this year. June shipments amounted to 32,480,668 tubes, up from May, and more than 3 times the figure for June '49.

Shipments for the first 6 months of this year totaled 170,375,921, as compared with 81,663,218 in the corresponding period of '49. Military orders had no influence on this increase. The June report shows 25,985,896 for new equipment, 5,351,709 for replacements, 1,041,907 for export, and only 101,156 for Government agencies.



TV, FM, and AM Set Production Barometer, prepared from RTMA figures

FM-TV, the JOURNAL of RADIO COMMUNICATION

FM STATION OPERATORS!

Here's what one
FM broadcaster
says about
Zenith,
its distributors
and its dealers...

Radio WFMW Station

"The Radio Voice of The Messenger"
OWNED AND OPERATED BY
MESSENGER BROADCASTING COMPANY
INCORPORATED
Madisonville, Ky.
16 Mar. '50

PHONE
1885

Zenith Radio Corporation
Attention: Mr. Ted Leitzell
Chicago, Illinois

Dear Sir,

This station will broadcast all of the
baseball games of the "Madisonville Miners"... a member
of the Kitty League... on all of the road games. The
baseball corporation will not allow us to broadcast
the home games

The Madisonville Miners is a farm club of
the Chicago White Sox.

We had also planned to carry the St. Louis
Cardinal games, however due to the fact that we are in
a "Dry" territory and the sponsor is a beer company,
we have had to drop these.

The games we carry will be sponsored by a
local coal mining company, and we as well as the
sponsor will be glad to accept your advertising.

We also wish to take this opportunity to
thank the Zenith Corporation for their untiring
efforts in the promotion of FM broadcasts. YOUR
PROMOTION HAS HELPED US PUT THIS STATION ON A
PAYING BASIS IN LESS THAN ONE YEAR OPERATION.

Radio Station WFMW

H. W. Wells
H. W. Wells, Station Mgr

The Zenith Distributor in your territory is anxious to
work with you to get more good FM sets throughout your listening area . . . to build bigger,
better audience for you. Get in touch with him now . . . or write direct to Advertising Manager

ZENITH RADIO CORPORATION • 6001 Dickens • Chicago, Illinois

**NOW—ONE FULL WATT
ANTENNA POWER**

littlefone

Portable FM Radiotelephone

PJZ-4 PJZ-14
25-50 MC 152-174-MC
*PJZ-2 *PJZ-12

Especially designed for the new low power industrial radio service, the "littlefone" now provides real power output for maximum performance under FCC regulations.

Complete in one lightweight unit, the "littlefone" includes a powerful 10-tube transmitter, an ultra-sensitive 12-tube superheterodyne receiver, self-contained rechargeable storage batteries and power supply . . . ready for immediate 2-way communication.

Available in one-watt and half-watt *Hand Carried* and *Backpack* models.

"SQUELCH" available on all Models

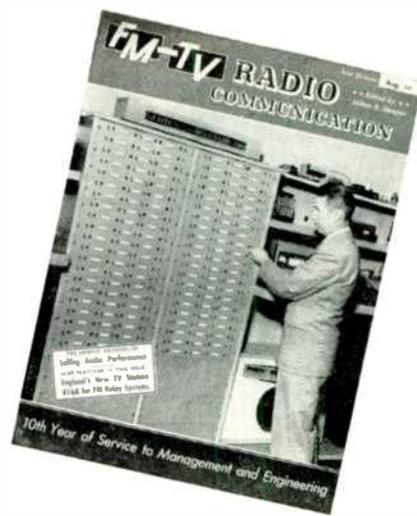
* Dry Battery Operation Optional
* ONE-HALF WATT MODELS



Doolittle
RADIO, INC.
Builders of Precision
Radio Communication Equipment
7421 S. LOOMIS BLVD., CHICAGO 36, ILL.

THIS MONTH'S COVER

No one can sell high-fidelity audio reproduction by arguing for clean, clear quality vs. beer-barrel boom. But when parts jobbers let their customers compare the performance of various types of tuners, pickups, turntables, amplifiers, and speakers, they invariably end up by buying the best audio equipment they can afford. This month's cover shows Roy Neusch at the new audio demonstration board recently installed by Harvey Radio of New York City. Switches permit equipment on display to be connected in any radio-phonograph arrangement a customer wants to hear.



SPOT NEWS NOTES

ITEMS AND COMMENTS, PERSONAL AND OTHERWISE, ABOUT PEOPLE AND COMPANIES CONCERNED WITH RADIO COMMUNICATIONS

Edgar Kobak:

Quoted from an open letter to American broadcasters: "I have found from experience, the hard way, that when an association is in trouble, that is the time when all members of the industry must pitch in and help. Getting out after gaining benefits for years, even though you have given more than you have received, does not correct the situation. If the association is badly managed, or the by-laws are wrong, or you are misunderstood, then the thing to do is to continue as a member and be sure that your better ideas are carried out. These matters take time, but not as long as they will take when you are on the outside looking in—or on. NAB won't fold. It may even lose a few more members, but it will gain new ones, and gradually correct the troubles it now has."

Start of Phonevision:

FCC has approved October 1 starting date for Zenith's 90-day Phonevision test. Transmission on channel 2 will originate from new installation on the Field Building. Zenith and other makes of sets equipped with Phonevision circuits are being installed now in 300 homes. Commander McDonald's announcement points out that tests "are not to be construed as indicating that the Commission has or will approve Phonevision as a permanent public commercial service."

A New Audio System:

When we announced last month the publication of a series of articles, to start in October, on a new system of audio reproduction, all our staff had heard several demonstrations, but the inventor hadn't shown us the equipment involved, or explained its operation. All we knew was what we had heard, and that was

truly magnificent. On a subsequent visit, however, we got the full details, and the manuscript for the first article. Now we are building an installation which we shall demonstrate in room 639 at the Audio Fair. As to the components, you'll be interested to know that they are standard items, available from any parts jobber. This new system is the most intriguing development that has come along in the audio field, opening up endless avenues for experimentation.

New Corporation:

Ferroxcube Corporation of America has been formed by Sprague Electric and Philips Industries to manufacture Ferroxcube powdered iron. Robert C. Sprague is president of the concern. Factory is being set up at Saugerties, N. Y. The headquarters office is at 50 E. 41st Street, New York City.

For the Record:

Lee Jacobs, president of Inland Radio, Oregon, commenting on an item in this column about his luncheon address at the NAB Convention: "Probably no one was happier than I when the FM meeting was so outstanding, and drew such a large audience. I am definitely not anti-FM, and my opening speech at the next morning session will prove that statement. My embarrassment and shame came from making the off-the-cuff crack which was not at all premeditated. The minute the words were out of my mouth I was sorry, and had you reported the full details, you would have mentioned how I endeavored to clean up my remark. My sincerest apologies to anyone who was offended."

Casting Resin Techniques:

Information on improved resin is disclosed in Circular 493, entitled "Development" (Continued on page 7)

SPOT NEWS NOTES

(Continued from page 6)

ment of the National Bureau of Standards Casting Resin." Copies can be obtained at 10c each from the Government Printing Office, Washington 25, D. C. Do not send stamps!

Color-Selective Mirrors:

Westinghouse has developed a method for making mirrors which reflect only red, or green, or blue. They will be used to explore new methods of TV color transmission and reception.

Elliott M. Sanger:

Executive vice president of WQXR AM-FM, commenting about our reference last month to FM coverage: "I know there is a great deal of outlying coverage [outside metropolitan New York], but if you tell people that WQXR-FM can be heard at a distance of 100 miles, everybody will think they are going to hear the station regardless of the type of sets they have, and that gets you into trouble, as you well know. Anyhow, I am glad to hear that we continue to come in so strong in Great Barrington." Mr. Sanger missed our point. What we intended to suggest was that WQXR survey its FM listeners beyond the primary service area of the AM transmitter.

Ferrite Powder:

Production of Ferrite iron powder (Ceromag) by Stackpole Carbon Company, a Philips licensee, will be augmented under an arrangement by which Stackpole will supply assistance and engineering information to Allen-Bradley. It is understood that Allen-Bradley will produce both the powder and molded parts.

UN Will Have FM:

FCC has reserved 89.1 mc. for an FM transmitter to be erected on the United Nations headquarters building now being completed in New York City. An antenna height of 500 ft. above average terrain and 20 kw. effective radiation are stipulated.

Unattended FM Station:

Keep an eye on the FM network set up by *The New York Times* and Rural Radio Network. This operation has smart business and engineering brains behind it. FCC has authorized 5-month test of WVBT, FM station at Bristol Center, N. Y., as an unattended satellite, controlled from WVCN, De Ruyter. Reason is that WVBT is inaccessible during winter months. Supersonic frequencies, 20 to 25 kc., will be superimposed on WVCN signals to control WVBT, and monitoring information will be trans-

(Continued on page 8)

Gray

RESEARCH

FEATURES IDEAL REPRODUCTION

TRANSCRIPTION ARMS

NEW VISCOUS-DAMPED 108-B ARM



For all records — 33 $\frac{1}{3}$, 45 and 78 r.p.m. Radically new suspension development on the viscous damping principle for perfect tracking of records and elimination of tone arm resonance. Instant cartridge change with automatic correct stylus pressure. Solves all transcription problems. Ideal for LP records. For Pickering, new GE (short), old GE (long) cartridges. Write for bulletin. Price, less cartridges, \$50.70

For all records — 33 $\frac{1}{3}$, 45 and 78 r.p.m. Radically new suspension development on the viscous damping principle for perfect tracking of records and elimination of tone arm resonance. Instant cartridge change with automatic correct stylus pressure. Solves all transcription problems. Ideal for LP records. For Pickering, new GE (short), old GE (long) cartridges. Write for bulletin. Price, less cartridges, \$50.70

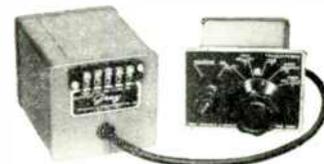
MODEL 106-SP ARM



Designed to meet strictest requirements of modern highly compliant pick-up cartridges. 3 cartridge slides furnished enable GE 1-mil, 2 $\frac{1}{2}$ -mil or 3-mil cartridges or Pickering cartridge to be slipped into position in a jiffy. No tools or solder! Superb reproduction of 33 $\frac{1}{3}$, 45 or 78 r.p.m. records. Low vertical inertia, precisely adjustable stylus pressure. Write for bulletin. Price, less cartridges, \$45.15

EQUALIZERS

MODEL 603 EQUALIZER



Latest of the universally adopted Gray Equalizers used, with Gray Tone Arms, as standard professional equipment by broadcast stations. High-frequency characteristics obtainable comprise 5 steps — flat, high roll-off, NAB, good records, poor records. For both GE and Pickering cartridges. Price, \$50.70

MODEL 602 EQUALIZER

Has 4 control positions, highly accurate response curves. Price, \$49.50

Write for bulletins on Gray Equalizers.

GRAY RESEARCH and Development Co., Inc.

20 Arbor St., Hartford 1, Conn.

Division of The GRAY MANUFACTURING COMPANY
Originators of the Gray Telephone Pay Station and the Gray Audograph



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EXECUTIVE OFFICES:
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Washington 4, D. C. ME 5411

OFFICES AND LABORATORIES:
1339 Wisconsin Ave. N.W.,
Washington 7, D. C. AD 2414

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299 Atlantic Ave., Boston 10, Mass.
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11 West 42nd St., New York 18, N. Y.

SPOT NEWS NOTES

(Continued from page 7)

mitted in a similar manner from WVBT to the WVCN control point. If experiment is successful, FCC will entertain a petition to amend Rules, to permit regular satellite operation of remote FM stations.

30-In. TV Receiver:

Du Mont has announced a new model, designed for use in schools, hotels, hospitals, and public places, with a 30-in. direct-view tube. Using a 90° deflection angle, the tube is shorter in length than in diameter! Smallest sets in the new Du Mont line have 17-in. rectangular tubes.

Walter A. Buck:

Elected vice president and general manager of RCA Victor Division. Mr. Buck has been operating vice president since January, 1949. Previously, he was president of Radiomarine, following his retirement as Rear Admiral of the U. S. Navy in March, 1948.

Terminology:

Apropos of comments which have appeared in these pages concerning the words *radio* and *television*, we were interested to note that a letter from Howard Chinn of CBS was signed Chief Audio-Video Engineer. However, in his letter he said: "It has been our practice to refer to what is frequently called *radio* as *aural broadcasting* and, silly as it may seem, we call *television* just that." Maybe we never should have brought up this subject of terminology in the first place!

C-R Tube Production:

Reeves Soundcraft Corporation is in full production at the Springdale, Conn., plant acquired from Remington-Rand. Currently, rectangular tubes 16KP4, 16TP4, and 16RP4 are being manufactured. In August, 17- and 19-in. types will be added.

WTMJ's FM Transmitter:

The Journal kept very quiet about it, but the 50-kw. FM transmitter that helped to make Milwaukee famous has been purchased by the University of Illinois. This most powerful educational transmitter will be operated from Monticello, near the center of Illinois's population, as it is to feed certain programs to other stations.

John A. Green:

Former head of Collins broadcast engineering department has established the Equipment & Service Company as a consulting and manufacturing concern at

(Concluded on page 9)

Professional Directory

McNARY & WRATHALL

CONSULTING RADIO ENGINEERS

906 National Press Bldg. DI. 1205
Washington, D. C.

1407 Pacific Ave. Phone 5040
Santa Cruz, California

KEAR & KENNEDY

Consulting Radio Engineers

1703 K St., N.W. STerling 7932
Washington, D. C.

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Radio, Communications, Electronics
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Radio & Electronics*

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Washington 5, D. C.

WELDON & CARR

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SPOT NEWS NOTES

(Continued from page 8)

6815 Oriole Drive, Dallas, Texas. Also the John A. Green Company, at the same address, will represent equipment manufacturers in the southwestern area.

10% Excise Tax on TV Sets:

Although Congress voted down a previous effort to tax television receivers, one of the first means adopted for meeting the cost of the Korean war was a 10% TV tax. The percent increase to the public will be larger than on audio sets, because most of the TV models carry very short discounts.

New Tubes:

Three new miniature tubes have been announced by RCA. All are designed for on-off operation, as in computers, where they may be operated under cutoff conditions for long periods. They are type 5915 seven-pin pentagrid amplifier for gated-amplifier service; 5963 nine-pin medium-mu triode for frequency-divider circuits; 5964 seven-pin medium-mu triode, also for frequency divider circuits. Technical data is available from RCA Tube Department, Harrison, N. J.

Eitel-McCullough has three new transmitting tubes: The 2C39A, an improved version of the 2C39, is built to meet JAN specs. 4X150G is a general purpose tetrode of the 4X150A type, but with a coaxial terminal arrangement to raise the operating-frequency limits on UHF applications. 4E27A/5-125B is an improved version of the 4E27, in that it is more rugged, with higher performance characteristics and plate dissipation of 125 watts. Eimac also has a new air-system socket, type 4X150A/1000, for the 4X150A power tetrode.

Practical Television Engineering:

This is the title of an excellent and very comprehensive book by Scott Helt, of Du Mont's research division. It is the most complete source of how-and-why TV information we have seen, and we recommended it highly as an understandable reference text, well illustrated, with mathematics limited to simple algebra: 708 pages, about 1,000 illustrations, cloth bound, 9¼ by 6 ins., published by Murray Hill Books, Inc., 232 Madison Ave., New York 16. Price \$7.50.

TV Tower for Cuba:

The 200-ft. TV tower for CMQ, Havana, to be supplied by Blaw-Knox, will resist wind pressures up to 200 miles per hour. To be erected in the hurricane belt, this tower has been designed to carry what is probably the heaviest load such a structure of this height has ever been called upon to bear.

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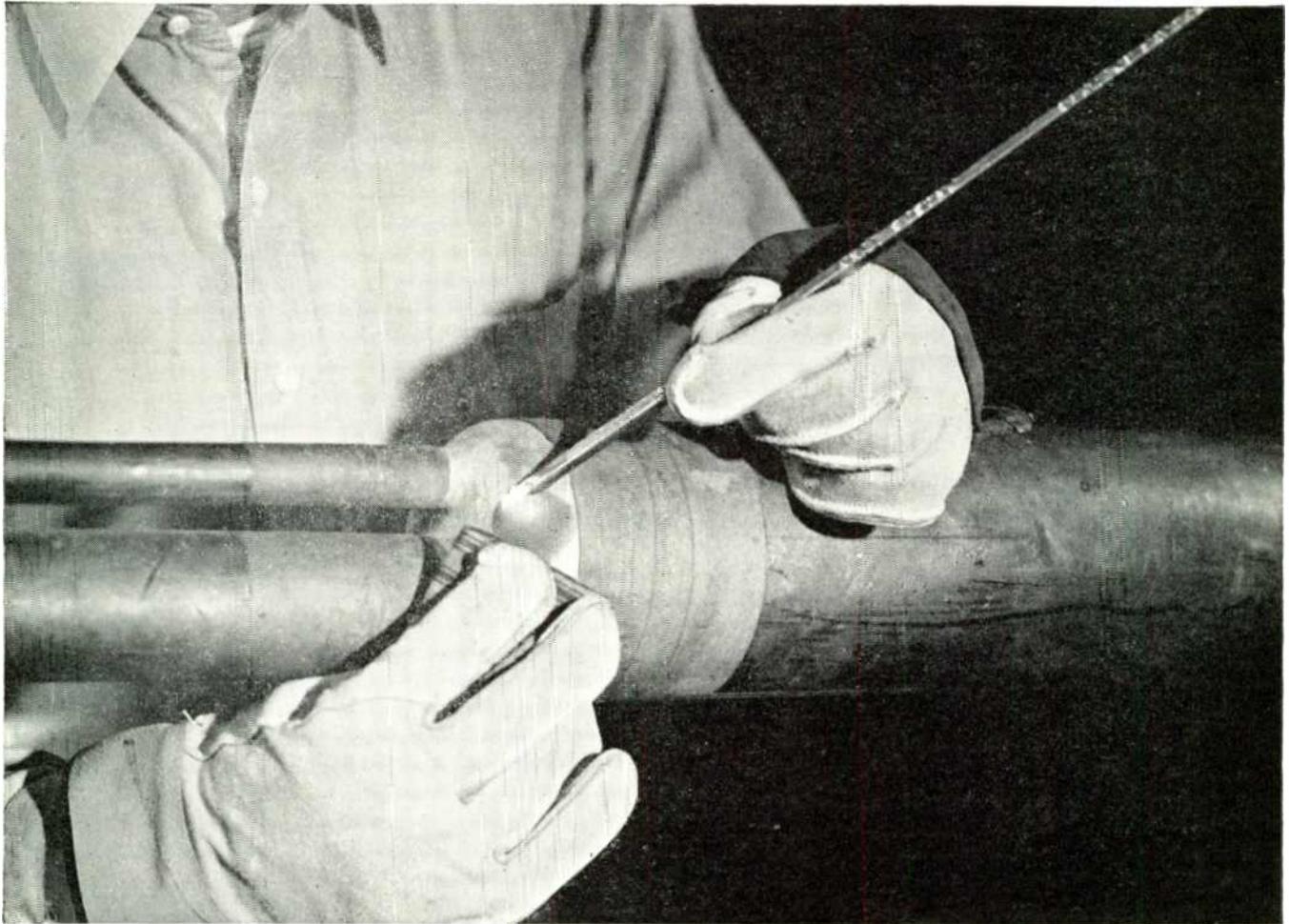
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Two kinds of solder are now used. One makes the splice strong; the other seals it. First, the splicer builds up a joint with a solder of lead and tin, which flows easily under his wiping cloth. To seal the joint, he applies a light coating of low-melting-point solder, composed of lead, tin and bismuth. On contact with the still hot joint, it flows into and seals every pore.

