PRICE—TWENTY-FIVE CENTS

FM RADIO-ELECTRONICS

JULY 1943

CHIEF SIGNAL OFFICER

Radio-Electronic Products Directory

ENGINEERING • MANUFACTURING • OPERATION

★ ★ Edited by M. B. Sleeper ★ ★

U.S.PAT.OFF.

and women
MEN AT WORK

WINNING a war is not an easy job. Victory goes to the side that *fights* harder, and *works* harder. ★ From all reports our fighting men will stand up to anybody, anywhere. It is our job, here at home, to prove that we can work as hard as they can fight. ★ The way the women of America have accepted this responsibility is worthy of tribute. Here at Simpson much of our *man*power has changed to *woman*power—good soldiers all, taking the place of husbands, brothers and sweethearts. ★ Like all men and women in American industry, we know but one resolution—to make *all* the electrical instruments and testing equipment we can, the *best* we can, as *fast* as we can.

SIMPSON ELECTRIC CO.
5200-5218 Kinzie Street, Chicago, Illinois

Simpson

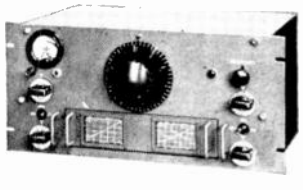
INSTRUMENTS THAT STAY ACCURATE

Buy War Bonds and Stamps for Victory

PHOTO BY U.S. ARMY SIGNAL CORPS

PRACTICE MAKES PERFECT

How many sacks of flour does an attack Bomber drop on friendly tanks? How often does a Tank Commander draw a bead on a friendly plane? How long must Air and Armored Forces flex their muscles together in practice before they become welded in a coordinated striking force?

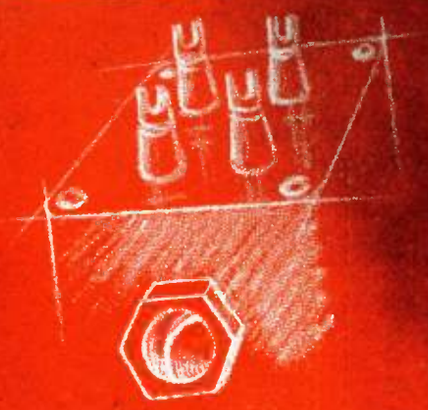


Know-how takes time to acquire. We are thankful that National had years of radio communications know-how all ready.

NATIONAL COMPANY, INC., MALDEN, MASS.

Designs for War . . . Transformers

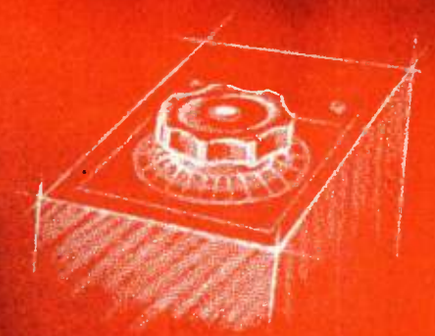
The requirements in war transformers differ considerably from those of commercial units. The UTC engineering staff has pioneered many of the design features which make possible modern war transformers. A few typical designs are illustrated.



This transformer is tunable . . . ideal for signal frequency amplifiers.

This oil filled transformer is hermetically sealed with glass high voltage terminals solder-sealed to case.

Designed for minimum amplitude distortion . . . this unit has distortion under .01% for a power range of 100 : 1 . . . Q over 150.



This Varitran supplies fixed filament and bias voltages, as well as variable plate voltage all in one unit.

May we design a War Unit to your application?

UNITED TRANSFORMER CO.

150 VARICK STREET ★ NEW YORK, N. Y.

EXPORT DIVISION 100 VARICK STREET NEW YORK, N. Y. CABLES: "ARLAB"

FM RADIO-ELECTRONICS

FORMERLY: FM RADIO-ELECTRONIC ENGINEERING & DESIGN
COMBINED WITH: APPLIED ELECTRONIC ENGINEERING

VOL. 3 JULY, 1943 NO. 8

CONTENTS

★ ★ ★ ★ ★ ★

M. B. SLEEPER, *Editor and Publisher*

JEROME J. BROOKMAN, *Advertising Manager*

GORDON CROTHERS, *Circulation Manager*

Published by: FM COMPANY

Editorial and Advertising Office: 240 Madison Avenue, New York City, Tel. LE 2-8070

Chicago Advertising Representative:
MARIAN FLEISCHMAN, 360 N. Michigan Ave., Tel. STAte 4439

FM Magazine is issued on the 30th of each month. Single copies 25¢ — Yearly subscription in the U. S. A. $3.00; foreign $4.00. Subscriptions should be sent to FM Company, 240 Madison Avenue, New York City.

A charge of 25¢ each will be made for duplicating copies returned because of subscriber's failure to give change of address.

The publishers will be pleased to receive articles, particularly those well illustrated with photos and drawings, concerning radio-electronic developments. Manuscripts should be sent to the publication office, at New York City. Contributions will be neither acknowledged nor returned unless accompanied by adequate postage, packing, and directions, nor will FM Magazine be responsible for their safe handling in its office or in transit.

Advertising correspondence, copy, and cuts should be addressed to the advertising office at New York City.

New Chief Signal Officer of the Army is Major General Harry C. Ingles, who has come to Washington headquarters from duty as deputy commander of the European Theatre of Operations in London. Previously, he was Chief of Staff of the Caribbean Defense Command. His Army career dates from the 1914 Class at West Point. He has served as Signal Officer of the Philippine Department, and as director of the Signal School, Ft. Monmouth. In 1927 he graduated from the Command and General Staff School, and remained as an instructor until 1931. The following year he graduated from the Army War College.

WHAT'S NEW THIS MONTH

HOW much fact lies behind the vague and unsubstantiated promises of new things to come in radio as soon as the industry can return to peacetime activities? Are important developments actually awaiting only the release of manpower and materials from military priorities? Or is the imposition of secrecy being used by those who would imply much to cover up the fact that there is, in truth, nothing to say?

The average radio engineer cannot answer these questions fully, for almost everyone is hemmed in by the walls of his own laboratory, and the confinement of one-track responsibilities which overtax his time and mental output.

However, there are individuals who occupy positions from which they can survey the radio scene and, with complete knowledge of all phases of radio's progress for war, appraise this progress in terms of service for peace.

On the horizon, as seen now through battle clouds, are the much-discussed possibilities of television, radar, and facsimile, but nearer at hand, of more immediate importance, are entirely new applications of radio communications equipment already developed which will afford immediate peacetime outlets that did not exist pre-war.

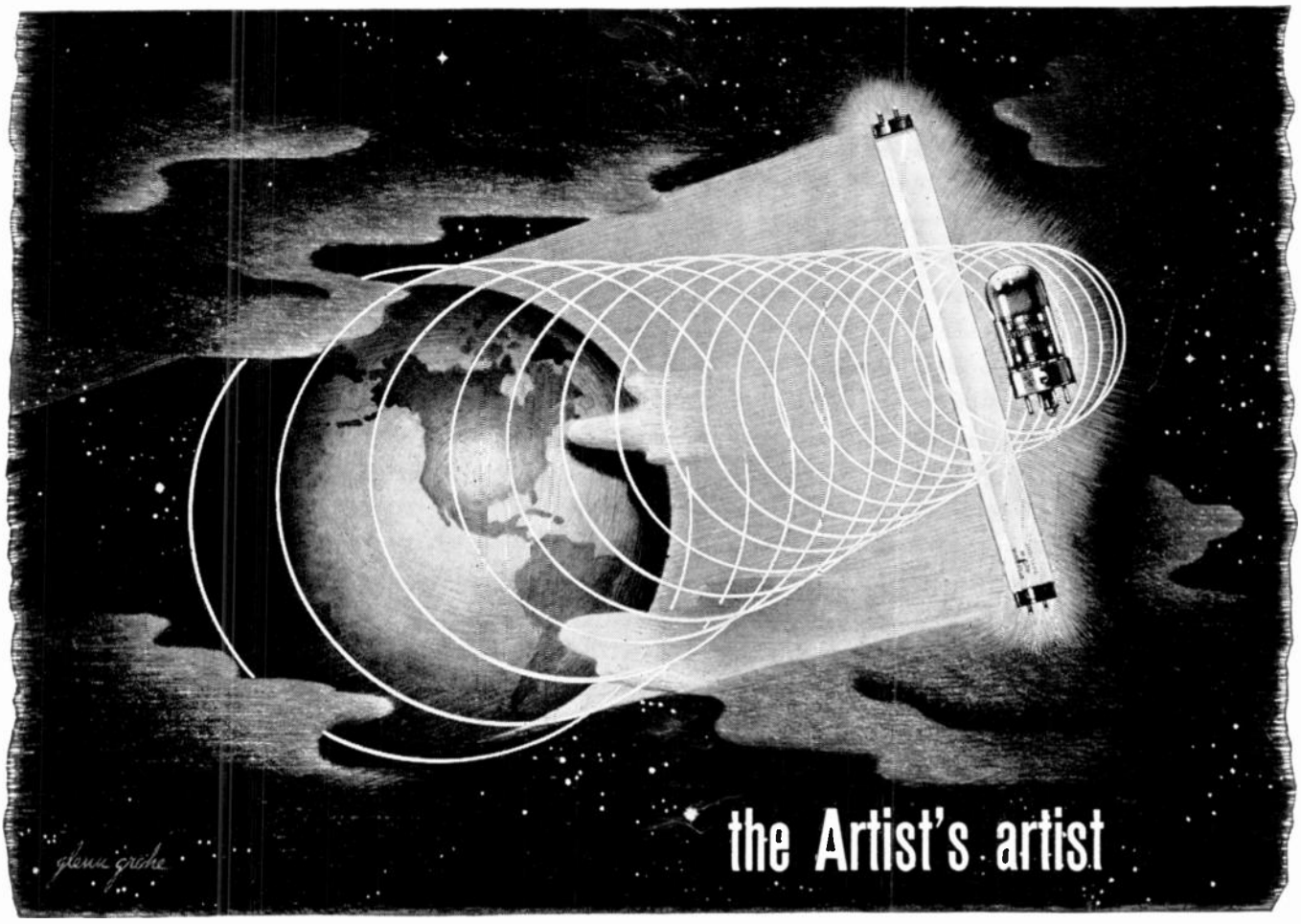
A typical example is disclosed in this issue of *FM* Radio-Electronics. It is the use of radio communication by the railroads. The initial application is in the handling of freight cars, but this is merely a door-opener to other services which radio will perform in the peacetime reorganization and expansion of railroad transportation.

The background story is interesting, because somewhat similar conditions have opposed the introduction of radio applications in other fields.

First of all, it must be realized that railroad executives, practically without exception, have been deeply schooled in the traditional means and methods of railroading, from which strictly disciplined thinking encourages no departure. Against the hazards of storms they have pitted steel, concrete, and rock ballast, with each move timed to the second-hands of thick, gold watches.

No wonder that such men have had only disdain for the idea that delicate radio equipment, using fragile tubes, could perform useful service in their field. So,

(CONTINUED ON PAGE 43)



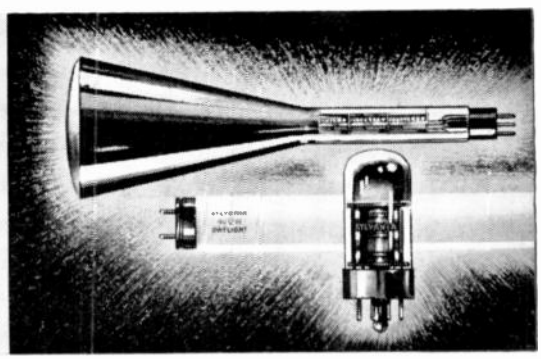
We are not zealous here at Sylvania to be the largest in our field. We had rather be known for excellence than for size. You have heard of the man so painstaking that to his talented fellows of larger fame he is known as the writer's writer, or the painter's painter, or the singer's singer. We understand that, and it seems to us there could be no higher praise. So in all the things we build – incandescent lamps, fluorescent lighting equipment, radio and electronic tubes – we aim uncompromisingly high, high as we possibly can. The function of these things, conceived as they are to amplify the indispensable miracles of human sight and hearing, seems to us to deserve the very best that can be given. So believing, it is only natural we should seek in all our work to attain the highest standards anywhere known.

SYLVANIA ELECTRIC PRODUCTS INC.

EMPORIUM, PA.

MAKERS OF INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, CATHODE RAY TUBES AND ELECTRONIC DEVICES

INDUSTRIAL ELECTRONICS is doing much to help win the war on the production front, but can do a great deal more by more widespread application. Sylvania Electronic Tubes for devices that can automatically gauge, count, control, actuate, test, detect, protect, guide, sort, magnify, heat, transform, "see," "feel" and even "decide" are tested and available. The more electronic "know how" is put to work to make precision war production speedier and more precise, the sooner the Victory.



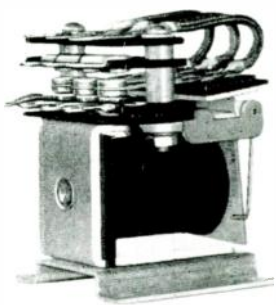
FROM "HAM" TRANSMITTER RIGS

TO INTER-PLANE COMMUNICATION

RELAYS BY GUARDIAN

★ **Today they are off the air . . . voices stilled . . . home-built rigs carefully covered. For most of yesterday's "hams" are lending their experience, knowledge, and ingenuity to the war effort . . . creating and perfecting new communication devices . . . the amazing new flight recorder, for instance . . . or Radar. But whether they work in a wartime lab or have their "office" in a Fortress, they are still close to one of their early friends—"Relays by Guardian".**

One of the newer developments is a multi-purpose aircraft radio relay pictured at the right. It is built in contact combinations up to three pole, double throw. Coils are available in resistances from .01 ohm to 15,000 ohms. At 24 volts DC it draws 0.12 amperes. This relay is also built for AC with a contact rating of 12½ amperes at 110 volts, 60 cycles. Standard AC voltage is 92-125 volts but coils are available for other voltages.



Aircraft Radio Relay
DC Model—Bulletin 345
AC Model—Bulletin 340

Write on your business letterhead for these new bulletins: B-8, Six pages of Aircraft Contactors—195, Midget and Signal Corps Relays — B2A, Aircraft Relay — SC65, Solenoid Contactor.

GUARDIAN ELECTRIC

1642-H WEST WALNUT STREET CHICAGO, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN WAR INDUSTRY

WORKMANSHIP

PLUG PL-55 JACK JK-26 JACK J-310 JACK JK-34A

For more than 46 years the products of the Chicago Telephone Supply Company have been the standard for high quality workmanship. From their inception in the engineering laboratories to the craftsmanship of the finished article, Chicago Telephone Supply products are planned for maximum performance and trouble-free long life. If you are a manufacturer of electronic equipment—all of the engineering skill and great production facilities of Chicago Telephone Supply Company are at your service.

Plugs, Jacks, Switches, Variable Resistors

Telephone Generators and Ringers

CHICAGO TELEPHONE SUPPLY Company

ELKHART ★ INDIANA

Representatives

R. W. Farris
127 E. Thirty-first St.
Kansas City, Mo.
Phone: Logan 0234

Frank A. Emmet Co.
2837 W. Pico Blvd.
Los Angeles, Calif.

Branch Offices

S. J. Hutchinson, Jr.
401 N. Broad St.
Philadelphia, Pa.
Phone: Walnut 5369

In Canada:

C. C. Meredith & Co.
Streetsville, Ontario

Manufacturers of Quality Electro-Mechanical Components Since 1896

SH-H-H-H! THE ENEMY IS LISTENING!

● Sailors at sea couldn't listen to their favorite radio programs until one of our foremost radio manufacturers was commissioned to build a special sea-going receiver. It was found that ordinary radios "rebroadcast" and tipped off the ship's location. And without any radio, morale suffered.

Now, it's different! Sailors around the world are listening to radio programs from home through this low-radiation receiving set. The speed with which it was produced and put in service is a tribute, in part, to the *E·L* engineers asked to provide a suitable power supply. They did it—fast, and well.

This is just one of the many contributions to America's war effort which *E·L* research and specialized knowledge of vibrator power supplies and electronic circuits has made possible. You'll find *E·L* Vibrator Power Supplies on the job in all types of service, and on every front where the United Nations are fighting.

Wherever electric current must be changed, in voltage, frequency or type, *E·L* Vibrator Power Supplies and Converters offer a wide range of advantages, for peace, as well as for war.

For Operating Radio Transmitters in Lifeboats—E-L Model S-1229-B Power Supply. Input Voltage, 12 Volts DC; Output Voltage, 500 Volts DC; Output Current, 175 MA; Dimensions, 7½" x 5½" x 6¼".

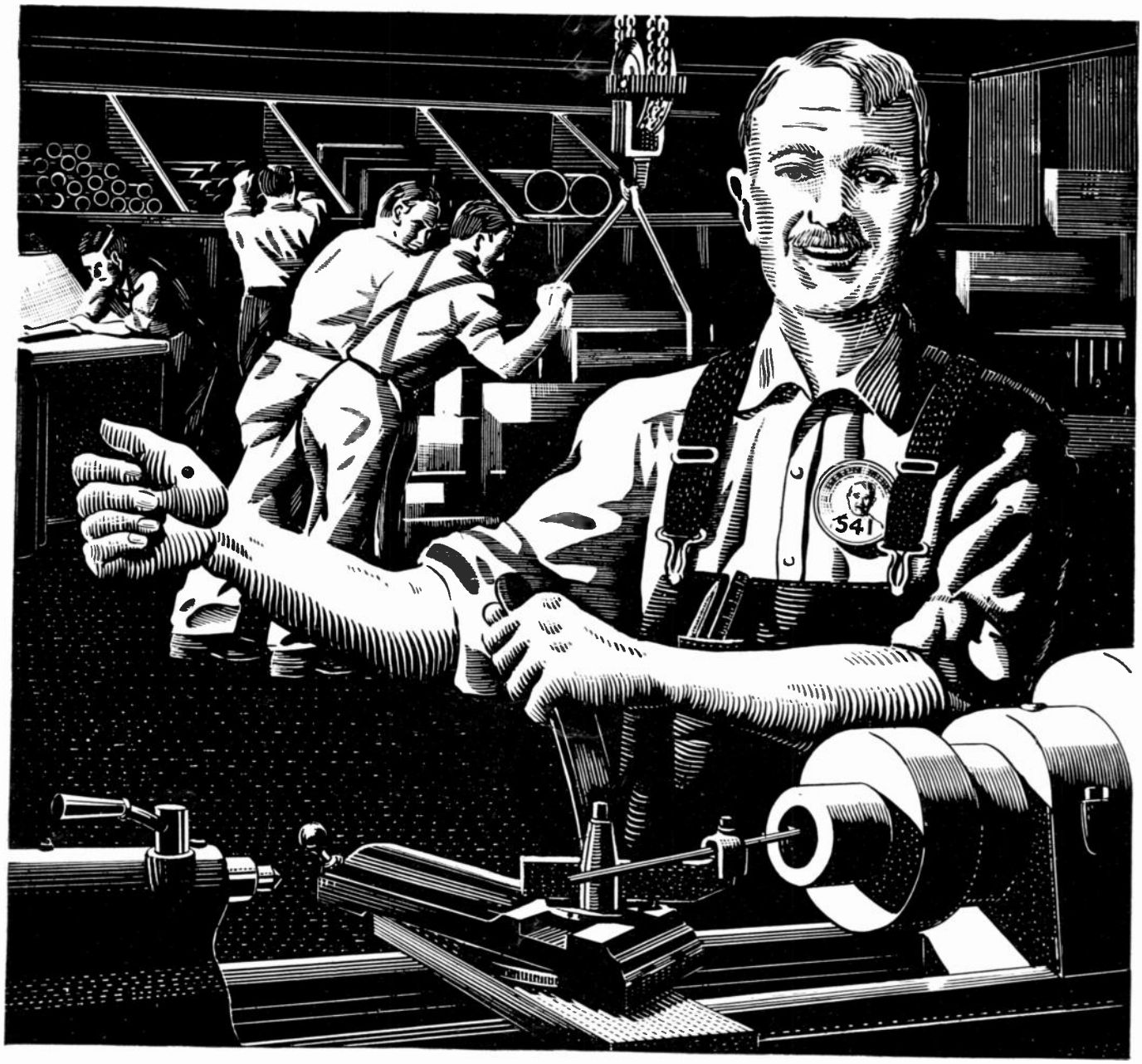
For Operating AC Radio Receivers from DC Current—E-L Model 262 Marine Power Supply. Input Voltage, 110 Volts DC; Output Voltage, 110 Volts AC; Output Power, 250 Volt-Amperes; Output Frequency, 60 Cycles; Dimensions, 10½" x 7⅜" x 8¼".

Electronic LABORATORIES, INC.

INDIANAPOLIS

***E·L* ELECTRICAL PRODUCTS**—Vibrator Power Supplies for Communications . . . Lighting . . . Electric Motor Operation . . . Electric, Electronic and other Equipment . . . on Land, Sea or in the Air.

WRH



"My Boy Owns This Place!"

SOME TIME AGO I retired, just a good, old fashioned, real-American retirement... thought I had served my time and done my share.

When the war started I went back to work . . . a good tool maker can do a lot to help lick those fellows, you know. And it is fun to work for my boy. I'm proud of him and proud of America that makes men like him possible. He had the same start I had only now he owns this shop. And that is one of the things we are all fighting for — to preserve that American FREEDOM of opportunity.

Pardon me, I've got work to do now. When the war's over look me up — on the front porch.

BUY MORE BONDS!

hallicrafters

CHICAGO, U.S.A.

SH-H-H-H! THE ENEMY IS LISTENING!

● Sailors at sea couldn't listen to their favorite radio programs until one of our foremost radio manufacturers was commissioned to build a special sea-going receiver. It was found that ordinary radios "rebroadcast" and tipped off the ship's location. And without any radio, morale suffered.

Now, it's different! Sailors around the world are listening to radio programs from home through this low-radiation receiving set. The speed with which it was produced and put in service is a tribute, in part, to the *E·L* engineers asked to provide a suitable power supply. They did it—fast, and well.

This is just one of the many contributions to America's war effort which *E·L* research and specialized knowledge of vibrator power supplies and electronic circuits has made possible. You'll find *E·L* Vibrator Power Supplies on the job in all types of service, and on every front where the United Nations are fighting.

Wherever electric current must be changed, in voltage, frequency or type, *E·L* Vibrator Power Supplies and Converters offer a wide range of advantages, for peace, as well as for war.

For Operating Radio Transmitters in Lifeboats—E·L Model S-1229-B Power Supply. Input Voltage, 12 Volts DC; Output Voltage, 500 Volts DC; Output Current, 175 MA; Dimensions, 7½" x 5½" x 6¼".

For Operating AC Radio Receivers from DC Current—E·L Model 262 Marine Power Supply. Input Voltage, 110 Volts DC; Output Voltage, 110 Volts AC; Output Power, 250 Volt-Amperes; Output Frequency, 60 Cycles; Dimensions, 10½" x 7⅝" x 8¼".

Electronic

LABORATORIES, INC.

INDIANAPOLIS

***E·L* ELECTRICAL PRODUCTS**—Vibrator Power Supplies for Communications . . . Lighting . . . Electric Motor Operation . . . Electric, Electronic and other Equipment . . . on Land, Sea or in the Air.

WRH

REPRINTED TO SHOW REVISED PRICES

SELECT for SERVICE

NEW HYTRON TUBES

Type	Description*	Price
836	Half-wave, high-vacuum rectifier	$11.50
837	12-watt, r.f. pentode	2.80
954	Sharp cut-off, acorn pentode	4.50
955	Acorn triode	2.75
956	Remote cut-off, acorn pentode	4.50
1616	Half-wave, high-vacuum rectifier‡	5.75
1625	25-watt, r.f. tetrode (12-v. heater)	3.50
1626	5-watt, triode oscillator	2.50
E1148	3.5-watt, u-h-f triode	2.25
VR105-30	Gaseous voltage regulator	1.25
VR150-30	Gaseous voltage regulator	1.25

Type	OTHER POPULAR HYTRON TUBES* Description†	Price
2C25	15-watt, medium-mu triode	$3.00
2C45	7.5-watt, triode (modulator)	2.50
10Y	15-watt, general-purpose triode	1.50
801A/801	20-watt, general-purpose triode	2.50
HY61/807	25-watt, r.f. beam tetrode	2.25
841	15-watt, high-mu triode	1.50
864	Non-microphonic voltage-amp. triode	1.50
HY24	2-watt, power triode	1.50
HY312	30-watt, high-mu twin triode	3.00
HY65	15-watt, r.f. beam tetrode	2.95
HY69	40-watt, u-h-f triode	2.95
HY75	15-watt, u-h-f triode	2.25
HY1148	(2C24) 1.8-watt, u-h-f triode	2.25
HY615	3.5-watt, u-h-f triode	2.25

*This is not a complete list. Voltage ratings indicate maximum plate dissipation.
†Instant-heating filament.
‡For complete characteristics consult Government specification.

On this list of tubes which have recently joined the growing legions of Hytron types already marching on to Victory, you may find just the ones you want for your War equipments. Whether you choose the tiny "acorns" or the husky 1616 rectifier, you will discover the same high quality and design refinements which have made other Hytron tubes famous. If you place your orders well in advance, you will also be pleased by Hytron's on-schedule deliveries. Not too infrequently, deliveries are made from stock.

HYTRON CORPORATION
SALEM AND NEWBURYPORT, MASS.
Since 1921 Manufacturers of Radio Tubes

HYTRON RADIO TUBES

GUNNER BY REMOTE CONTROL

His battleground is located far from the fighting fronts. His skill and long experience have been lent to the making of vital parts—parts that are vital to a boy in a bomber over Germany or his neighbor's son in a fighter in the Pacific. Their equipment is dependent on split-hair accuracy of Utah Parts—and he's giving it to them. He's a gunner by remote control.