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WHAT'S NEW THIS MONTH

FM NETS AND MORE GOOD SETS NEEDED FOR CIVILIAN DEFENSE—CONTROL OF SET PRODUCTION—WHY THE FCC MAY NOT END THE TV FREEZE NOW

ON at least two points related to the communist attack on Korea, there is some degree of certainty. One is that lack of forehanded thinking and planning has put us in much the same sort of situation as confronted us when the Philippines were attacked. The other is that audio broadcasting will be continued if, Heaven forbid, a Russian campaign is launched against the USA.

Since our Government considers this a possibility to the extent of issuing the assurance that broadcasting is considered an essential civilian service in wartime, as all-too-recent experience proved it to be, no time should be lost in reviewing the status of our facilities.

If it is essential to continue broadcasting as a means of maintaining civilian morale, and as a means of instant, widespread communication, then it is important to an enemy to disrupt our broadcasting system. As we know from Russian efforts to jam our long-distance voice transmissions, and the unintended but equally effective blanketing of many domestic stations by Cuban and Mexican broadcasters, it would be an easy matter for an enemy to reach into almost every American home with a blanket of AM interference. As a psychological weapon it would be more powerful than any super-bomb, for it would convey the sense of malign intent into every home in the nation, reaching areas far away from military targets.

The means for creating such interference are well known. The fact that the AM broadcast band is barely 1,000 kc. wide simplifies the problem.

However, we have in this Country, and only in this Country, a system of civilian broadcast service that no enemy can disrupt. This, of course, is FM.

First, FM offers inherent protection against interference. Second, it operates on relatively short-range frequencies, so that the effectiveness of interfering signals would be too limited to justify their use. Furthermore, FM radio networks are less vulnerable than the wire lines connecting AM stations.

As FCC Chairman Coy pointed out in his recent RMA address, "more than 700 [FM] stations give the nation more total nighttime coverage than is given by all the regional and local AM stations. . . ." In this connection, it will be recalled that, during the last war, every New England broadcast station was required to monitor FM transmission from

Paxton, Mass., and Mt. Washington, N. H., for airraid warnings. Those two FM stations afforded complete coverage of New England except the very northern tip of Maine. To accomplish the same result on AM would have required dozens of transmitters. Super-power AM stations cannot provide adequate coverage, and they are vulnerable to interference beyond a radius of a few miles.

Now, we would like to point out that Government acknowledgment of the wartime importance of maintaining broadcast service offers no assurance that the service will be provided on AM. It simply emphasizes the need for immediate planning so that the widest possible use of FM can be made if an emergency arises. This calls for:

1. Planning of FM networks designed to meet the requirements of civilian defense.

2. Actual testing of such nets to make certain that equipment is available and ready for use at a moment's notice. Increased power may be indicated at certain stations.

3. A substantial and immediate increase in the production of high-sensitivity receivers, capable of effective noise limiting. While many current audio and video models have FM circuits, it is unfortunately true that they are insensitive and lack adequate limiting action.

4. Design and production of FM broadcast receivers for automobiles. As far as we know, no one is producing such models now.

Probably the less said to the general public about the possibility of reviving wartime restrictions, the better it will be at this time. However, manufacturers must face this prospect. It is quite possible that production of FM receivers might be continued, even if AM and TV models are stopped. The reason is, of course, that the number of good FM sets in use is not great enough to meet national emergency needs.

Broadcasters and manufacturers share with our Government officials the responsibility of making certain that audio service, free of enemy interference, is available for civilian defense purposes.

WHILE it is too early to appraise the impact of the war situation on the peacetime activities of the radio industry, certain basic information has been released from Government sources.

About \$500 million in contracts for

military electronics equipment were outstanding prior to the President's message delivered on July 19. These orders, scheduled for delivery over a period of 2 years, must now be completed in 12 months. It is planned to place orders for an additional \$500 million within the next 60 to 90 days. Thus it appears that the industry must make facilities available for an annual production of about \$1 billion. Although this is approximately the rate of present non-military production, it does not necessarily indicate that civilian set manufacture must be stopped, for many components and assemblies for military use will be made by companies not concerned with civilian radio.

However, with tubes and components for audio and television receivers already in short supply, it is certain that civilian equipment will be cut back. The only Government action discussed so far has concerned TV sets, but the components situation is so serious now that any worsening will surely affect audio broadcast receivers. Even before the Korean situation developed, there were complaints that tube manufacturers were refusing to accept orders to be scheduled for future delivery.

There's one thing to watch in statements by Government officials. As soon as an action has been definitely decided upon, standard practice is to announce that so-and-so is not contemplated. Almost invariably, this is followed within a short time by a statement that so-and-so has been found necessary. Thus, it can be expected that TV set production will be stopped unless there is some sudden and prompt change in the international situation. Our guess is that the red light will be flashed before the end of the year. As for audio sets—there's nothing to worry about until they are mentioned in the Washington news!

AS the color TV situation is developing, the FCC's decision will be influenced greatly by two factors not contemplated when the proceedings were initiated.

First, time and public opinion are running against CBS, and the FCC may decide against the whirling disc on other than technical grounds. The first demonstrations of whirling-disc reception were made with 7-in. picture-tubes, then the most popular size. Today, the 7-in. tube

(Continued on page 34)

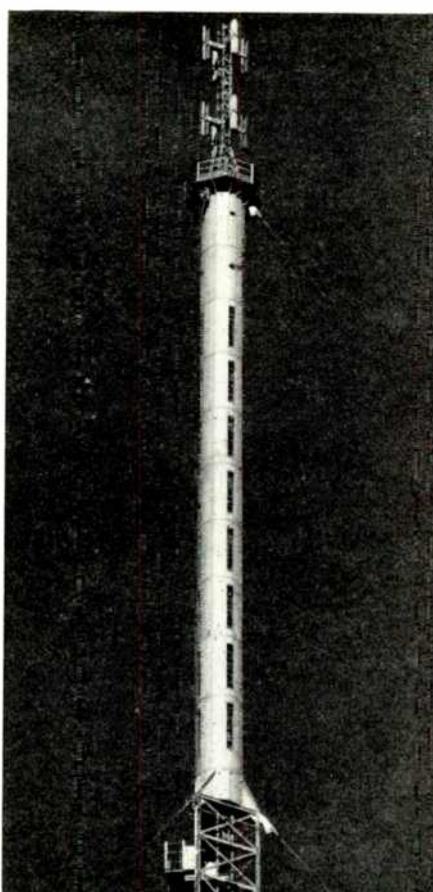
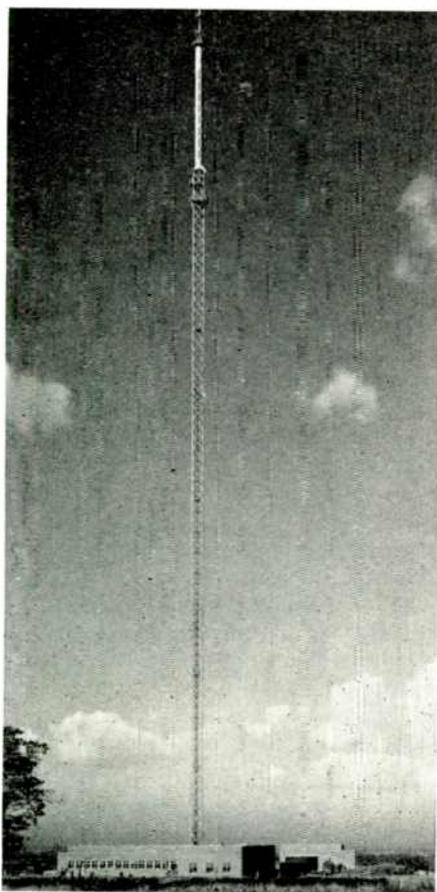


Fig. 1. Sutton Coldfield's 750-ft. tower. Fig. 5. Total length of antennas is 150 ft.

TV IN ENGLAND

A REPORT ON THE PROGRESS OF TELEVISION UNDER BBC-CONTROLLED DEVELOPMENT — *By* JAMES MOIR*

ALL broadcasting in Great Britain is controlled by a Government-sponsored authority, the British Broadcasting Corporation. Its revenue is derived from a tax on listeners and viewers, of \$3 and \$6 per year respectively. The merits and demerits of this system are much debated, although it is not intended to discuss them here. However, one inescapable disadvantage of the system is that development can proceed at just the pace set by the controlling authority, the spur of commercial competition being entirely absent. Even so, British TV has been progressing steadily. It is proposed in this paper to give a report of the present television situation, and plans projected for the future.

General TV Setup:

The first TV transmitter providing regular high-definition, 405-line service was opened in 1936. The second at Sutton Coldfield, has just gone into operation.

* 87 Catesby Road, Rugby, England.

No regular FM service exists at all, though an experimental FM station is operating on a non-scheduled basis in the London area.

Five high-power (40-kw.) TV stations and five low-power (5- to 10-kw.) stations are expected to be in operation by the end of 1954, serving about 80 per cent of the total population.

About 20 per cent of the population of Great Britain is covered by the London station. The second station covers probably another 20 per cent of the population, as it is situated on a commanding site in the middle of a densely populated industrial area. It went into public service on December 17, 1949, after some weeks of preliminary testing. There are at present no studios for the station, all programme material originating in the London studios about 110 miles away, although a film reproducer is installed to take care of the inevitable technical hitch in the link system.

The central studios in London will have two alternative links with the Sut-

ton Coldfield station. The first is a chain of radio relay repeaters, operating on 870 and 890 mc. The second will be an underground coaxial cable, with repeater amplifiers every few miles. The cable is not yet completed, so the radio relay link carries about 5½ hours of programme material every day, apart from testing signals. Two-way communication will eventually be provided by the radio link, 917 and 937 mc, being used for transmission from Sutton Coldfield to London. When the stations farther north are open, the radio link will be extended to serve them.

The Relay Link:

Frequency modulation is employed for the video signal, the radiated power being approximately 10 watts. Four intermediate relay points are sited on ridges of low hills, with an average spacing of about 40 miles. Each relay station employs two 14- by 10-ft. paraboloids on 100-ft. steel towers. Stations receiving on 870 mc. retransmit on 890 mc., and vice versa. This avoids all difficulties due to coupling between receiver and transmitter aerial systems.

Antenna de-icing is provided by 50-cycle heater elements inside the light tubular structural elements. In this connection it should be noted that our winter weather is much less severe than that encountered in America, central England having had only a few days this winter with temperatures below the freezing point.

At each repeater station the received signal is heterodyned with a local oscillator to produce an IF of 34 mc. This is amplified and beat with the locally-generated carrier, the appropriate sideband selected by filters, and supplied by a short coaxial line to the dipole and parasitic reflector. Duplicate equipment is kept warmed up in the standby position, with automatic changeover in case of failure.

Sutton Coldfield Transmitter:

The Sutton Coldfield transmitter is believed to be the most powerful TV station in operation at the present time, with a peak white power of 37 kw. and sound power of 12 kw. It should be noted that the BBC transmission standards include positive picture modulation. Peak white corresponds to 100 per cent carrier amplitude, in contrast to FCC standards with which peak white signal is produced by 15 per cent carrier.

The transmitter buildings, shown in Fig. 1, are located on a 24-acre site about 6 miles northeast of the centre of the city of Birmingham. This is Britain's second city, with a population of over 1 million. From 7 to 10 millions are situated within a radius of 70 miles. The site is roughly

550 ft. above sea level, with the actual aerial mounted on a 750-ft. guyed mast.

Fifty-cycle power is brought into the station over duplicate 11-kv. feeders from the British Electricity Authority grid system. The transmitter HT supply is obtained from hot-cathode mercury-vapour rectifiers, through a moving-coil AC voltage stabiliser. Additional valve stabilisers are used for the HT supply to critical stages. All valve heaters are supplied with AC power except the CAT. 21 type in the modulated output stage which obtains its DC heater supply from an electronically-controlled motor generator.

The vision transmitter, Figs. 2 and 3, is housed in ten side-by-side cubicles, the RF chain commencing on the left and the video chain on the right. This makes it possible to mount the modulator and the final RF stage in adjacent cubicles. The carrier frequency is derived from a precision quartz crystal followed by two multiplier stages and succeeding amplifiers. The final output stage employs two CAT. 21 (Marconi) triodes in an earthed-grid linear wide-band amplifier, employing grid-circuit modulation.

Asymmetric sideband transmission has been standardized for TV stations in the 40- to 70-mc. band. The upper sideband is attenuated by a constant-resistance network, consisting of a low-pass and a high-pass filter constructed of concentric feeder. The network is mounted on the wall behind the transmitter racks. At 63.25 mc., the frequency of the adjacent-channel sound, attenuation is approximately 12 db.

The sound transmitter, with a carrier power of 12 kw., is fairly conventional. It can be seen at the end of the hall in Fig. 2. The final stage is an anode-modulated Marconi BR. 128 earthed-grid coaxial-line circuit. Amplitude modulation is standard for all British TV sound.

Fig. 4 shows the control console for both sound and vision transmitters. The control room is located behind the curved window, visible in the left background, Fig. 2.

Two 5-in., 51-ohm concentric lines carry the vision and sound signals up the mast. Provision is made for expansion of joints and for blowing warm dry air through the feeders. For 600 ft. the mast is a conventional triangular structure of high-tensile steel, supported at three levels by guys. At the 600 ft. level, a cylindrical steel mast, 110 ft. high and 6 ft. 6 ins. diameter, is mounted. This is a slot aerial intended for a future VHF sound transmitter, possibly FM.

On top of the structure, Fig. 5, is the actual TV aerial, a system of 8 folded dipoles assembled in two levels of 4 units, all aerials radiating both picture and
(Continued on page 38)

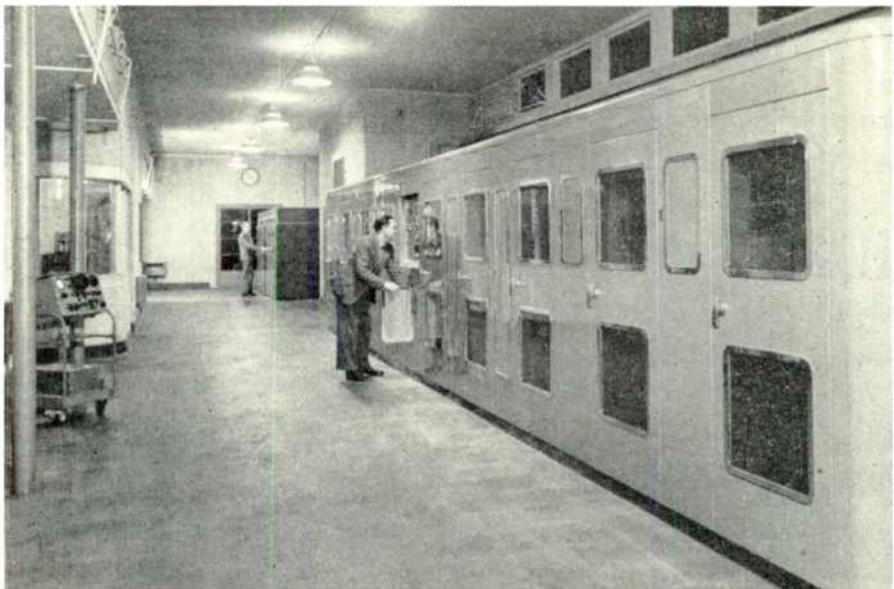


Fig. 2, above: The transmitter room at Sutton Coldfield. Video section is at this end

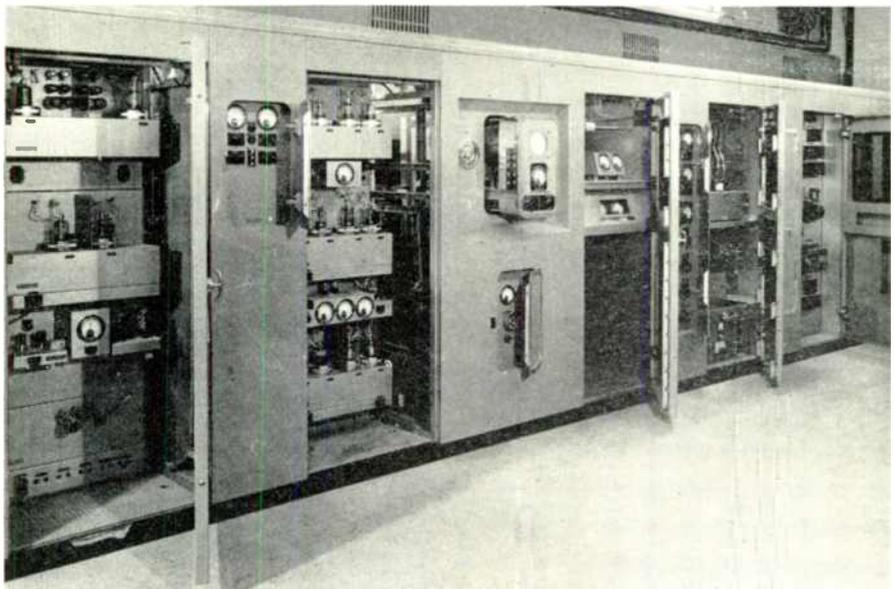
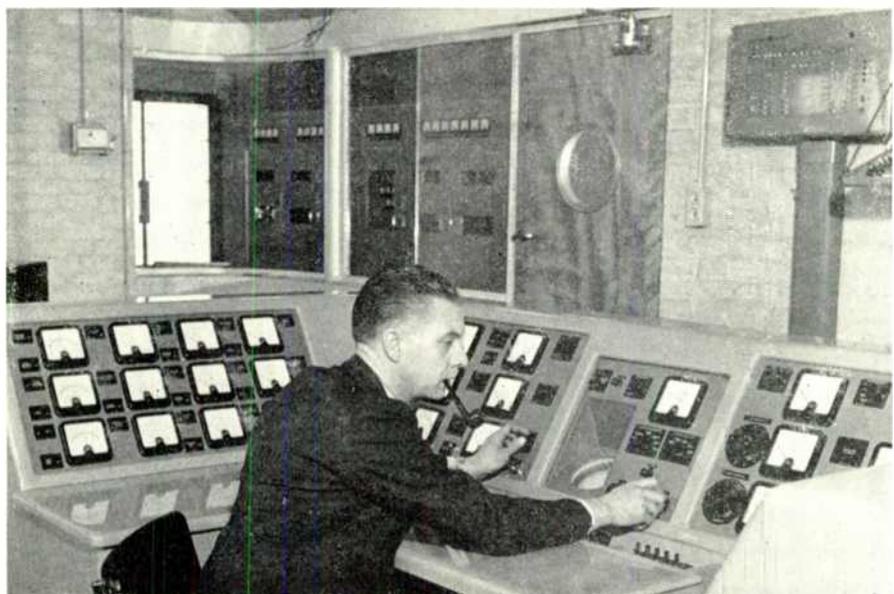


Fig. 3, above: Another view of the video transmitter. Fig. 4, below: The control room



95-MILE TV RECEPTION

REPORT ON RESULTS OBTAINED UNDER EXTREMELY ADVERSE DX CONDITIONS — *By* ROY F. ALLISON

BECAUSE editors are supposed to be well-equipped with personal knowledge on matters with which they are concerned, it was decided that the *EM-TV* staff should acquire some first-hand experience with long-distance television reception. Our location at Great Barrington is approximately 95 miles airline from New York City and Boston, 60 miles from New Haven, and 50 miles from Schenectady, all in different compass directions.

Now, the FCC says that TV stations are only expected to give service up to 40 miles. On the other hand, we have heard many reports from set owners in our town about their consistently perfect reception from New York.

The more we listened the more we were convinced that, while the FCC may be a little conservative, there is considerable latitude in describing TV reception as consistently perfect.

So we set out to erect a very good antenna of conventional design, with a rotator by means of which we could explore the directional effects. We picked the Editor's home because it is on an elevation of 1,250 ft., at the head of a valley running toward New York, with a stretch of 13 miles before it is closed off by a high ridge.

Fig. 1. Antenna is in lower box at left. Other cartons hold rotator, control box



It should be explained, however, that the surrounding Berkshire Hills are as unfavorable terrain as could be found if one were deliberately seeking the most adverse conditions.

For our tests, we selected a Radio Craftsmen RC-100A receiver and a Radiart antenna consisting of stacked fans with reflectors.

This equipment was shipped in three easily-carried cartons, as shown in Fig. 1. It seemed doubtful that an antenna could be constructed from the parts shown in Fig. 2, but we began working from the instructions provided.

The first step in assembly was the insertion of the fan and reflector elements in their brackets, Figs. 3 and 4. Caution was necessary at this point — there was only a slight difference in length between fan and reflector elements. The short elements, of course, were inserted in the fan bracket, which has tilted slots to project the elements forward at the ends.

When the individual bays were assem-

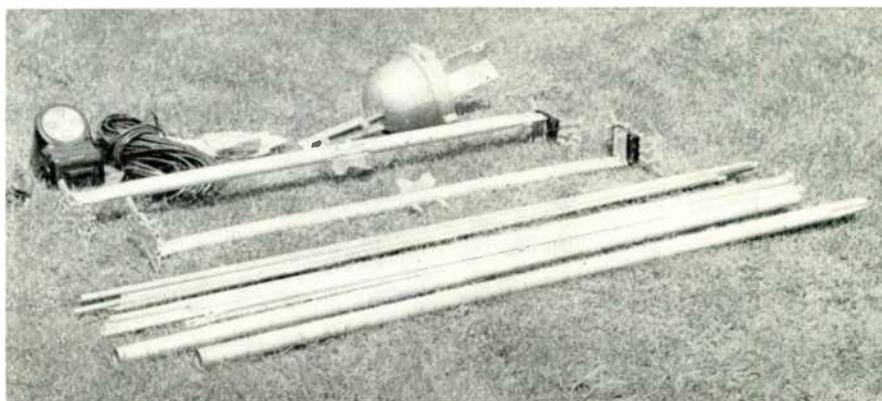


Fig. 2. Contents of boxes in Fig. 1. Rotator cable shown has 8 separate conductors

nably, a wooden broom handle was found with a diameter the same as the inside of the pipe. We cut off about a foot and hammered it into the pipe. The completed antenna is shown in Fig. 7.

Fig. 8 shows the terminal board on the lower end of the rotator. After an 8-conductor cable was connected, the watertight lid was put in place to seal the housing.

If the inner construction of the rotator is of interest, it is suggested that Fig. 9 be given careful examination, because the housing was not meant to be taken apart. Removal of the top half is easy enough. When replacing the cover, however, it is extremely difficult to get the keys at-

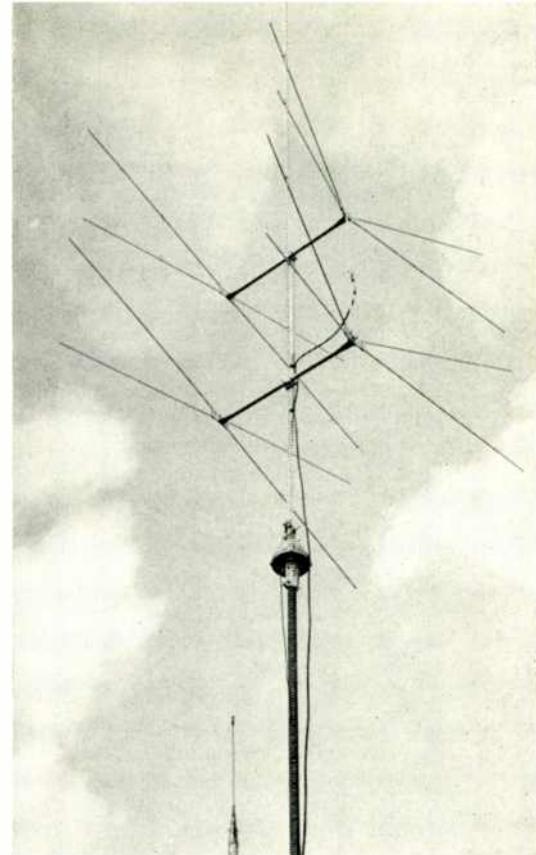


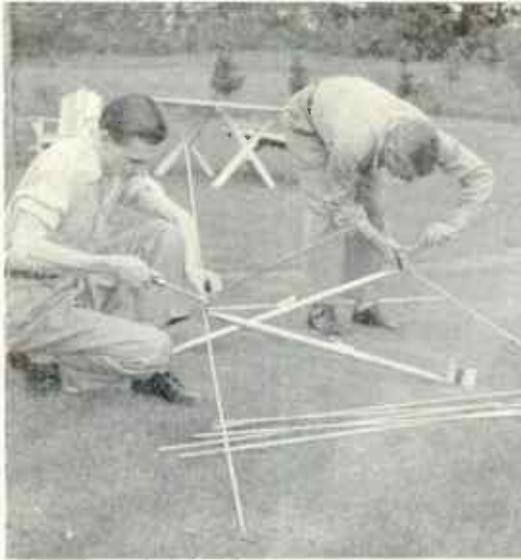
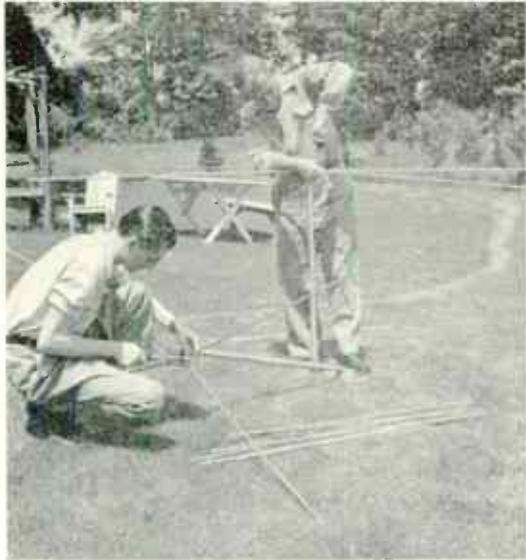
Fig. 12. Completed antenna with rotator

tached to it in the right slots simultaneously.

While we were tightening the clamps which secure the rotator to the antenna pipe, Fig. 10, the pipe buckled. Fortu-

nately, a wooden broom handle was found with a diameter the same as the inside of the pipe. We cut off about a foot and hammered it into the pipe.

The antenna and rotator assembly was taken to the roof, Fig. 11, and the transmission line attached. Coaxial cable was taped to the supporting pipe. The lower end of the rotator was fastened to a 25-ft. steel pipe, secured to a chimney with steel strapping. Fig. 12 shows the completed assembly. Our installation would be a headache for a serviceman, but it has given us endless opportunities to try interesting experiments. Since Schenectady is our nearest station and provides the most powerful signals in our area, we checked on that first. Most of the time, this station gives excellent reception, but



Figs. 3 and 4. Assembling the individual bays was first step. Fig. 5. Connector rods were attached to space bays properly

there is not much signal to spare when weather conditions drop the level. That is only part of the story, however.

Watching the lights of the rotator control, we thought it was 180° out with the antenna. Later, we shifted the mast by that amount. But then, when we rotated

west. Best reception, however, was from the east, using signals bounced back from a high hill.

Our venetian blind effect on Schenectady, channel 4, was also explained when we discovered our mistake. With the antenna pointed east, the hill which

stations are at shorter range. To make sure that atmospheric conditions and not the receiver were at fault, we checked the signals with a Simpson antenna compass meter.¹ This showed considerable variation in signal strength, and checked with the changes in picture quality.

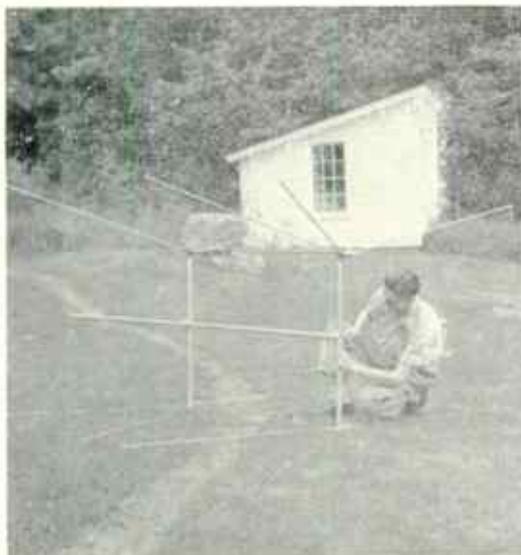


Fig. 6. With correct spacing determined, pipe was attached. Fig. 7. Completed antenna. Fig. 8. Rotator connections at base

the antenna to point it south, toward New York City, we couldn't pick up any signal at all. A more careful check on the antenna and the control proved that we had the antenna set correctly in the first place. The trouble lay in the fact that, just off the edge of the roof, there are two high, thick maple trees to the

bounced back the Schenectady signals to us cut off reception from Boston, but we got just enough signal on channel 4 from that direction to cause slight interference.

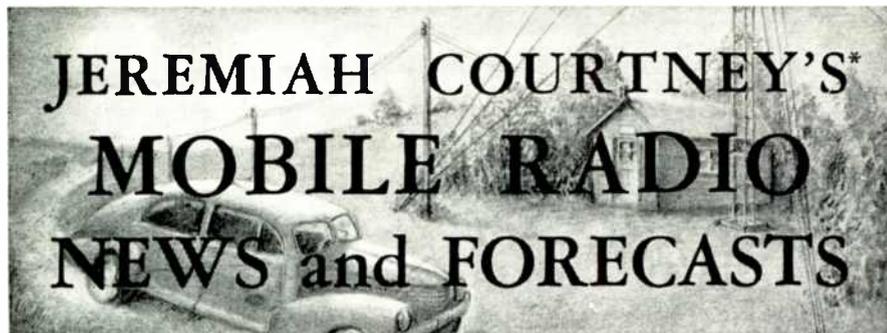
Lower-band reception from New York City is excellent at times, but it is more likely to come in with too much snow to satisfy anyone who knows how good the

Altogether, despite our particularly adverse conditions, we have been well repaid for our efforts by the amount of entertainment the set has provided. Now we are anxious to see what will happen when there are no leaves on the trees.

¹ See "Locating and Orienting Antennas" by Roy F. Allison, *FM-TV*, Sept. 1949.

Fig. 9. Inside of rotator. Don't try this. Fig. 10. Clamping rotator to pipe. Fig. 11. Taping line prevents strain on connection





JEREMIAH COURTNEY'S* MOBILE RADIO NEWS and FORECASTS

FCC reorganization of mobile radio services in a new Safety and Special Radio Services Bureau and the selection of Edwin L. White to head the reorganized mobile radio staff have been uniformly well received.

New Organization Plan:

Of primary importance to the mobile radio manufacturers, new applicants, and present licensees is the promise that sweeping reorganization will speed up all application processing through establishment of an independent Authorization Analysis Division for review and grant of all properly-filed applications.

Four other divisions established are Aviation, Marine, Industry and Commerce (Industrial, Land Transportation and Citizens Radio Services), and State-Local Government (Public Safety) and Amateur services.

The office of the Chief of the Bureau will take care of enforcement problems through an Enforcement Unit charged with responsibility for planning the enforcement of the safety and special services rules, evaluating the citations issued in the field to determine whether recommended actions should be taken to suspend or revoke licenses, and coordinating with the Office of the General Counsel in those cases where prosecution is deemed necessary. Experimentation not connected with improvement of established safety and special services will henceforth be handled by the Office of the Chief Engineer instead of the former Experimental Section.

The Safety and Special Radio Services Bureau was the second major operating bureau to be established by the FCC in reorganizing its staff along functional instead of professional lines. The Common Carrier Bureau was the first established.

Major thrust of the reorganization in both cases was to abolish the coordinate jurisdictions of the Engineering and Legal Departments. Heavy volume of applications filed for mobile system authorizations made this division of authority a serious draw-back in the mobile radio sector. New plan for amal-

gamation of engineering and legal talent under one head should help all mobile radio service activities, and application processing particularly.

White Choice Lauded:

Although confronted with a plentitude of able engineers and lawyers as possible choices to head up the new Bureau, FCC selection of Ed White would be hard to improve upon. In addition to his twenty years of radio regulation experience, Ed has a happy faculty for dealing with people and problems—listening to all but making his own decisions, and then delegating the necessary authority promptly to carry out the decisions made. His capacity for effective administration is perhaps best indicated by the gleaming bareness of his desk at all times, a not inconsiderable tribute in a division noted for its heavy application file. Ed has kept his desk clean by deciding problems as they come up instead of "taking them under advisement." Obviously, he subscribes to the administrative creed of the military communications head who held that he was not performing his top war-time job unless he was able to spend one day a week looking out the window, (over a clean desk), while he considered ways to improve the functioning of his department.

Full Time Leadership:

The importance of such full time leadership in the mobile field was forcibly brought home in Commissioner E. M. Webster's remarks before the Atlantic City convention of the American Taxicab Association. At that meeting, Webster admitted regretfully that he is forced to devote 90% of his time as a Commissioner to problems involving broadcasting and television. In view of Commissioner Webster's keen interest in the mobile radio field in which he has gained international repute, it is safe to assume (and more in sorrow than criticism) that the other Commissioners find an equal amount of their time similarly occupied with broadcast matters. With telephone, telegraph, and international radio common carrier regulatory matters making heavy inroads on the remaining 10%, the time that can be spent by the Com-

mission itself on any particular mobile problem is cut pretty fine. The present imbalance should be partially offset, at least, through the creation of the new Bureau posts, the heads of which can be expected to dispose of many problems without recourse to the Commission, leaving it, in turn, free to deal carefully with the major problems of all the different radio services. Broadcasting and Field Engineering and Monitoring are next on the FCC's reorganization agenda.

Special Industrial Proposals:

Properly coming under the classification of a major problem and warranting the most careful Commission attention before adoption are the amendments proposed to the Special Industrial Radio Service Rules. Among other things, the amendments would single out the Special Industrial category of Industrial Radio Services users 1) for denial of point-to-point radio circuit use if wire lines are available between the points to be interconnected, and 2) for the limitation of base station intercommunications except "in emergencies involving the immediate safety of life or protection of property." Present Rules do not contain these serious restrictions and Commission advanced no reason to explain the necessity for the changes in these respects which will most adversely affect all Special Industrial Radio Service operators with more than one base station.

The group most vitally affected by the proposed Rule changes, however, are the general contractors engaged in construction, road-building, and similar activities. Under present Rules, a contractor engaged on a public project (state, county, municipal, public utility) is eligible to use radio to improve the safety and efficiency of operations regardless of the site of construction activities. Proposed Rule change would ban base-mobile communications when mobile units are within the limits of any city of more than 2,500 population. Only exception to mobile radio use within cities of more than 2,500 population is the case where the base station and mobile unit are both within the boundaries of a single area under the control of the licensee—which is seldom if ever true in the case of any contractor's radio use. Contractors are also most seriously hit by proposal to limit base-station power to 120 watts input, as many are now using higher power. This higher power is particularly needed on long road construction jobs to control public traffic at either end of the job, as well as supervisory personnel operating over entire area.

Critical Burden of Proof:

Quite apart from the detailed objection—
(Continued on page 34)

* 1707 H Street, N. W., Washington, D. C.

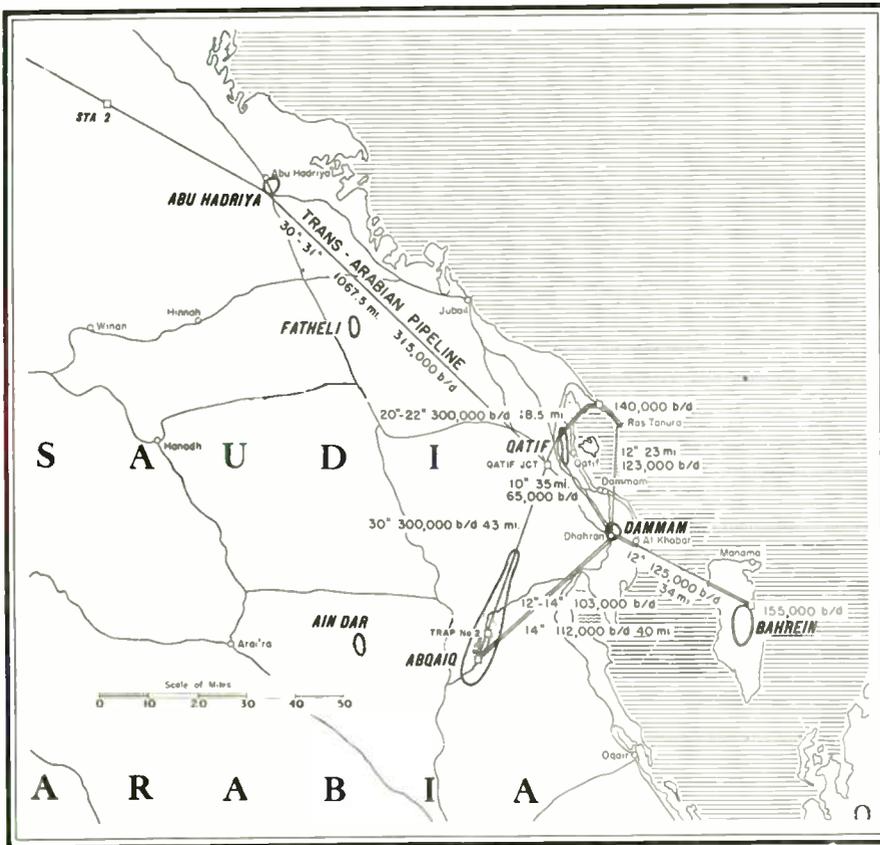


Fig. 2. Map showing Aramco's oil-drilling operations on the Persian Gulf, south of Iran

FM PIPE-LINE SYSTEM

HOW ARAMCO IS USING FM FOR RADIO TELEPHONE SERVICE IN THE ARABIAN DESERT — By A. D MAIR*

FM communications equipment has played a strategic role in aiding American enterprise to tame the desert of Saudi Arabia.

In its 17 years of desert oil operations, the Arabian American Oil Company has utilized new types of radio-telephone equipment, as it has been progressively developed, to meet the problems and dangers encountered in a barren land as large as Texas and California combined. Fig. 1 gives a glimpse of the desert waste, while Fig. 2 shows the area of Aramco operations.

The first geological parties starting out in 1933 took off into the nowhere of desert flats and dunes, each with communications equipment comprising only a 5-watt CW transmitter, a receiver, and a piece of paper with the telegraph code written on it. The adventures of these groups in trying to maintain contact with the base camp in the face of the everyday cussedness of what was then modern radio equipment have become legends in the Company's history. But the success of those pioneers as

radio operators was truly remarkable. Not a life was lost.

Today, geological field parties are

equipped with 50-watt Link 50-FMTR-7a units, by which they can contact Company headquarters at Dhahran on 30 to 40 mc. from any location within the 450,000 square mile concession. Dhahran maintains a continuous guard on these frequencies. Illness, accident or any emergency brings the immediate dispatch of a doctor in an Aramco airplane from headquarters. Routine radio contacts are used to make reports, order supplies, and dispatch transportation. Solid FM communication, despite static conditions, permits the oil search parties to operate farther from the base camp and remain away for longer periods, with the result that more work can be done during the limited exploration season, from September to May.

Thanks to radio, the company's 22 aircraft can take on any mission, even when blowing sand makes earth and sky almost indistinguishable. Numerous low-powered radio beacons are operated on the main air routes. Communication is maintained at all times in flight, while position and weather reports are sent to Dhahran at half-hour intervals.

The Company's basic communications network is between Dhahran and three principal points. These are: the Abqaiq oil fields, 40 miles to the Southwest; Ras Tanura, where Aramco has a 100,000-barrel refinery, 50 miles to the north; and Bahrein Island, where a sister company, The Bahrein Petroleum Company, has a refinery, 35 miles to the Southeast. Dhahran is roughly in the center of a triangle formed by these localities, as can be seen in Fig. 2.