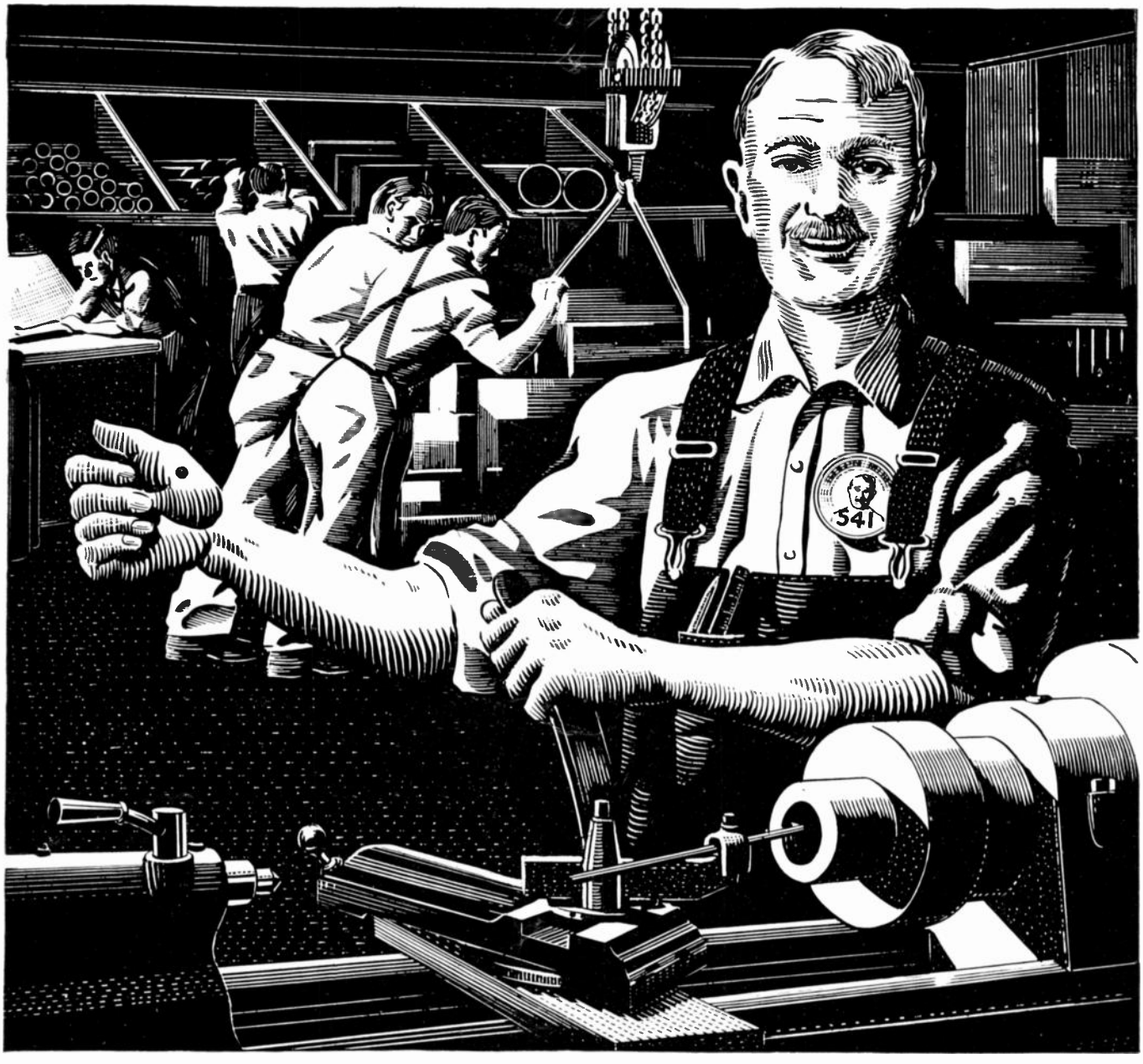
There are hundreds like him at Utah—soldiers in coveralls. By the skill of their hands and the sweat of their brow, they're making sure that Utah Parts don't fail at the critical moment—as a switch releases a stream of machine gun bullets . . . as a headset receives a command to take a strategic height. These and many other vital electrical and electronic devices are being turned out in quantity and *on time* . . . by this precision task force at Utah. Important to the success of this task force is the work of the Utah laboratories. Here, new solutions to electrical and electronic problems are being worked out. Here, a great store of knowledge and experience is being accumulated.

Tomorrow that knowledge and experience will be at the service of peacetime America. There will be better Utah products built—more convenience, enjoyment and efficiency for many Americans—because of today's great advancements, necessitated by war.

UTAH RADIO PRODUCTS COMPANY, 860 Orleans Street, Chicago, Illinois. Canadian Office: 560 King Street, West, Toronto. In Argentine: UCOA Radio Products Co., SRL, Buenos Aires. Cable Address: UTARADIO, Chicago.

PARTS FOR RADIO, ELECTRICAL AND ELECTRONIC DEVICES, INCLUDING SPEAKERS, TRANSFORMERS, VIBRATORS, VITREOUS ENAMELED RESISTORS, WIREWOUND CONTROLS, PLUGS, JACKS, SWITCHES, ELECTRIC MOTORS

Utah



"My Boy Owns This Place!"

SOME TIME AGO I retired, just a good, old fashioned, real-American retirement... thought I had served my time and done my share.

When the war started I went back to work . . . a good tool maker can do a lot to help lick those fellows, you know. And it is fun to work for my boy. I'm proud of him and proud of America that makes men like him possible. He had the same start I had only now he owns this shop. And that is one of the things we are all fighting for—to preserve that American FREEDOM of opportunity.

Pardon me, I've got work to do now. When the war's over look me up—on the front porch.

BUY MORE BONDS!

hallicrafters

CHICAGO, U.S.A.

WMCA—570k
9:00 a. m. News and popular music.
1:00 p. m. News; Jack Eigen.
1:15 Good Health to You.
1:30 Front-page drama.
1:45 "Shangri-La" campaign.
2:00 News; Masterworks of Music.
3:00 News and popular music.
5:15 Jack Shafer.
6:00 News; dance music.
6:30 Sports, Joe O'Brien.
6:45 "Fighting Words."
7:00 News; "Platterbrains."
7:30 Johannes Steel.
7:45 Popular music and news.
9:15 City Amateur Symphony Concert.
10:00 News and dance music.
10:15 Marine Corps program.
11:00 News; Ben Whitehurst.
11:15 Inspirational talk.
11:30 Popular music and news.

WNYC—830k
9:00 a. m. Masterwork hour.
10:00 "Save, Salvage and Survive."
10:15 Music Album.
10:45 "Our Marines."
11:00 News; rations.
11:15 Musical souvenirs.
11:45 "Your Health."
Noon Music at Work.
1:00 p. m. Missing persons.
1:05 Police safety program.
1:30 Pages of Melody.
2:00 News; "Rigoletto."
3:45 News; rationing.
4:00 Dr. Harry F. Van Walk.
4:30 Pals of the P. A. L.
5:00 Sigma Alpha Iota musicale.
5:30 Victory concert.
6:30 "Uncle Sam."
6:45 News.
7:00 Masterwork hour.
8:00 "Lest We Forget."
8:15 Municipal Concert Hall.
8:30 City Amateur Symphony Orchestra.
9:15 News.
9:30 Famous songs series.

WHN—1050k
9:00 a. m. Gloom Dodgers; news.
10:30 Variety show.
11:15 Gloom Dodgers; news.
1:00 p. m. Popular music and news.
1:30 Warm-Up Time.
1:50 Dodgers vs. Boston.
4:30 Sports Extra.
4:45 Treasury Star parade.
5:00 Harry Horlick's Orch.
5:30 News.
5:45 Stamp Club.
6:00 Latin rhythms.
7:00 George H. Combs Jr.
7:15 Baseball, Bert Lee.
7:30 Adrienne Ames.
7:45 News.
8:00 Word of Life hour.
8:30 Popular music and news.
10:45 Sports Final.
11:00 News.
11:30 Music to Read By; news.
12:00 Music to Read By; news.

WNEW—1130k
9:00 a. m. Swing-Billies; news.
10:00 Make-Believe Ballroom.
11:30 News and popular music.
5:15 p. m. Paula Stone.
5:30 News; Make-Believe Ballroom.
7:30 News and popular music.
9:15 Treasury Star parade.
10:00 Bing Crosby.
10:15 Dance parade.
10:30 News; Samuel H. Cuff.
10:45 BBC news.
11:00 Dance parade; news.
1:00 a. m. Milkman Matinee.

WLIB—1190k
9:00 a. m. Popular classics and news.
Noon Musicale; news.
1:00 p. m. This Is Romance.
1:30 Matinee melodies; news.
2:00 Gilbert and Sullivan music; news.
3:00 Moments of melody.
3:30 Great Voices; news.
4:00 Recital Hall.
4:30 Dance music; news.
5:00 Waldo Mayo.
5:15 Candlelight and Silver; news.
6:00 Great Classics; news.
7:00 American composers.
7:30 18th Century Drawing Room; news.
8:00 Music Hall; news.
9:00 Band concert.

WQXR—1560k
9:00 a. m. Treasury Star parade.
9:15 Classical music and news.
Noon Concert; news.
1:00 p. m. Symphony; news.
2:00 Chamber music.
2:30 Latin serenade; news.
3:00 Requests; news.
4:00 Symphony; news.
5:00 Remember This?
5:30 Classical music and news.
7:30 Great names in music.
8:00 Symphony Hall.
9:00 Chamber music; news.
10:00 Wagner music.
10:30 France in the news.
10:45 Music Box; news.
11:00 Just music; news.

Frequency Modulation

W2XMN—42.8mc
4 to 11 p. m. Transcribed music.

W39NY—43.9mc
2 to 5 and 7 to 10 p. m. Programs of WNYC.

W47NY—44.7mc
5:00 Symphony hour.
7:00 Opera: "La Traviata."
9:00 Treasury of Melody.
10:00 In the Blue of Evening.

W2XWG—45.1mc
3 to 11 p. m. Programs of N. B. C.

W59NY—45.9mc
5 p. m. to midnight. Programs of WQXR.

W63NY—46.3mc
2 to 9 p. m. Music and WHN feature programs.

W67NY—46.7mc
3:00 p. m. News.
3:15 Choral music.
3:30 Chamber music.
4:00 Operetta.
4:15 Symphony hour.
5:15 Song recital.
5:30 Organ vespers.
5:45 News; concert miniatures.
7:00 News.
7:15 Dinner music.
7:45 Music on the Esplanade.
8:15 Operetta.
8:30 Symphonic hour.
9:30 Dance music.
9:50 News.

W71NY—47.1mc
1:00 p. m. Chick Floyd's Orch.
1:15 Treasury Star parade.
1:30 California melodies.
2:00 Harmony Hall.
2:30 Variety show.
3:15 Concert orchestra.
3:30 Dancetime.
5:00 Navy Bulletin Board.
6:00 I Hear America Singing.
6:15 William Ewing.
6:30 Hawaii Calls.

W75NY—47.5mc
3:00 p. m. Treasury Star parade.
3:30 "History in the Making," Marcus Duffield.
3:45 Music for Manhattan.
4:30 Opera hour.
5:30 Music for young people.
6:00 Tell Me a Story.
6:15 The Young Idea.
7:00 Dinner concert.
7:30 Symphony concert.
9:15 Herald Tribune news.

Copyright, 1943, New York Tribune Inc.

A.M.	WEAF 660k	WOR 710k	WJZ 770k	WABC 880k
7:00	World News.....	Fiesta	News, Robt. Bellaire	News of the World.
7:5	Commando Mary....	"	Coast to Coast	E. Power Biggs.
	oseph Stopak Orch.	The Navy Goes	on a Bus.....	Wolfe Wollinson
	c; news, 9:55	to Church	"	English Melodies...
	ehlights:	News, A. Van Horn	Gypsy Serenade...	Church of the Air:
	Stamm.	Dr. Frank Kingdon	Stories, Tom Terriss	Speaker .....
		Pauline Alpert, piano	Southernaires	Wings Over Jordan:
		Memo for Tomorrow	"	Rev. G. T. Settle
		Calls of Montezuma	News; Soldiers of	News; Egon Petri,
		"	Production	piano recital....
		Chapel; Dr.	Josef Marais'	Invitation to Learn'g.
		alliday....	African Trek...	Maurice Hindus..
	V PROGRAMS			
	Weekly War Journal:		Salt Lake City	
	Roy Porter.....		Tabernacle Choir	
	&Stopak's Orch		Trans-Atlantic Call:	
	ineHouston		Grand Coulee...	
	ial:		Church of the Air:	
	ran		Speaker	
			Edward R. Murrow	
			he Little Show...	
			uis Municipal	
			Company.	
			Today	

OF THE 19 STATIONS WHOSE PROGRAMS ARE LISTED EACH DAY IN THE NEW YORK HERALD TRIBUNE, 9 ARE FM STATIONS

LET'S HAVE THE FACTS

Industry's Postwar Progress May Be Hurt by Careless Misstatements

FREQUENCY Modulation broadcasting needs no defenders, but the public and the nontechnical section of the industry need more accurate information than they are getting today on this subject if all consumers, distributors, and producers are to enjoy the full benefits which this development can bring after the War.

FM Has Not Been Frozen ★ Most needed, perhaps, is a true answer to the question: "What has happened to FM since Pearl Harbor?" The idea that the development of FM was frozen, stopped in its tracks by war restrictions, is entirely mistaken.

The truth is that military applications of FM have gone beyond anything that was dreamed of in December, 1941. Die-hards in the Signal Corps, once firm in their stand against the use of FM, have found that it is superior to AM in one application after another.

Our Bureau of Ships was even more definite in its stand against FM. Not so long ago, any mention of the subject to a Navy man brought the prompt challenge: "What can be done with FM that can't be done with AM on the same frequency?" But one doesn't hear that any more for, however conservative the Navy may be, and it is very conservative indeed, it is open to conviction. The fact that it is now using FM equipment, and in increasing quantities, is evidence that the Navy is satisfied that it can deliver performance which AM cannot equal on the same frequencies for a great many applications.

(CONTINUED ON PAGE 45)

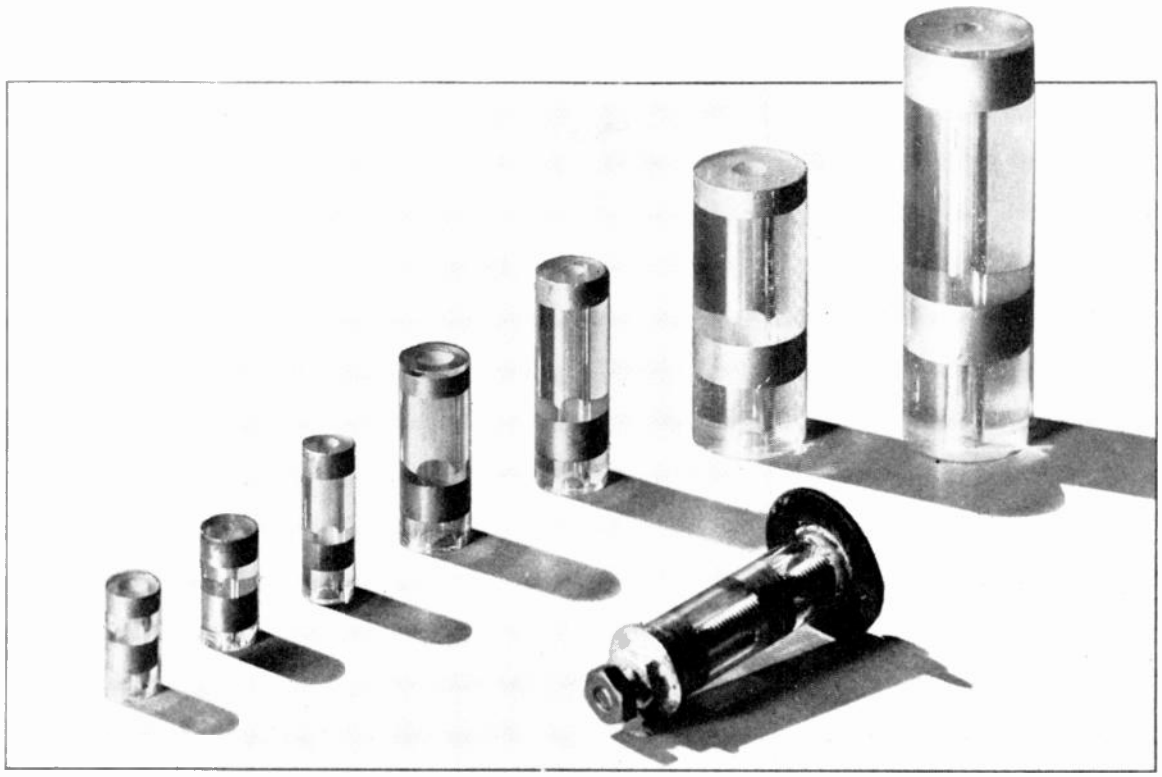


FIG. 1. SOME OF THE STANDARD SIZES OF CORNING METALLIZED GLASS BUSHING FOR RADIO COMPONENTS

METHODS OF HERMETIC SEALING

Part 2 — Metallized Glass Bushings for Sealing Condensers and Transformers

BY D. E. NEWTON *

HERMETIC metallizing on glass is a process recently developed by Corning Glass Works. The process has numerous applications, one of the most important at this time being its use for glass bushings to provide hermetic seals for leads and terminals on metal cases of transformers and condensers.

This new technique of fusing metal and glass permits the attachment of metal parts or fittings to glass bushings by the simple means of soldering. The result is a permanent, hermetic seal which can withstand both the salt water immersion test for marine service and the fresh water immersion test [1] for aircraft service.

Standard sizes of metallized glass bushings, such as those shown in Figs. 1 and 2, are now available for all types of potted and gas- or liquid-filled radio transformers, condensers and other electrical apparatus.

To meet the exacting demands of war, radio components must now be so designed and constructed as to assure unfailing service in all climates and under the most extreme conditions. For this reason, more and more components are being required to pass immersion tests, thus presenting an entirely new design problem.

Hermetic sealing calls for sealing-off leads or terminals in a manner which will prevent leakage of air, water, and oil. Many of the insulating materials which were commonly used for this purpose in the past are not adequate to meet wide variations of temperature and pressure. In addition to providing a hermetic seal, a bushing must be a good insulator in the hot, humid atmosphere of the tropics, the cold, rarefied atmosphere of the high altitudes, and the salt atmosphere of the sea.

It must have sufficient mechanical strength to withstand the severe shocks to which it may be subjected, must be resistant to wide and sudden changes in temperature and pressure, must not weather, corrode, nor absorb moisture, and must be so designed as to be quickly, easily and inexpensively installed or assembled. The Pyrex metallized bushings now being produced by the Corning Glass Works meet all these conditions.

These bushings, shown in the accompanying illustrations, consist of thick-walled, heat-resistant Pyrex tubing with bands of metallizing applied in such a manner that they actually become part of the glass itself. The metallized surface is tinned to prevent corrosion, and has the soldering characteristics of solid brass or copper. The metallizing is not harmed by ordinary soldering temperatures, and soldering can be done with an iron, soft air-gas flame, or induction heating. The op-

TABLE 1

RECOMMENDED STANDARDS FOR CORNING BUSHINGS

	Striking Distance between Bands, ins.			
	Low Altitude		High Altitude	
Voltage Class	Air	Oil	Air	Oil
0–500	¼	⅛	¼	⅛
500–1,500	¼	⅛	½	3/16
1,500–2,500	½	3/16	¾	3/16
2,500–3,500	½	3/16	1	¼
3,500–5,000	¾	3/16	1½	¼
5,000–7,500	1	¼	2¼	¼
7,500–10,000	1½	¼	3¼	¼

* Insulation Division, Corning Glass Works, Corning, New York.

[1] For details of these immersion tests, see *Methods of Hermetic Sealing*, Part 1, *FM* RADIO-ELECTRONICS, June, 1943.

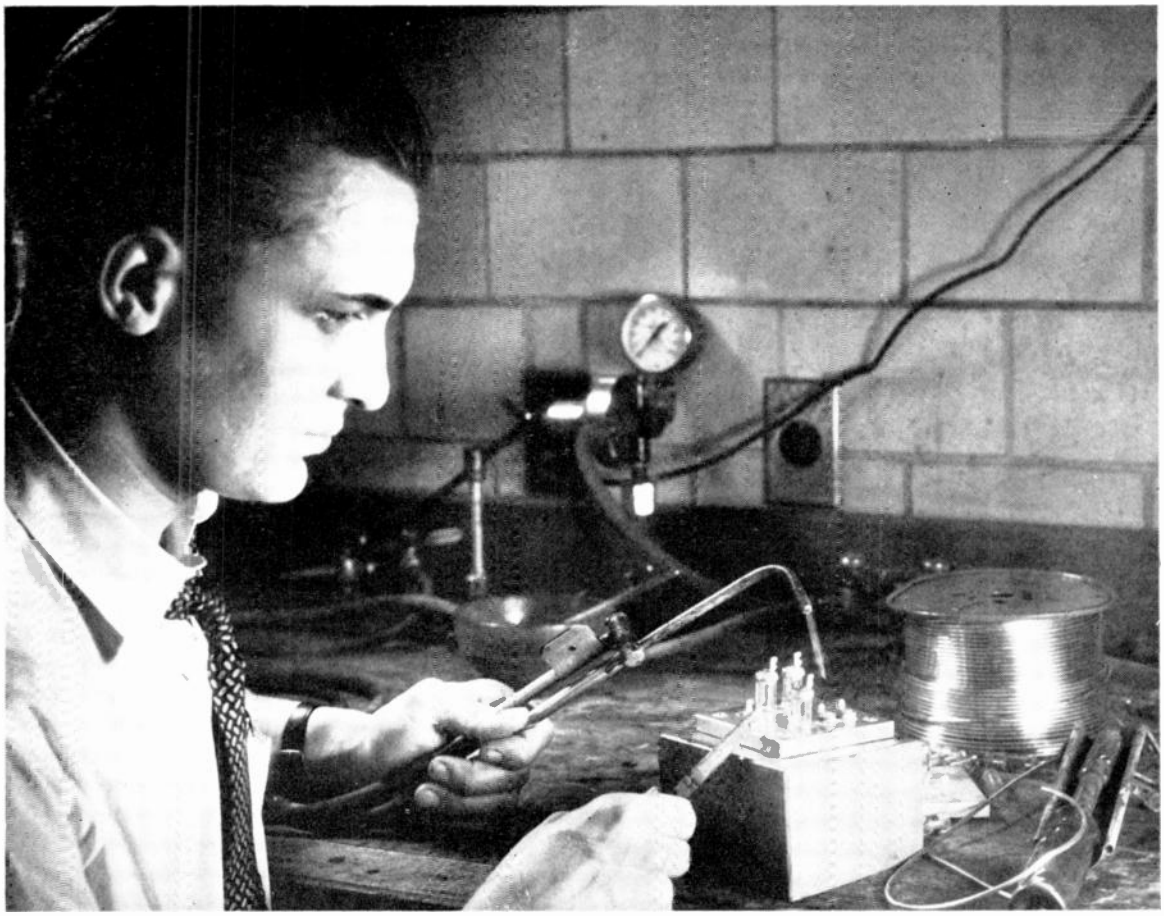


FIG. 2. CORNING TECHNICIAN SOLDERING BUSHINGS IN A TYPE OF COVER USED BY UTC FOR TRANSFORMERS

eration does not require any particular skill or training, or complicated, expensive equipment, nor does it necessitate any radical changes in the design of parts to which the metallized bushings are attached.

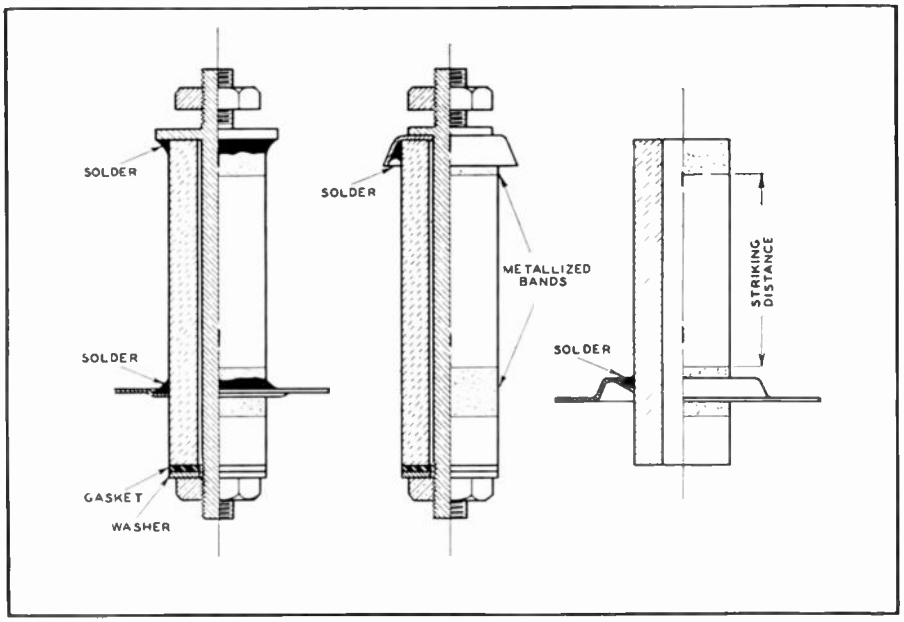
The method of assembly is simple. The hole provided for the bushing in the metal case or cover should be from 0.010 to 0.015 in. larger than the maximum diameter of the bushing. The case or cover should be stamped out with a shallow well or cup around the hole, as indicated in Fig. 3, to provide space for the solder.

The metallized band should extend approximately the same distance above and below the cover when soldered in place. It is important that the edge of the metallizing be left exposed and not completely covered by the solder. The metal cover should be kept as light as possible, preferably 0.020 to 0.030 in. and not more than 0.040 in. thick. If a cap is used to seal the top end of the bushing, the metal in the cap should be .010 to 0.015 in. thick.

The bushing is inserted in the hole and properly positioned by means of a simple jig. A ring of small-diameter solder is slipped over the bushing and sufficient heat applied to melt the solder, as shown in Fig. 2. The cap can be soldered to the bushing either before or after the bushing

RECOMMENDED STANDARDS OF CORNING METALLIZED GLASS BUSHINGS

Nominal O.D., ins.	Actual O.D., ins.	Minimum I.D., ins.	Metallized Band Width		Outside Flashover Distance, ins.	Recommended Metal Thickness, ins.		Mounting Hole Diameter, ins.
			Top	Center		Bushing Cap	Case Cover	
5/16	.275–.315	.069	5/32–3/16	7/32–1/4	1/4 1/2	.015	.020	Mounting Hole Diameter .010 in. larger than maximum outside diameter
3/8	.354–.395	.140	5/32–3/16	7/32–1/4	1/4 1/2 3/4	.015	.020	
1/2	.477–.523	.200	5/32–3/16	7/32–1/4	1/4 1/2 3/4 1	.015	.025	
3/4	.703–.770	.187	7/32–1/4	9/32–5/16	3/4 1 1 1/2 2 1/4 3 1/4	.020	.030	
1	.953–1.016	.240	5/16–11/32	3/8–13/32	1 1 1/2 2 1/4 3 1/4	.025	.040	



If a given transformer, for example, is to be used on ground or marine equipment, the low-altitude values should be used. For aircraft equipment, the high-altitude figures apply. It is surprising to note the difference in striking distance for a given voltage at low and high altitudes.

Variations of the mounting methods and types of metallized glass bushings described here are being used for other applications. These include hermetically sealed envelopes for resistors, RF chokes, gas-filled spark gaps, mica condensers, and related components. Such designs are proving thoroughly practical because of the toughness of Pyrex glass and the positive seal to the glass afforded by the Corning metallizing method.

FIG. 3. SUGGESTED METHODS FOR MOUNTING BUSHINGS ON METAL COVERS, AND FOR TERMINAL DESIGNS USING SOLID RODS FOR CONNECTIONS

is soldered to the cover, whichever is more convenient. The lead wire can be attached either before or after, or at the same time the cap is soldered on. A shallow, cup-shaped cap is recommended with a lug or machine screw stud attached by spot welding. This and alternate types of construction are shown in Figs. 3 and 4.