In 1943, Aramco was authorized to build the Ras Tanura refinery, and to



Fig. 1. Portable FM units are used to maintain pipe lines laid on the desert sands

*Superintendent of Communications, Arabian American Oil Company, Dhahran, Saudi Arabia.



Fig. 3. Main building at Dhahran. The antenna is for marine communications

lay an 8-in. submarine pipeline to Bahrain Island, 25 miles off the Arabian coast. In order to carry out this wartime job, Arameo sought the most efficient communications system available.

Past difficulties with maintaining telephone lines over the desert, and experience with the abrasive effect of Persian Gulf coral on submarine cable, influenced the company to utilize voice-carrier channels on VHF radio circuits.

The radio channels consisted of 50-watt Link 14-98 FM transmitters and receivers, crystal-controlled on frequencies between 70 and 100 mc. Horizontally-polarized dipoles, with reflectors

Fig. 5. Italian and Saudi Arab at Dhahran shop where all equipment is repaired

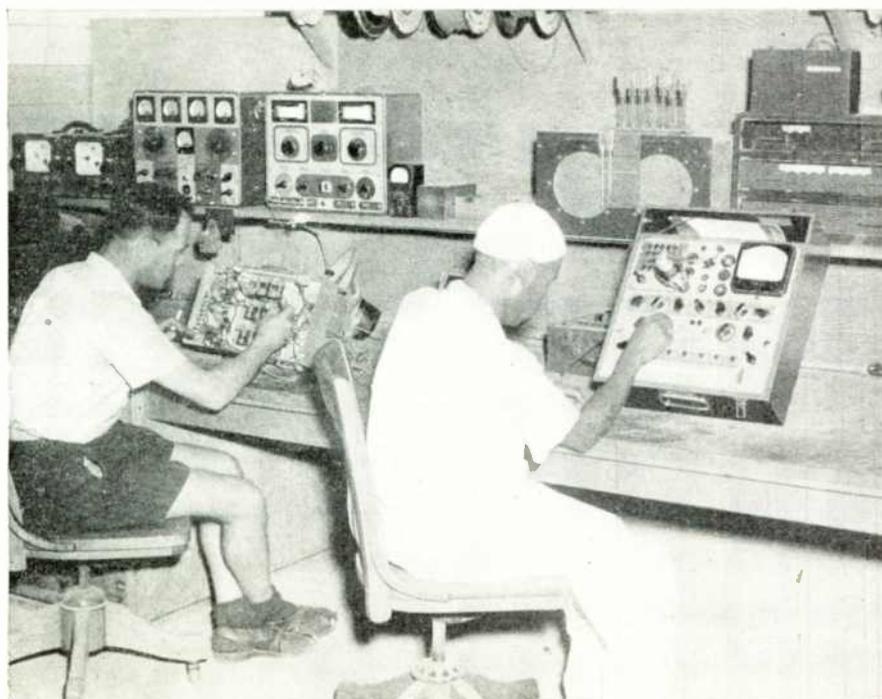


Fig. 4. Dhahran office handles all radio as well as wire phone and teletype circuits and directors, were used for antennae.

The circuit to Bahrain Island was the first to be put in service, and it provided valuable data for the installation of the other two circuits to Abqaiq and Ras Tanura. By means of hybrid networks, the circuits were terminated at the local telephone switchboard supplied by Automatic Electric Company.

The Dhahran headquarters, Figs. 4 to 6, is located near a rock hill, 498 ft. high, which provided an ideal location for line-of-sight circuits. The transmitters and receivers were housed in a windowless stone building 14 by 14 ft., air-conditioned to an ambient temperature of 76°. The antennas were mounted on 60-ft. telephone poles adjacent to the building. The original feed lines consisted of 3/8-in. copper coaxial line, filled with dry air to prevent breathing during periods of excessive humidity.

Four-channel voice carriers were employed on the Ras Tanura circuit to pro-

vide four 2-way talking circuits. Some difficulty was encountered because of the limited audio-frequency range of the radio equipment, since it was not designed for that purpose. Accommodation of the four-channel carrier required a redesign of the audio circuits to extend their range in both directions. Fig. 4 shows the terminal installation.

The three circuits have been practically trouble free except for short periods of power outage. Company officials say that records kept for the last two years show that the initial investment and maintenance expense of radio circuits between these points amount to only one-tenth that of wire lines or cables.

Dhahran, Ras Tanura and Abqaiq — the three mainly populated districts — are served by an automatic telephone exchange, and trunk dialing facilities are provided over VHF voice carrier channels. Thus, a resident of one district can dial numbers in any other district.

Work is now under way to provide oil wells and some of the company automobiles with access to the automatic exchanges by means of VHF communication.

Sharing part of one voice channel between Dhahran and Ras Tanura, and Dhahran and Abqaiq is a teletype service. This handles all traffic not requiring personal contact, provides a written record of orders and instructions, and relieves the load on the telephone lines.

Telephone service to drilling wells was a thorny problem in the first years of operation. In the Abqaiq area, the wells were widely spaced among large, drifting sand dunes. Even with constant patrolling, the effort to keep telephone lines functioning was a losing battle against the shifting masses of sand.

Members of the communication staff who had seen naval service in the Pacific

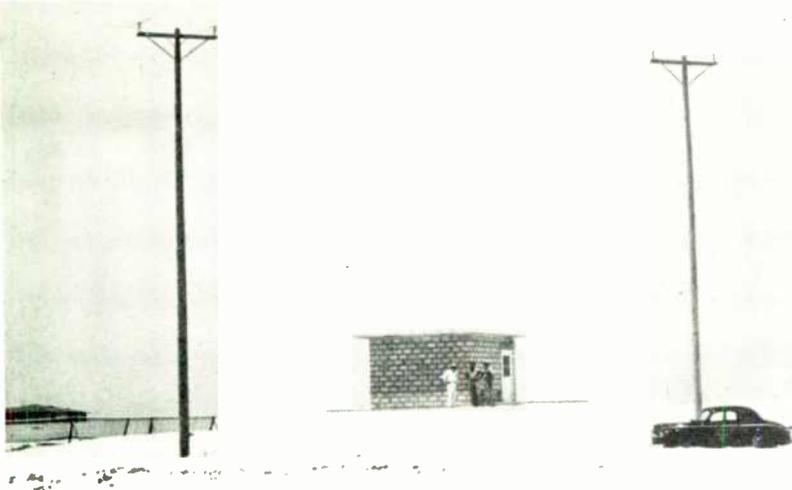


Fig. 8. Ras Tanura terminal of Aramco's inter-district FM radio telephone system

during the war believed that Link 5FRX-W VHF units which had been used on PT boats and elsewhere with signal success would meet the problem.

A rush order was placed for ten of these FM units, and shipment was re-

miles. Fig. 9 shows one of these installations.

The success of these low-powered VHF circuits has resulted in networks for numerous other Company operations. For example, when a tanker approaches an

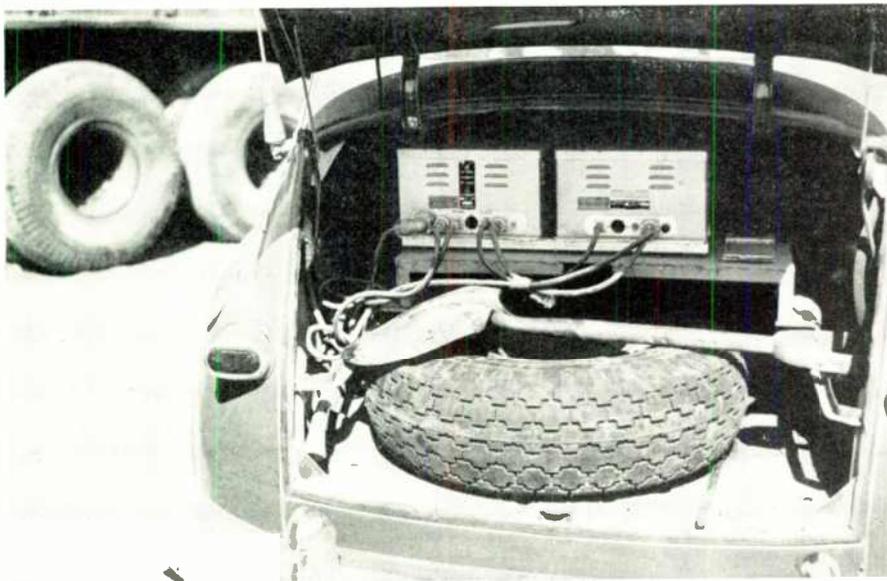


Fig. 7. Cars and trucks use standard FM units. Note big tires for desert driving

ceived by air express. They have given performance which Company veterans called "astounding." Their operation is unaffected by such operating conditions as ambient set temperatures of 150 to 175°, excessive vibration, and blowing sand.

These units consist of a 3-watt FM transmitter and receiver contained in a metal box approximately 18 by 12 by 8 ins., with a self-contained power supply. The drilling-rig sets were placed in the dog house with the speaker and handset mounted near the brake. The dipole antenna was hung from the walk-around, and connected by RG-8/U coaxial line to the unit. An identical unit was installed at the tool house, the antenna being, in this case, modified to a ground-plane type, mounted on a 70-ft. joint of pipe used as a mast.

Similar networks have been set up at the Dhahran and Qatif oil fields, where good operation is maintained up to 50

off-shore loading terminal, a portable VHF unit is put aboard so that its operations can be directed from the pump-

Fig. 9. Trap operator at Qatif trap setting, gets dispatching orders from Dhahran

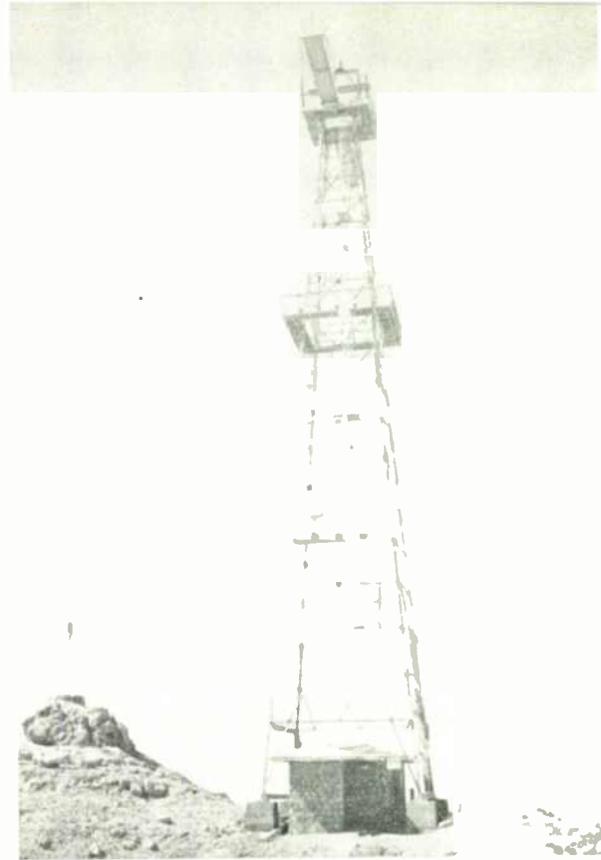
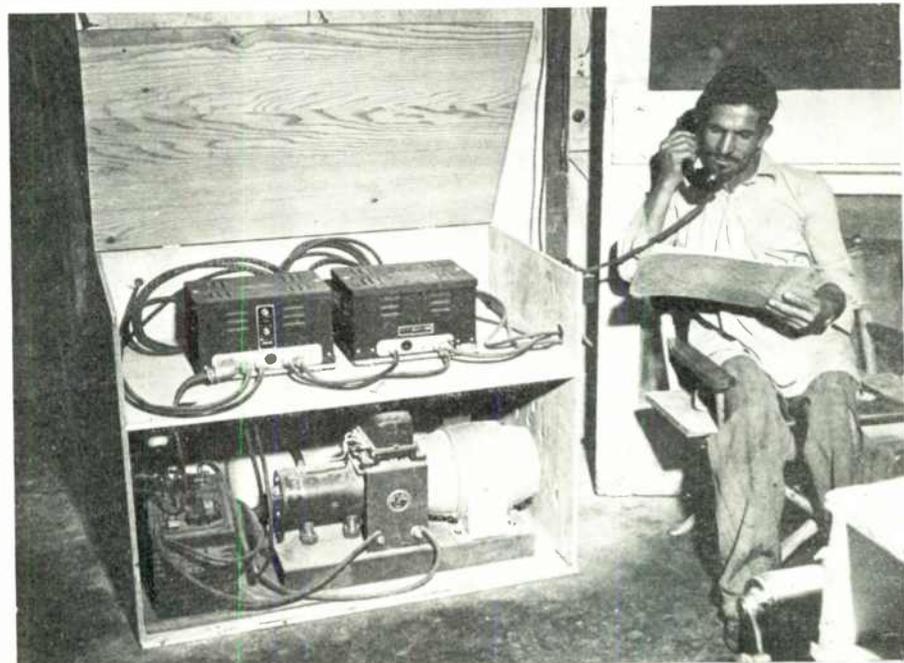


Fig. 6. Dhahran central antenna system is installed on this 136-ft. oil derrick

house. The pumphouse can dial any one of three tankers without alerting the other two. The portable units operate on 6 volts DC, or 110 volts DC or AC, depending upon the source of power available on the individual tanker.

FM mobile units, Fig. 7, are also used in oil dispatching, maintenance, and repair of pipelines. Radio is also used for power dispatching, and is invaluable during power outages. All units, both mobile and fixed, operate from 6 volt batteries and are independent of the main power system.

Marine cargo offloading utilizes a circuit similar to the oil-loading network. The marine division network connects
(Concluded on page 34)

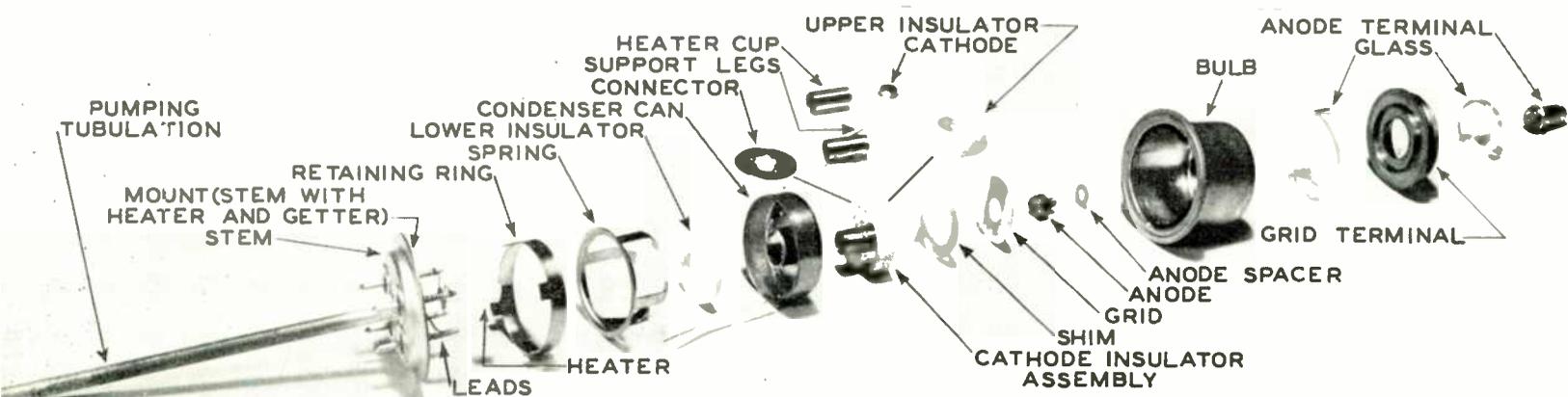


Fig. 2. Parts which make up the 416A triode. Cathode insulator assembly, center, is composed of the parts shown above it

416A TUBE FOR MICROWAVE RELAYS

MANY NEW MANUFACTURING AND ASSEMBLY TECHNIQUES ARE EMPLOYED FOR FACTORY PRODUCTION OF THE 416A CLOSE-SPACED TRIODE—By K. P. DOWELL*

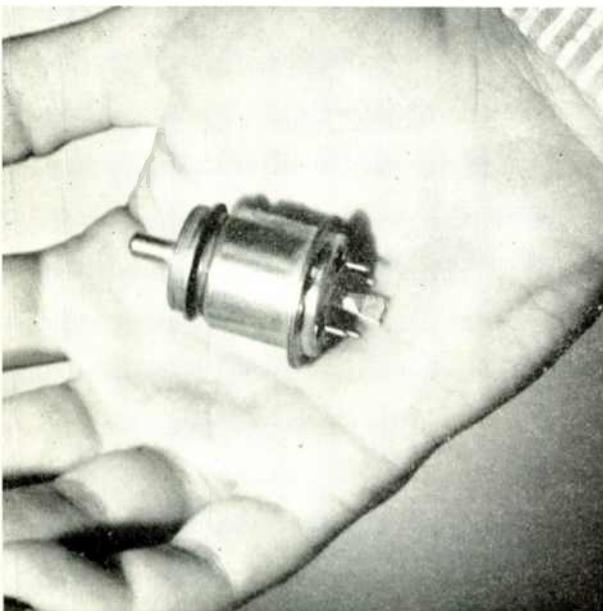
FOR construction of its cross-country microwave relay chain, the Bell System required a 4,000-mc. amplifier tube having a greater gain-bandwidth product than any available at the time. The 416A planar triode, shown in Fig. 1, was developed especially for this application. Because of its exceptionally close inter-electrode spacing, new techniques were necessary for factory production of the tube. It is the purpose of this paper to show some of the unique operations employed in its manufacture and assembly.

Design of the 416A:

Many wide-band repeating amplifiers are required in a long-distance microwave relay system. At 4,000 mc., amplifiers using existing tubes would cause serious degradation of television signals and telephone conversations unless costly equal-

* Western Electric Company, Inc., 195 Broadway, New York, N. Y.

Fig. 1. This shows relative size of 416A



izing networks were provided. Studies at Bell Laboratories indicated that a triode with electrodes in parallel planes could be designed to provide the necessary gain-bandwidth product if the cathode emission density was made 3 to 4 times that of contemporary repeater tubes, and if inter-electrode spacings were reduced by a factor of about 5. After sample models had proved its practicability, designers studied the tube with a view to manufacturing it in quantity, maintaining the close tolerances required. It is now being produced in the Western Electric plant at Allentown, Pa., employing the assembly techniques shown here.

Fig. 2 is an exploded view of the 416A showing its various parts, and Fig. 3 shows its internal construction in a cut-away view. Detail A is included to show the close electrode spacings. Distance between grid and cathode is .0005 in. The cathode coating is .0005 in. thick. Spacing between grid and anode is .010 in. The overall height of the tube, including leads and anode terminal, is less than 2 ins. Largest diameter, at the base flange, is approximately 1 in.

The metal bulb of the tube is drawn from flat Kovar stock. Kovar, an iron-nickel-cobalt alloy, is used because its rate of expansion is similar to that of the glass used in the tube. As Fig. 3 shows, there are two glass sections in the assembly: one between the metal bulb and the grid terminal, and another between the grid and anode terminals. The cylindrical section between the bulb and grid terminal is cut from tubing on a high-speed abrasive wheel. The other piece is molded on a lathe, Fig. 4.

The lower surface of the anode terminal is machined flat and threaded, so that

the anode can be inserted and located accurately. Similarly, the grid terminal has a lower surface machined flat to accommodate the grid assembly. Projecting below the flat surface of the grid terminal is a small annular ring which is used to align other parts, as described later.

Assembly Operations:

The bulb, anode terminal, grid terminal, and two glass sections are placed in an upright position in an induction heating fixture, as shown in Fig. 5. The metal is heated until the glass-to-metal seals are made. Special jiggling is used to stack these parts, in order to hold the spacings of the specially-prepared surfaces to close tolerances.

The assembly is cooled slowly to prevent strains. Then, after cleaning, the bulb is gold-plated on the inside.

The anode is of copper, chosen to conduct heat effectively and to have good surface conductivity. It is machined to screw into the anode terminal and abut against its flat lower surface. Fig. 6 shows an operator inserting the anode, using a special tool. This and succeeding operations are performed in assembly booths, where the air pressure is maintained slightly higher than that outside the booth. This prevents the entry of dust and other contaminants.

The 416A grids are wound with 0.3-mil tungsten wire on molybdenum frames. The grid frames are stamped from flat stock into rectangular shapes, with holes in the center. After careful polishing and cleaning, they are vapor-plated to provide the gold required for brazing the grid wires. The plating operation is shown in Fig. 7. After the frames are

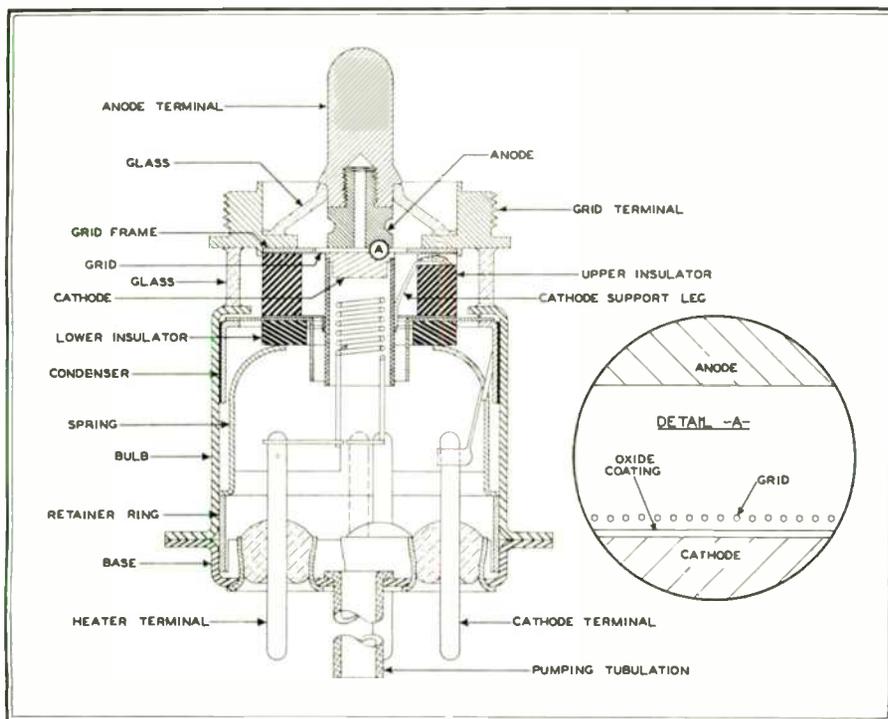


Fig. 3. Cross-section view and detail show extremely close electrode spacings

loaded, the machine is evacuated. Then the temperature is raised until the gold evaporates and deposits in a shiny, uniform surface on the grid frames.

The plated frames are then placed in a winding machine, Fig. 8. The fine tungsten wire is wound at 1,000 turns per inch around two frames placed back to back. A small torque motor, especially designed to limit the effects of inertia, maintains the winding tension to near the breaking strength of the wire. The gold is then melted to braze the wires to the grid frames, an operation that must be controlled accurately to maintain taut, well-aligned grids.

After brazing, the two grids are separated and undergo careful visual inspection under a 60-power microscope, Fig. 9. If there is a particle of dust on a grid or a small irregularity in a wire, or if the winding, brazing, or separating operations have been improperly controlled, this inspection will reveal the defect, and

unsatisfactory grids are rejected before further operations are performed.

Following this inspection, the rectangular grid frames are blanked into the shape shown in Fig. 10. The operator, using tweezers, places a completed grid in the bulb. The side of the grid opposite that to which the wires are brazed fits against the grid terminal and is aligned by the annular projection on the grid terminal. By rigid control of the grid-frame thickness and of the distance between the grid and anode terminals, accurate grid-to-anode spacing is accomplished.

The cathode-insulator assembly consists of the parts shown above it in Fig. 2—the upper insulator, cathode disk, heater cup, three support legs, and a connector whose function will be described later. The conventional nickel cathode disk is welded to the heater cup, which is supported by three legs connected between it and an extremely low-loss

steatite ring, the upper insulator. These legs fit into recesses in the steatite, to prevent electrical contact with the copper spacing-shim.

The top of the cathode-insulator assembly is ground flat in a precision surface grinder. A special machine then sprays the cathode disk with a smooth, dense coating of a barium-strontium-calcium carbonate mixture. The thickness of the coating is closely controlled. Accurate balances are used to measure the weight of the coating.

Sample cathodes are heated to operating temperature and the differences in expansion between the cathode disks and the steatite insulators are measured. The average must be added to the desired hot grid-to-cathode spacing, in order to determine the required cold spacing. A flat washer, or shim, having a thickness equal to the cold spacing is inserted next to the grid frame in the bulb, and the cathode-insulator assembly is then placed in position. The steatite insulator fits against the washer. Thus, the thickness of the washer determines the critical grid-to-cathode spacing.

The condenser can, shown in Fig. 2, establishes an RF connection between the cathode and the metal bulb. The cylindrical part of the condenser can is placed close to the bulb, as indicated in Fig. 3. In order to simplify circuit construction, this cylinder is coated with a layer of glass which prevents DC contact and acts as a capacitor dielectric. The top of the condenser can makes contact with the connector, which is welded to the heater cup directly below the steatite insulator.

To hold the assembly in position, a second ceramic insulator is placed inside the condenser can, and a spring is added to bear against the insulator. The spring is made of a refractory metal, for it must offer substantially the same pressure at temperatures up to 500° C. as at room

Fig. 4. Molding upper glass section

Fig. 5. Making glass-to-metal seals by induction heating.

Fig. 6. Inserting the anode

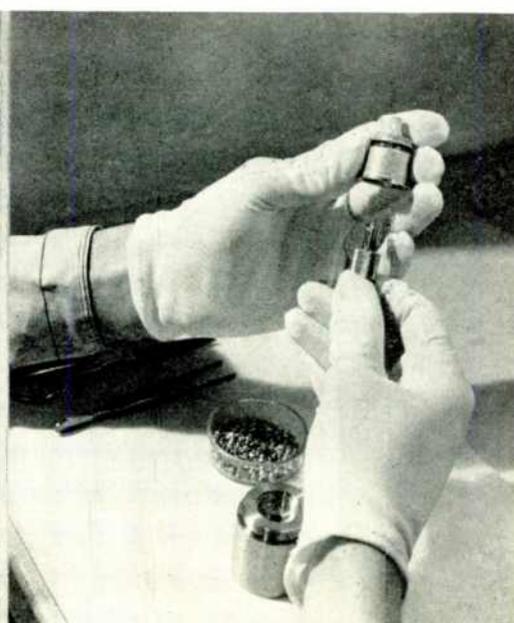
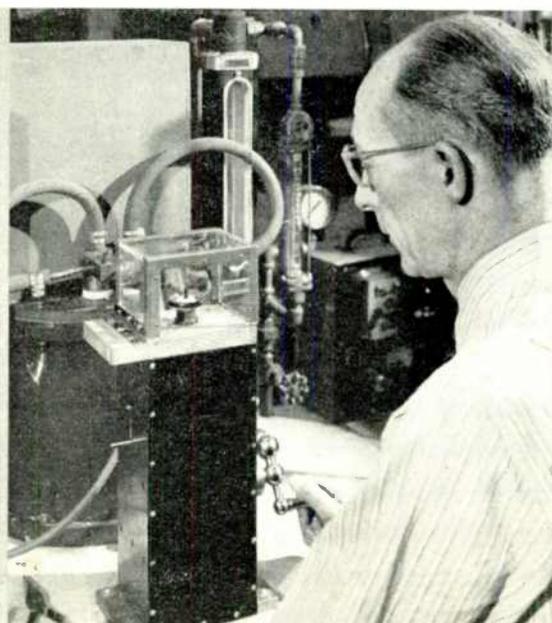
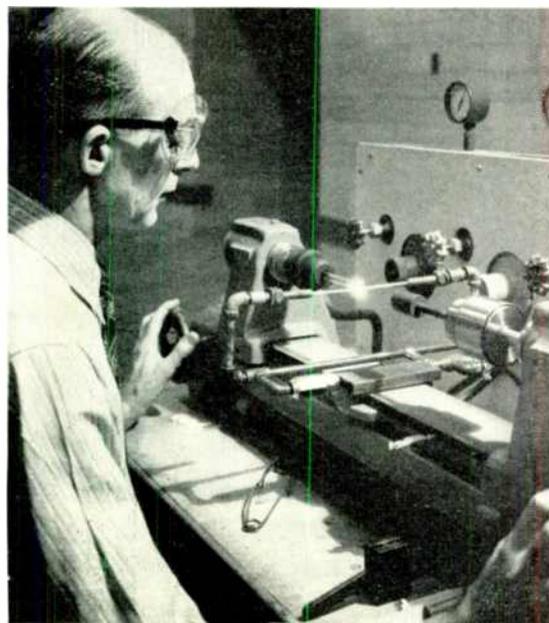




Fig. 7. Gold vapor-plating grid frames. Fig. 8. Winding grids with 3-mil tungsten wire. Fig. 9. Grids are inspected carefully

temperature. It is loaded to a predetermined force and the retainer welded in a special fixture, as shown in Fig. 11.

The base or stem of the 416A is similar to those used in other Western Electric tubes. It consists of a five-hole metallic disk, with four glass-insulated eyelets for the terminal leads. Exhaust tubulation is provided through the center hole of the stem.

The heater, which must be located accurately to fit inside the heater cup, is spot-welded to extensions from two of the terminals. Fig. 12 shows how a projection comparator is used for inspection of the heater alignment. An enlarged shadow of the heater is projected on a screen and gauged against limit lines marked on the screen. The base assembly can be seen in the foreground.

Fig. 10. Inserting finished grid. Fig. 11. Welding the retainer ring. Fig. 12. Checking heater alignment with shadow comparator

A mount, consisting of the stem with the heater and getter attached, is brought very close to the bulb assembly and the cylindrical condenser can be connected to the cathode terminal. Then, using projections on the retainer ring as guides, the operator welds the base of the tube to the bulb.

The 416A is exhausted carefully, using the latest high vacuum techniques, and the parts are thoroughly outgassed. Extreme care is taken in activating the cathode to assure a long, satisfactory life. The tube is then sealed, and the outside cleaned and gold plated to provide low contact loss.

Final step in its manufacture is a complete electrical test, simulating actual operating conditions. Mounted in the proper circuit, a typical 416A tube has

a gain of 10 db and a bandwidth of 100 mc., operating at a median frequency of 4,000 mc.

Conclusion:

This new tube is already serving in three short-distance radio relay links: Dayton to Cincinnati, Dayton to Columbus, and Albany to Syracuse. Type TE-2 equipment is used in these stations. The 416A also plays an important part in the TD-2 radio relay equipment now being produced for the New York to Chicago link. In this equipment, 416A's serve in a three-stage grounded-grid amplifier at 4,000 mc., in a 4,000-mc. modulator, and in a frequency multiplier chain as triplers to about 2,000 mc. and doublers to 4,000 mc. Further high-frequency applications of the 416A tube are anticipated.



NEWS PICTURES

Most tube failures occur in the first few hours of service. This is particularly true of mobile radio use where tubes are subjected to vibration and shock. RCA has set up techniques for a special line of tubes by which potential failures have been eliminated drastically. Some of the stages of manufacture and testing are illustrated here:

1. The aging process stabilizes tube characteristics and discloses faults which might develop in the first hours of use.

2. Plunging tubes into boiling water checks performance under extreme temperature changes.

3. Elements which might come loose are detected by watching the meters when the tube is struck with a soft hammer.

4. Meters can disclose defects, but extreme manual dexterity is required to assemble the elements into tubes that pass all inspection tests.

5. Factory inspection has been developed into the science of quality control, by which any tendency toward increasing rejections can be recognized quickly.

6. The most delicate parts are now made strong by spot welds so fine that they can hardly be seen by the naked eye.

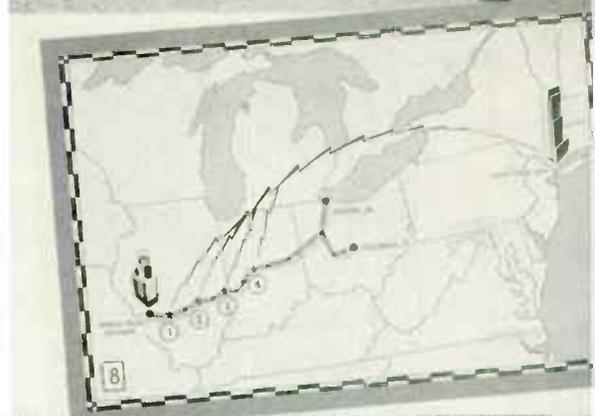
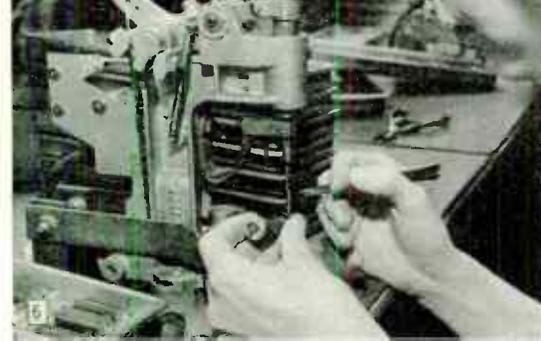
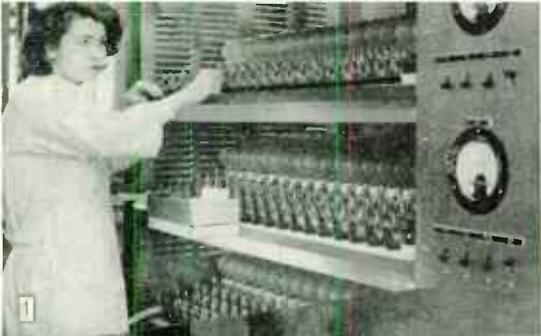
7. One of four pumping stations in the Shell pipeline at which valves are regulated by dial-operated radio control from New York City. Telemetering equipment informs the New York dispatcher of conditions at each station. If an emergency is indicated, the dispatcher can sound a siren to summon the man on duty at any station.

8. Map of the pipe line and G. E. radio system for controlling the flow of oil from Wood River, Ill., to Columbus, Ohio.

9. RCA mobile studio starting for XHTV, first television station in Mexico City, owned by Romulo O'Farrill. Mayor Bruner of Camden gave David Cervantes a letter of congratulation for Mexico City's Mayor Fernando Casas Aleman. Spectators are Herbert Edgar of RCA and Ernesto Zorrilla, Mexican Consul.

10. General Radio's new VHF bridge extends the range of conventional techniques for measuring the impedance of antennas, lines, networks, and components to 10 to 165 mc. Overall accuracy is plus or minus 2 per cent on resistance, and 5 per cent on reactance.

11. Communications is becoming the major market for high-quality test equipment. Harley-Davidson uses this setup to check FM sets to be installed on motorcycles.



TERMINAL RADIO, NEW YORK CITY, PROVIDES THIS AUDIO DEMONSTRATION ROOM FOR CUSTOMERS WHO WANT TO CHOOSE THEIR EQUIPMENT BY MAKING A-B TESTS. ILLUSTRATION AT THE RIGHT SHOWS THE DIFFERENT TYPES OF SPEAKERS WHICH CAN BE CONNECTED TO ANY AMPLIFIER



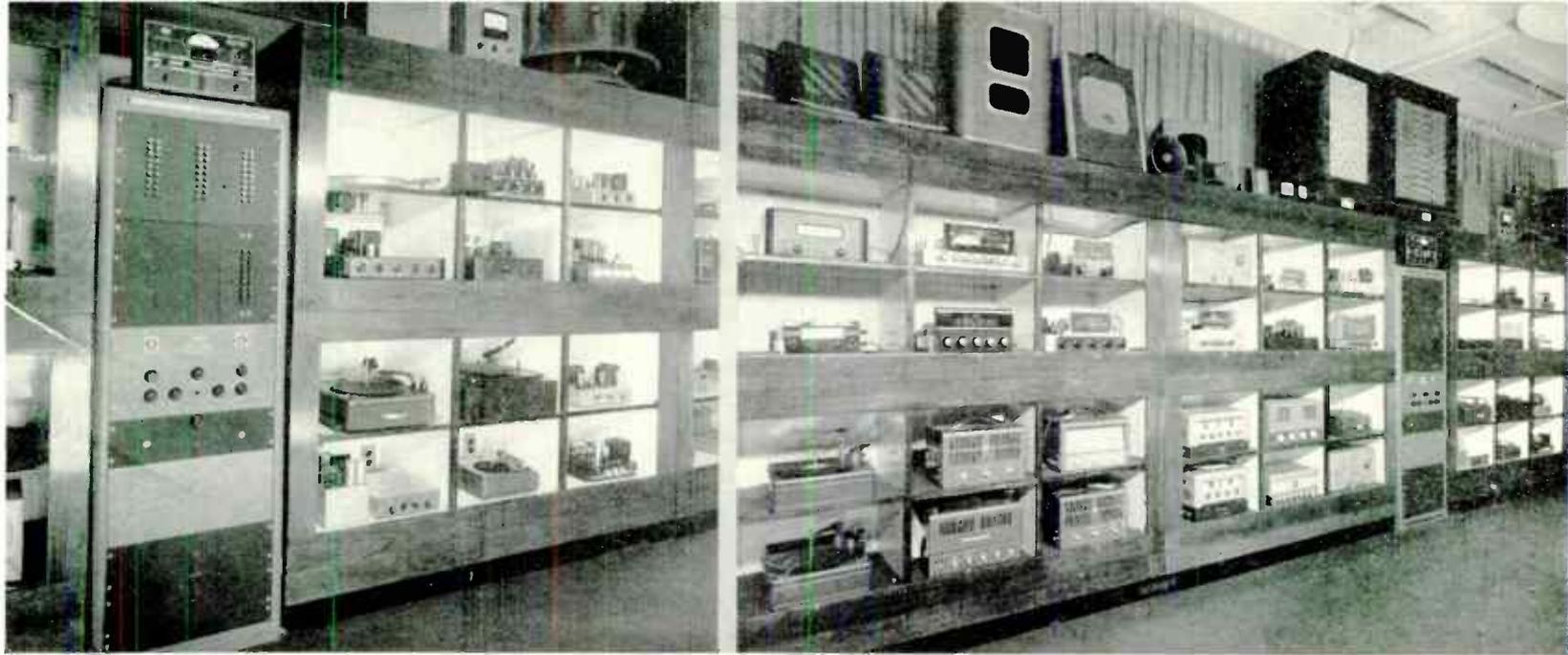
LEFT: ONE SIDE OF THE DEMONSTRATION ROOM CARRIES A FULL DISPLAY OF FM AND FM-AM TUNERS AND AUDIO AMPLIFIERS. EACH UNIT IS CONNECTED TO A CONCEALED WIRING SYSTEM, SO THAT TUNERS, AMPLIFIERS, AND SPEAKERS CAN BE OPERATED IN ANY COMBINATION TO PERMIT DIRECT COMPARISONS OF PERFORMANCE



RIGHT: ON THE OTHER LONG WALL, RECORD CHANGERS AND PORTABLE PLAYERS AND RECORDERS ARE SET UP. SPEAKERS ON THE BOTTOM SHELF ARE FOR USE WITH THE PORTABLE INSTRUMENTS. THIS METHOD OF GROUPING EQUIPMENT ENABLES EACH CUSTOMER TO FIND EXACTLY WHAT HE WANTS



LEFT: TERMINAL RADIO ALSO HAS A SMALL STUDIO AND RECORDING ROOM. THESE FACILITIES ALSO PROVIDE A MEANS FOR DEMONSTRATING PROFESSIONAL TYPES OF STUDIO EQUIPMENT, SUCH AS MICROPHONES, AMPLIFIERS, DISC AND TAPE RECORDERS, AND TURNTABLES FOR COMMERCIAL STUDIOS AND BROADCAST STATIONS



CONCORD RADIO, CHICAGO, PROVIDES INDIVIDUAL COMPARTMENTS FOR AUDIO EQUIPMENT. ON THE CONTROL BOARD SHOWN AT THE LEFT, ANY COMBINATION OF INSTRUMENTS CAN BE SET UP FOR RADIO OR PHONOGRAPH REPRODUCTION, AND SHIFTED INSTANTLY FOR A-B TESTS OF DIFFERENT COMBINATIONS

SELLING AUDIO PERFORMANCE

Selling Radio-Phonograph Equipment Strictly on Performance Is a Highly-Specialized Business. Only a Few Parts Jobbers Are Set up for it, although Annual Sales Run to Big Figures—By Milton B. Sleeper

THE statement that "the public doesn't want high-fidelity" has been made so many times that it has come to be widely believed—except by the increasingly large section of the public that rejects anything *less* than high-fidelity, and the parts jobbers who are set up to meet the needs of those iconoclasts.