Care must be used in selecting the correct bushings to meet the voltage and service requirements of each application. Recommended standards are listed in Tables 1 and 2.

The striking distances, or the distances between the top and center metallized bands, are listed in Table 1, both in air and in oil, and for low and high altitudes. The values given provide a safety factor of 100%.

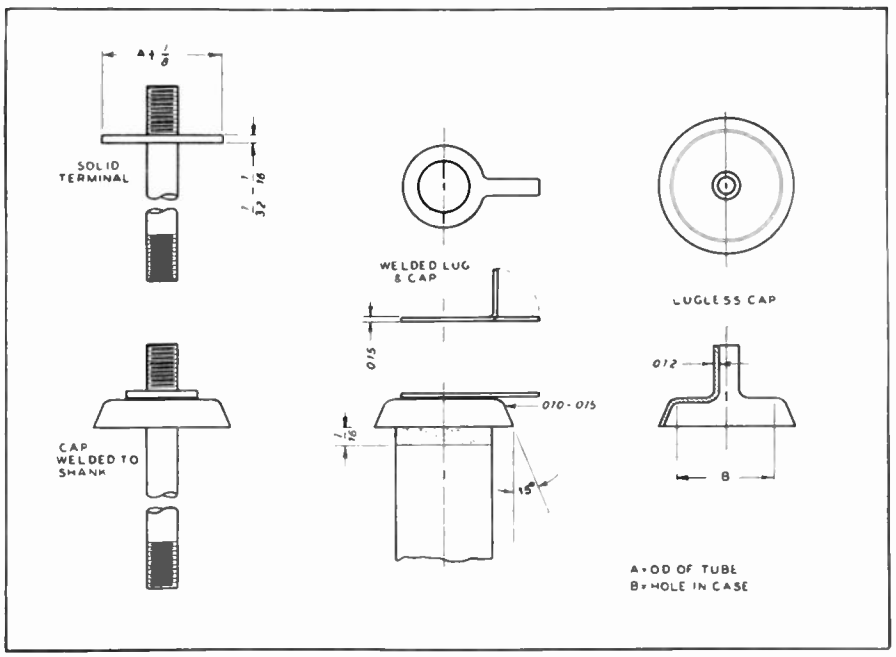


FIG. 4. FURTHER DETAILS OF ROD, LUG, AND LUGLESS TERMINALS. THE TWO TYPES AT THE LEFT ARE ALSO SHOWN IN FIG. 3, LEFT AND CENTER

POSTWAR CONVERSION DELAY

THE unanswered questions concerning frequency allocations for public and commercial radio services may result in a serious delay of the industry's conversion to peacetime status — unless a way is found to reach definite conclusions while manufacturers are still engaged in military production.

The one bright spot in the present picture of confusion and doubt is that, by the use of frequency modulation, more stations can operate on a given channel, without heterodyne interference, than would be the case with amplitude modulation, owing to the fact that, with FM, strong local signals block out weaker signals from distant stations on the same frequency.

Furthermore, because of the limited range of transmitters working on quasi-optical channels, there are no serious international interference problems.

On the dark side of the picture is the general reluctance of engineers to take any definite stand as to planning for future needs. Even the new public services, of television and facsimile cannot make a move until the FCC has made definite and final allocations of frequency bands, so that receivers and transmitters can be designed accordingly.

It might be easier if these allocations could be made without waiting to settle on the requirements of government, commercial, aviation, railway, and police communications, but that cannot be done because the problem must be considered as a whole. Any attempt to decide on one or two services in advance might result in subsequent readjustments. And that is the very thing everyone wants to avoid.

There may be a certain amount of jockeying around on the part of both commercial and government interests, looking toward obtaining the most advantageous channels. However, the situation is genuinely complicated, on the one hand, by uncertainty due to lack of experience with some of the latest and most promising developments, including those which cannot be discussed because of military restrictions, and on the other hand by the fact that all radio engineers are so deeply involved with war activities that they do not have the time to give this subject the exhaustive study it requires.

The only hope now is that some individual will advance a plan of sufficient merit as to serve as a starting point around which discussion will center, and from which a final plan can be developed.

The only certainty for manufacturers of home radios, at this time, is that the present AM and FM bands will be continued.

CADMIUM PLATING PROTECTS LETTERS ENGRAVED THROUGH WRINKLE FINISH

CADMIUM-PLATING STEEL

Production Method of Protecting Letters Engraved in Steel

BY C. H. DAY*

WHEN aluminum was readily available, practically all panels were engraved by cutting through the wrinkle, crackle, or crystal finish and letting the characters stand out in natural aluminum. Then came restrictions which required the substitution of less critical materials for radio equipment panels and chassis. Steel was just as satisfactory, except for weight considerations, for panels as aluminum, but the engraving of steel panels presented the problem of corrosion where letters and numerals were engraved through the wrinkle or crackle finish, because the exposed steel rusted within a few days. This, of course, was unsatisfactory.

Various methods were tried at the Browning Laboratories to eliminate this difficulty. One of the first processes considered was the coating of the exposed steel with clear lacquer. This was found unsatisfactory because the eye could not detect whether or not a complete coating had been applied. Panels which appeared to have been perfectly treated in this manner showed rust spots and, consequently, this process was rejected. Various other methods of covering the exposed steel were attempted and found equally unsatisfactory for one reason or another.

After numerous processes had been tried, we were lead to believe that cadmium plating offered a solution to the problem. Test pieces, plated by experimental methods, proved so satisfactory that we worked out a production method which has now been in use for more than a year. Not only is the exposed steel in the engraved characters preserved, but a sufficiently thick coating of cadmium can be placed in these letters to fill up the groove made by the engraving cutter. The following description of this process is given for those who have encountered this same problem:

The cadmium is deposited on the exposed steel by a brush method. The brush, or applicator, is made by attaching a metallic handle to a small cadmium anode over which 8 or 9 layers of cheesecloth are wrapped. The applicator is then dipped into the following solution:

8 oz. Cadux.
1 lb. Sodium cyanide balls.
1 gal. hot (not boiling) water.

This solution must be mixed and used in a non-metallic container. Pour the water over the cyanide balls and stir until dissolved. Add Cadux and stir the solution until it is clear. Care must be taken not to inhale the fumes. The applicator is then dipped in this solution. It should not be dripping wet when applied to the work, but it should be moist enough to insure transfer of the metallic cadmium. A little experimenting will show the proper degree of moisture to employ.

A source of direct current is required. This may be a battery, battery charger, or other DC source, regulated so that the current is from ½ to 2 amperes.

The steel panel, or other metal to be plated, is attached to the negative side of the battery and the cadmium applicator is attached to the positive terminal. Care must be taken to obtain good electrical contact between the negative terminal and the panel. A rheostat and a meter may be connected in the circuit to adjust the current to the correct value. A meter is not necessary if similar panels are being plated, for once the circuit has been adjusted for the correct current, small variations will not cause any serious difficulty. The voltage necessary for panels of the rack type is usually from 1½ to 3 volts.

The applicator, comprising the cadmium anode wrapped with cheesecloth, should be rubbed lightly over the exposed steel. This applicator should be kept in motion at all times while in contact with the panel to prevent "burning." The whole plating process should be accomplished as quickly as possible so that the plating solution will not attack the finish of the panel. This will occur if contact is permitted for too long a time depending, of course, upon the type of finish on the panel. With black wrinkle it has been found that the finish will not be injured if the plating process consumes less than 1½ minutes.

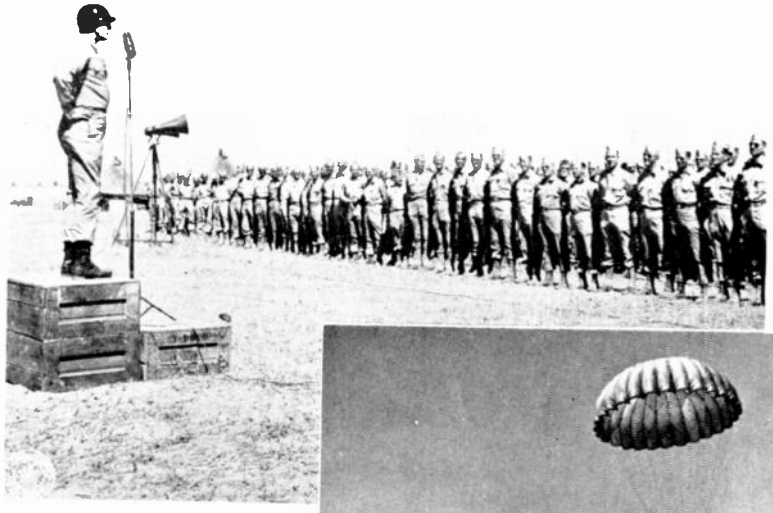
When the plating operation is completed, the panel should be thoroughly cleaned with warm water. A cellulose sponge will be found useful for this purpose, and washing should be continued until every trace of the solution has been removed. After washing, the panel should

(CONTINUED ON PAGE 48)

*General Manager, Browning Laboratories, Inc., Winchester, Mass.

SPOT NEWS NOTES

Items and comments, personal and otherwise, about manufacturing, broadcasting, communications, and television activities



ABOVE, LT. GENERAL GEORGE S. PATTON ADDRESSING THE FIELD OFFICERS OF THE 82ND AIRBORNE DIVISION, PRIOR TO THE ATTACK ON SICILY. CENTER, AN EXTRAORDINARY ACTION SHOT WHICH ILLUSTRATES THE PRECISION ACTION OF THE PARATROOPERS OF THE 82ND AIRBORNE DIVISION. THESE MEN BORE MUCH OF THE BRUNT OF THE FIRST LANDING ON THE ISLAND. BELOW, INFANTRY LANDING BY THE 5TH ARMY, COMMANDED BY LT. GENERAL MARK W. CLARK. EVERY MOVEMENT OF THIS CAMPAIGN IS CONTROLLED BY RADIO COMMUNICATION

IN CASE THE JOB OF BUILDING MILITARY RADIO EQUIPMENT IS GETTING TO SEEM LIKE A DEADLY GRIND, SPEND A MINUTE STUDYING THESE OFFICIAL SIGNAL CORPS PHOTOGRAPHS FROM THE NORTH AFRICAN - SICILIAN CAMPAIGN. THEY'LL HELP TO REMIND YOU THAT YOU AREN'T WORKING FOR SOME FUSSY OVERSEAS CUSTOMER, BUT FOR OUR OWN AMERICANS WHO CAN'T QUIT OR EVEN SLOW UP UNTIL THEY HAVE ACHIEVED THE PEACE THAT THEY CAN WIN ONLY WITH OUR UNREMITTING EFFORTS IN THEIR SUPPORT

FM in Canada: An important part of the postwar changes to be made in the Canadian broadcasting setup will be the extensive use of frequency modulation, according to Dr. Augustin Frigon, Assistant General Manager of CBC. This statement was made before the Radio Committee of the Canada House of Commons. Dr. Frigon stated that FM broadcasting will make possible the granting of a large number of licenses for community broadcasting stations which will not interfere with existing transmitters on standard frequencies. This means that postwar radio sets sold in Canada will have to provide both FM and AM tuning.

Television for D. C.: Allen B. DuMont Laboratories, Inc. have filed a request with the FCC for reinstatement of their commercial television station application for Washington, D. C. Application is for channel 1, 50 to 56 mc.

Number Tape: The name of the manufacturer of the cellophane cable-marking tape, shown on page 25 of our June issue was not given. It is: Minnesota Mining Company, 155 Sixth Avenue, New York City.

W2XMN Becomes W31NY: FCC has authorized Major Armstrong to operate his Alpine, N. J. transmitter as W31NY, using 40 kw. to serve an area of approximately 15,610 square miles.

Palmer M. Craig: Named chief engineer of the radio division of Philco Corporation.

(CONTINUED ON PAGE 35)

NEWS PICTURE

SUCH delays as have occurred in the delivery of military radio equipment have been due less to production lag or material shortage than to delays in settling on design requirements. The truth is that military and civilian engineers are being called upon to deliver apparatus suited to use in a global war which is being fought on four planes — and it is not possible to design equipment to meet new conditions before the conditions are known to exist. The most prolific source of new design information is the test chambers, large and small, in which temperature, pressure, and humidity are controlled. This picture shows two General Electric radio engineers entering a laboratory maintained at −100° F. They will short-circuit the long route which must be followed by experience reports coming back from the scenes of military operations, simply by reproducing those field conditions right on their own home grounds.

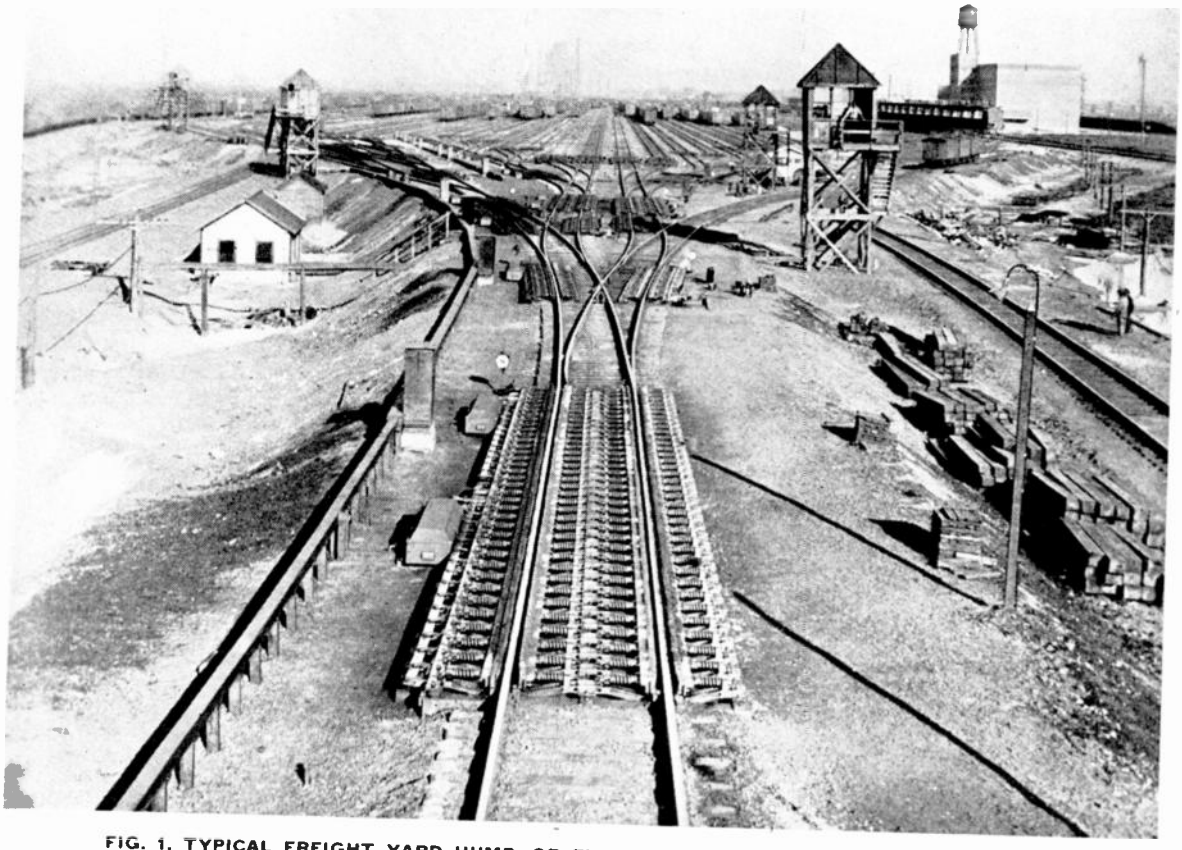


FIG. 1. TYPICAL FREIGHT YARD HUMP, OR ELEVATION, AT WHICH CARS ARE UNCOUPLED AND PERMITTED TO COAST DOWN TO THE PARTICULAR TRACKS WHERE THEY ARE WANTED

FM AIDS BATTLE OF TRANSPORTATION

Use of Frequency Modulation in War Emergency Promises to Revolutionize Railway Traffic Control and Communications Technique—Part 1

BY W. S. HALSTEAD*

WITH the United Nations fighting on extended fronts throughout the world, rail transportation has become a factor of utmost importance. Unless men and materials can be carried quickly to points where they are needed, our world-wide timetables, on which complex military operations are based, may be seriously disrupted. The bulk of this responsibility falls on the railroads, now overtaxed and handicapped by growing shortages of rolling stock and man-power.

Studies by the railroads and governmental agencies have shown that an appreciable loss of time in freight shipments occurs at bottleneck points such as classification yards, freight terminals, and in port areas where, in many cases, a few locomotives must handle the movement of several thousand freight cars each day. These delays may be attributed in substantial part to the fact that yard traffic control and communications methods have not kept pace with modern engineering developments in other phases of the transportation field.

In the majority of railroad yards, train orders and other instructions are still carried by indirect and relatively inefficient methods from control points, such as yard master's offices, to locomotive engineers or conductors. Usually, messages are carried by men on foot, by telephone circuits extending to different points in a yard, or by loudspeaker installations at a few strategic locations.

The disadvantage of these methods is that the yard master or dispatcher is never in direct two-way contact with locomotive engineers or conductors in their cabs, or with other key personnel who may be moving between remote parts of the yard area. Many times, an hour or more may be spent in locating a particular locomotive and in directing its movement to the portion of the yard where it is needed. In other cases, yard foremen or other supervisory personnel, urgently required at certain points, cannot be reached. And in the event of accident or other emergency when coördinated control of traffic operations may be a matter of life or death, no means other than the limited indications of wayside signals are usually available to the engineers.

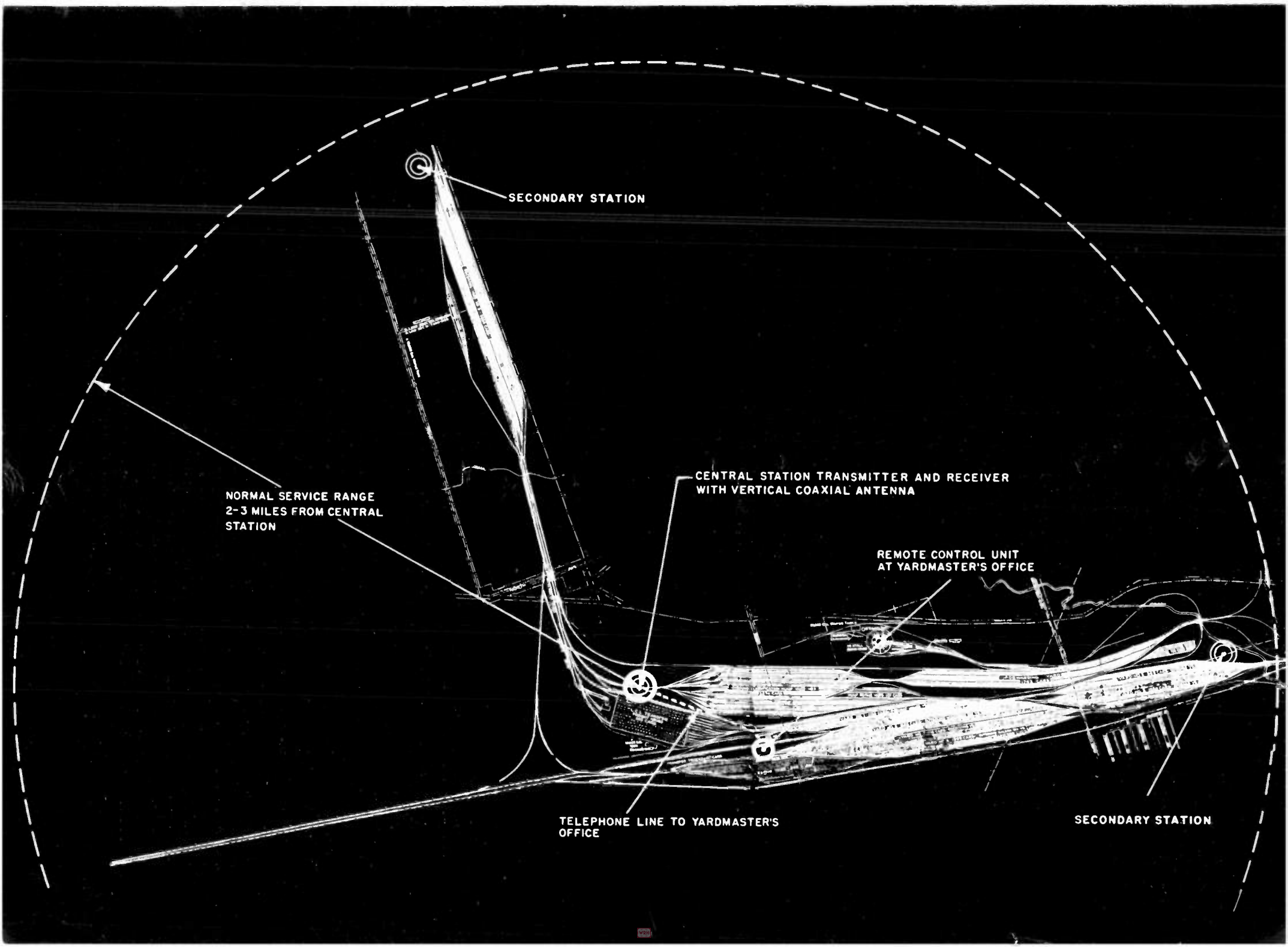
Prior to the war emergency period, amplitude-modulated radio or carrier telephone systems had been installed in a few yards in order to provide two-way voice communication facilities between control points and locomotive cabs, or between locomotives.[1, 2] However, the extension of amplitude-modulated systems to large yard areas in which diesel-electric locomotives are employed presents a technical problem in that the interference

* President, Halstead Traffic Communications Corporation, 155 E. 44th St., New York City.

[1] "Experiment with Radio in Freight Classifications," *Railway Age*, Vol. 110, p. 148, Jan. 1941.

[2] L. O. Grondahl and P. N. Bossart, "Train Communications," *AIEE Transactions*, Vol. 62, pp. 493–500, July 1943.

FIG. 2. LAYOUT OF TYPICAL FREIGHT TERMINAL ACCOMMODATING OVER 17,000 CARS. THIS SHOWS PLAN OF FACILITIES FOR 2-WAY FM RADIOPHONE COMMUNICATION ►


SECONDARY STATION
NORMAL SERVICE RANGE
2-3 MILES FROM CENTRAL
STATION
CENTRAL STATION TRANSMITTER AND RECEIVER
WITH VERTICAL COAXIAL ANTENNA
REMOTE CONTROL UNIT
AT YARDMASTER'S OFFICE
TELEPHONE LINE TO YARDMASTER'S
OFFICE
SECONDARY STATION

noise levels normally encountered in the vicinity of electromotive equipment are of such magnitude as to make this means of communication uncertain. In view of the increasing use of diesel-electric railroad equipment, any system, if it is to have general application, must be able to overcome the limiting factor of man-made static.

With the development of practical FM radiotelephony by Major E. H. Armstrong, it became possible to provide communications facilities which are relatively immune to both man-made and natural static. Technical means were thereby afforded with which to apply radio traffic control and communications methods in yards or on main line trackage served by diesel-electric as well as steam locomotives.

Speed, Safety, Economy ★ Through the application of two-way FM railway radiotelephone equipment and centralized control technique in the extensive yards of government-operated ordnance plants,[3] where radio traffic control methods direct and safeguard the movement of railroad cars carrying high explosives, it has been determined that the time required to carry out important yard operations has been drastically reduced. Better managerial control of all yard traffic has been provided, orders can be transmitted directly from the dispatcher to locomotive engineers or conductors and acknowledged immediately and, in the event of accident or other emergency, the engineers of all radio-equipped locomotives can be reached instantly.

Aside from providing an appreciable increase in the efficiency and safety of rail operations, these radiotelephone installations have materially decreased the amount of railway equipment required in handling traffic. In one plant, where eleven locomotives have been employed, it is reported that the purchase of two additional diesel-electric locomotives was made unnecessary by the general speed-up effected by the radio system. In this instance, the savings in terms of money and strategic materials are obvious.

As the war proceeds, with rail equipment wearing out, and man-power shortage injecting additional problems, it is believed that the extended application of radio control and communications technique in the railway field can be enormously useful, both in this country and abroad, by enabling existing rail equipment to move more traffic and by increasing the safety and efficiency of all railroad operations.

After the war, as many forward-looking railroad men today realize, rail transportation systems will have intensified competition from the trucking and air transport companies, as well as increased competition from the expanded merchant marine at coastal points. Any means, therefore, which will materially increase the efficiency and safety of railroad operations, while simultaneously decreasing the cost of freight transportation, will find favor in the railroad industry.[4] In this, radio will play an important part.

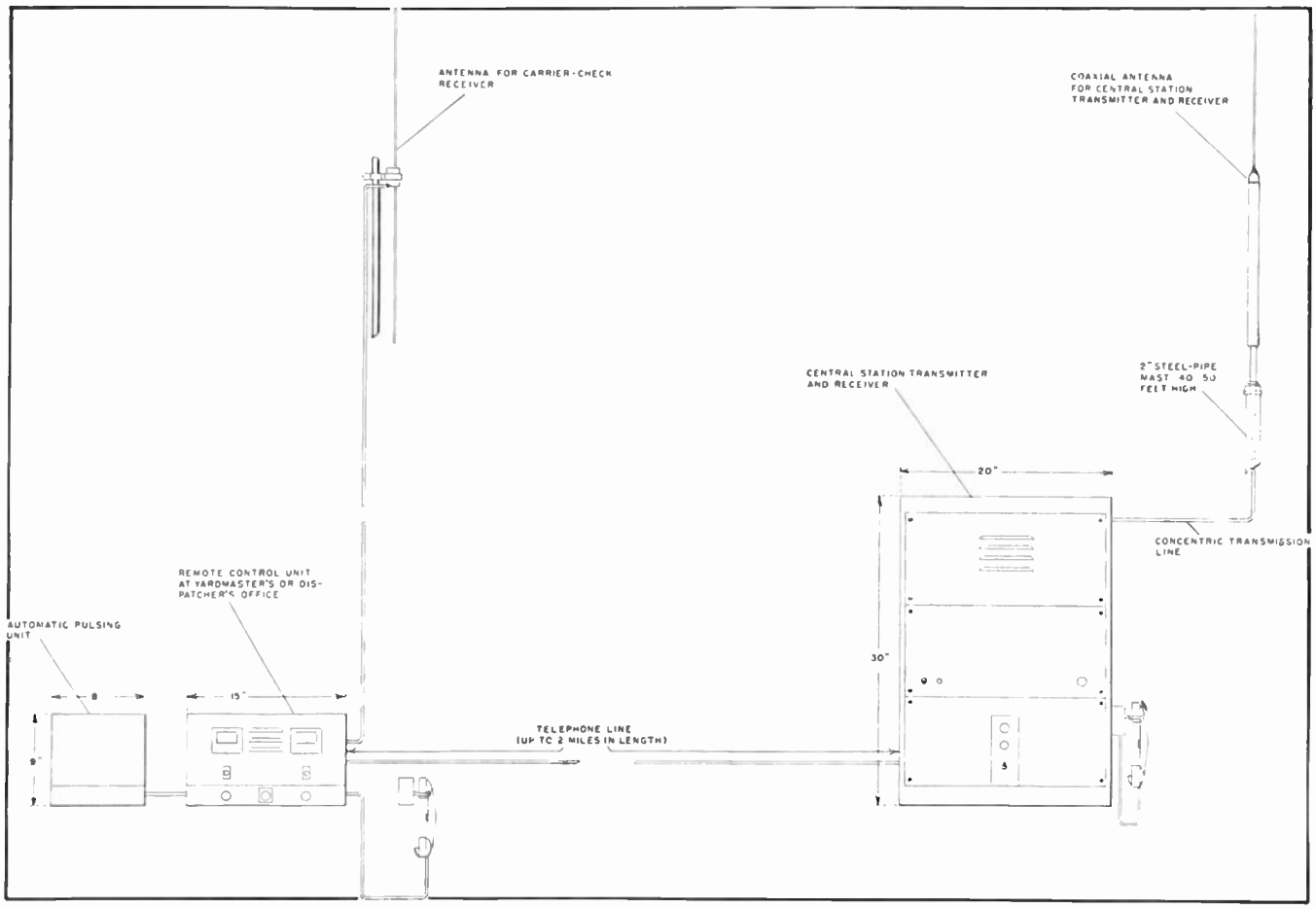


FIG. 3. REMOTE CONTROL AT YARD MASTER'S OFFICE FOR CENTRALLY-LOCATED FM TRANSMITTER AND RECEIVER

FM Communications in Terminal Areas ★ Among the promising applications of FM radio in the railway traffic control and communications field are the following:

1. *For voice communication between the hump conductor and engineers of humping or trimming locomotives.* Engineers of humping or trimming engines operating in classification yard service can be instructed to operate at specific speeds, slow down, back up, stop, or proceed with certain traffic movements. These operations can be controlled from the hump, the elevated point in the yard as shown in Fig. 1, where cars are uncoupled as they are pushed over the crest of the hump and allowed to run by gravity, singly or in groups, into various parallel tracks of the

[3] War Department Press Release No. 763, Bureau of Public Relations, "Radio to Control Shipping at Ordnance Plants," Nov. 4, 1941.