To get information on this type of business, we went to some of the leading specialists whose demonstration rooms

are illustrated here. We asked: "What kind of people buy high-fidelity equipment, and how are they sold?" The answers were very interesting, and they shed considerable light on matters of great importance to the industry.

Who Buys High-Fidelity:

Interest in fine audio reproduction is not limited to any particular class of people, but they do have this in common: They know musical quality from attending

concerts and recitals, or from listening to high-fidelity installations in other people's homes.

It is perfectly true that listeners who have become conditioned to AM broadcast reception and cheap phonographs are perfectly satisfied with that sort of quality. And they will continue to feel that way as long as they don't have a chance to hear more realistic reproduction.

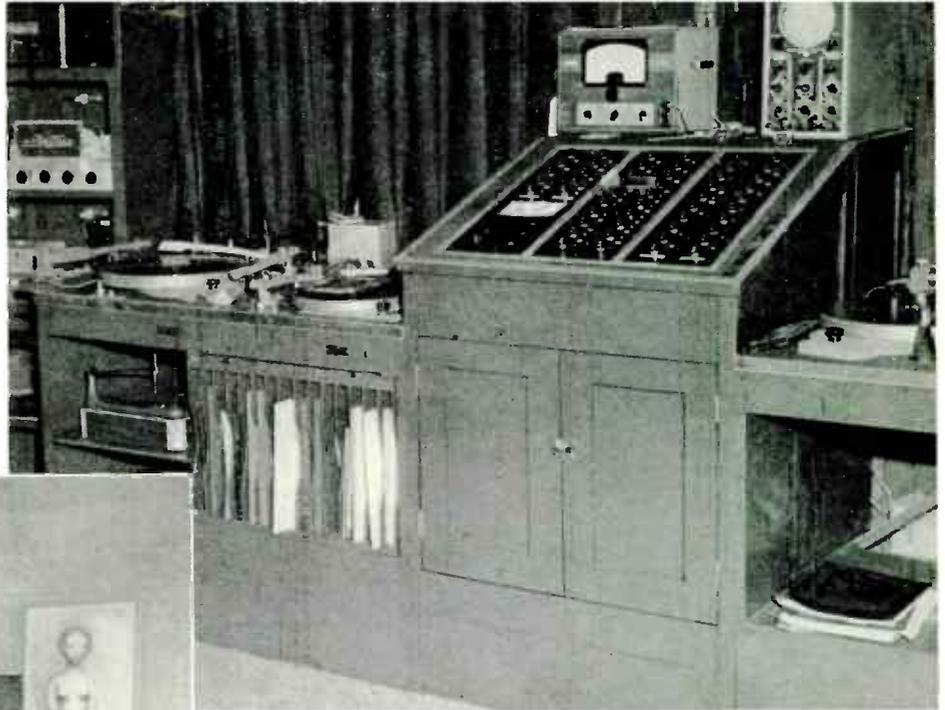
Many a family, moving into a new

SPEAKER DEMONSTRATION ROOM AT CONCORD RADIO IS ACOUSTICALLY TREATED TO SIMULATE, AS CLOSELY AS POSSIBLE, AVERAGE HOME LISTENING CONDITIONS. THE OPPORTUNITY OF MAKING SUCH THOROUGH COMPARISONS OF EQUIPMENT HAS VIRTUALLY ELIMINATED EXCHANGES AND RETURNS



home, has experienced a feeling of doubt and uncertainty upon being confronted with an oil burner for the first time. But who, after the first month of winter, would want to go back to shoveling coal and carrying ashes? People resist change, but the course of progress runs forward irresistibly.

So it is with audio entertainment. We are told that people have juke-box ears. It isn't true. They have juke-box standards, from which they



VIEWS OF THE AUDIO SETUP AT RADIO SHACK, BOSTON. ABOVE: THIS CONTROL BOARD, IN THE ROOM WHERE AUDIO EQUIPMENT IS DISPLAYED, PERMITS A-B TESTS OF RADIO-PHONO CIRCUIT COMBINATIONS. TURNTABLES AT THE LEFT ARE FOR COMPARING PICKUPS

LEFT: THIS IS ONLY A PART OF THE DEMONSTRATION SPEAKERS. WHEN A SPEAKER IS CUT IN AT THE CONTROL BOARD, IT IS AUTOMATICALLY IDENTIFIED BY ITS CORRESPONDING PILOT LIGHT



graduate quickly upon exposure to fine musical reproduction. If that were not so, there would have been no audio demonstration rooms to photograph for this article! Because it is so, some of the parts jobbers will run up more than \$500,000 in audio equipment sales this year!

How High-Fidelity Is Sold:

To understand how audio equipment is sold by the leading specialists, it is necessary to recognize



ABOVE: RADIO SHACK HAS ANOTHER CONTROL CONSOLE CONNECTED TO STUDIO-TYPE RECORDING EQUIPMENT. TELEVISION CHASSIS DISPLAYED ARE MODELS INTENDED FOR CUSTOM INSTALLATIONS

LEFT: ROOMS FOR AUDIO EQUIPMENT, PARTITIONED OFF AT THE REAR OF THE SECOND FLOOR, ARE BOTH SOUND-CONDITIONED AND AIR-CONDITIONED. INTERESTING EXHIBITS OF PAINTINGS BY LOCAL ARTISTS ARE CHANGED EVERY TWO OR THREE WEEKS



certain basic facts: Since each person judges reproduction according to his background of listening experience, opinions differ widely. Also, because radio-phonograph installations run from \$150 to \$1,000 or more, many customers must arrive at compromises between their tastes and their pocketbooks.

The answer to such a merchandising problem is to enable each customer to compare the performance of various combinations of audio equipment so that, by process of elimination, he can arrive at a choice with which he is completely satisfied as to quality of reproduction and price.

This explains the methods of display and the elaborate control boards illustrated here. They meet the following requirements:

1. A wide selection of tuners, turntables, pickups, amplifiers, and speakers must be available.



AT SUN RADIO, NEW YORK, ALL THE INSTRUMENTS DISPLAYED ARE CONNECTED TO THE CONTROL BOARD ILLUSTRATED ABOVE. PUSH-BUTTON SWITCHES SET UP ANY CIRCUIT COMBINATION TO OPERATE ANY OF THE TWELVE LOUDSPEAKERS AT THE LEFT. BELOW: SHADOWGRAPH SHOWS STYLUS MAGNIFIED 500 TIMES

2. Each device must be in operating condition.

3. Controls and connections must be provided so that any combination of radio-phonograph circuit components can be set up instantly, and switched to a different combination for comparison purposes.

Radio Shack calls their control board the Audio Comparator. It provides over 9,100 combinations of the components on display. Lewis Kornfeld explained the policy established at Radio Shack in

this way: "The customer must receive the best possible value for his money. We run rigid tests on all new products, as well as periodic quality checks on equipment accepted by our audio engineering staff. If products fail to meet our *best possible value* policy, they are not sold by us regardless of the publicity or demand. If products currently on sale fail to meet our continuing quality checks, they are taken out of the department immediately and put on clearance sale in the downstairs store, often



NEWEST DEMONSTRATION ROOM IS THIS ONE JUST COMPLETED BY HARVEY RADIO, NEW YORK. OVER 500 INPUT AND OUTPUT CONNECTORS ALONG THE DISPLAY SHELVES ARE WIRED TO SWITCHES ON THE CONTROL BOARD. RIGHT: VIEW OF THE ROOM LOOKING TOWARD THE FRONT OF THE STORE. SPACE WAS FORMERLY USED FOR TV AND AUDIO SETS



at prices well below our cost. Manufacturers' representatives in this area will—often to their sorrow—attest to the fact that this is literally true."

Roy Neusch, at Harvey Radio, supplied this information about their audio demonstration setup, just completed this summer: "More than 2 miles of low-capacity coaxial cable was used for the interconnection of the various items on display, with over 500 Cannon XL connectors. All inputs and outputs terminate on the rack-mounted switchboard, which has 175 DPDT toggle switches. These permit instantaneous interconnection of any tuner, record-player, pickup, amplifier, and speaker a customer wants to hear. There is a jack paralleled with
(Concluded on page 32)

LEFT: ALTHOUGH SOME OF THE SPEAKER CABINETS ARE SIMILAR IN APPEARANCE, THEY CONTAIN DIFFERENT TYPES OF SPEAKERS. THIS PICTURE AND THE ONE BELOW SHOW THE REAR OF THE ROOM. BELOW: THIS DISPLAY WAS PLANNED PARTICULARLY FOR CUSTOMERS FROM THE THEATRICAL DISTRICT, WHERE PORTABLE RECORDING AND PLAY-BACK EQUIPMENT IS WIDELY USED



"I think Terminal's Sound Department is the best in the country" says leading audio authority*



New Permaflux ROYAL EIGHT

A BARGAIN! The speaker that amazed 'em at the Audio Fair! Response 50 to 12,000 cps, 8 watts. Efficiency high, distortion low! 8" diameter, 8 ohm V.C.

Now only **8⁸²**

radio craftsmen chassis as used in the finest custom installations

RC-100A TELEVISION CHASSIS

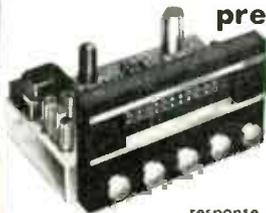
with built-in booster.

This is the finest! Use 19" or 16" square or round kinescopes. Less picture tube, amplifier, speaker



230⁰⁰

radio craftsmen RC-10 FM-AM tuner with built-in pre-amplifier

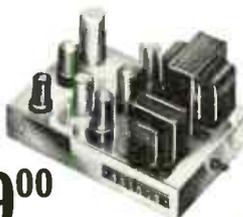


compensated for G. E. Pickering and crystal phono cartridges. Continuously variable bass and treble controls with flat response from 20 to 20,000 cycles. Automatic frequency control entirely eliminates station drift.

119⁵⁰

RC-2 wide range amplifier

Companion unit for RC-10 tuner, or any high fidelity application. Over 10 watts output with less than 1% distortion. 20-20,000 cycles frequency response.

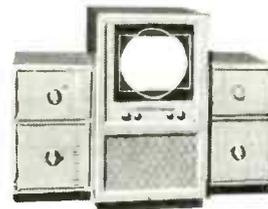


39⁰⁰

Net

Richard H. Dorf, New York audio consultant and author of authoritative articles in leading radio publications

There is a **UNI-MODE** cabinet ensemble for every custom requirement!



- RECORD CHANGERS
- TELEVISION CHASSIS
- TUNERS
- RECEIVERS
- PHONO AMPLIFIER SYSTEMS
- RECORD STORAGE

LOUDSPEAKERS RECORDERS

With Uni-Modes, you can create an entertainment center that will combine utility, beauty and allow for future expansion. It's easy and surprisingly moderate in cost! UNI-MODE is available in beautiful hand-rubbed Blonde and Cordovan Mahogany; also unfinished, if desired. Interiors are attractive Tarragon Green or Afghan Red.

See **UNI-MODE** in our sound catalog for pictures, sizes and prices.

New UNIVERSITY 6200 Wide Range 12" Speaker

30 watt FOCUSED FIELD wide range PM speaker! Advanced magnetic structure concentrates all of the magnetic force where it belongs — in the voice coil. Response of 45 to well beyond 10,000 cycles with amazing efficiency. Standard 12" mtg., 6 to 12 ohm voice coil.



A real buy, at only **20⁵⁸**

New Webster-Chicago series 100 3-speed Automatic Changers

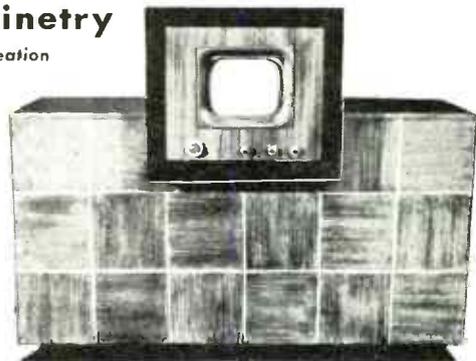


Terminal has the new Webster-Chicago record changers, available with Audak polyphase, General Electric reluctance, Pickering magnetic and standard crystal cartridges. Wide range cortridges with sapphire or diamond styli.

Masterpiece in Cabinetry

An **ELECTRONIC DECORATORS** creation

Artfully constructed of finest woods, scientifically planned layout for proper housing of TV, radio, amplifier, record changer, speaker and record storage.



Dealers and installers — check with us for prices on your needs

WRITE FOR OUR NEW SOUND CATALOG



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TERMINAL
RADIO CORPORATION

Distributors of Radio & Electronic Equipment

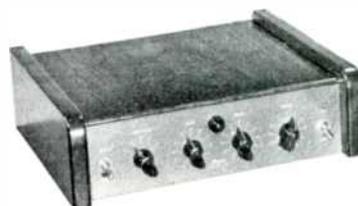
85 CORTLANDT ST., NEW YORK 7, N. Y. • Worth 4-3311 • Cable: TERMRADIO



Type 50W-2 \$249.50

impedance load such as a speaker or cutter head, not just into an ideal resistive load. McIntosh 50W-2 and 20W-2 amplifiers perform substantially the same under dynamic conditions into a speaker load, as into a pure resistive load.

Full dynamic range can be realized only if the noise is low. McIntosh amplifiers are designed so that the noise components (rms) are 80 to 90 decibels



Type AE-2 \$74.50

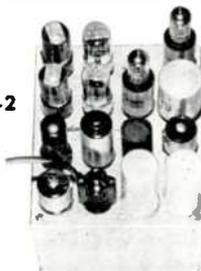
AUDIO power peaks reach 200 to 400 times the average power of speech and music. The unique design of McIntosh amplifiers provides adequately for such peak power requirements.

A bass drum delivers 140 decibels above threshold at 20 cycles, and a cymbal delivers 120 decibels above threshold at 20 kc. McIntosh amplifiers, delivering full-rated power at all frequencies from 20 cycles to 20 kilocycles with less than 1% distortion, satisfy this requirement of dynamic range.

The ear is extremely sensitive to distortion. For completely enjoyable reproduction, intermodulation at peak powers must not exceed 1%. McIntosh amplifiers type 50W-2 and 20W-2 meet that requirement for 100-watt and 40-watt peak powers, respectively, regardless of the frequency combination within the band of 20 cycles to 20,000 cycles.

Here is another important specification: Be sure to choose an amplifier that works properly with a variable

Type 20W-2



\$149.50

below full rated output, which is an inaudible noise level.

Factors of economy should not be overlooked. The efficiency of McIntosh amplifiers almost equals class B, with the highest theoretical efficiency possible. They are the most economical on tubes and power requirements — the most watts at the lowest distortion at the least cost. Service is simplified by plug-in

circuits. Size is small because of the high efficiency.

Performance of the control unit should compare with the amplifier. The McIntosh AE-2 8-stage Amplifier-Equalizer provides stable, distortion-free performance that matches the performance of the 50W-2 and 20W-2 amplifiers.

Engineers agree that McIntosh amplifiers reach the practical limits of low distortion and high efficiency. Music lovers agree that the theoretical advantages are fully reflected in superlative audio reproduction. For further information, write or telephone:

McIntosh

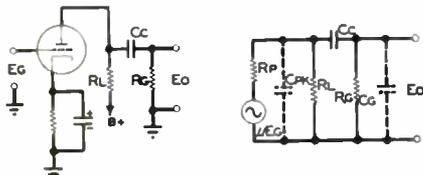
Engineering

Laboratory Inc.

910 KING STREET, APRIL 7, 1950 SILVER SPRING, MD.

DESIGN DATA for AF AMPLIFIERS — No. 3: RC Coupling, Part 1

FACTORS WHICH DETERMINE THE RESPONSE OF RC-COUPLED AMPLIFIERS. HOW TO COMPUTE GAIN AT ANY FREQUENCY, AND FLAT-RESPONSE RANGE



Figs. 1 and 2. Amplifier and equivalent circuit

RESISTIVE-CAPACITIVE coupling, better known as resistance or RC coupling, is widely used between audio voltage-amplifier stages. Excellent results are obtainable with this coupling method. In order to obtain the performance required, however, component values for use with different tubes must be chosen carefully. The factors affecting high- and low-frequency response, means for computing response at any frequency, and the significance and method of computing half-power points are discussed in Part 1 of this Design Data Sheet.

Fig. 1 is a schematic diagram of a typical voltage-amplifier stage with its associated coupling network. The equivalent circuit is given in Fig. 2, where E_G is the input signal, R_p is the plate resistance of the tube, and C_{PK} is capacity between plate and cathode plus distributed wiring capacity to ground before the coupling capacitor C_c . R_L is the plate load resistor, R_G is the grid resistor of the following stage, and C_G represents the capacity from grid to cathode and grid to plate of the following stage plus wiring capacity to ground after the coupling capacitor.

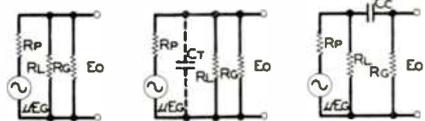
When triodes are used, the effective value of C_{PK} is not that listed in tables of tube characteristics. This figure must be multiplied by the factor $(1 + A_2)$, where A_2 is the estimated gain of the following stage. Two or three micromicrofarads, as allowance for wiring capacity, are added to the resultant figure to obtain the effective value. The foregoing applies only to triodes. The listed value of C_{PK} plus wiring-capacity allowance should be used for subsequent tetrode or pentode stages.

Amplification factor is represented by M_u . The total voltage impressed on the circuit is the product of the input signal and the amplification factor, or $M_u E_G$. However, this is not the output signal, E_o . The signal appearing at the

following grid is invariably less than $M_u E_G$, for reasons which appear later.

It can be assumed without significant error that resistors have constant impedances over the audio-frequency range, and also that tube plate-resistance is constant in the same range. Since there are no wiring-inductance effects involved at audio frequencies, the only frequency-sensitive elements involved here are capacitors. Therefore, these necessarily determine the response of the RC-coupled amplifier.

From consideration of Fig. 2, it is obvious that the coupling capacitor has little effect on the output amplitude except at low frequencies, where its reactance becomes appreciable. Likewise, capacities C_G and C_{PK} have high reactances at low frequencies but, since they are in parallel with the output load, have little effect on the signal. Only at higher frequencies does their shunting effect become significant. Thus, for a certain middle range of frequencies, neither



Figs. 3, 4, and 5. Circuits equivalent to Fig. 1 at middle, high, and low frequencies respectively

series nor shunt reactance has an appreciable effect on the output, and the circuit can be represented as in Fig. 3.

The gain of a stage, designated by A , is the ratio of output to input signal amplitudes. It is greatest at middle frequencies, and can be calculated for this range as follows:

$$A = \frac{M_u R_s}{R_p + R_s}$$

where R_s is the parallel impedance of R_L and R_G , Fig. 3. It can be seen that the voltage $M_u E_G$ is divided between the plate resistance and the equivalent load. Thus, the full voltage never appears across the grid resistor, and A is always less than M_u .

Fig. 4 is the equivalent circuit at high frequencies, where the coupling capacitor reactance is negligible but shunt capacity must be taken into account. Both shunt capacities are combined

as C_T for convenience. The gain at high frequencies is given by:

$$A_H = \frac{A}{\sqrt{1 + (2\pi f)^2 C_T^2 R_T^2}}$$

where f is frequency and R_T is the parallel impedance of R_p , R_L , and R_G .

At low frequencies the shunt capacity can be disregarded, but the coupling capacitor becomes less efficient. The circuit in Fig. 5 then applies. Low-frequency gain is calculated by:

$$A_L = \frac{A}{\sqrt{1 + \frac{1}{(2\pi f)^2 C_c^2 M^2}}}$$

Where M is the sum of R_G and the parallel impedance of R_L and R_p .

Frequency response is usually taken as the range between half-power points, as shown in Fig. 6. These points are high and low frequencies at which gain is decreased 3 db from that at medium frequencies. While admittedly arbitrary as response boundaries, they are chosen because they can be calculated easily:

$$HF \text{ CUTOFF} = \frac{0.1592(R_G R_p + R_L R_p + R_L R_G)}{C_T(R_G R_p R_L)}$$

$$LF \text{ CUTOFF} = \frac{0.1592(R_p + R_L)}{C_c(R_G R_p + R_p R_L + R_L R_G)}$$

Methods for obtaining required frequency response will be discussed in Part 2.

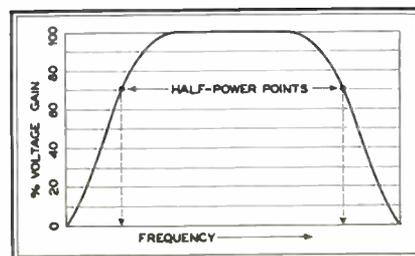


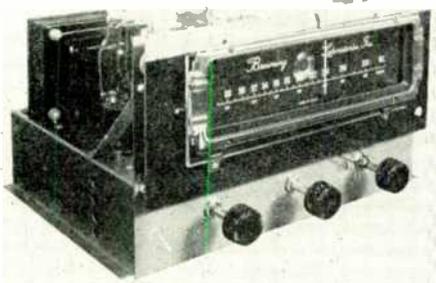
Fig. 5. A typical RC amplifier response curve

WILL FM REPLACE AM BROADCASTING?

WE haven't an opinion on that question. Our concern is to enable each purchaser of a BROWNING tuner to compare for himself the finest FM reception with the finest AM reception obtainable in his particular location.

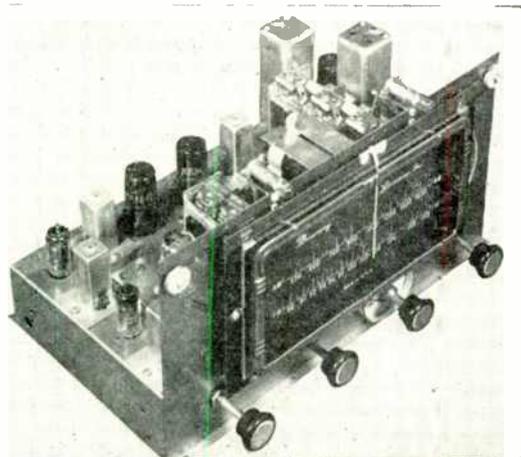
To achieve this objective, we maintain a continuous program of improving both the FM and

AM performance of BROWNING tuners. In this effort we have been extremely successful. BROWNING tuners are not the cheapest available. However, a thorough A-B test will show conclusively that any difference in price is amply justified by the quality of reception engineered into these BROWNING models.



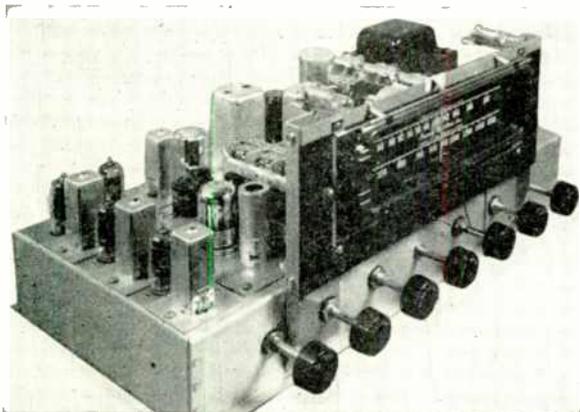
BROWNING RV-10 FM TUNER

High-sensitivity FM reception can be added easily to any AM receiver. The moderately-priced BROWNING RV-10 tuner is designed for that purpose. A tuned RF stage with an Armstrong dual limiter and discriminator produce complete noise limiting with signals of less than 10 microvolts. This is the same FM section as in the RJ-12A and RJ-20. Controls: phono switch, radio-phono volume, and tuning. Tubes: three 6AU6, one 7F8, two 6SJ7, one 6H6, one 5Y3 rectifier, and 6AL7 tuning eye. As illustrated, or on a 19-inch rack panel.



BROWNING RJ-12A FM-AM TUNER

This model combines high-sensitivity FM reception from an Armstrong circuit that limits noise completely on signals of less than 10 microvolts, with the best reception of AM broadcasting. FM and AM circuits are completely separate. FM audio response is flat within 1½ db from 20 to 15,000 cycles. No drift after 2-minute warming. AM is flat within 3 db from 20 to 6,600 cycles. Front phono switch and combined radio-phono volume control. Tubes: three 6AU6, one 7F8, one 6SK7, one 6SG7, two 6SJ7, one 6H6, one 6SA7, one 1N34 detector, one 6AL7 tuning eye. Operates from separate PF12 power supply with one 5Y3GT. As illustrated, or on a 19-in. rack panel.



BROWNING RJ-20 FM-AM TUNER

The RJ-20 is intended particularly for those who require superlative reproduction quality on both radio and records. Armstrong circuits, incorporating every refinement, deliver the full promise of FM's interference-free performance with maximum receiving range. Variable IF bandwidth allows AM selectivity adjustment from 4 to 9 kc. A 2-stage audio system is built in to provide separate treble and bass boost up to 20 db for record reproduction. Tubes: Five 6AU6, one 7F8, one 6SG7, one 6SA7, one 6SK7, two 6AL5, one 6NS7, 6AL7 tuning eye, 5Y3GT rectifier. As illustrated, or on a 19-in. rack panel.

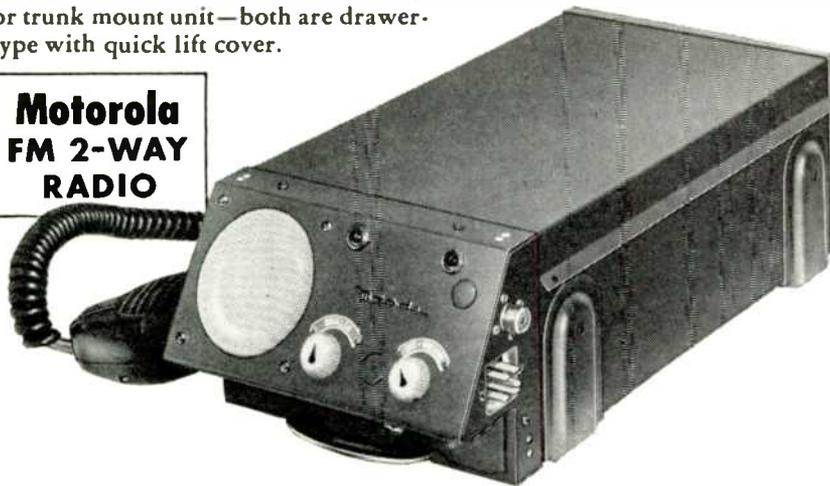
For Complete Technical Data on These FM and FM-AM Tuners, Address:

BROWNING LABORATORIES, Inc.

700 Main Street, Winchester, Massachusetts

Choice of new all-in-one front model, or trunk mount unit—both are drawer-type with quick lift cover.

**Motorola
FM 2-WAY
RADIO**



**New UNI-CHANNEL SENSICON DISPATCHER—
with the marvelous Sensicon circuit...**

--- with the broad nose and steep skirt characteristic, offers the most practicable solution to adjacent channel operation plus protection against obsolescence for many years to come. It provides full modulation acceptance of ± 15 Kc. at 6db. down and full adjacent channel rejection at the skirts.

THE NEW UNI-CHANNEL SENSICON DISPATCHER incorporates all of these Motorola inventions and developments:

- The Sensicon Circuit
- Statomic Oscillator
- Differential Squelch
- Permakay-10 Wave Filter
- Capacitance Discriminator
- Instantaneous Deviation Control
- Thermally Balanced Crystal Oven

ENGINEERED for true adjacent channel operation. Available for operation in the 25-50 mc. band and 152-174 mc. band. R.F. power output: 10-12 watts.

Motorola
COMMUNICATIONS & ELECTRONICS DIV.

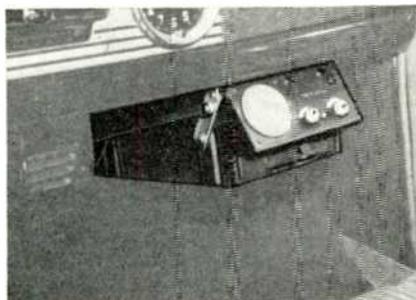
4545 Augusta Blvd., Chicago 51 - in Canada: Rogers Majestic, Ltd., Toronto

AUDIO PERFORMANCE

(Continued from page 28)

each switch to permit the substitution of any piece of equipment a customer may bring in to hear it in use with other components on display."

Since the audio specialists go to such lengths to enable each customer to select his equipment according to his own opinion of comparative performance, it is obvious that no high-pressure methods can be used by the salesman. Rather, the men chosen to handle sales are sales-minded engineers who, from their knowledge of audio installations, are able to assist customers in the selection of equipment best-suited to their needs at prices they can afford.



QUICK INSTALLATION

In any of several mounting positions, the complete, permanent installation requires only four screws.

COMPLETE "SHAKE-DOWN" TESTED

—by Motorola's engineering laboratory, the unit undergoes exhaustive tests to meet extreme conditions of service. (Tests made against temperature, humidity, and shock.)

ANTI-DUST HOUSING, with heavy duty construction throughout. Here is truly the all-purpose 2-way radio for every type of mobile application—offering the owner the benefits of advanced design, complete reliability, enduring economy, and freedom from obsolescence.

As for selling-up the customers, this technique is never employed. Nor is it necessary, because it is accomplished so effectively by demonstrations of comparative performance.

Further information was supplied by Roy Neuseh: "Our demonstration room is neat and clean in appearance. It was designed with emphasis on esthetic appeal, yet in no sense does it give the impression of being a lounge or hangout.

"Long and sometimes painful experience has taught us that the average audio enthusiast expects to be treated as the serious-minded individual he really is, and is resentful if he is handled in the manner to which the tinkerers are most responsive.

"This should not be interpreted as

meaning that we do not welcome lovers of fine music who are just discovering, for the first time, that high-quality reproduction is available for their homes. Quite the reverse. It is our established policy to think first of the customer, and to let the sale take care of itself."

The elimination of high-pressure is not only good public relations but sound business policy. When a customer has been assisted in the exercise of his own judgment, he is sure to be satisfied with his purchases. Robert Corenthal, at Terminal Radio, remarked that the return of goods for credit or exchange has been virtually eliminated by the adoption of this sales practice.

Among the various special services provided in audio demonstration rooms is a new feature recently installed by Sun Radio. It is a Shadowgraph instrument for examining styli. Magnification is about 500 times. Irving Greene explained this innovation: "We offer to let people examine their styli without charge. It is an effective way to bring them to our store. By letting them use the Shadowgraph, they can see for themselves if they should buy replacements. Sometimes people blame the stylus when the fault lies in an electrical component. It's very seldom that a man who comes in to use the Shadowgraph goes out without making a purchase."

Another aspect of selling by demonstration was brought out by Jerry Levenfeld, of Concord Radio. People who send for catalogs often make tentative selections but wait to make their purchases until they can visit headquarters and actually hear the equipment they plan to buy. Generally they wind up by spending more than they had intended.

The Profit Angle:

The audio specialists are not engaged in any altruistic effort. Their purpose is to build sales on merchandise which carries a substantially higher profit than factory-built audio and TV receivers. However, in accomplishing this purpose, they are definitely raising American listening standards. This is a public service that has a practical end product: it is increasing the size of the market for fine audio equipment. The people who are sold on high-fidelity are not only their own best salesmen, but sell their friends and neighbors.

Prices and discounts on tuners and audio equipment are stable, and relatively free of price competition. If a line gets out of hand, it is generally dropped, and quickly. Furthermore, most customers realize that organizations which provide elaborate facilities for performance tests and comparisons can't be argued into giving fancy discounts or inside prices.

ACKNOWLEDGED STANDARD OF FM PERFORMANCE

Information for Radio Dealers about Selling the 646-B Receiver

SOME of the largest orders for REL 646-B receivers come from relatively small dealers. The reasons for this are interesting. Here, for example, is the story of a very active dealer in one of the Chicago suburbs:

He had been doing a substantial volume on TV sets, but as soon as they were available at every store in the City, his customers began to ask for discounts. A little checking showed that stores in the Loop were selling TV sets at prices lower than this dealer could buy them from his jobbers.

Moreover, customers in his town who bought TV sets in the City had to pay for service, and they paid plenty, but if they bought from him, they expected to have their sets serviced free.

He couldn't turn to AM sets, because the cut-price situation was the same as on TV. So he made a survey of FM broadcasting. This is what he found:

There are 26 FM stations in the Chicago area, with a combined power of more than 500 kw. (This compares with 16 AM stations totaling only 323 kw.)

| | |
|------------------------|------------------------|
| 88.1 WEPS Elgin | 97.9 WEHS Cicero |
| 88.5 WNUR Northwestern | 98.7 WGNB Chicago |
| 91.5 WBEC Chicago | (MBS) |
| 92.1 WILA Woodstock | 99.5 WEFM Chicago |
| 92.3 WJIZ Hammond | 100.3 WFMF Chicago |
| 93.1 WFJL Chicago | 101.1 WMAQ-FM Chicago |
| 93.9 WAAF-FM Chicago | (NBC) |
| 94.3 WRBI Blue Island | 101.9 WXRT Chicago |
| 94.7 WENR-FM Chicago | 102.7 WMOR Chicago |
| (ABC) | 103.9 WBNU Aurora |
| 95.5 WMBI-FM Chicago | 105.1 WEAU Evanston |
| 95.9 WCHI Chicago | 105.9 WOAK Chicago |
| Heights | 106.3 WEXI St. Charles |
| 96.3 WBIK Chicago | 106.7 WKR5 Waukegan |
| 97.1 WBBM-FM Chicago | 107.1 WLEY Elmwood |
| (CBS) | Park |

With more stations, better reception, and all network programs available on FM, it looked as if there was a prospect of doing a substantial volume on FM sets, and at a respectable profit.

He put in carefully-selected FM receivers and phono combinations, choosing them for high sensitivity, full noise-limiting, and freedom from drift. Also, he picked out some of the insensitive, noisy sets that carry widely-advertised names. And of course he kept a display of AM and TV models.

In other words, he had the makes and models that people would ask for. They were necessary as starters for trading prospects to genuine FM receivers, and for comparative demonstrations to show the difference between inferior and genuine FM performance.

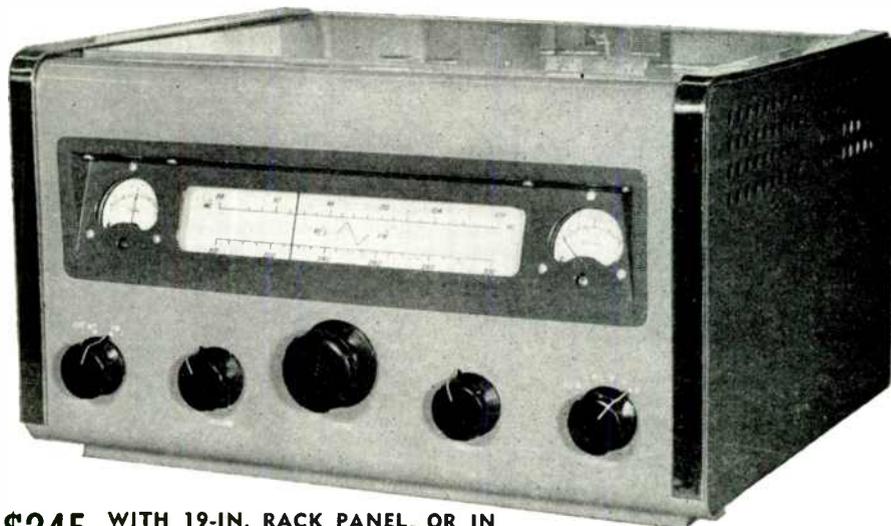
The plan worked. While other dealers in his community are sweating it out with City competition on AM and TV sets, he is going his quiet but very busy way on FM demonstrations and sales. If there is a chance to sell an AM or TV model at a profit, that's fine. If a prospect mentions a discount, he immediately starts talking about the advantages of FM. But where, you may ask, does the REL 646-B fit in this picture? We asked the same question, and got this added information:

"Certain people buy radios the way

they buy automobiles. They want superlative performance, handsome appearance, and fine workmanship. The REL receiver is a natural for them. I seldom try to sell a 646-B in my store. I have a list of special prospects, and I keep the REL's circulating in their homes.

"This is an ideal model to sell by home demonstrations. I put up a simple antenna, locate the set at any convenient spot, and run a lead to a speaker across the room. If they have a phonograph, it takes only a minute to hook it up to the 646-B. When I go back in two days, it's an even bet that I have made a sale, and I always pick up two or three names of friends who have heard the set, and are prospective customers. Nearly every 646-B involves a new speaker, turn table, and pickup. These sales run into big profit, and it's clean business because I don't have to meet price-competition."

If you, too, are looking for additional profits, we invite you to write for technical data on the 646-B, and information as to the trade discount. You will find it an exciting and profitable experience to demonstrate and sell FM receivers of such distinctive performance.



\$345 WITH 19-IN. RACK PANEL, OR IN METAL CABINET, AS ILLUSTRATED



RADIO ENGINEERING LABORATORIES, Inc.

36-40 37th STREET
LONG ISLAND CITY 1, N. Y.

**EMSCO FREE-STANDING
TRIANGULAR RADIO TOWERS**

**The Ultimate
in Structural
Rigidity**

Less horizontal deflection . . . less wind area . . . less weight . . . less cost per lineal foot. These are the outstanding advantages afforded by Enesco's new free-standing triangular towers. Rigid, triangular design prevents distortion and assures uniform distribution of loads to foundation piers. Slender proportions provide maximum signal strength. Hot dip galvanizing insures long life, low maintenance cost and maximum electrical conductivity. Standard Enesco free-standing triangular towers available in heights from 300 to 700 feet with 30, 40, 50 or 60 lbs. per sq. ft. RMA design. Other towers available on special order.

EMSCO
TOWERS OF STRENGTH

New bulletin F-173 describes the complete line of Enesco guyed triangular and free-standing square and triangular towers. Write for your copy today!

EMSCO DERRICK & EQUIPMENT CO.
Houston, Texas • Garland, Texas
LOS ANGELES, CALIFORNIA

WHAT'S NEW THIS MONTH

(Continued from page 11)

is obsolete. RMA reports show a steady shift in demand to large tubes. The limit of tube size for the CBS system is about 12 ins. However, the RMA report for May, the latest issued at this time of writing, reveals that 65 per cent of the tubes produced in that month were 14 ins. or larger in diameter. As for the magnifiers used on some CBS sets, the public has now rejected them completely.