[4] "What Will the Railroads Do?" — *Fortune Magazine*, p. 124, Nov. 1942.

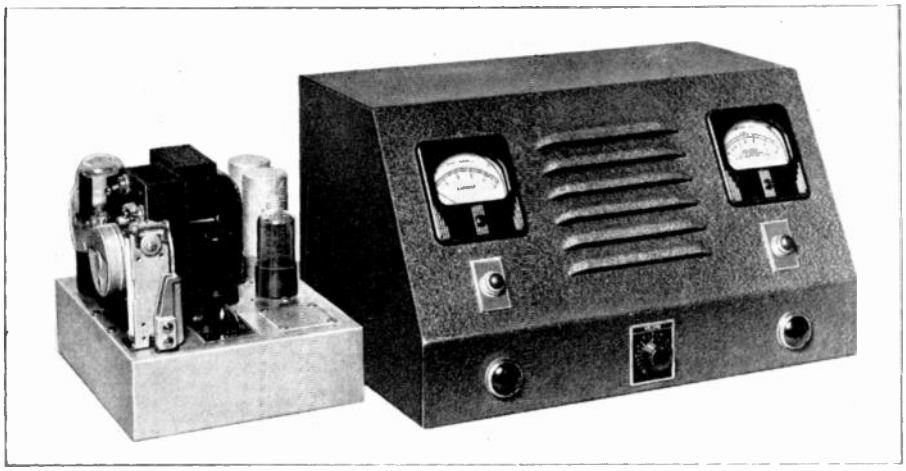


FIG. 5. LEFT, IMPULSE UNIT. RIGHT, REMOTE CONTROL AND MONITOR, INSTALLED AT YARD MASTER'S OFFICE, SHOW THAT SIGNALS ARE GOING OUT ON THE AIR

classification yard, as determined by selective operations of rail switches under control of towermen. In this procedure, all humping operations must be observed and correlated with other traffic operations on various tracks of the classification yard area. Through two-way radio communications every instruction can be immediately acknowledged by the engineer. There is no chance for misunderstanding, hence all movements can be carried out quickly, with full confidence, by the engineer. In fog, storms, or whenever visibility is limited and wayside signals are obscured, communications between the hump conductor and humping engineer have proved to be of great value in enabling continuation of humping operations with safety to personnel and equipment, just as radio has aided in these respects in airport and marine traffic control services.

The complexity of handling cars in a classification yard is illustrated by Fig. 2. The capacity of this yard is over 17,000 cars. The different areas are identified on the drawing. This can be seen by using a magnifying glass.

By means of radio-transmitted and instantly-acknowledged orders from the hump conductor to engineers of trimming locomotives, which move as required from track to track in various sections of the classification yard, certain tracks can be cleared quickly to receive cars which, simultaneously, are being pushed toward the hump. The hump conductor, by observing all operations, can keep the humping locomotive in movement at a desired speed in order to time the arrival of the first car at the hump with the completion of trimming operations. Thus, the humping locomotive does not have to stop and start repeatedly under heavy loads which, when traction is poor, as in cold weather, can lead to serious delay.

2. *For communications between the yard master and engineers of roustabout locomotives or other switching engines.* Switching locomotives can be located immediately and engineers instructed to carry out complicated movements at any point within a yard area, with consequent saving in transit time of cars on terminal tracks, economies in locomotive operating and maintenance cost, and with a substantial reduction in the amount of time required to locate particular locomotives. "Lost" locomotives can be spotted in a matter of seconds whereas, without radio, several men may waste valuable time locating a given engine, especially in the larger yards where traffic is heavy.

3. *For communications between the yard master or hump conductor and the engineer of any locomotive.* Because FM reaches every part of an entire yard terminal area from a central control station, the yard master or other authority can talk with engineers of all radio-equipped locomotives, either steam or diesel-electric type, including trimmer, relief, or road engines, on any track or at any part of a yard within the communications range of the central station. This is illustrated in Fig. 2. The operation range is not limited by the extent of bonded rails, wires along certain tracks, high interference noise levels, or variations in conductivity of rail circuits under changing operating conditions.

4. *For communications between tower men and engineers.* Radio communication between tower men and engineers has additional advantages when conventional signaling methods are not adequate to meet, with maximum efficiency, special traffic problems that are presented in terminal operations.

5. *For communication between engineers of locomotives in the same terminal area.* The ability to conduct two-way communications between engineers of locomotives at different parts of a yard area contributes further to efficiency and safety of operations. Unexpected delays in arrival of relief engines, or delays at the water tower can be made known to engineers who have timed their operations to coincide with the arrival of the relief locomotives at a specific location. It also meets the need for communication between engineers of locomotives in tandem, or at the front and rear of long trains.

6. *For communications between yard master or other operating officials and yard personnel.* Radio can be employed in con-

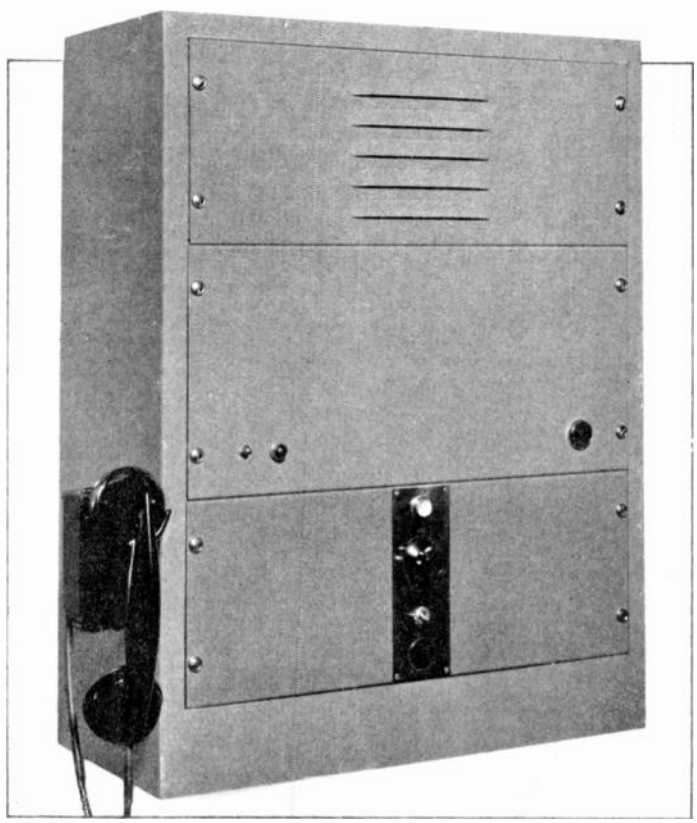


FIG. 4. LINK CENTRAL STATION TRANSMITTER-RECEIVER UNIT CAN BE OPERATED FROM OFFICE SEVERAL MILES DISTANT

junction with portable two-way radio equipment to expedite delivery of orders to foremen, inspectors, skatemen, and others in various parts of a yard area. Battery-operated units, weighing but a few pounds, similar to equipment employed by the Armed Forces, can be used in radio paging services, or in emergencies where wire-connected loudspeakers cannot compete with the noises from locomotives and moving cars.

7. *For communications associated with preparations of trains at terminals.* FM can be used to facilitate routine checks and tests between a locomotive and the rear of a road train prior to its departure from a terminal. Inspectors, equipped with portable battery-operated two-way transmitter-receivers can expedite routine tests involving coöperation between themselves and locomotive crews or caboose personnel. Such portable equipment has many uses when the locomotive and caboose have two-way radio apparatus.

8. *For communication with motor trucks, repair trucks, motorcars, and service cars within the radio range.* As the FM railway radio system is independent of rail or wire circuits, radio-equipped trucks within the terminal area can be reached while they are moving between various points within the communication range of the central station. Similarly, repair trucks, service cars or automobiles carrying yard officials can be reached instantaneously as long as they are provided with suitable radio equipment.

Main Line Operations ★ Uses of FM communications are by no means limited to yard areas. There are many applications to main line operations:

1. *For cab to caboose communication.* For many years there has been a need for improved communication between locomotives and rear of freight trains. FM is ideally suited to this kind of service, particularly because of its relative immunity to all types of static, and its adaptability in connection with directional antenna systems.

2. *For emergency communications in lieu of wire circuits.* FM communication is independent of wayside wire circuits or rail continuity. Therefore, it is not disrupted by storms, floods, or emergency conditions which destroy the effectiveness of signaling devices which involve telephone, telegraph, or other metallic circuits. Thus communications are possible under all conditions between road engineers and towermen, between engineers of locomotives on the same or adjacent tracks, or between central control points and locomotives along any section of track.

3. *For passenger communications.* The development of practical radio repeater systems employing antennas of high directivity for concentrating signal energy in a desired path over long distances provides the technical means for the establishment of new railway communications services, available to passengers as well as train personnel. It is anticipated that FM railway radio facilities will, during the modernization period in the post-war era, carry toll-call and entertainment services to moving trains, breaking the present wall of isolation between rail travelers and the outside world.

4. *For control of cab signals by radio.* Through the application of radio-control techniques at present developed, STOP, GO, CAUTION, or other signal lights located within the cab and in the engineers' field of vision, can be energized selectively and concurrently with reception of voice signals by the locomotive receiving equipment. This technique has been successfully applied in experimental installations of radio traffic control systems developed by the Halstead Corporation, and will be described in a subsequent article in *FM* RADIO-ELECTRONICS.

FIG. 6. MOBILE FM EQUIPMENT IS MOUNTED IN A STEEL CABINET. LEFT TO RIGHT ARE THE TRANSMITTER, POWER SUPPLY, AND RECEIVER. CURRENT IS FURNISHED BY STORAGE BATTERY ON STEAM OR DIESEL-ELECTRIC LOCOMOTIVE

Advantages of FM ★ The practical application of railway radio control methods now in use on governmental frequencies in ordnance plant areas stems principally from a concentrated development program in the traffic control and transport communications field, initiated in 1937 by the Halstead engineering group. During this project, ultra high frequency radio-

FIG. 7. HAND SET AND CONTROL UNIT FOR FM RADIO LOCOMOTIVE INSTALLATION

telephone and automatic radio control systems were developed as safety and operational aids.[5, 6] Much of the early work was conducted with directional microwave equipment on frequencies above 300 mc. under FCC experimental station license, W2XVL. Subsequently, radio traffic control methods for use at lower frequencies were developed.[7, 8, 9, 10]

Both ultra-high and low frequency methods incorporated automatic controls, in addition to voice signaling circuits, through which audio tones, red, green, and amber traffic signals and protective devices could be selectively energized by radio in locomotive cabs or other mobile units.

In 1940, under auspices of the General Railway Signal Company, one of the first organizations to recognize the potential value of ultra-high frequency radio as an operational aid on railroads, this initial program was extended into the railroad field through an experimental ultra-high frequency locomotive communications project in the freight classification yard of the Chicago and Northwestern Railway Company at Proviso, Illinois. This experimental installation, W9XYE, demonstrated the advantages of radio communications in speeding yard operations and in adding to the safety of rail movements. As a part of the communications system, automatic checking equipment was utilized at the central station and in the locomotive cab to provide visual and aural indication that the control station transmitter and locomotive receiver were continuously in proper operating condition. This served as reassurance to the engineer, and provided instantaneous notice of any failure in the communications circuit.

The successful operation of the Proviso equipment throughout the experimental period, and the beneficial results derived from the use of radio communicating methods, were brought to the attention of Todd and Brown, Inc., operators of the Kingsbury Ordnance Plant, then under construction, by members of the Halstead group. After competitive tests which were observed by government representatives and ordnance plant operators at Kingsbury in May 1941, this system, with FM equipment in lieu of the AM components as employed at Proviso, together with audio-visual checking equipment, was incorporated in War Department specifications for railway radiotelephone systems to be used in ordnance plants then under construction. Subsequently, this FM equipment was supplied to a number of ordnance plants by General Railway Signal Company. The FM transmitting and receiving units employed in these installations were manufactured by F. M. Link.

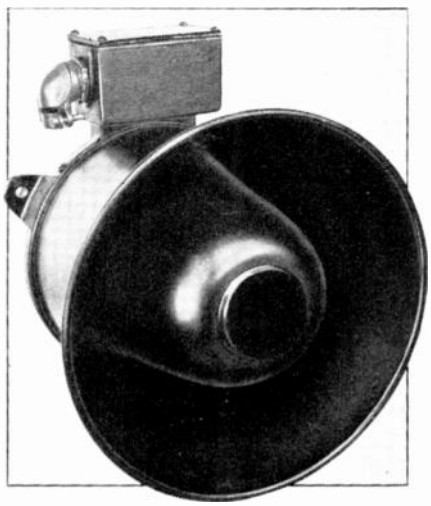


FIG. 8. LOUDSPEAKER IS MOUNTED ABOVE ENGINEER'S SEAT IN LOCOMOTIVE CAB

The requirement of FM for this new communications service was deemed a necessity because of the extremely high interference levels in diesel-electric locomotives. Older forms of amplitude-modulated radio equipment would, in most instances, be of no value when operated in proximity to locomotives of this type.

With a limited number of frequencies available for this new service, the interference between AM stations operating on the same frequencies is a serious consideration. That is, reception from a nearby AM transmitter may be rendered unintelligible by the squeal set up from another AM transmitter on the same frequency, even though the second station is so far away that its signals cannot be heard. To drown out that squeal, signals from the wanted transmitter must be at least 100 times stronger than those from the other transmitter on the same frequency.

With FM, however, if signals from the nearby station are only 3 times louder than those from the more distant station, the desired signals will blank out the unwanted signals.

Consequently many more stations can operate on the same frequency, without interfering with one another, if FM is employed in place of AM.

FM equipment also is well-adapted for use with directional antenna systems which concentrate the signal energy in a desired direction along railroad right-of-way or yard area. Directional technique, combined with the dominating effect of strong FM signals over weaker, unwanted signals, offer technical means for obtaining comprehensive radio control of main line operations, independent of wire circuits, through the use of automatic ultra-high frequency repeater stations located at selected wayside points.

FM railway radiotelephone systems designed for operation at frequencies above 100 mc. are typified by the Halstead type RTC-10-UF railway radiotelephone system, employing FM transmitters and receivers manufactured by F. M. Link. This equipment incorporates in an integrated radiotelephone network the following units:

1. Located at the central station are transmitting and receiving equipment, Fig. 4, with the associated remote-control and checking equipment, Fig. 5, and the

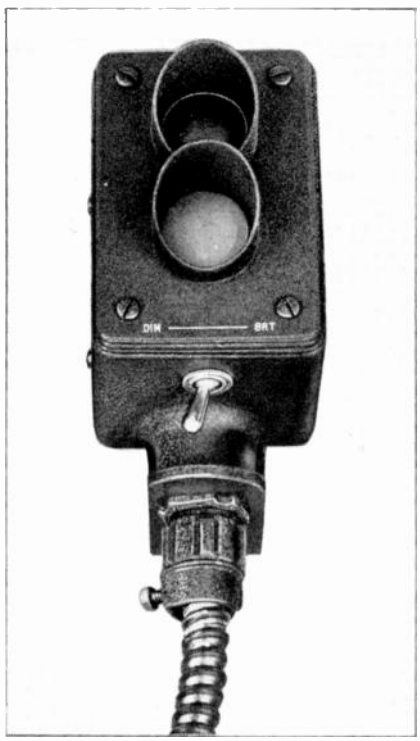


Fig. 9. CHECK-LIGHT BEFORE ENGINEER SHOWS THAT SYSTEM IS IN OPERATION

[5] U. S. Reissue Patent No. 21818, June 3, 1941; U. S. Patent 2,254,218, Sept. 2, 1941; U. S. Patent 2,260,315, Oct. 28, 1941.

[6] Albert E. Sindlinger, "Traffic Lights in Your Car by Radio," *Radio Craft Magazine*, Vol. 10, pp. 328–329 and p. 368, Dec. 1938.

[7] U. S. Patent 2,255,055, Sept. 9, 1941.

[8] Neal G. Adair, "Shall We Control Traffic by Radio?" *Motor*, Vol. LXIV, pp. 84–85 and pp. 244–250.

[9] "Tune 550-Highway Radio Ahead," *Electronics*, Vol. 13, p. 32, Sept. 1940.

[10] *Proc. IRE*, Vol. 29, p. 95, March 1941.

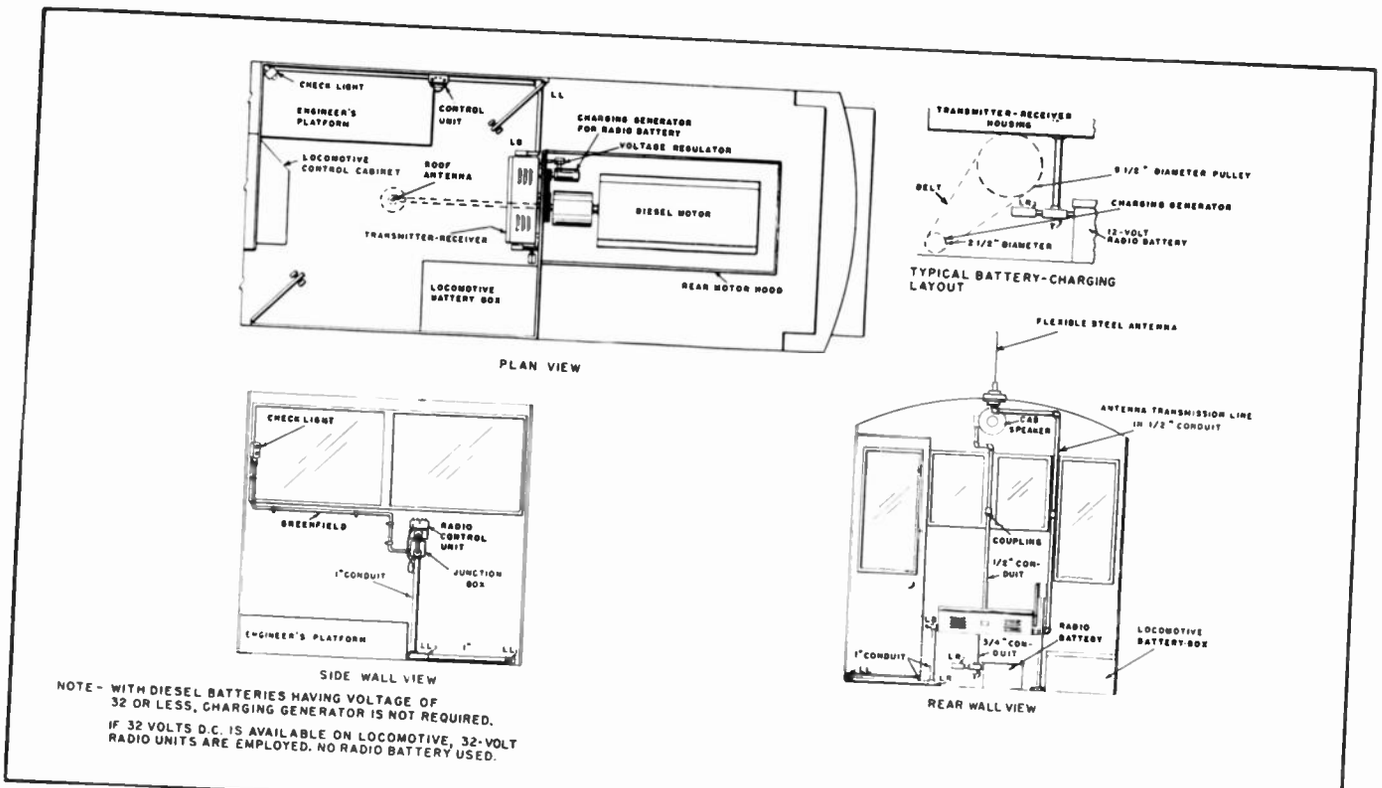


FIG. 10. DETAILS OF TWO-WAY FM RADIO TELEPHONE INSTALLATION IN THE ENGINEER'S CAB OF A DIESEL-ELECTRIC LOCOMOTIVE

coaxial antenna. The installation is shown diagrammatically in Fig. 3. The remote control unit by means of which the central station can be operated, is illustrated in Fig. 5. It is customarily installed at the yardmaster's or dispatcher's office and is connected to the central-station transmitter and receiver by telephone line, as indicated in Figs. 2 and 3.

2. Locomotive transmitting and receiving equipment, remote control unit, loudspeaker, and check-light unit are shown in Figs. 6 to 9 inclusive. Typical installations for diesel-electric and steam locomotives, yard cranes, or other mobile units operated in the yard area, are illustrated in Figs. 10 to 12 inclusive.

3. Secondary-station transmitting and receiving equipment, with associated antenna and accessories are required for use at secondary control points in the railway yard or along the right-of-way.

Protective Methods ★ The checking equipment in locomotive cabs, employed in the Halstead system, provides visual as well as aural indication of proper operation of the central-station transmitter and locomotive receiving equipment by transmitting impulses at 5-second intervals. These actuate both the loudspeaker and a signal lamp, indicating that the central station transmitter is on the air, and that the receiver in the locomotive cab is functioning. At the central station, a meter, actuated by picking up the transmitted signals, shows that signals are actually going out over the air. Thus the engineers of all radio-equipped locomotives, as well as the yardmaster or dispatcher, are continuously informed of the operating condition of the communicating system. This protective method of checking the radiotelephone circuit is equivalent to the closed-circuit principle employed in railway signaling.

In railroad operations, unlike those in other transportation and communications fields, a locomotive engineer who has been instructed to carry out a given operation will follow minutely the yardmaster's or dispatcher's orders unless other instructions are relayed from the dispatching point by hand or wayside signaling methods. Should central-station radio transmitting equipment fail after issuance of orders, or should the locomotive receiving apparatus become inoperative, the engineer, if he were not aware of such failure, would proceed to follow the original instructions despite a subsequent and urgent need on the part of the dispatcher to countermand the original orders. As the sequence of locomotive movements is not ordinarily determined by the engineer, the protective indicating and monitoring means prevent any serious consequences in case of failure of the radio signaling system. Furthermore, the receipt of instructions is always acknowledged by the engineer by repeating them back to the central station.

In order that automatic checking signal pulses, as well as voice communications, can be handled without mutual interference on the same radio frequency, an automatic pulse lock-out control circuit, also developed by Halstead engineers, is employed in the central station receiver to suspend the automatic transmission of the checking signal whenever radio signals from a locomotive transmitter or secondary station are being received at the central control point.

In addition to the radio control of a visual cab signal for checking purposes equipment a system for selective energization of STOP, GO, CAUTION or other signals can be coordinated with FM locomotive radiotelephone receiving equipment as employed in the RTC-10-UF installations. Operation of these units for localized radio traffic control can be effected in connection with directional, low-power wayside transmitters installed at selected control points, much as conventional wayside signal lights or semaphores would be located.

The quasi-optical characteristics of these directional radio units, combined with the discriminatory effect of FM systems, provide a restricted-range signaling technique analogous, in some respects, to wayside light signaling methods, but with the advantage that the radio system will operate with maximum efficiency under adverse weather conditions when the effectiveness of visual wayside signals is reduced.

Further, the radio system will handle voice communications concurrently with transmission of control signals for selective operation of the cab signals, thereby expanding the usefulness of the locomotive receiving equipment. Equipment of this type is of particular value at approaches to freight yard humps, and at other points where sustained operation of visual signals indicating STOP, GO, or similar orders would aid in controlling locomotive movements.

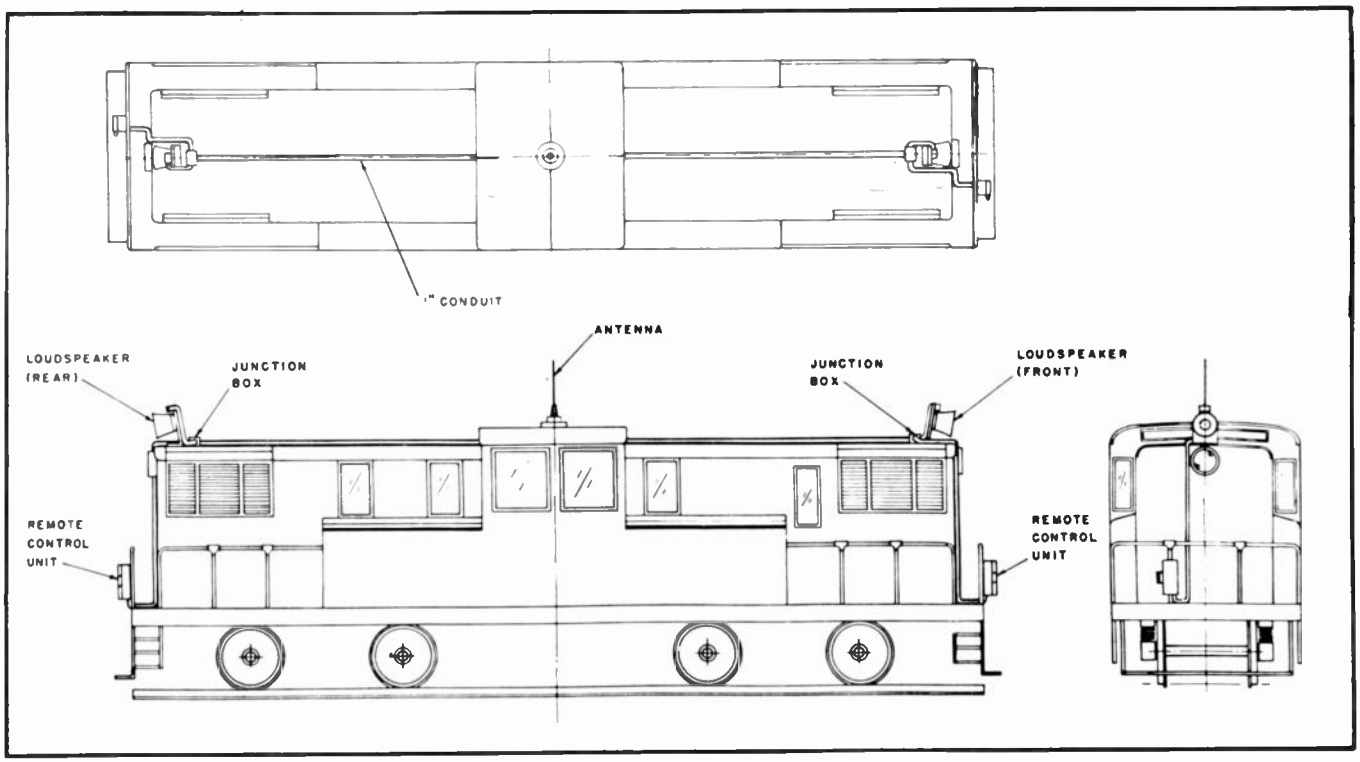


FIG. 11. EXTERNAL UNITS OF THE INSTALLATION. NOTE ADDITIONAL HANDSETS AND CONTROL BOXES AT FRONT AND REAR

Directivity can be given to ultrahigh frequency wave propagation by several methods involving directional antenna systems, or by use of wayside conductors to serve as wave-guides. Experimental installations of both types of directive systems have found important war applications, and give promise of greatly expanded use in the period of postwar reconstruction.

EDITOR'S NOTE: *Part 2, to be published in the August issue, will give detailed information on railway radio equipment and operating technique.*

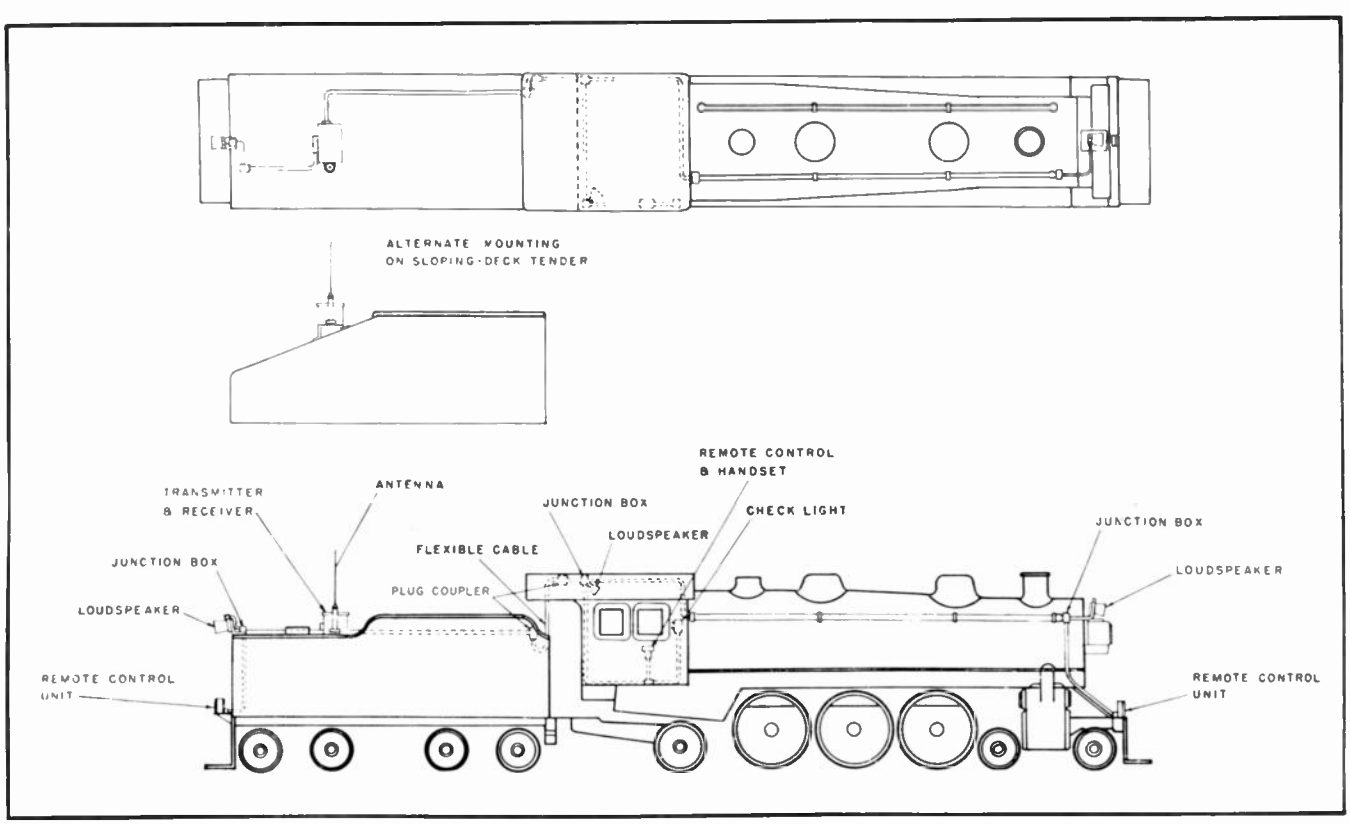


FIG. 12. METHOD OF INSTALLING FM EQUIPMENT, CHECK-LIGHT, AND OPERATING CONTROLS ON A STEAM LOCOMOTIVE

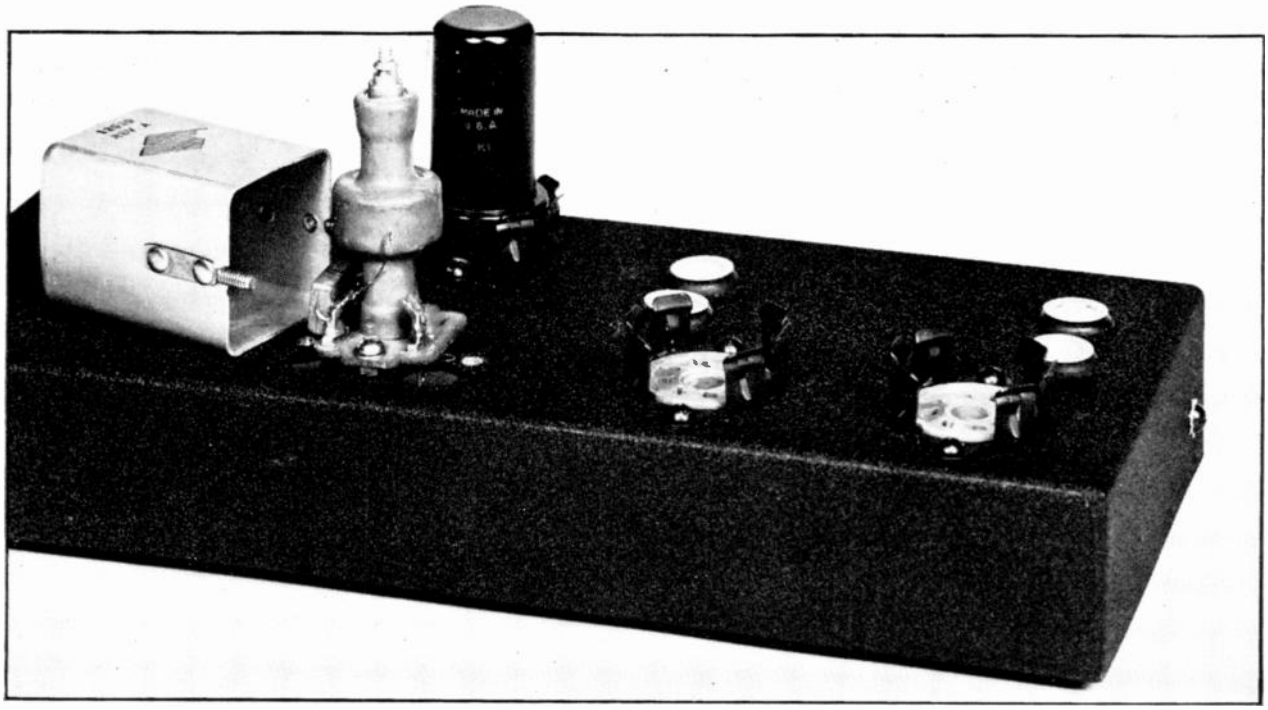


FIG. 1. IN MANY CASES, SPECIFICATIONS CALL FOR RF AND IF TRANSFORMERS MOUNTED INDEPENDENTLY OF THEIR SHIELD CANS. ALSO SHOWN ARE TUBE CLAMPS AND GROMMET-TYPE SHOCK ABSORBERS

DESIGN PLANNING FOR AIRCRAFT RADIO

Notes on Methods Which Have Proved Successful in Meeting Requirements of Service Conditions Aloft. Part 2—Characteristic Features

BY BURT L. ZIMET*

BEFORE going into the details of aircraft radio equipment design, it may be well to review some of the broader aspects of this subject.

Interestingly enough, while aircraft radio is a distinct department of apparatus design, the standards of methods and practices developed for this application are being drawn upon more and more by designers of ground and marine equipment.

That is, the standards set for airborne equipment are so high and cover such a wide range of operating conditions and requirements that what is good enough to be used aloft is sure to be adequate on the ground and at sea.

At the same time, there are features of distinction between the three applications. For example, most ground equipment is designed for operation from a current source of 115 volts, 60 cycles, and is generally required to give much higher output. An exception is low-power mobile apparatus which is usually operated from 6 volts DC. Shock mounting, a universal requirement for airborne radio, is seldom needed for use on the ground. Space is generally made available for access to all sides, but space limitations on aircraft usually permit access only from the front.

Most marine equipment operates from 110 volts DC, with storage batteries as an emergency power source. Rugged construction is a prime requisite, and weight is not considered a prime factor. Consequently, marine apparatus is generally designed to be tough and rugged enough for years and years of service. Another point of variance is that aircraft communication is principally by voice, while ship-to-shore and ship-to-ship communication is almost entirely by code. Nevertheless, an understanding of aircraft radio design is of great advantage in working on any other type of application.

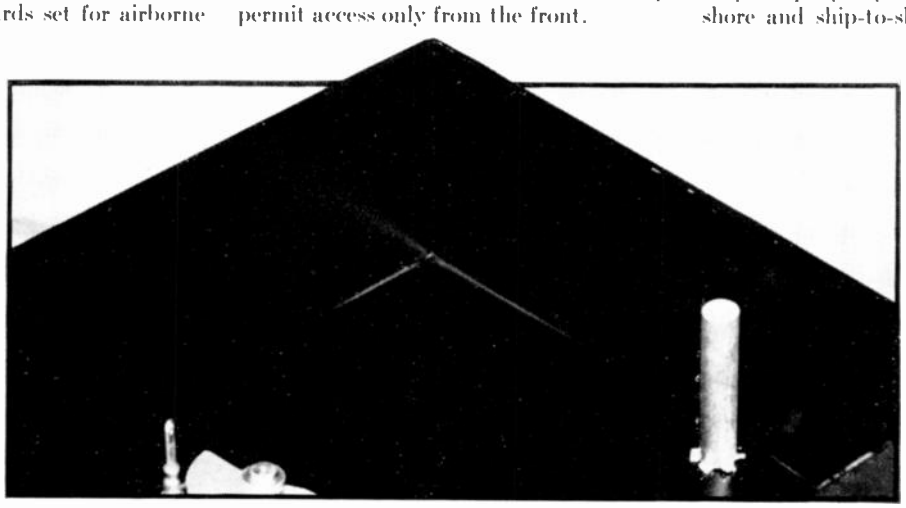
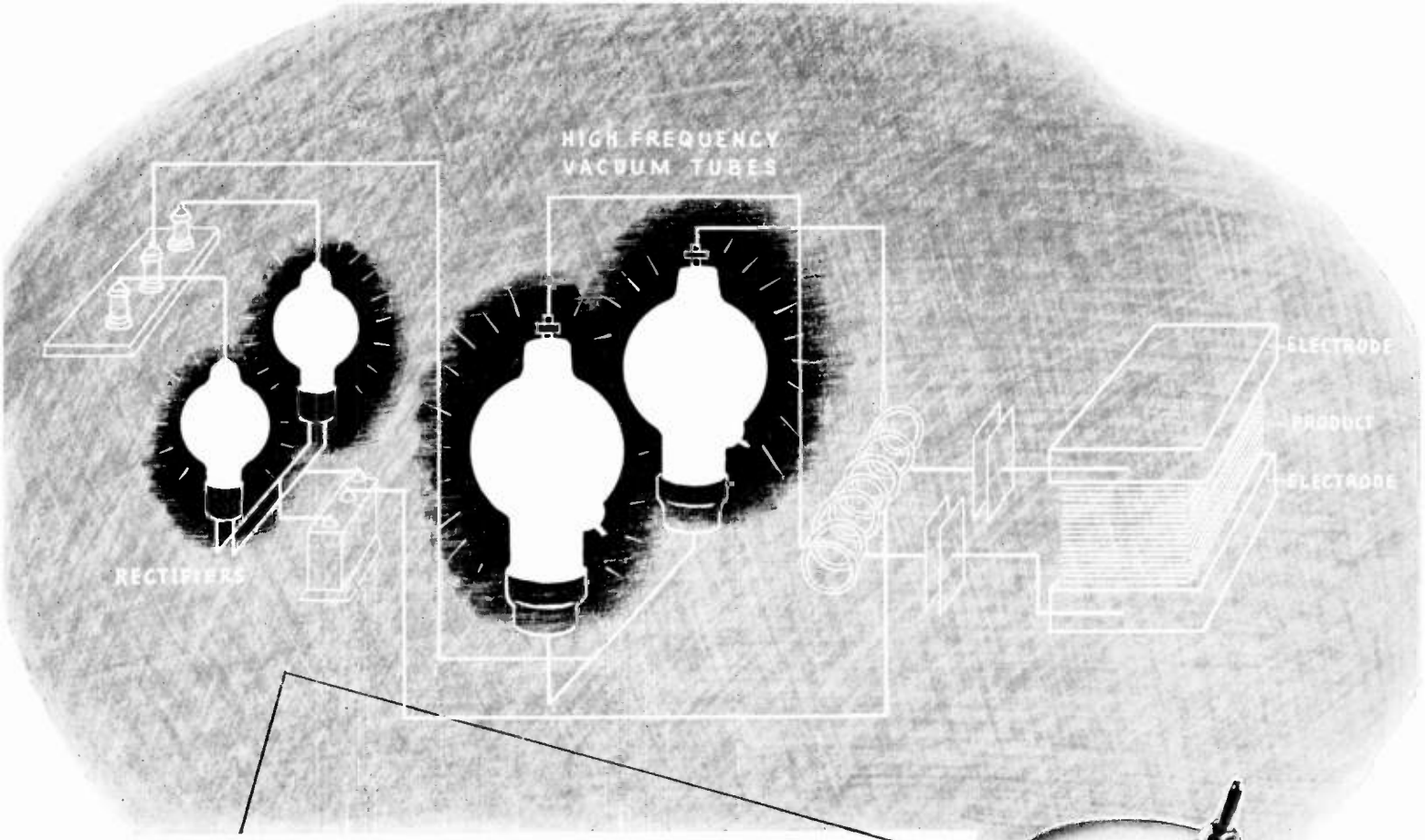


FIG. 2. GAS-WELDED CORNERS ARE GENERALLY REQUIRED FOR AIRCRAFT RADIO CHASSIS. JOINTS MUST BE SMOOTH AND FREE FROM PITTING

Electrical Circuit Design ★ Present restrictions now in force preclude any discussion of current aircraft radio circuit developments. However, there are several important points which can and

*Design Engineer, Freed Radio Corp., 200 Hudson Street, New York City.



ELECTRONIC BRIEFS: Electrostatic Heating

High frequency electrostatic heating is simply the use of electricity to create friction between the molecules of a substance. The generation of heat in non-metallic substances by molecular friction is accomplished by the application of high frequency current, which is converted from a standard power supply. The equipment used employs the basic electronic circuit used in radio transmitters. The output of the power amplifier is connected direct to the material to be heated exactly as the output of a transmitter is connected to antenna and ground. The energy is sufficient to cause the molecules within the material to distort and rub against one another very rapidly. The friction thus caused creates heat within the material.

As with all things in the field of electronics, Electrostatic heating is wholly dependent upon the vacuum tubes employed. Eimac tubes are first choice of the world's leading engineers, first in the key sockets of the important new developments in electronics. You'll get long life, dependability and superior performance with Eimac tubes in the key sockets. Today Eimac tubes are proving their superiority in the most gruelling test — WAR.

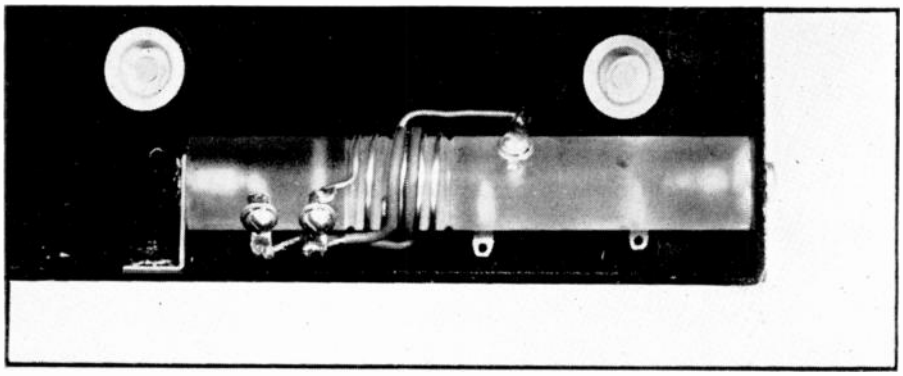


FIG. 3. COUPLING COIL WOUND ON THREADED POLYSTYRENE ROD, NOTE THAT TERMINALS ARE MOUNTED ON COIL FORM. FLEXIBLE LEADS ARE FORBIDDEN

should be emphasized in this paper.

In general, trick circuits should be avoided for all aircraft use. This applies particularly to circuits that are "souped up," because they invariably prove to be unstable, and fail to deliver the required performance over the wide voltage variations encountered in service, or are upset by changes in electrical constants that take place under flight conditions.

As a matter of fact, such equipment is usually eliminated by test-chamber runs before it ever leaves the laboratory. In the end, the familiar circuits win out on the strength of their dependability, stability, and simplicity.

Another point on which designers still run into trouble concerns the use of non-approved tubes. Whatever advantage there may be derived from special tubes, they are out-weighed by the trouble they cause in the field, where they are not available. That is why the limitations on such tubes have been drawn tighter and tighter.

In consequence, equipment designed around special tubes, however effective it may be, is seldom accepted until it has been redesigned to operate with tubes on the approved list. Today, the circuits most highly regarded are those which employ the smallest possible number of different tube types, and the ideal circuit is one in which all tubes are of the same type.

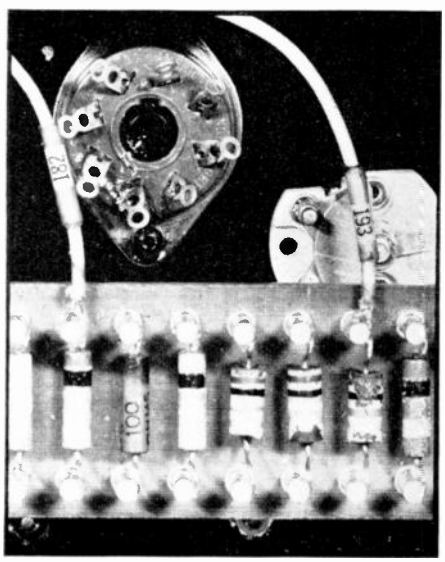


FIG. 5. IDENTIFICATION NUMBERS ON THE LEADS SIMPLIFY SERVICE WORK

Characteristic Features ★ The basis for mechanical design of transmitters and receivers is established by the type of chassis and shock-mounting construction which has been in use for several years for both commercial and military service. Until recently, there were many variations in dimensions and details, but the JRB standards, which have been adopted at last, will prevail in the future. Complete information on these basic standards will be given in Part 3 of this paper.

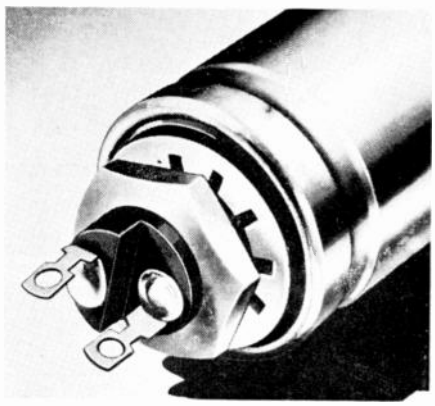


FIG. 4. OIL CONDENSERS ARE FAVORED FOR AIRCRAFT USE. THIS IS A NEW TUBULAR AEROVOX TYPE

Originally, chassis, covers, and other supporting structures were made of aluminum. Later, to conserve aluminum, cold roll steel was largely substituted. More recently, those who have been successful in attaining extremely light-weight construction with steel are inclined to prefer it, partly because of its strength and partly because of the advantages it offers in manufacturing operations.

As a result, there is no hard and fast rule concerning the choice of materials. It has become largely a matter of the designer's personal preference. To some, the extreme precautions required to protect steel from corrosion offset the structural advantages. Others give first consideration to the mechanical advantages of steel. The matter can be summed up in this way: If the weight limitations can be met, steel should be given the preference.

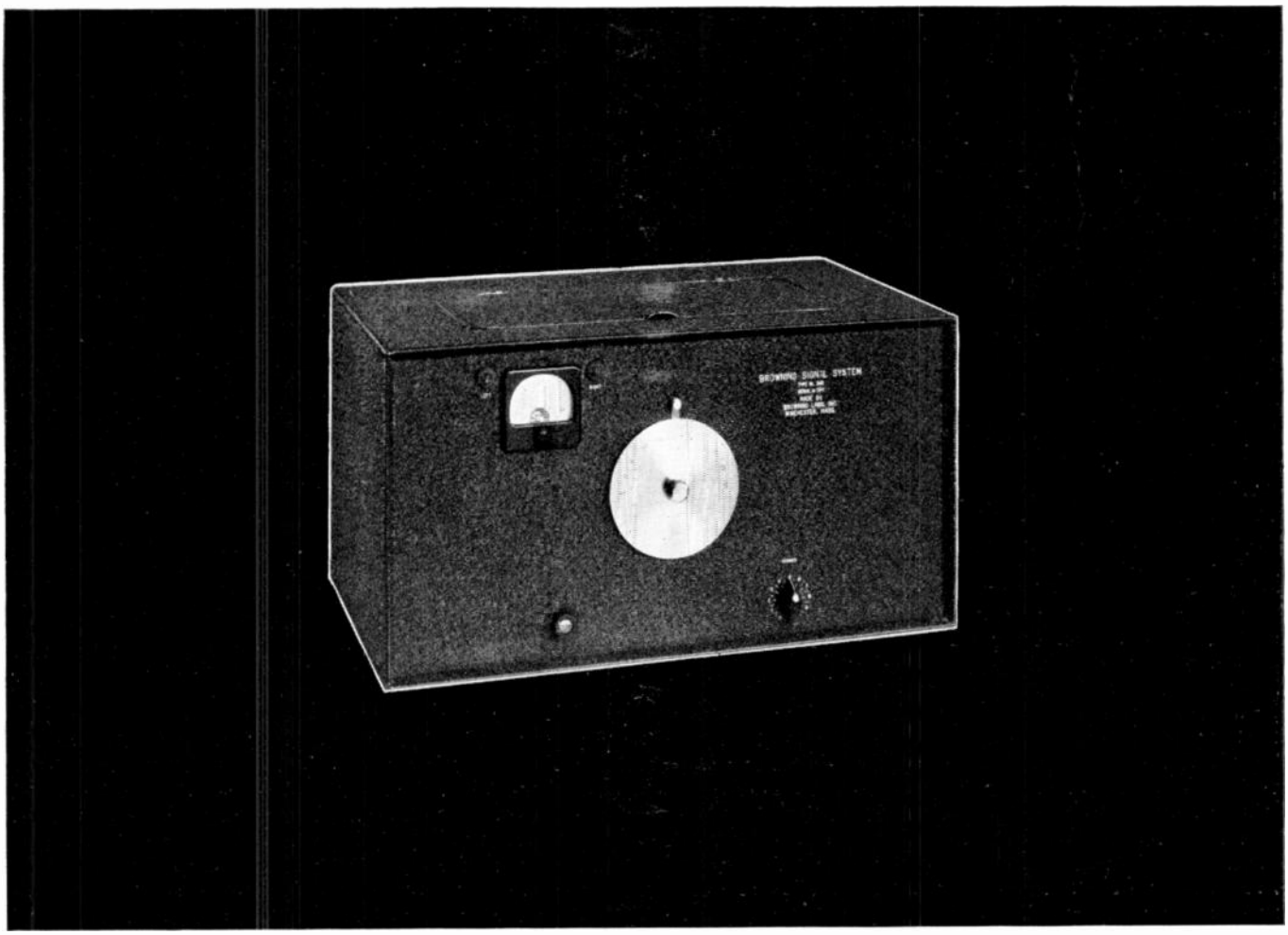
Another controlling design factor is vibration. As shake-table tests show, constant vibration, even of limited amplitude and despite the protection of shock absorbers, can wreak havoc on mechanical construction that would last forever on the ground.

That accounts for many precautions that are taken on aircraft radio apparatus which may seem like going overboard to those whose previous experience has been on ground equipment. For example, there is the application of Glyptol to parts that are held together by screws and nuts. The origination of this practice as it applies to radio is generally credited to Bendix. Their policy, as many subcontractors have learned, is that Glyptol is better used than omitted on mechanical assemblies! Purple Glyptol, rather than clear, is employed so that its use will be self-evident to inspectors.

In this connection, it should be pointed out that the application of thick Glyptol defeats the purpose of using it, because it remains soft, and hence has no binding effect. It must be kept thinned down to the point where it will dry out within 24 hours, and set solidly. This means handling it on the bench in small covered bottles, and daily checking to see that thinner is added, or the entire contents thrown out, if necessary.

Clamping arrangements are required for all tubes. One type in common use is shown in Fig. 1. This is a simple ring with four springs which catch on the tube base. Others, of more complicated design, are used also. In every case some type of clamp must be provided to prevent the tube pins from working out of the sockets under the influence of vibration. The smaller types of tubes are usually held in place by a post carrying a phosphor

FIG. 7. NUMBERS ENGRAVED ON PANEL ARE SHOWN IN INSTRUCTION BOOKS



Picture of an Impenetrable Wall

"Product of Browning Laboratories Research"

THE Browning Signal System employs a small instrument of rugged construction, yet so enormously is its sensitivity multiplied by electronic circuits that it makes the boundary of any property into a continuous "wall" that cannot be approached without giving an alarm and actuating a location indicator!