Second, if it appears that the Government will shut down TV set manufacture, or that TV channels will be needed for military communications, the FCC will not attempt to reach a decision on color or allocations at this time. The presumption is that further military research would add to present knowledge. Under those circumstances, a postponement would not affect the industry or the public adversely.

FM PIPE-LINE SYSTEM

(Continued from page 19)

the headquarters office with tugs and passenger launches plying between the mainland and Bahrein Island.

The motor transport division has a circuit used in road patrol and truck dispatching.

Procurement of specialized equipment, getting it halfway around the world, installing it, and adapting it to the unusual operating conditions of the desert has been made possible by the cooperation of manufacturers, and the persistence and ingenuity characteristic of radio engineers.

And Arameo communications men feel that the dramatic transition from the camel couriers they found when they came to the desert to the present fixed and mobile FM communications system has played a vital part in the Company's desert operations.

MOBILE RADIO NEWS

(Continued from page 16)

tions that may be advanced to the Commission's proposals in this case, the general procedure followed is not without significance.

In tax matters, the liability for or freedom from tax often turns on which party carries the burden of proof—the Government of the tax payer. The FCC's procedure for issuing proposed Rule changes in the mobile field throws the entire burden of proof against the mobile radio user who would resist the changes which the Commission proposes on its own motion. If the mobile radio user were proposing a change in Rules, he should be expected to carry the full bur-

(Continued on page 36)

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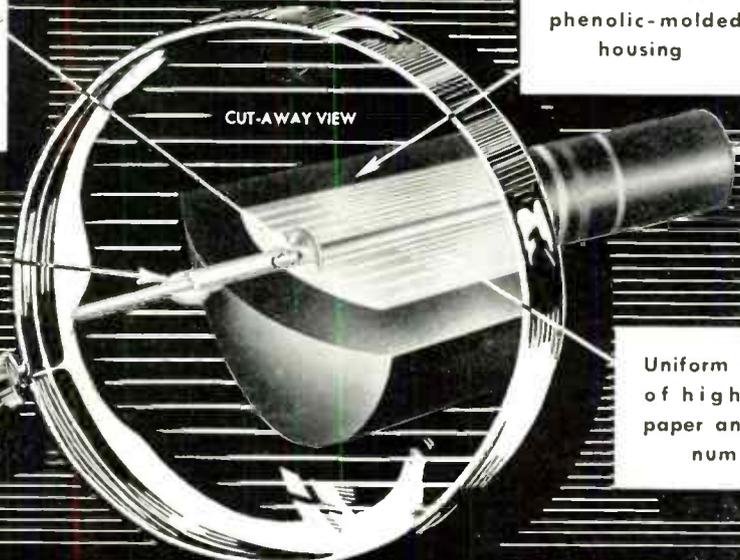
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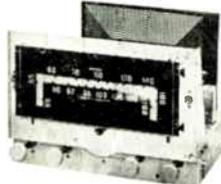
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MOBILE RADIO NEWS

(Continued from page 34)

gen of proof. But when the Commission decides to change the rules of the game after the players have started out, shouldn't it at least come forward with an explanation for the changed rules?

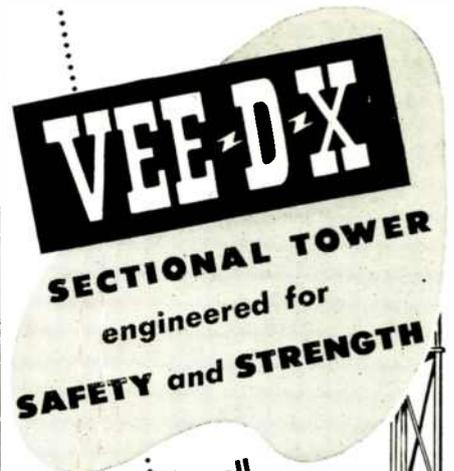
This department has often been impressed with the reluctance of people to reduce a position to writing. When an orally-stated position has been so reduced upon request, even more impressive are the changes the orally-stated position undergoes in the process of reduction to writing. The care with which people of responsibility formulate their written conclusions often results in a re-examination of basic assumptions and a winnowing of the sound from the unsound conclusions.

When the Commission singles out the Special Industrial Radio Service, among all the Industrial Radio Service users, for 1) an absolute prohibition of point-to-point radio use when wire lines are "available," 2) for a very serious limitation on base station intercommunications, 3) for a change in the authorized power, and 4) limitation of the area of use of previously licensed equipments, it would seem that the initial burden of justifying such radical changes should rest with the Commission.

The extensive amendments proposed to the Special Industrial Radio Service, however, were not accompanied by any specific justification. Moreover, much the same procedure was followed in the Commission's recent proposal for 60-ke. adjacent-channel assignments in the miscellaneous common carrier radio service, despite the widespread economic injury admittedly entailed in this proposal.

The Commission may not be required under the Administrative Procedure Act to accompany its Notices of Proposed Rule-Making with a Statement of Considerations supporting the proposed Rule-Making. But it would seem to be good administrative practice to do so, since the reasons advanced for a proposed change might either obviate argument on, or changes in, the Commission's proposals. It would also help the adversely-affected user in directing his requested comments on the Commission's proposal, besides explaining what may otherwise often appear to particular users as arbitrary judgments on the part of the Commission. If Rule changes originating with the FCC were invariably accompanied by a Statement of Considerations supporting the changes proposed, the ends of good administration and effective public relations would be served. It is also possible that mobile radio users would have fewer upsetting Commission

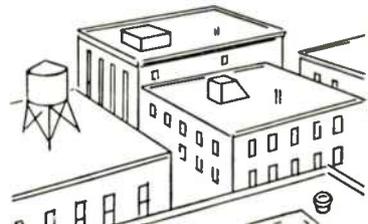
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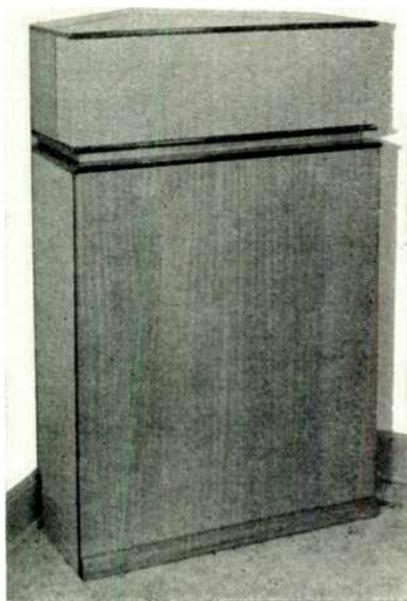
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MOBILE RADIO HANDBOOK

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EDITOR: MILTON B. SLEEPER — ASSOCIATES: JEREMIAH COURTNEY, ROY ALLISON

PLANNING: How to plan a mobile or point-to-point communications system. This chapter covers the overall problems of power and topography, interference, city ordinances, public liability, operation, maintenance, expansion, and interconnection.

FREQUENCIES: FCC rules and allocations which became effective in July, 1949 provided for many new services. Complete details are presented on every service in the common carrier, public safety, industrial, and transportation groups.

LICENSES: How to apply for a construction permit, license, and renewal for a communications system. Complete FCC forms, filled out in the correct manner, are shown. This is of the utmost importance; incorrect forms may cause months of delay.

EQUIPMENT: Three chapters are devoted to the problems of selecting the right equipment for a particular system, specifications on transmitters and receivers of all makes, selective calling and fleet control and adjacent-channel operation.

ANTENNAS, TOWERS: The problems of planning antenna installations are covered very thoroughly in two chapters which explain the various special-purpose types of radiators, and the correct method of erecting a standard guyed, steel antenna tower.

MAINTENANCE: How to keep a communications system at peak performance. Methods and record forms that have been perfected by years of experience are described in detail. Proper balance between essential and superfluous maintenance is explained.

OPERATORS: The FCC is becoming increasingly strict about the observance of rules relating to operator requirements at communications systems. Official information is given, with a detailed explanation from FCC Secretary T. J. Slowie.

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MOBILE RADIO NEWS

(Continued from page 36)

proposals to deal with if a statement of reasons supporting the need for the change were required for each proposal.

Miscellaneous:

Jack Werner has been appointed Chief of the Common Carrier Bureau, succeeding Harold J. Cohen, who became associated with a New York law firm. Curtiss M. Bushnell was promoted to Assistant Chief of the Bureau, while Robert E. Stromberg became Chief of the Bureau's Telephone Division, which deals with common carrier mobile radio matters.

The Commission finalized its proposal for the use of the 456- to 458-mc. band for fixed operations in the Industrial Radio Services in exact accordance with its Notice of Proposed Rule-Making, the details of which were outlined in the May issue of *FM-TV*.

TV IN ENGLAND

(Continued from page 13)

sound. The dipole groups are spaced vertically by one wavelength, opposite dipoles in a group being λ wavelength apart. Sound and vision signals are fed to all dipoles, but with opposite phase rotation, i.e., the dipoles in a group are phased at 0°, -90°, -180° and -270° for vision and 270°, 180°, 90°, and 0° for sound. This increases the power gain of the system and provides a constant input impedance. The actual dipole elements are constructed of galvanized steel strip. They are de-iced by internal heaters.

Future of British TV:

This station is the second unit of the chain of 405-line stations in the 40- to 70-mc. band. The equipment for the third station, 120 miles to the north near Huddersfield in the Pennine mountains, is of identical design and is well forward in construction. No definite opening date has been given, but the end of 1951 is probable. This may seem slow, and is slow by American standards, but the absence of any competitive drive and the economic difficulties are probably responsible. With the third station in operation, almost 60 per cent of our population will have a single programme service. While further stations follow, attention will probably be directed toward a second chain of stations, having higher definition, in the 200-mc. region. No standards have yet been finalised, but 819 lines are being considered. However, careful consideration will be paid the relative merits of high-definition black-and-white and the lower-definition three-colour system, demonstrated by Pye Ltd.

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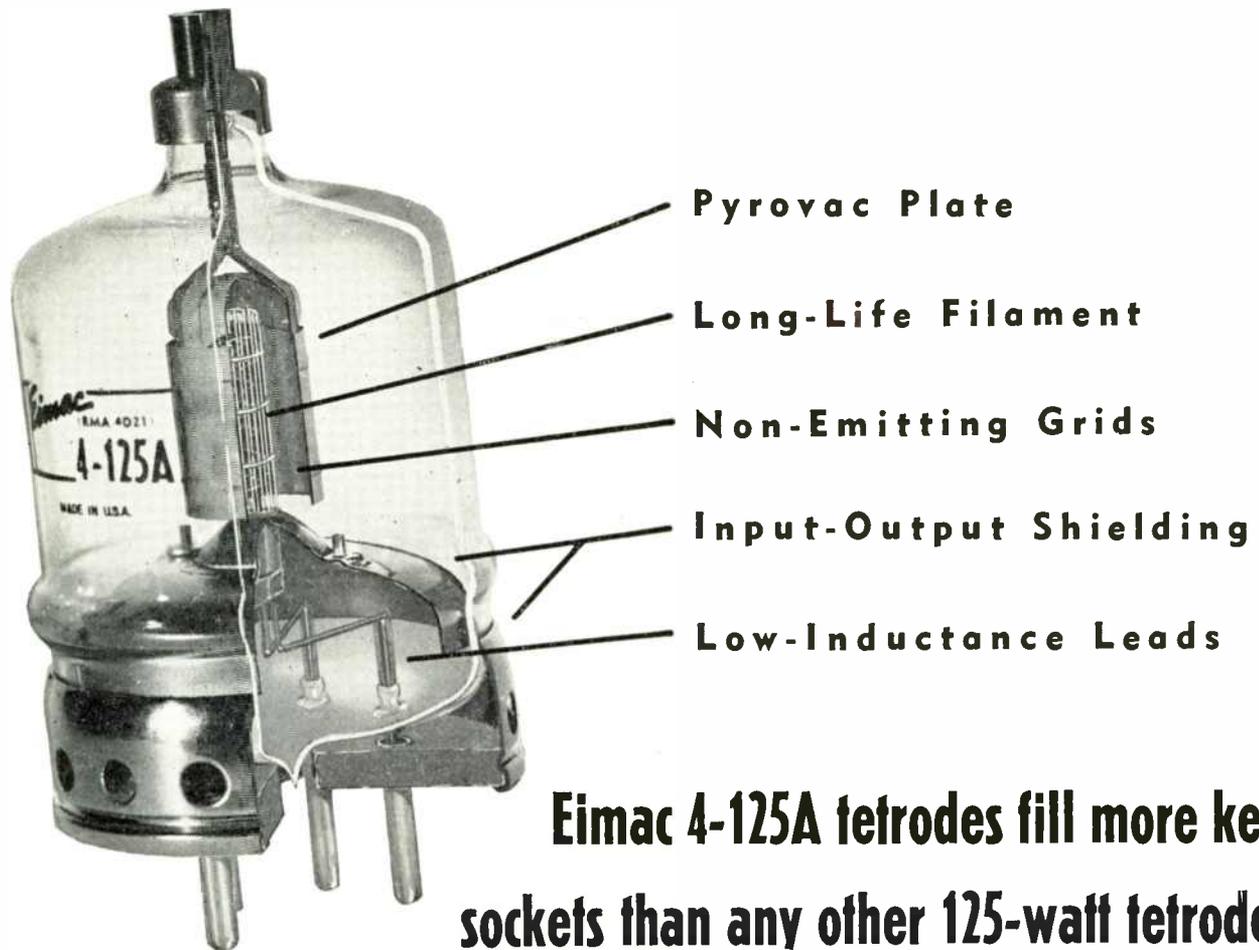
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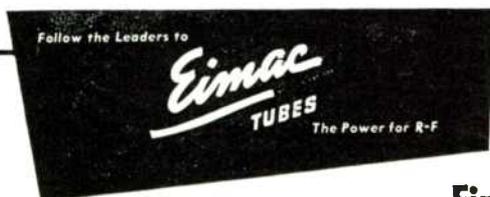
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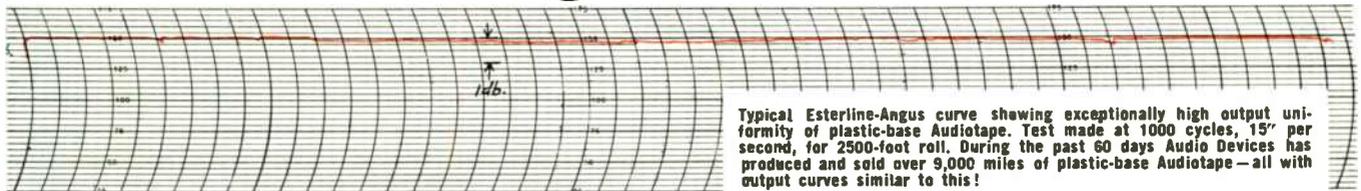
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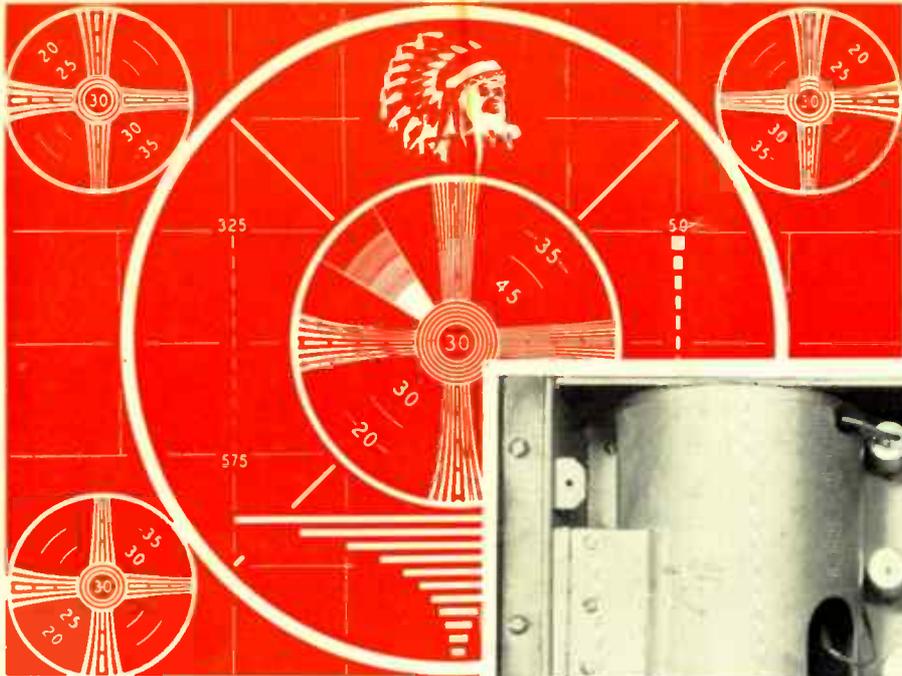
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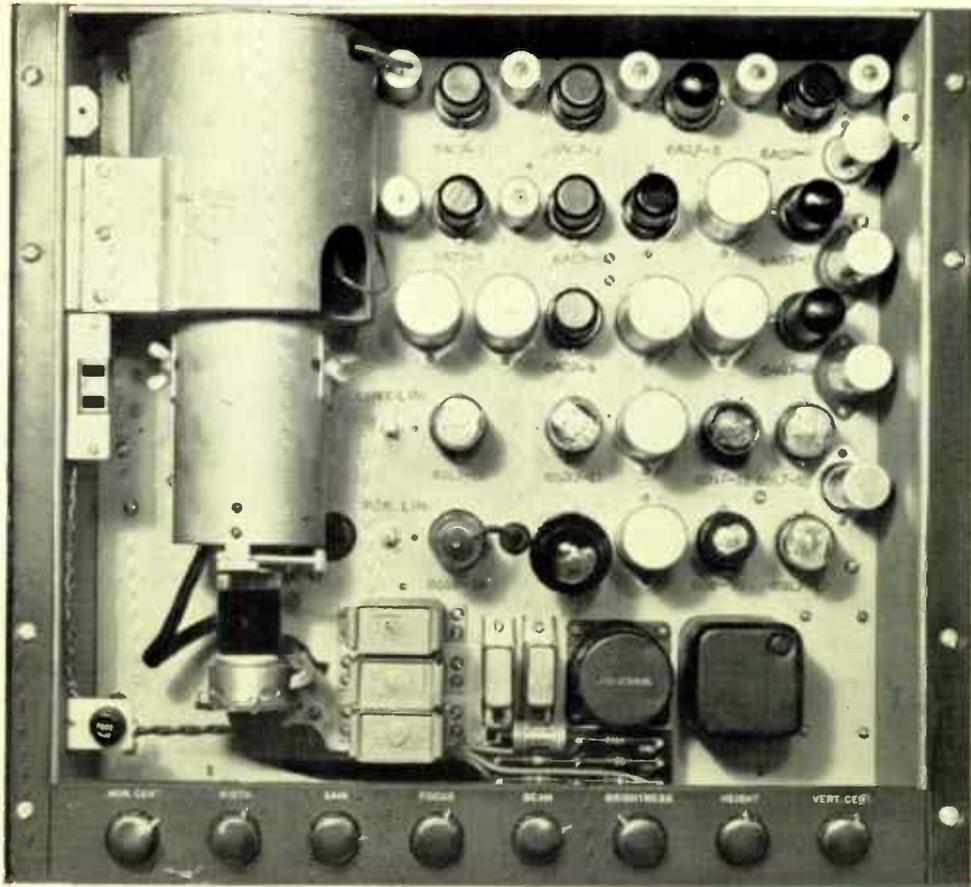
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Send me your technical bulletin on the RCA Type TK-1A Monoscope Camera.

Name _____

Company or station _____

Address _____

City _____ State _____