Public utilities and war plants where the Browning Signal System is in use report that it has greatly decreased the cost and increased the effectiveness of guard protection. Information is available to authorized officials.

BROWNING LABORATORIES, Inc.
751 Main Street Winchester, Mass.

bronze spring which presses down on the top of the tube.

Chassis and supporting structures are gas-welded or spot-welded, both for permanence and rigidity. Fig. 2 shows corner of a finished chassis that was gas-welded so perfectly that it gives the appearance of a solid sheet, without any evidence of the method of joining the sides.

Inspection of welded parts is extremely critical, because poorly welded joints have no strength. This is particularly true of spot-welding. Under actual test, what may appear to be a perfect weld may come apart in the hands.

The use of screws or rivets for securing heavy parts or assemblies must be avoided. They are only acceptable for very light construction. An exception, of course, is made in the case of units or sections which must be made removable. In that case, screw or bolt heads must be drilled and safetied with wires. When rivets are used, it is always wise to put two where, ordinarily, one would be sufficient.

Even on small parts, it is wise to avoid the use of rivets if a substitute construction can be found. The question as to what constitutes an acceptable roll-over on a rivet is still a source of bitter arguments between inspection and production. Some inspectors will not allow any cracks in the roll-over. Others will pass one crack or two. Unfortunately this is a matter that does not lend itself to the establishment of standard practice, and each situation must be decided individually. The only definite answer is that a solid roll-over is stronger than one which is cracked!

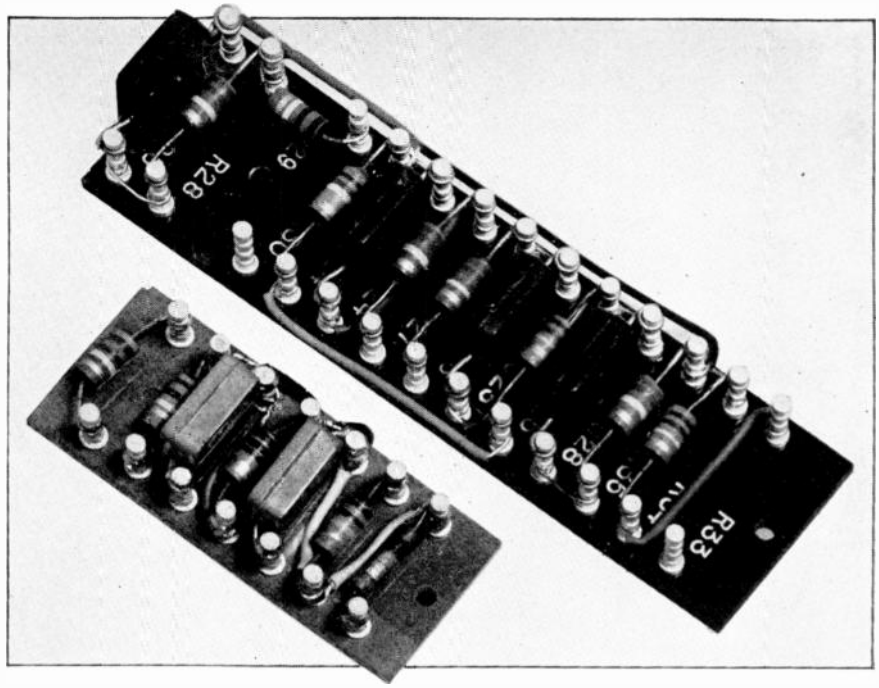


FIG. 8. UPPER BOARD IS CONSIDERED BETTER DESIGN BECAUSE IDENTIFICATION NUMBERS CAN BE SEEN WITHOUT REMOVING COMPONENTS

The simplest way to guard against the effects of vibration is to provide ample support to all components. This is illustrated in the coil mounting shown at Fig. 3. Both ends of the coil form are secured to the chassis. That assures the security of the unit. In addition, the ends of the windings are anchored directly to terminals on the form itself. Then the connecting wires can be anchored to fixed points, and nothing is left free to vibrate.

Extreme compactness required of aircraft radio equipment brings up many problems of accessibility and convenience for servicing. A design may be brilliantly conceived, and still be rejected if it does not take these factors into account.

The features of mechanical design which have been covered broadly in these pages will be taken up in detail in Part 3.

EDITOR'S NOTE: *Part 3 will appear in the August issue.*

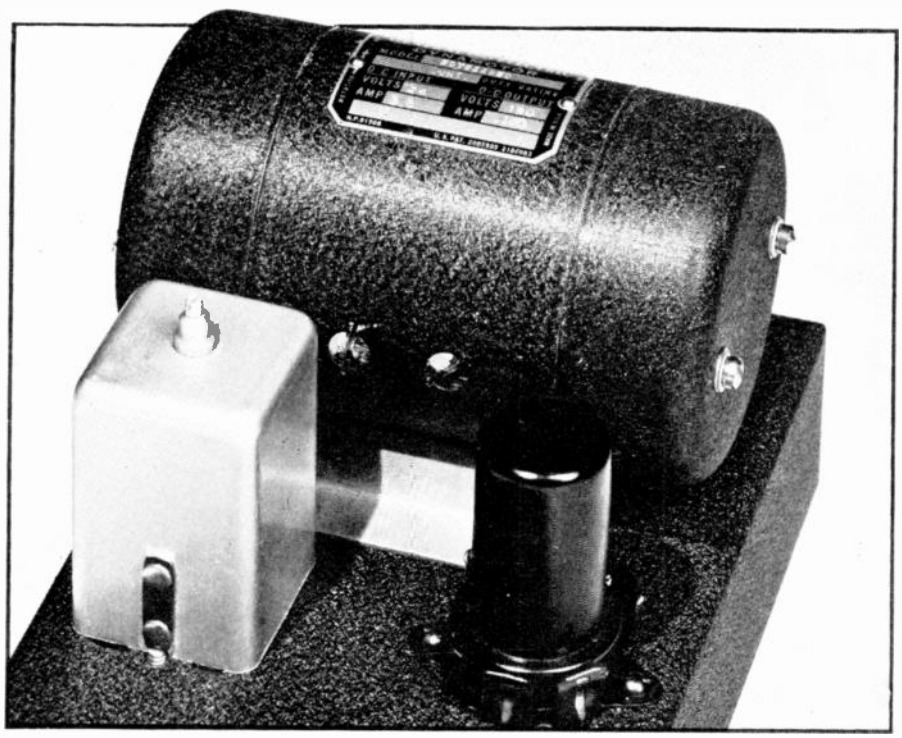


FIG. 9. EXPERIMENTAL CHASSIS SHOWS RELATIVE SIZE OF TYPICAL DYNAMOTOR USED TO SUPPLY B VOLTAGE FOR AIRCRAFT RECEIVER TUBES

THE *Ability* TO GO TO WAR!

In 1929, fourteen years ago, the first JENSEN Auditorium speaker was introduced. The first of its kind, it has during all the succeeding years faithfully served the public and professional need for a heavy duty, high quality loud speaker. We think it is undeniably the world's best known and respected loud speaker product. Now, this fourteen year old JENSEN product goes to war. Naturally it incorporates the refinements and improvements which have been steadily added, but the basic design and function remains the same. Many other JENSEN products are thus endowed with the ability to go straight to war.

Jensen
RADIO MFG. CO.

6601 SOUTH LARAMIE AVENUE
CHICAGO, U. S. A.

RADIO-ELECTRONIC PRODUCTS DIRECTORY

The Radio Engineers' & Purchasing Agents' Guide to Essential Materials, Components, and Equipment

★ Indicates advertiser in this issue of FM Radio-Electronics

ANTENNAS, Mobile Whip & Collapsible

Birnbach Radio Co., 145 Hudson St., N. Y. C.
Brach Mfg. Corp., L. S., Newark, N. J.
Camburn Elec. Co., 484 Broome St., N. Y. C.
Galvin Mfg. Corp., Chicago, Ill.
★ Link, F. M., 125 W. 17th St., N. Y. C.
Premax Products, 4214 Highland Ave., Niagara Falls, N. Y.
★ Radio Eng. Labs., Inc., L. I. City, N. Y.
Snyder Mfg. Co., Noble & Darien Sts., Phila.
Tech. Appl. Co., 516 W. 34 St., N. Y. C.
Ward Products Corp., 1523 E. 45 St., Cleveland, O.

ANTENNAS, Tower Type

Blaw-Knox Co., Pittsburgh, Pa.
Harco Steel Cons. Co., E. Broad St., Elizabeth, N. J.
Lehigh Structural Steel Co., 17 Battery Pl., N. Y. C.
★ Lingo & Son, John E., Camden, N. J.
Truscon Steel Co., Youngstown, O.
Wincharger Corp., Sioux City, Iowa

ATTENUATORS

Cinema Engineering Co., Burbank, Calif.
Daven Co., Summit Ave., Newark, N. J.
General Radio Co., Cambridge, Mass.
International Resistance Co., 429 Broad St., Phila.
Malbry & Co., P. R., Indianapolis, Ind.
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago
Remler Co., Ltd., 2101 Bryant St., San Francisco
Shallcross Mfg. Co., Collingdale, Pa.
Tech Laboratories, Lincoln St., Jersey City, N. J.
★ Utah Radio Prod. Co., 842 Orleans St., Chicago

BEADS, Insulating

Amer. Lava Corp., Chattanooga, Tenn.
Corning Glass Works, Corning, N. Y.
Dunn, Inc., Struthers, 1321 Cherry, Phila., Pa.
Star Porcelain Co., Trenton, N. J.
Steward Mfg. Co., Chattanooga, Tenn.

BINDING POSTS, Plain

Amer. Hdware Co., 476 B'way, N. Y. C.
Radex Corp., 1308 Elston Ave., Chicago

BINDING POSTS, Push Type

Amer. Radio Hdware Co., 476 B'way, N. Y. C.
Eby, Inc., H. H., W. Chelten Ave., Phila.

BOOKS on Radio & Electronics

Macmillan Co., 60 Fifth Ave., N. Y. C.
Maedel Pub. House, 593AE 38 St., Bklyn, N. Y.
McGraw-Hill Book Co., 330 W. 42 St., N. Y. C.
Pitman Pub. Corp., 2 W. 45 St., N. Y. C.
Radio Tech. Pub. Co., 45 Astor Pl., N. Y. C.
Rider, John F., 404 Fourth Ave., N. Y. C.
Ronald Press Co., 15 E. 26 St., N. Y. C.
Van Nostrand Co., D., 250 Fourth Ave., N. Y. C.
★ Wiley & Sons, John, 440 Fourth Ave., N. Y. C.

BRIDGES, Percent Limit Resistance

Leeds & Northrup Co., 4901 Stenton Ave., Phila.
★ Radio City Products Co., 127 W. 26 St., N. Y. C.
Shallcross Mfg. Co., Collingdale, Pa.

BRIDGES, Wheatstone

Industrial Instruments, Inc., Culver Ave., Jersey City, N. J.
Leeds & Northrup Co., 4901 Stenton Ave., Phila.
Shallcross Mfg. Co., Collingdale, Pa.

BUSHINGS, Hermetic Sealing

Corning Glass Works, Corning, N. Y.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

CABLE, Coaxial

American Phenolic Corp., 1830 S. 54 Av., Chicago
Anaconda Wire & Cable Co., 25 B'way, N. Y. C.
Andrew Co., Victor J., 363 E. 75 St., Chicago
Belden Mfg. Co., 4673 W. Van Buren, Chicago
Boston Insulated Wire & Cable Co., Boston
Communications Prods. Co., Jersey City, N. J.
Cornish Wire Co., 15 Park Row, N. Y. C.
★ Doolittle Radio, Inc., 7521 S. Loomis Blvd., Chicago

Additions This Month

5 NEW LISTINGS

28 NEW MANUFACTURERS' NAMES

This Directory is revised every month, so as to assure engineers and purchasing agents of up-to-date information. We shall be pleased to receive suggestions as to company names which should be added, and hard-to-find items which should be listed in this Directory.

General Cable Corp., 420 Lexington, N. Y. C.
General Insulated Wire Corp., 53 Park Pl., N. Y. C.
Johnson Co., E. F., Waseca, Minn.
Radex Corp., 1308 Elston Ave., Chicago
Simplex Wire & Cable Corp., Cambridge, Mass.

CABLE, Coaxial, Solid Dielectric

American Phenolic Corp., 1830 S. 54 Ave., Chicago
Federal Tel. & Radio Corp., E. Newark, N. J.
Simplex Wire & Cable Corp., Cambridge, Mass.

CABLE, Microphone, Speaker & Battery

Alden Prods. Co., Brockton, Mass.
Anaconda Wire & Cable Co., 25 Broadway, N. Y. C.
Belden Mfg. Co., 4633 W. Van Buren, Chicago
Boston Insulated Wire & Cable Co., Dorchester, Mass.
Gavett Mfg. Co., Brookfield, Mass.
Holyoke Wire & Cable Corp., Holyoke, Mass.

CASES, Wooden Instrument

Hoffstatter's Sons, Inc., 43 Ave. & 24 St., Long Island City, N. Y.
Tillotson Furniture Co., Jamestown, N. Y.

CASTINGS, Die

Aluminum Co. of Amer., Pittsburgh, Pa.
American Brass Co., Waterbury, Conn.
Dow Chemical Co., Dow Metal Div., Midland, Mich.

CERAMICS, Bushings, Washers, Special Shapes

Akron Porcelain Co., Akron, O.
Amer. Lava Corp., Chattanooga, Tenn.
Centralab, Div. of Globe-Union Inc., Milwaukee, Wis.
Corning Glass Works, Corning, N. Y.
Electronic Mechanics, Inc., Paterson, N. J.
Gen'l Ceramics & Steatite Corp., Keasbey, N. J.
Isolantite, Inc., Belleville, N. J.
Lapp Insulator Co., Leroy, N. Y.
Louthan Mfg. Co., E. Liverpool, O.
Star Porcelain Co., Trenton, N. J.
Steward Mfg. Co., Chattanooga, Tenn.
Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Victor Insulator Co., Victor, N. Y.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

CHOKES, RF

Aladdin Radio Industries, 501 W. 35th, Chicago
Alden Prods. Co., Brockton, Mass.
American Communications Corp., 306 B'way, N. Y. C.
Barber & Williamson, Upper Darby, Pa.
Coto-Coil Co., Providence, R. I.
D-X Radio Prods. Co., 1575 Milwaukee, Chicago
Gen. Winding Co., 420 W. 45 St., N. Y. C.
Guthman & Co., Edwin, 400 S. Peoria, Chicago
Hammarlund Mfg. Co., 424 W. 33 St., N. Y. C.
Johnson Co., E. F., Waseca, Minn.
Lectrohm, Inc., Cicero, Ill.
★ Meissner Mfg. Co., Mt. Carmel, Ill.
Miller Co., J. W., Los Angeles, Cal.
Muter Co., 1255 S. Michigan, Chicago
★ National Co., Malden, Mass.
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago
Radex Corp., 1328 Elston Av., Chicago
Sickles Co., F. W., Chicopee, Mass.
Teleradio Eng. Corp., 484 Broome St., N. Y. C.
Triumph Mfg. Co., 4017 W. Lake St., Chicago

CLIPS, Connector

Mueller Electric Co., Cleveland, O.

CLIPS & MOUNTINGS, Fuse

Alden Prods. Co., Brockton, Mass.
Dante Elec. Mfg. Co., Bantam, Conn.
Disco Copper Tube & Prods., Inc., Station M., Cincinnati
Jefferson Elec. Co., Bellwood, Ill.
Jones, Howard B., 2300 Wabansia, Chicago
Littlefuse, Inc., 4753 Ravenswood, Chicago
Patton MacGuyer Co., Providence, R. I.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Stewart Stamping Co., 621 E. 216 St., Bronx, N. Y.
Zierick Mfg. Co., 385 Girard Ave., Bronx, N. Y. C.

CLOTH, Insulating

Acme Wire Co., New Haven, Conn.
Brand & Co., Wm., 276-4th Av., N. Y. C.
Endurette Corp. of Amer., Cliffwood, N. J.
Insulation Mfgrs. Corp., 565 W. Wash. Blvd., Chicago
Irvington Varnish & Insulating Co., Irvington, N. J.
Mica Insulator Co., 196 Varick, N. Y. C.

COIL FORMS, Phenolic, Cast without Molds

★ Creative Plastics Corp., 963 Kent Ave., B'klyn, N. Y.

COILS, Radio

See Transformers, IF, RF

CONDENSERS, Fixed

★ Aerovox Corp., New Bedford, Mass.
American Condenser Corp., 2508 S. Michigan, Chicago
Art Radio Corp., 115 Liberty, N. Y. C.
Atlas Condenser Prods. Co., 548 Westchester Ave., N. Y. C.
Automatic Winding Co., E. Newark, N. J.
Bud Radio, Inc., Cleveland, O.
Cardwell Mfg. Corp., Allen D., Brooklyn, N. Y.
Centralab, Milwaukee, Wis.
Condenser Corp. of America, South Plainfield, N. J.
Condenser Prods. Co., 1375 N. Branch, Chicago
Cornell-Dubilier Elec. Corp., S. Plainfield, N. J.
Cosmic Radio Co., 699 E. 135th St., N. Y. C.
Crowley & Co., Henry, W. Orange, N. J.
Deutschmann Corp., Tobe, Canton, Mass.
Dumont Elec. Co., 34 Hubert St., N. Y. C.
Electro-Motive Mfg. Co., Willimantic, Conn.
Erie Resistor Corp., Erie, Pa.
Fast & Co., John E., 3123 N. Crawford, Chicago
General Radio Co., Cambridge, Mass.
Girard-Hopkins, Oakland, Calif.
H. R. S. Prods, 5707 W. Lake St., Chicago
Illinois Cond. Co., 1160 Howe St., Chicago
Industrial Cond. Corp., 1725 W. North Av., Chicago
Insuline Corp. of America, Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Kellogg Switchb'd & Supply Co., 6650 Cicero, Chicago
Magnavox Co., Fort Wayne, Ind.
Mallory & Co., P. R., Indianapolis, Ind.
Micamold Radio Corp., Brooklyn, N. Y.
Muter Co., 1255 S. Michigan, Chicago
Noma Electric Corp., 55 W. 13 St., N. Y. C.
Polymet Condenser Co., 699 E. 139 St., N. Y. C.
Potter Co., 1950 Sheridan Rd., N. Chicago
RCA Mfg. Co., Camden, N. J.
Sangamo Elec. Co., Springfield, Ill.
Sickles Co., F. W., Chicopee, Mass.
Solar Mfg. Corp., Bayonne, N. J.
Sprague Specialties Co., N. Adams, Mass.
Teleradio Engineering Corp., 484 Broome St., N. Y. C.
Westinghouse Elect. & Mfg. Co. E. Pittsburgh, Pa.

CONDENSERS, Gas-filled

Lapp Insulator Co., Inc., Leroy, N. Y.

CONDENSERS, High-Voltage Vacuum

Centralab, Milwaukee, Wis.
★ Eitel-McCullough, Inc., San Bruno, Calif.
Erie Resistor Corp., Erie, Pa.
★ General Electric Co., Schenectady, N. Y.

CONDENSERS, Small Ceramic Tubular

Centralab; Div. of Globe-Union, Inc., Milwaukee, Wis.
Erie Resistor Corp., Erie, Pa.

CONDENSERS, Ceramic Case Mica Transmitting

★ Aerovox Corp., New Bedford, Mass.
Cornell-Dubilier, S. Plainfield, N. J.
RCA Mfg. Co., Inc., Camden, N. J.
Sangamo Electric Co., Springfield, Ill.
Solar Mfg. Corp., Bayonne, N. J.

CONDENSERS, Variable Receiver Tuning

Alden Prods. Co., Brockton, Mass.
American Steel Package Co., Defiance, Ohio
Barker & Williamson, Ardmore, Pa.
Bud Radio, Inc., Cleveland, O.
Cardwell Mfg. Corp., Allen D., Brooklyn, N. Y.
General Instrument Corp., Elizabeth, N. J.
Hammarlund Mfg. Co., 424 W. 34th St., N. Y. C.
Insuline Corp. of Amer., L. I. City, N. Y.
Meissner Mfg. Co., Mt. Carmel, Ill.
★ Millen Mfg. Co., Malden, Mass.
★ National Co., Malden, Mass.
Oak Mfg. Co., 1267 Clybourn Ave. Chicago
Radio Condenser Co., Camden, N. J.
Rauland Corp., Chicago, Ill.

CONDENSERS, Variable Transmitter Tuning

Barker & Williamson, Upper Darby, Pa.
Bud Radio, Cleveland, O.
Cardwell Mfg. Corp., Allen D., Brooklyn, N. Y.
Hammarlund Mfg. Co., 424 W. 33 St., N. Y. C.
Insuline Corp. of Amer., L. I. City, N. Y.
Johnson, E. F., Waseca, Minn.
Millen Mfg. Co., James, Malden, Mass.
★ National Co., Malden, Mass.
Radio Condenser Co., Camden, N. J.

CONDENSERS, Variable Trimmer

Alden Prods Co., Brockton, Mass.
American Steel Package Co., Defiance, O.
Bud Radio, Inc., Cleveland, O.
Cardwell Mfg. Corp., Brooklyn, N. Y.
Centralab, Milwaukee, Wis.
Fada Radio & Elec. Corp., Long Island City, N. Y.
General Radio Co., Cambridge, Mass.
Guthman, Inc., E. I., 400 S. Peoria, Chicago
Hammarlund Mfg. Co., 424 W. 33 St., N. Y. C.
Insuline Corp. of America, Long Island City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Mallory & Co., Inc., P. R., Indianapolis, Ind.
★ Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, Malden, Mass.
Miller Co., J. W., Los Angeles, Cal.
Muter Co., 1255 S. Michigan Av., Chicago
★ National Co., Malden, Mass.
Potter Co., 1950 Sheridan Rd., N. Chicago
Sickles Co., F. W., Chicopee, Mass.
Solar Mfg. Corp., Bayonne, N. J.
Teleradio Eng. Corp., 484 Broome, N. Y. C.

CONNECTORS, Cable

Aero Electric Corp., Los Angeles, Calif.
Airadio, Inc., Stamford, Conn.
Alden Prods., Brockton, Mass.
Amer. Microphone Co., 1915 S. Western Av., Los Angeles
Amer. Phenolic Corp., 1830 S. 54th St., Chicago
American Radio Hardware Co., 476 B'way, N. Y. C.
Andrew, Victor J., 363 E. 75 St., Chicago
Astatic Corp., Youngstown, O.

SPOT NEWS NOTES

(CONTINUED FROM PAGE 18)

Graduated from University of Delaware in 1927, with a degree of B.S. in electrical engineering, he joined the Philco organization in 1933.

FMBI Engineering Committee: New engineering committee members of FM Broadcasters, Inc., are: Chairman John V. L. Hogan of W2XQR and WQXR, New York; Franklin M. Doolittle of W65H and WDRC, Hartford; J. R. Poppele of W71NY and WOR, New York; Walter Evans of Westinghouse Radio Stations, Inc., operating W57PH, W67B, W75P, and W49FW; and O. B. Hanson of National Broadcasting Company, operating W2XWG. Communications should be addressed to the Chairman at 730 Fifth Avenue, New York City.

APCO Convention: To be held August 31st to September 2nd inclusive at Madison, Wis. Inquiries should be addressed to Ray S. Groenier, Conference Chairman, Associated Police Communications Officers, Inc., 14 Webster Street, Madison, Wis.

New England: The Gerber Sales Company, Boston, Mass., has been appointed New England factory representative for Universal Microphone Company, Inglewood, Calif.

Changes in Signal Corps: Major General Harry C. Ingles, who became Chief Signal Officer of the Signal Corps on July 1st, has instituted organizational changes which are already in effect. The Signal Supply Services has been divided into:

1. Procurement and Distribution Service. This is headed by Major General William H. Harrison. Under his direction, Col. Eugene V. Elder will continue to head the Procurement Division, while Col. George I. Beck heads the Distribution Division.

2. Engineering and Technical Service. Major General Roger B. Colton, formerly in charge of Signal Supply Services, has been given direction of all development, research, and maintenance activities in Washington and in the field.

3. Army Communications Service. This is headed by Brig. General Frank E. Stoner.

4, 5. Personnel and Training Service, and Army Pictorial Service. At this time of writing, no information has been received concerning appointments to these two new services.

Warren, Pa.: The fifteenth manufacturing plant of Sylvania Electric Products, Inc., is being set up in a steel and brick structure of 17,600 sq. ft. at Warren, Pa., where production will start in September.

WGRB: General Electric television station at Schenectady has started experimental

(CONTINUED ON PAGE 37)

Atlas Sound Corp., 1442 39th St., Brooklyn, N. Y.
Birnbach Radio, 145 Hudson St., N. Y. C.
Breeze Mfg. Corp., Newark, N. J.
Brush Development Co., Cleveland, O.
Bud Radio, Cleveland, Ohio
Cannon Elec. Development, 3209 Humboldt, Los Angeles
Eby, Inc., Hugh H., Philadelphia
Electro Voice Mfg. Co., South Bend, Indiana
Franklin Mfg. Corp., 175 Varick St., N. Y. C.
General Radio Co., Cambridge, Mass.
Harwood Co., 747 N. Highland Ave., Los Angeles
Insuline Corp. of Amer., L. I. City, N. Y.
Jones, Howard B., 2300 Wabansia, Chicago
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago
Mallory & Co., P. R., Indianapolis, Ind.
Monowatt Electric Co., Providence, R. I.
★ Radio City Products Co., 127 W. 26 St., N. Y. C.
Remler Co., Ltd., 2101 Bryant St., San Francisco
Selectar Mfg. Co., L. I. City, N. Y.
★ Universal Microphone Co., Ltd., Inglewood, Calif.

CONTACT POINTS

Brainin Co., C. S., 233 Spring St., N. Y. C.
Callite Tungsten Corp., Union City, N. J.
Mallory & Co., Inc., P. R., Indianapolis, Ind.

COUPLINGS, flexible

Cardwell Mfg. Corp., Brooklyn, N. Y.
Johnson Co., E. F., Waseca, Minn.
Millen Mfg. Co., James, Malden, Mass.
★ National Co., Inc., Malden, Mass.

CRYSTAL GRINDING EQUIPMENT

Felker Mfg. Co., Torrance, Calif.

CRYSTAL HOLDERS

REC Mfg. Co., Hollston, Mass.

CRYSTALS, Quartz

Bausch & Lomb Optical Co., Rochester, N. Y.
Bliley Elec. Co., Erie, Penna.
Collins Radio Co., Cedar Rapids, Iowa
Crystal Prod. Co., 1519 McGee St., Kansas City, Mo.
Crystal Research Labs., Hartford, Conn.
DX Crystal Co., W. Carroll Ave., Chicago
Electronic Research Corp., 800 W. Washington Blvd., Chicago
Federal Engineering Co., 37 Murray St., N. Y. C.
★ General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Harvey-Wells Communications, Southbridge, Mass.
Higgins Industries, Santa Monica, Calif.
Hipower Crystal Co., 2035 W. Charleston, Chicago
Hunt & Sons, G. C., Carlisle, Pa.
Jefferson, Inc., Ray, Westport, L. I., N. Y.
Kaar Engineering Co., Palo Alto, Cal.
Meck Industries, John, Plymouth, Ind.
Miller, August E., North Bergen, N. J.
Monitor Piezo Prod. Co., S. Pasadena, Calif.
Peterson Radio, Council Bluffs, Iowa
Precision Piezo Service, Baton Rouge, La.
Premier Crystal Labs., 63 Park Row, N. Y. C.
Radell Corp., Guilford Ave., Indianapolis, Ind.
RCA Mfg. Co., Camden, N. J.
Scientific Radio Products Co., Council Bluffs, Ia.
Scientific Radio Service, Hyattsville, Md.
Standard Piezo Co., Carlisle, Pa.
Valpey Crystals, Holliston, Mass.
Zelss, Inc., Carl, 485 Fifth Ave., N. Y. C.

DIALS, Instrument

Crowe Name Plate Co., 3701 Ravenswood Ave., Chicago
General Radio Co., Cambridge, Mass.
Gits Molding Corp., 4600 Huron St., Chicago
Mica Insul. Co., 198 Varick St., N. Y. C.
★ National Co., Inc., Malden, Mass.
Rogan Bros., 2003 S. Michigan Ave., Chicago

DISCS, Recording

Advance Recording Products Co., Long Island City, N. Y.
Allied Recording Products Co., Long Island City, N. Y.
Audio Devices, Inc., 1600 B'way, N. Y. C.
Federal Recorder Co., Elkhart, Ind.
Gould-Moody Co., 395 B'way, N. Y. C.
Presto Recording Corp., 242 W. 55 St., N. Y. C.
RCA Mfg. Co., Camden, N. J.

DYNAMOTORS — See Motor-Generators

ENGRAVING MACHINES

★ Auto-Engraver Co., 1776 B'way, N. Y. C.

ETCHING, Metal

Crowe Name Plate & Mfg. Co., 3701 Ravenswood Ave., Chicago
Etched Prod. Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.

FACSIMILE EQUIPMENT

Alden Products Co., Inc., Brockton, Mass.

FASTENERS, Separable

Camloc Fastener Co., 420 Lexington Ave., N. Y. C.
Shakeproof, Inc., 2501 N. Keeler Ave., Chicago

FELT

Amer. Felt Co., Inc., Glenville, Conn.
Western Felt Works, 4031 Ogden Ave., Chicago

FIBRE, Vulcanized

Brandywine Fibre Prods. Co., Wilmington, Del.
Continental-Diamond Fibre Co., Newark, Del.
Insulation Mfgrs. Corp., 565 W. Wash. Blvd., Chicago
Mica Insulator Co., 196 Varick, N. Y. C.
Nat'l Vulcanized Fibre Co., Wilmington, Del.
Spaulding Fibre Co., Inc., 233 B'way, N. Y. C.
Taylor Fibre Co., Norristown, Pa.
Wilmington Fibre Specialty Co., Wilmington, Del.

FILTERS, Electrical Noise

Avia Products Co., 737 N. Highland Ave., Los Angeles
Com. Equip. & Eng. Co., N. Parkside Ave., Chicago
Freed Radio Corp., 200 Hudson St., N. Y. C.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Tobe Deutschmann Corp., Canton, Mass.

NEW SCHEDULE FOR MONTHLY DIRECTORIES

Effective with the August issue, there will be inaugurated a new plan for the Directories in FM RADIO-ELECTRONICS. The schedule is as follows:

RADIO-ELECTRONIC PRODUCTS
January, March, May, July, September, November

CHIEF ENGINEERS OF BROADCAST STATIONS
February, August

POLICE RADIO COMMUNICATIONS OFFICERS
June, December

CHIEF ENGINEERS OF RADIO MANUFACTURERS
April, October

Under this new schedule, FM RADIO-ELECTRONICS will broaden the usefulness of its Directory pages, and present up-to-date listings, with complete corrections and additions, which are available in no other publication.

FINISHES, Metal

Alrose Chemical Co., Providence, R. I.
Aluminum Co. of America, Pittsburgh, Pa.
Ault & Wiborg Corp., 75 Varick, N. Y. C.
Hilo Varnish Corp., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
New Wrinkle, Inc., Dayton, O.

FREQUENCY METERS

Bendix Radio, Towson, Md.
★ Browning Labs., Inc., Winchester, Mass.
General Radio Co., Cambridge, Mass.
Lavole Laboratories, Long Branch, N. J.
★ Link, F. M., 125 W. 17 St., N. Y. C.
Measurements Corp., Boonton, N. J.

FREQUENCY STANDARDS, Primary

General Radio Co., Cambridge, Mass.

FREQUENCY STANDARDS, Quartz Secondary

Garner Co., Fred E., 43 E. Ohio St., Chicago
Hewlett-Packard Co., Palo Alto, Calif.
Millen Mfg. Co., Inc., Malden, Mass.

FUSES, Enclosed

Dante Elec. Mfg. Co., Bantam, Conn.
Jefferson Elec. Co., Bellwood, Ill.
Littlefuse, Inc., 4753 Ravenswood Av., Chicago

GEARS & PINIONS, Metal

Continental-Diamond Fibre Co., Newark, Del.
Gear Specialties, Inc., 2650 W. Medill, Chicago
Perkins Machine & Gear Co., Springfield, Mass.
Quaker City Gear Wks., Inc., N. Front St., Phila.
Thompson Clock Co., Bristol, Conn.

GEARS & PINIONS, Non-Metallic

Brandywine Fibre Prods. Co., Wilmington, Del.
Formica Insulation Co., Cincinnati, O.
Gear Specialties, Inc., 2650 W. Medill, Chicago
★ General Electric Co., Pittsfield, Mass.
Mica Insulator Co., 196 Varick St., N. Y. C.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., Springfield, Mass.
Richardson Co., Melrose Park, Ill.
Spaulding Fibre Co., Inc., 233 B'way, N. Y. C.
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Wilmington Fibre Specialty Co., Wilmington, Del.

GENERATORS, Gas Engine Driven

Hunter-Hartman Corp., St. Louis, Mo.
Kato Engineering Co., Mankato, Minn.
Onan & Sons, Royalston Ave., Minneapolis, Minn.
★ Pioneer Gen-E-Motor, 5841 W. Dickens Ave., Chicago, Ill.

GENERATORS, Hand Driven

Burke Electric Co., Erie, Pa.
Carter Motor Co., 1608 Milwaukee, Chicago
Chicago Tel. Supply Co., Elkart, Ind.

GENERATORS, Standard Signal

Boonton Radio Corp., Boonton, N. J.
Ferris Instrument Co., Boonton, N. J.
General Radio Co., Cambridge, Mass.
Hewlett-Packard Co., Palo Alto, Calif.
Measurements Corp., Boonton, N. J.

GENERATORS, Wind-Driven, Aircraft

General Armature Corp., Lock Haven, Pa.

GLASS, Electrical

Corning Glass Works, Corning, N. Y.

GREASE, for Electrical Contacts & Bearings

Royal Engineering Co. (Royco Grease), East Hanover, N. J.

HEADPHONES

Brush Development Co., Cleveland, O.
Conn. Tel. & Electric Co., Meriden, Conn.
Cannon Co., C. F., Springwater, N. Y.
Carron Mfg. Co., 415 S. Aberdeen, Chicago
Connecticut Tel. & Elec. Co., Meriden, Conn.
Consolidated Radio Prod. Co., W. Erie St., Chicago
Elec. Ind. Mfg. Co., Red Bank, N. J.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago
Murdock Mfg. Co., Chelsea, Mass.
Permoflux Corp., W. Grand Ave., Chicago
Telephonics Corp., 350 W. 31 St., N. Y. C.
Trimm Radio Mfg. Co., 1770 W. Berteau, Chicago
★ Universal Microphone Co., Inglewood, Cal.
★ Utah Radio Prod. Co., 842 Orleans St., Chicago

HORNS, Outdoor

Graybar Elect. Co., Lexington Ave. at 43 St., N. Y. C.
★ Jensen Radio Mfg. Co., 6601 S. Laramie Ave., Chicago
Operadio Mfg. Co., St. Charles, Ill.
Oxford Tartak Radio Corp., 915 W. Van Buren St., Chicago
Racon Electric Co., 52 E. 19 St., N. Y. C.
RCA Mfg. Co., Camden, N. J.
★ University Laboratories, 225 Varick St., N. Y. C.

INDUCTION HEATING EQUIPMENT

Induction Heating Corp., 389 Lafayette St., N. Y. C.
Lepel High Frequency Labs., 39 W. 60 St., N. Y. C.

INDUCTORS, Variable Tuning

Barker & Williamson, Upper Darby, Pa.

INSTRUMENTS, Radio Laboratory

Ballantine Laboratories, Inc., Boonton, N. J.
General Radio Co., Cambridge, Mass.
Hewlett Packard Co., Palo Alto, Calif.
Measurements Corp., Boonton, N. J.

INSULATORS, Ceramic Stand-off, Lead-in, Rod Types

America Lava Corp., Chattanooga, Tenn.
Corning Glass Works, Corning, N. Y.
Electronic Mechanics, Inc., Clifton, N. J.
Isolantite, Inc., Belleville, N. S.
Johnson Co., E. F., Waseca, Minn.
Lapp Insulator Co., Inc., Leroy, N. Y.
Locke Insulator Co., Baltimore, Md.
Millen Mfg. Co., Malden, Mass.
★ National Co., Inc., Malden, Mass.

IRON CORES, Powdered

Aladdin Radio Industries, Inc., 501 W. 35 St., Chicago
Crowley & Co., Henry, W. Orange, N. J.
Ferrocart Corp. of Amer., Hastings-on-Hudson, N. Y.
Genl. Aniline Wks., 435 Hudson St., N. Y. C.
Gibson Elec. Co., Pittsburgh, Pa.
Mallory & Co., P. R., Indianapolis, Ind.
Pyroferric Co., 175 Varick St., N. Y. C.
Stackpole Carbon Co., St. Marys, Pa.
Western Electric Co., 195 Broadway, N. Y. C.
Wilson Co., H. A., Newark, N. J.

IRONS, Soldering

Acme Electric Heating Co., 1217 Washington St., Boston
Amer. Electrical Heater Co., 6110 Cass Ave., Detroit
Drake Elec. Wks., Inc., 3656 Lincoln Ave., Chicago
★ Electric Soldering Iron Co., Deep River, Conn.
★ General Electric Co., Schenectady, N. Y.
Hexacon Elec. Co., Roselle Park, N. J.
Vaseo Electrical Mfg. Co., 4116 Avalon Blvd., Los Angeles
Vulcan Electric Co., Lynn, Mass.

JACKS, Telephone

Alden Prods. Co., Brockton, Mass.
Amer. Molded Prods. Co., 1753 N. Honore St., Chicago
★ Chicago Tel. Supply Co., Elkhart, Ind.
Guardian Elec. Mfg. Co., 1627 W. Walnut St., Chicago
Insuline Corp. of Amer., L. I. C., N. Y.
Johnson, E. F., Waseca, Minn.
Jones, Howard B., 2300 Wabansia Ave., Chicago
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Mangold Radio Pts. & Stamping Co., 6300 Shelbourne St., Philadelphia
Molded Insulation Co., Germantown, Pa.
★ Universal Microphone Co., Inglewood, Calif.
★ Utah Radio Prod. Co., Orleans St., Chicago

KEYS, Telegraph

Amer. Radio Hardware Co., Inc., 476 Broadway, N. Y. C.
Bunnell & Co., J. H., 215 Fulton St., N. Y. C.
Massman, Inc., Donald P., 6133 N. Northwest Hy., Chicago
Remler Co., Ltd., 2101 Bryant St., San Francisco
Signal Electric Mfg. Co., Menominee, Mich.
Telephonics Corp., 350 W. 31 St., N. Y. C.
Winslow Co., Inc., Liberty St., Newark, N. J.

KNOBS, Radio & Instrument

Alden Prods. Co., Brockton, Mass.
American Insulator Corp., New Freedom, Pa.
Chicago Molded Prods. Corp., 1025 N. Kolmar, Chicago
General Radio Co., Cambridge, Mass.
Gits Molding Corp., 4600 Huron St., Chicago
Imperial Molded Prods. Corp., 2921 W. Harrison, Chicago
Kurtz Kasch, Inc., Dayton, O.
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Millen Mfg. Co., James, Malden, Mass.
★ Nat'l Co., Inc., Malden, Mass.
★ Radio City Products Co., 127 W. 26 St., N. Y. C.
Rogan Bros., 2001 S. Michigan, Chicago

SPOT NEWS NOTES

(CONTINUED FROM PAGE 35)

commercial broadcasts. BBD&O, as advertising agency, will handle the programs for their clients B. F. Goodrich Rubber Company, Lever Bros., and Hamilton Watch. Purpose is to develop both the entertainment and advertising techniques of television.

New Trademark: North American Philips Company, Inc., will use the trademark *NORELCO* on their cathode ray, transmitter, rectifier, and amplifier tubes, quartz oscillator plates, fine, bare, plated, and enameled wire of various metals, diamond dies, direct-reading frequency meters, and quartz crystal analysis equipment. All these items are products of their plant at Dobbs Ferry, N. Y.

Chicago: Request for reinstatement of FM application has been filed by Chicago Federation of Labor, for a station to operate on 47.9 mc.

New Cleveland Station: WJW, 5 kw Blue Network outlet, transferred from Akron, will go on the air August 29th. One of the few stations opened since Pearl Harbor, it is owned by the son of William F. O'Neil, head of General Tire & Rubber Company, recent purchasers of New England's Yankee Network.

Los Angeles: Controlling interest in The Phonette Company of America, Los Angeles radio plant, has been acquired by Aircraft Accessories Corporation, according to president Randolph C. Walker. Phonette will be operated as a subsidiary by Aircraft Accessories' Electronics Division, under which nine plants in Kansas City, Kansas, and four in Slater, Mo., are now producing transmitters and other aircraft radio equipment. W. S. Farrell is president of Phonette.

New FMBI Members: There are now 55 members of FM Broadcasters, Inc. This organization is growing steadily, and will be a most important influence in peacetime broadcasting. The latest additions to the membership are:

American Broadcasting Corp. of Kentucky, Lexington, Ky., operators of WLAP.

Ashland Broadcasting Company, Ashland, Ky., operators of WCMI.

Courier Journal and Louisville Times, Louisville, Ky., operators of WHAS.

Earle C. Anthony, Inc., Los Angeles, Calif., operators of KFI-KECA.

Evening Star Broadcasting Company, Washington, D. C., operators of WMAL.

Greater New York Broadcasting Corp., operators of WNEW.

Portland Broadcasting System, Inc., Portland, Me., operators of WGAN.

(CONTINUED ON PAGE 39)

CONDENSERS —
Electrolytic
Mica
Oil
Variable
HARRISON has 257,980

RESISTORS —
Carbon
Wire-wound
Rheostats
Controls
HARRISON has 52,390

TRANSFORMERS —
Audio
Power
Reactors
HARRISON has 2,810

TUBES —
Industrial
Receiving
Transmitting
HARRISON has 29,470

OTHER ELECTRONIC SUPPLIES —
HARRISON HAS PLENTY

For Immediate Delivery!

Our complete stock, speedy service, procurement experience, and technical knowledge make us the logical source for ALL your Electronic Parts and Equipment requirements.

Give us your orders—large and small. We can "deliver the goods"—sooner!

FREE! 800-PAGE BUYER'S GUIDE
Kindly write on Company letterhead, giving title

Phone WOrth 2-6276

ESTABLISHED 1925

Authorized Distributors for All Leading Manufacturers

HARRISON
RADIO CORPORATION
12 WEST BROADWAY NEW YORK 7

LABELS, Removable
Avery Adhesives, 451 3rd St., Los Angeles

LABELS, Stick-to-Metal
Ever Ready Label Corp., E. 25th St., N. Y. C.
Tablet & Ticket Co., 1021 W. Adams St., Chicago

LABORATORIES, Electronic
★ Browning Labs., Inc., Winchester, Mass.
Hazeltine Electronics Corp., 1775 B'way, N. Y. C.
Sherron Metallic Corp., Flushing Ave., Brooklyn, N. Y.
Worner Prod. Corp., 1019 W. Lake St., Chicago

LOCKWASHERS, Spring Type
Natl. Lock Washer Co., Newark, N. J.

LUGS, Soldering
Burndy Engineering Co., 459 E. 133rd St., N. Y. C.
Cinch Mfg. Corp., W. Van Buren St., Chicago
Dante Elec. Mfg. Co., Bantam, Conn.
Ideal Commutator Dresser Co., Sycamore, Ill.
Ilsco Copper Tube & Prods., Inc., Station M, Cincinnati
Krueger & Hudepohl, Third & Vine, Cincinnati, O.
Patton-MacGuyer Co., 17 Virginia Av., Providence, R. I.
Sherman Mfg. Co., Battle Creek, Mich.
Thomas & Betts Co., Elizabeth, N. J.
Zierick Mfg. Co., 385 Girard Ave., Bronx, N. Y. C.

LUGS, Solderless
Aircraft Marine Prod., Inc., Elizabeth, N. J.
Burndy Eng. Co., 107 Eastern Blvd., N. Y. C.

MACHINES, Impregnating
Stokes Machine Co., F. J., Phila., Pa.

MACHINES, Screwdriving
Detroit Power Screwdriver Co., Detroit, Mich.
Stanley Tool Div. of the Stanley Works, New Britain, Conn.

MAGNETS, Permanent
★ General Elec. Co., Schenectady, N. Y.
Thomas & Skinner Steel Prod. Co., Indianapolis, Ind.

MAIL ORDER SUPPLY HOUSES
Allied Radio Corp., 901 W. Jackson Blvd., Chicago
★ Burstein-Applebee Co., Kansas City, Mo.
★ Harrison Radio Corp., 12 W. B'way, N. Y. C.
★ Lafayette Radio Corp., 901 W. Jackson Blvd., Chicago
Sun Radio Co., 212 Fulton St., N. Y. C.

MARKERS, Wire Identification
Brand & Co., Wm., 276 4th Ave., N. Y. C.
Irvington Varnish & Ins. Co., Irvington, N. J.
Minn. Mining Co., 155 Sixth Ave., N. Y. C.
Ntl. Varnished Prod. Corp., Woodbridge, N. J.

METAL, Thermostatic
Baker & Co., 113 Astor, Newark, N. J.
C. S. Brainin Co., 20 VanDam, N. Y. C.
Callite Tungsten Corp., Union City, N. J.
Chace Co., W. M., Detroit, Mich.
Metals & Controls Corp., Attleboro, Mass.
Wilson Co., H. A., 105 Chestnut, Newark, N. J.

METERS, Ammeters, Voltmeters, Small Panel
Cambridge Inst. Co., Grand Central Terminal, N. Y. C.
De Jur-Amsco Corp., Shelton, Conn.
★ General Electric Co., Bridgeport, Conn.
Hickok Elec. Inst. Co., Cleveland, O.
Hoyt Elec. Inst. Works, Boston, Mass.
Readrite Meter Works, Bluffton, O.
Roller-Smith Co., Bethlehem, Pa.
★ Simpson Elec. Co., 5218 W. Kinzie, Chicago
★ Triplett Elec. Inst. Co., Bluffton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Weston Elec. Inst. Corp., Newark, N. J.
Wheelco Inst. Co., 847 W. Harrison St., Chicago

METERS, Q
Boonton Radio Corp., Boonton, N. J.

METERS, Vacuum Tube Volt
Ballantine Laboratories, Inc., Boonton, N. J.
Ferris Instrument Corp., Boonton, N. J.
General Radio Co., Cambridge, Mass.
Hewlett-Packard Co., Palo Alto, Calif.
Measurements Corp., Boonton, N. J.
★ Radio City Products Co., 127 W. 26 St., N. Y. C.

METERS, Vibrating Reed
Biddle, James G., 1211 Arch St., Phila.
★ Triplett Elec. Inst. Co., Bluffton, O.

MICA
Brand & Co., Wm., 276 Fourth Av., N. Y. C.
Insulation Mfgrs. Corp., 565 W. Wash. Blvd., Chicago
Macallen Co., Boston, Mass.
Mica Insulator Corp., 196 Varick, N. Y. C.
New England Mica Co., Waltham, Mass.
Richardson Co., Melrose Park, Ill.

MICROPHONES
Amer. Microphone Co., 1015 Western Av., Los Angeles
Amperite Co., 561 B'way, N. Y. C.
Astatic Corp., Youngstown, O.
Brush Development Co., Cleveland, O.
Electro Voice Mfg. Co., South Bend, Ind.
Kellogg Switchboard & Supply Co., 6650 S. Cicero, Chicago
Radio Speakers, Inc., 221 E. Cullerton, Chicago
Philmore Mfg. Co., 113 University Pl., N. Y. C.
Permoflux Corp., 4916 W. Grand Av., Chicago
Rowe Industries, Inc., Toledo, O.
Shure Bros., 225 W. Huron St., Chicago
Telephonics Corp., 350 W. 31 St., N. Y. C.
Turner Co., Cedar Rapids, Ia.
★ Universal Microphone Co., Inglewood, Cal.

MONITORS, Frequency
★ General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
RCA Mfg. Co., Camden, N. J.

MOTOR-GENERATORS, Dynamotors, Rotary Converters
Alliance Mfg. Co., Alliance, O.
Air-Way Mfg. Co., Toledo, O.
Bendix, Red Bank, N. J.
Black & Decker Mfg. Co., Towson, Md.
Bodine Elec. Co., 2262 W. Ohio, Chicago
Carter Motor Co., 1608 Milwaukee, Chicago
Clements Mfg. Co., Chicago, Ill.
Continental Electric Co., Newark, N. J.
Delco Appliance, Rochester, N. Y.
Diehl Mfg. Co., Elizabethport, N. J.
Dormeyer Co., Chicago, Ill.
Eclipse Aviation, Bendix, N. J.
★ Elcor, Inc., 1060 W. Adams, Chicago
Electric Motors Corp., Racine, Wis.
Electric Specialty Co., Stamford, Conn.
Electrolux Corp., Old Greenwich, Conn.
Eureka Vacuum Cleaner, Detroit, Mich.
General Armature Corp., Lock Haven, Pa.
★ General Electric Co., Schenectady, N. Y.
Jannette Mfg. Co., 558 W. Monroe, Chicago
Knapp-Monarch, St. Louis, Mo.
Leland Electric Co., Dayton, O.
Ohio Electric Co., 74 Trinity Pl., N. Y. C.
★ Pioneer Gen-E-Motor, 5841 W. Dickens Av., Chicago
Redmond Co., A. G., Owosso, Mich.
Russell Co., Chicago, Ill.
Small Motors, Inc., 1308 Elston Ave., Chicago
Webster Co., Chicago, Ill.
Westinghouse Elect. Mfg. Co., Lima, O.
Wincharger Corp., Sioux City, Iowa

MOTORS, Very Small Types
★ Utah Radio Prod. Co., 842 Orleans St., Chicago

MOUNTINGS, Shock Absorbing
Lord Mfg. Co., Erie, Pa.
Pierce-Roberts Co., Trenton, N. J.
U. S. Rubber Co., 1230–6th Ave., N. Y. C.

MYCALEX
★ General Electric Co., Schenectady, N. Y.
Mycalex Corp. of Amer., Clifton, N. J.

NICKEL, Sheet, Rod, Tubes
Eagle Metals Co., Seattle, Wash.
Pacific Metals Co., Ltd., San Francisco, Calif.
Steel Sales Corp., 129 S. Jefferson St., Chicago
Tull Metal & Supply Co., J. M., Atlanta, Ga.
Whitehead Metal Prod. Co., 303 W. 10th St., N. Y. C.
Williams and Co., Inc., Pittsburgh, Pa.

NUTS, Self-locking
Boots Aircraft Nut Corp., New Canaan, Conn.
Elastic Stop Nut Corp., Union, N. J.
Palnut Co., Inc., Irvington, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

OSCILLOSCOPES, Cathode Ray
Du Mont Laboratories, Inc., Allen B., Passaic, N. J.
★ General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Millen Mfg. Co., Malden, Mass.
RCA Mfg. Co., Inc., Camden, N. J.
★ Radio City Products Co., Inc., 127 W. 26 St., N. Y. C.

OVENS, Industrial & Laboratory
★ General Elec. Co., Schenectady, N. Y.
Trent Co., Harold E., Philadelphia

PANELS, Metal Etched
(See Etching, Metal)

SPOT NEWS NOTES

(CONTINUED FROM PAGE 37)

Radio Service Corporation of Utah, Salt Lake City, Utah, operators of KSL.
St. Louis Post-Dispatch, St. Louis, Mo., operators of KSD.
United Broadcasting Company, Cleveland, O., operators of WHK-WCLE.
WJR, The Goodwill Station, Detroit, Mich.

Four of these companies already hold FM construction permits, issued prior to the freeze order. They are: W51L, Lexington; W47SL, Salt Lake City; W53D, Detroit; K37LA, Los Angeles. The others have FM applications on file with the FCC.

Cow-catchers and Hitch-hikers: These names were given to spot announcements and 5-minute commercials, in a resolution condemning their use, passed by the NAB Sales Managers Executive Committee. Such resolutions have been passed before, but they seem to be forgotten as soon as a sponsor offers to sign a contract.

A-N Plugs and Jacks: A new catalog listing standard A-N type plugs and jacks has been issued by Universal Microphone Company, Ingelwood, Calif. Also listed are prongs, cord clamps, jack inserts, and shells for both plugs and jacks.

Radar: Byron Price, director of the Office of Censorship, has asked editors not to publish articles and advertisements which relate to radar, explaining that "So inclusive a request would not be made if the highest considerations of national security were not directly involved."

This is certainly a sufficient reason for any publication to carry out Mr. Price's instructions to the letter.

There is another reason, a matter of engineering ethics, for putting an end to the use of articles and photographs which purport to convey information which they do not actually contain.

For example, illustrations of pre-Pearl Harbor military equipment are being published with the implication that they show apparatus in use today. To engineers engaged in military work, such half truths and deceptions are obvious. But why take advantage of the high school boys and lay readers who are led to believe that they are looking at pictures of the very latest equipment in use by our Armed Forces?

The same thing is true of radar. Since the real information can't be published, it seems better to leave the subject alone, instead of trying to give information in such a way that no information will be given at all!

Atlanta: The Constitution Publishing Company of Atlanta, Ga., has filed a request for reinstatement of its application for an FM transmitter to be operated on 45.3 mc.

Off the Beam: It is difficult to see how any immediate settlement of the pressing matter of postwar frequency allocations can be reached, or even any constructive efforts initiated, unless the FCC members can conduct the work of their office in such a way that there will be no further need for the investigations and hearings which keep them away from the work they were appointed to do. Instead of technical discussions we are led to believe that the FCC is mostly devoting itself to matters concerning pro-fascism, Wall Street, star chamber tactics, dereliction, and grave abuses. What about public interest, convenience, and necessity?

FM Station Call Letters: FM Broadcasters, Inc., has filed a formal petition with the FCC asking that the special FM station call letter system be replaced with conventional calls such as are used by AM stations. It is claimed that the combinations of letters and numbers, indicating the frequency and the location of the transmitter, have not met with public acceptance. Even more serious is the fact that a change of a station's frequency would mean new call letters, and the assignment of the old call to a new organization would carry the good will already associated with the station call.

(CONTINUED ON PAGE 41)

PANELS, Phenolic, Cast without Molds

★ Creative Plastics Corp., 963 Kent Ave., B'klyn, N. Y.

PILOT LIGHTS

Alden Prods. Co., Brockton, Mass.
Amer. Radio Hardware Co., Inc., 467 B'way, N. Y. C.
Dial Light Co. of Amer., 90 West, N. Y. C.
Drake Mfg. Co., 1713 W. Hubbard, Chicago
General Control Co., Cambridge, Mass.
★ General Elec. Co., Lamp Dept., Nela Specialty Div., Hoboken, N. J.
Gothard Mfg. Co., Springfield, Ill.
Herzog Miniature Lamp Works, 12–19 Jackson Av., Long Island City, N.Y.C.
Kirkland Co., H. R., Morristown, N. J.
Mallory & Co., P. R., Indianapolis, Ind.
Signal Indicator Corp., 140 Cedar St., N. Y. C.

PHOSPHOR BRONZE

American Brass Co., Waterbury, Conn.
Bunting Brass & Bronze Co., Toledo, O.
Driver-Harris Co., Harrison, N. J.
Phosphor Bronze Smelting Co., Philadelphia
Revere Copper & Brass, 230 Park Av., N. Y. C.
Seymour Mfg. Co., Seymour, Conn.

PLASTICS, Cast without Molds

★ Creative Plastics Corp., 963 Kent Ave., B'klyn, N. Y.

PLASTICS, Extruded

Blum & Co., Inc., Julius, 532 W. 22 St., N. Y. C.
Brand & Co., Wm., 276 4th Ave., N.Y.C.
Extruded Plastics, Inc., Norwalk, Conn.
Industrial Synthetic Corp., Irvington, N. J.
Irvington Varnish & Insulator Co., Irvington, N. J.

PLASTIC SHEET, for Name Plates

Mica Insulator Co., 200 Varick St., N. Y. C.

PLASTICS, Injection Molded

Remler Co., Ltd., 2101 Bryant St., San Francisco
Tech-Art Plastics, 41-01 36th Ave., Long Island City, N. Y.
Universal Plastics Corp., New Brunswick, N. J.

PLASTICS, Laminated or Molded

Acadia Synthetic Prods., 4031 Ogden Av., Chicago
Alden Prods. Co., Brockton, Mass.
American Cyanamid Co., 30 Rockefeller Plaza, N. Y. C.
American Insulator Corp., New Freedom, Pa.
American Molded Prods. Co., 1753 N. Honore, Chicago
Auburn Button Works, Auburn, N. Y.
Barber-Colman Co., Rockford, Ill.
Brandywine Fibre Prods. Co., Wilmington, Del.
Catalin Corp., 1 Park Av., N. Y. C.
Celanese Celluloid Corp., 180 Madison Av., N. Y. C.
Chicago Molded Prods. Corp., 1024 N. Kolmar, Chicago
Continental-Diamond Fibre Co., Newark, Del.
★ Creative Plastics Corp., 963 Kent Ave., B'klyn, N. Y.
Dow Chemical Co., Midland, Mich.
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.
Extruded Plastics, Inc., Norwalk, Conn.
Formica Insulation Co., Cincinnati, O.
★ General Electric Co., Plastics Dept., Pittsfield, Mass.
General Industries Co., Elyria, O.
Gits Molding Corp., 4600 Huron St., Chicago
Imperial Molded Prods. Co., 2921 W. Harrison, Chicago
Industrial Molded Prods. Co., 2035 Charleston, Chicago
Kurz-Kasch, Inc., Dayton, O.
Macallen Co., Boston, Mass.
Mica Insulator Co., 196 Varick, N. Y. C.
Monsanto Chemical Co., Springfield, Mass.
National Vulcanized Fibre Co., Wilmington, Del.
Northern Industrial Chemical Co., Boston, Mass.
Printloid Corp., 93 Mercer St., N. Y. C.
★ Radio City Products Co., 127 W. 26 St., N. Y. C.
Remler Co., Ltd., 2101 Bryant St., San Francisco
Richardson Co., Melrose Park, Ill.
Rogan Bros., 2000 S. Michigan Ave., Chicago
Rohm & Haas Co., Philadelphia
Spaulding Fibre Co., Inc., 233 B'way, N. Y. C.
Stokes Rubber Co., Joseph, Trenton, N. J.
Surprenant Elec. Ins. Co., Boston
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wilmington Fibre Specialty Co., Wilmington, Del.

PLASTICS, Materials

Bakelite Corp., 30 E. 42 St., N. Y. C.
Carbide & Carbon Chemicals Corp., 30 E. 42 St., N. Y. C.

PLASTICS, Transparent

Carbide & Carbon Chemicals Corp., 30 E. 42 St., N. Y. C.
Celanese Celluloid Corp., 180 Madison Ave., N. Y. C.
du Pont de Nemours & Co., E. I., Arlington, N. J.
Plax Corp., Hartford, Conn.
Printloid Corp., 93 Mercer St., N. Y. C.
Rohm & Haas Co., Washington Sq., Philadelphia

PLATING, Metal on Molded Parts

Metaplast Corp., 205 W. 19 St., N. Y. C.

PLUGS (Banana), Spring Type

Amer. Radio H'dw're Co., 476 B'way, N. Y. C.
Birnbach Radio Co., 145 Hudson St., N. Y. C.
Eastman Kodak Co., Rochester, N. Y.
Eby, Inc., Hugh H., Philadelphia, Pa.
Franklin Mfg. Corp., 175 Varick St., N. Y. C.
General Radio Co., Cambridge, Mass.
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Ucinite Co., Newtonville, Mass.

PLUGS, Telephone Type

Alden Prods. Co., Brockton, Mass.
American Molded Prods. Co., 1753 N. Honore, Chicago
★ Chicago Tel. Supply Co., Elkhart, Ind.
★ Guardian Elec. Mfg. Co., 1400 W. Wash. Blvd. Chicago
Insuline Corp. of Amer., L. I. City, N. Y.
Johnson Co., E. F., Waseca, Minn.
Jones, H. B., 2300 Wabansia, Chicago
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Remler Co., Ltd., Bryant St., San Francisco
★ Universal Microphone Co., Ltd., Inglewood, Calif.
★ Utah Radio Prod., Orleans St., Chicago.

PLYWOOD, Metal Faced

Haskelite Mfg. Corp., 208 W. Washington St., Chicago

RECTIFIERS, Current

Benwood Linze Co., St. Louis, Mo.
Continental Elec. Co., 903 Merchandise Mart, Chicago
★ Electronics Labs., Indianapolis, Ind.
Fansteel Metallurgical Corp., N. Chicago, Ill.
★ General Electric Co., Bridgeport, Conn.
International Tel. & Radio Mfg. Corp., E. Newark, N. J.
Mallory & Co., P. R., Indianapolis, Ind.
Nothelfer Winding Labs., Trenton, N. J.
United Cinephone Corp., Torrington, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

RECTIFIERS, Instrument & Relay

Selenium Corp. of Amer., 1800 W. Pico Blvd., Los Angeles

REGULATORS, Temperature

Allen-Bradley Co., Milwaukee, Wis.
Dunn, Inc., Struthers, 1321 Cherry, Philadelphia
Fenwal Inc., Ashland, Mass.
★ General Electric Co., Schenectady, N. Y.
Mercoid Corp., 4217 Belmont, Chicago
Minneapolis-Honeywell Regulator, Minneapolis, Minn.
Spencer Thermostat Co., Attleboro, Mass.

REGULATORS, Voltage

Acme Elec. & Mfg. Co., Cuba, N. Y.
Amperite Co., 561 Broadway, N. Y. C.
Ferranti Elec., Inc., 30 Rockefeller Plaza, N. Y. C.
★ General Elec. Co., Schenectady, N. Y.
H-B Elec. Co., Philadelphia
Sola Electric Co., 2525 Clybourn Av., Chicago
★ United Transformer Corp., 150 Varick St., N. Y. C.

RELAYS, Small Switching

Allied Control Co., Inc., 223 Fulton St., N. Y. C.
Amperite Co., 561 Broadway, N. Y. C.
G-M Laboratories, Inc., 4313 N. Knox Ave., Chicago
★ Guardian Elec. Co., 1400 W. Wash. Blvd., Chicago
Potter & Brumfield Co., Princeton, Ind.
Sigma Instruments, Inc., 76 Freeport St., Boston, Mass.
Struthers Dunn, Inc., 1326 Cherry St., Philadelphia
Ward-Leonard Elec. Co., Mt. Vernon, N. Y.

RELAYS, Small Telephone Type

Amer. Automatic Elect. Sales Co., 1033 W. Van Buren St., Chicago
Clare & Co., C. P., 4719 W. Sunnyside Ave., Chicago
★ Guardian Elec. Co., 1400 W. Wash. Blvd., Chicago
Wick Organ Co., Highland, Ill.

RELAYS, Stepping

Advance Elect. Co., 1260-A W. 2nd St., Los Angeles
Automatic Elect. Co., 1032 W. Van Buren St., Chicago
Autocall Co., Shelby, O.
★ Guardian Elect. Mfg. Co., 1620 W. Walnut St., Chicago
Presto Elect. Co., N. Y. Ave., Union City, N. J.
Struthers Dunn, Inc., Arch St., Phila.

RELAYS, Time Delay

Amperite Co., 561 Broadway, N. Y. C.
Haydon Mfg. Co., Inc., Forestville, Conn.
Industrial Timer Corp., Newark, N. J.
Sangamo Elec. Co., Springfield, Ill.
Ward-Leonard Elec. Co., Mt. Vernon, N. Y.

RELAY TESTERS, Vibration

Kurman Electric Co., Inc., 3030 Northern Blvd., L. I. City, N. Y.

RESISTORS, Fixed

Acme Elec. Heating Co., Boston, Mass.
★ Aerovox Corp., New Bedford, Mass.
Allen-Bradley Co., Milwaukee, Wis.
Atlas Resistor Co., 423 Broome St., N. Y. C.
Carborundum Co., Niagara Falls, N. Y.
Centralab, Milwaukee, Wisconsin
Clarostat Mfg. Co., Brooklyn, N. Y.
Cont'l Carbon, Inc., Cleveland, O.
Daven Co., 158 Summit St., Newark, N. J.
Dixon Crucible Co., Jersey City, N. J.
Erie Resistor Corp., Erie, Pa.
Globar Div. Carborundum Co., Niagara Falls, N. Y.
Hardwick, Hindle, Inc., Newark, N. J.
Instrument Resistors Co., Little Falls, N. J.
Intern'l Resistance Co., Philadelphia
Lectrohm, Inc., Cicero, Ill.
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Ohmite Mfg. Co., 4835 W. Flournoy, Chicago
Sensitive Research Inst., Corp., 4545 Bronx Blvd., N. Y. C.
Shallcross Mfg. Co., Collingdale, Pa.
Speer Resistor Corp., St. Marys, Pa.
Sprague Specialties Co., N. Adams, Mass.
Stackpole Carbon Co., St. Marys, Pa.
★ Utah Radio Prod. Co., 842 Orleans St., Chicago
Ward-Leonard Elec. Co., Mt. Vernon, N. Y.
White Dental Mfg. Co., 10 E. 40th St., N. Y. C.
Wirt Co., Germantown, Pa.

RESISTORS, Fixed Precision

Instrument Resistors, Inc., Little Falls, N. J.
Intern'l Resistance Co., Philadelphia
Ohmite Mfg. Co., 4835 Flournoy St., Chicago
Shallcross Mfg. Co., Collingdale, Pa.

RESISTORS, Flexible

Clarostat Mfg. Co., Inc., Brooklyn, N. Y.

RESISTORS, Variable

★ Aerovox Corp., New Bedford, Mass.
Allen-Bradley Co., Milwaukee, Wis.
Amer. Instrument Co., Silver Spring, Md.
Atlas Resistor Co., N. Y. C.
Biddle Co., James G., Arch St., Phila., Pa.
Centralab, Milwaukee, Wis.
★ Chicago Tel. Supply Co., Elkhart, Ind.
Cinema Eng. Co., Burbank, Cal.
Clarostat Mfg. Co., Brooklyn, N. Y.
Cutler-Hammer, Inc., Milwaukee, Wis.
DeJur Amsco Corp., Shelton, Conn.
Electro Motive Mfg. Co., Willimantic, Conn.
General Radio Co., Cambridge, Mass.
G-M Labs., Inc., Chicago, Ill.
Hardwick, Hindle, Inc., Newark, N. J.
Instrument Resistors, Inc., Little Falls, N. J.
Intern'l Resistance Co., Philadelphia
Kellogg Switchboard & Sup. Co., 6650 S. Cicero Ave., Chicago
Lectrohm, Inc., 5125 W. 25 St., Cicero, Ill.
Mallory & Co., P. R., Indianapolis, Ind.
Ohio Carbon Co., Cleveland, Ohio
Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago
Shallcross Mfg. Co., Collingdale, Pa.
Stackpole Carbon Co., St. Marys, Pa.
★ Utah Radio Prods. Co., 820 Orleans St., Chicago
Ward-Leonard Elec. Co., Mt. Vernon, N. Y.
Wirt Co., Germantown, Pa.

RESISTORS, Variable, Ceramic Base

Hardwick, Hindle, Inc., Newark, N. J.
Lectrohm, Inc., 5125 W. 25 St., Cicero, Ill.
Ohmite Mfg. Co., 4835 Flournoy St., Chicago

SCREW MACHINE PARTS, Brass, Steel

Ward Products Corp., E. 45 St., Cleveland, O.

SCREW MACHINE PARTS, Non-Metallic

Continental-Diamond Fibre Co., Newark, Del.

SCREWS, Recessed Head

American Screw Co., Providence, R. I.
Bristol Co., The, Waterbury, Conn.
Chandler Prods. Co., Cleveland, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Federal Screw Prod. Co., 224 W. Huron St., Chicago
International Screw Co., Detroit, Mich.
Lamson & Sessions, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
New England Screw Co., Keene, N. H.
Parker Co., Charles, The, Meriden, Conn.
Parker-Kalon Corp., 198 Varick, N. Y. C.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., Chicago
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Shakeproof, Inc., 2501 N. Keeler Av., Chicago
Southington Hardw. Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

SCREWS, Self-Tapping

American Screw Co., Providence, R. I.
Central Screw Co., 3519 Shields Av., Chicago
Continental Screw Co., New Bedford, Mass.
Federal Screw Prod. Co., 224 W. Huron St., Chicago
Parker-Kalon Corp., 198 Varick, N. Y. C.
Shakeproof, Inc., 2501 N. Keeler, Chicago

SCREWS, Set and Cap

Allen Mfg. Co., Hartford, Conn.
Federal Screw Prod. Co., 224 W. Huron St., Chicago
Parker-Kalon Corp., 198 Varick, N. Y. C.
Republic Steel Corp., Cleveland, O.
Shakeproof, Inc., 2501 N. Keeler Av., Chicago

SCREWS, Hollow & Socket Head

Allen Mfg. Co., Hartford, Conn.
Central Screw Co., 3519 Shields, Chicago
Federal Screw Prod. Co., 224 W. Huron St., Chicago
Parker-Kalon, 198 Varick, N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.

SELENIUM

Federal Tel. & Radio Corp., S. Newark, N. J.
Benwood Linze Co., St. Louis, Mo.
Selenium Corp. of Amer., 1800 W. Pico Blvd., Los Angeles

SHAFTING, Flexible

Breeze Corps., Inc., Newark, N. J.
Mall Tool Co., 7708 S. Chicago Ave., Chicago
Steward Mfg. Corp., 4311 Ravenswood Ave., Chicago
Walker-Turner Co., Inc., Plainfield, N. J.
White Dental Mfg. Co., 10 E. 48 St., N. Y. C.

SHEETS, Electrical

Amer. Rolling Mill Co., Middletown, Conn.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Follansbee Steel Corp., Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Newport Rolling Mill Co., Newport, Ky.
Republic Steel Corp., Cleveland, O.
Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

SHIELDS, Tube

Goat Metal Stampings, Inc., 314 Dean St., Brooklyn, N. Y.

SOCKETS, Cathode Ray Tube

Franklin Mfg. Corp., 175 Varick St., N. Y. C.

SOCKETS, Tube

Aladdin Radio Industries, 501 W. 35th St., Chicago
★ Alden Prods. Co., Brockton, Mass.
Amer. Phenolic Corp., 1830 S. 54th Av., Chicago
Amer. Radio Hardware Co., 476 B'way, N. Y. C.
Birnbach Radio Co., 145 Hudson, N. Y. C.
Bud Radio, Inc., Cleveland, O.
Cinch Mfg. Co., 2335 W. Van Buren St., Chicago
Cont'l-Diamond Fibre Co., Newark, Del.
Eagle Elec. Mfg. Co., Brooklyn, N. Y.
Eby, Inc., H. H., Philadelphia
Federal Screw Prods. Co., 26 S. Jefferson, Chicago
Franklin Mfg. Corp., 175 Varick, N. Y. C.
Hammarlund Mfg. Co., 424 W. 33 St., N. Y. C.
Johnson Co., E. F., Waseca, Minn.
Jones, Howard B., 2300 Wabansia, Chicago
Micarta Fabricators, Inc., 4619 Ravenswood, Chicago
Millen Mfg. Co., James, Malden, Mass.
Miller Co., J. W., Los Angeles, Cal.
★ Nat'l Co., Malden, Mass.
Remler Co., San Francisco, Cal.

SPOT NEWS NOTES

(CONTINUED FROM PAGE 39)

There are plenty of unassigned four-letter combinations, beginning with K or W, available for FM stations. On the other hand, there aren't enough one- or two-letter combinations which are initials of cities where FM transmitters will be located, come peace.

Postwar Planning: "If our company, or any other, should get an order for a television transmitter the day peace is declared, it will take at least 18 months to make delivery, and 6 months more to complete the installation. That's two years' time. That is why we are going into FM full speed when the War is over. It will give us an immediate volume of business while television is going through the initial stages of getting started." This comment, from one of the top sales executives in one of the largest organizations producing radio equipment, makes sense.

W75C on Full Schedule: The Moody Bible Institute's FM station in Chicago is now operating 7 days a week. Regular schedule is 11:00 A.M. to 9:30 P.M., and on Sundays from 8:00 A.M. until sunset. Transmitter is operating on 1 kw. for the present.

Foreign Patents: Over 40,000 patents and patent applications have been taken over by the Alien Property Custodian. Licenses can be obtained for a flat fee of $15 per patent by applying to the Office of Alien Property Custodian, Field Building, Chicago, Ill.

WHEN YOU

CHANGE YOUR ADDRESS

PLEASE GIVE US YOUR OLD ADDRESS AS WELL AS YOUR NEW ADDRESS.

IF YOUR COPIES ARE UNDELIVERED BECAUSE YOU DID NOT NOTIFY US IN ADVANCE, WE SHALL NOT BE ABLE TO REPLACE YOUR LOST COPIES.

FM RADIO-ELECTRONICS
240 Madison Ave., New York 16, N. Y.

SOCKETS, Tube, Ceramic Base

Johnson Co., E. F., Waseca, Minn.
★ National Co., Inc., Malden, Mass.
Nat'l Fabricated Products, W. Belden Ave., Chicago
Ucinite Co., Newtonville, Mass.

SOLDER, Self-fluxing

Garden City Laboratory, 2744 W. 37th Pl., Chicago
Gardiner Metal Co., S. Campbell Ave., Chicago
★ General Elec. Co., Bridgeport, Conn.
Kester Solder Co., 4209 Wrightwood Ave., Chicago
Ruby Chemical Co., Columbus, O.

SOLDER POTS

★ Elec. Soldering Iron Co., Inc., Deep River, Conn.
Lectrohm, Inc., Cicero, Ill.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

SPEAKERS, Cabinet Mounting

Cinaudagraph Speakers, Inc., 3911 S. Michigan Ave., Chicago
Crescent Industries, Inc. Belmont Ave., Chicago
★ Jensen Radio Mfg. Co., 6601 S. Laramie St., Chicago
Magnavox Co., Fort Wayne, Ind.
★ Utah Radio Prod. Co., 842 Orleans St., Chicago

SPEAKERS, Outdoor Type

★ Jensen Radio Mfg. Co., 6601 S. Laramie St., Chicago
★ University Labs., 225 Varick St., N. Y. C.

SPRINGS

Accurate Spring Mfg. Co., 3817 W. Lake, Chicago
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes Co., Wallace, Bristol, Conn.
Cuyahoga Spring Co., Cleveland, O.
Gibson Co., Wm. D., 1800 Clybourn Av., Chicago
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Instrument Specialties Co., Little Falls, N. Y.
Muehlhausen Spring Corp., Logansport, Ind.
Peck Spring Co., Plainville, Conn.
Raymond Mfg. Co., Corry, Pa.
Standard Spring & Mfg. Co., Ind., 236-42 St., Brooklyn, N. Y.

STAMPINGS, Metal

Bud Radio, Inc., E. 55 St., Cleveland, O.
Goat Metal Stampings, Inc., 314 Dean St., Brooklyn, N. Y.
Insuline Corp. of Amer., Long Island City, N. Y.
Par-Metal Prod. Corp., Long Island City, N. Y.
Stewart Stamping Corp., 621 E. 216 St., N. Y. C.

STEATITE, See Ceramics

SUPPRESSORS, Parasitic

Ohmite Mfg. Co., 4835 Flournoy St., Chicago

SWITCHES, Aircraft Push

Square D Co., Kollsman Inst. Div., Elmhurst, N. Y.
★ Universal Microphone Co., Inglewood, Calif.

SWITCHES, Key

Audio Development Co., Minneapolis, Minn.
★ Chicago Tel. Supply Co., Elkhart, Ind.
General Control Co., Cambridge, Mass.
Mossman, Inc., Donald P., 6133 N. Northwest Hy., Chicago

SWITCHES, Micro

Allied Control Co., Inc., E. End Ave., N. Y. C.
Aero Electric Co., 3167 Fulton Rd., Cleveland
Micro Switch Corp., Freeport, Ill.

SWITCHES, Rotary Gang, Bakelite Wafer

Mallory & Co., Inc., P. R., Indianapolis, Ind.
Stackpole Carbon Co., St. Marys, Pa.

SWITCHES, Rotary Gang, Ceramic Wafer

Oak Mfg. Co., 1267 Clybourn Ave., Chicago
Ohmite Mfg. Co., 4835 Flournoy St., Chicago
Shallcross Mfg. Co., Collingsdale, Pa.

SWITCHES, Time Delay

Haydon Mfg. Co., Inc., Forestville, Ct.
Industrial Timer Corp., 115 Edison Pl., Newark, N. J.
Sangamo Elect. Co., Springfield, Ill.

TERMINAL STRIPS

Cinch Mfg. Corp., W. Van Buren St., Chicago
Curtis Devel. & Mfg. Co., N. Crawford Ave., Chicago
Franklin Mfg. Corp., 175 Varick St., N. Y. C.
Jones, H. B., 2300 Wabansia, Chicago

TEST CHAMBERS, Temperature, Humidity, Altitude, Salt Spray

American Coils Co., 25 Lexington St., Newark, N. J.
Industrial Filter & Pump Mfg. Co., W. Carroll Ave., Chicago
Kold-Hold Mfg. Co., 446 N. Grand Ave., Lansing, Mich.
★ Mobile Refrigeration, Inc., 630-5th Ave., N. Y. C.
Northern Engineering Labs., 50 Church St., N. Y. C.
Tenney Engineering, Inc., Montclair N. J.

TRACING PAPERS, CLOTH, CELLOPHANE

Arkwright Finishing Co., Providence, R. I.
Brown & Bro., Arthur, 67 W. 44 St., N. Y. C.
Keuffel & Esser, Hoboken, N. J.

TRANSFORMERS, Constant-Voltage Power

Dongan Elec. Co., 74 Trinity Pl., N. Y. C.
★ General Electric Co., Schenectady, N. Y.
Raytheon Mfg. Co., Waltham, Mass.
Sola Electric Co., 2525 Clybourn Ave., Chicago

TRANSFORMERS, IF, RF

Aladdin Radio Industries, 501 W. 35th St., Chicago
Amer. Transformer Co., Newark, N. J.
Automatic Windings Co., E. Passaic, N. J.
★ Browning Labs., Inc., Winchester, Mass.
Cambridge Thermionic Corp., Concord Ave., Cambridge, Mass.
Caron Mfg. Co., 415 S. Aberdeen, Chicago
D-X Radio Prods. Co., 1575 Milwaukee, Chicago
Essex Specialty Co., Inc., Broad St., Newark, N. J.
Gen'l Winding Co., 420 W. 45 St., N. Y. C.
Greyhound Equip. Co., 1720 Church Ave., Brooklyn, N. Y.
Guthman & Co., 400 S. Peoria St., Chicago
Hammarlund Mfg. Co., 424 W. 33 St., N. Y. C.
★ Meissner Mfg. Co., Mt. Carmel, Ill.
Millen Mfg. Co., James, Malden, Mass.
Miller Co., J. W., Los Angeles, Cal.
★ Nat'l Co., Malden, Mass.
Radex Corp., 1308 Elston Ave., Chicago
Sickles Co., F. W., Springfield, Mass.
Super Elec. Prod. Corp., Jersey City, N. J.
Teleradio Eng. Corp., 484 Broome St., N. Y. C.
Triumph Mfg. Co., 4017 W. Lake, Chicago

TRANSFORMERS, Receiver Audio & Power

Acme Elec. & Mfg. Co., Cuba, N. Y.
Amer. Transformer Co., Newark, N. J.
Amplifier Co. of Amer., 17 W. 20th St., N. Y. C.
Audio Devel. Co., N. Minneapolis, Minn.
Chicago Transformer Corp., 3501 Addison St., Chicago
Cinaudagraph Speakers, Inc., 3911 S. Michigan, Chicago
Dinion Coil Co., Caledonia, N. Y.
Dongan Elec. Co., 74 Trinity Pl., N. Y. C.
Electronic Trans. Co., 515 W. 29 St., N. Y. C.
Ferranti Elec., Inc., 30 Rockefeller Plaza, N. Y. C.
Freed Trans. Co., 72 Spring St., N. Y. C.
Gen'l Radio Co., Cambridge, Mass.
General Trans. Corp., 1250 W. Van Buren, Chicago
Halldorson Co., 4500 Ravenswood, Chicago
Jefferson Elec. Co., Bellwood, Ill.
Kenyon Transformer Co., 840 Barry St., N. Y. C.
Magnetic Windings Co., Easton, Pa.
Newark Transformer Co., Newark, N. J.
New York Transformer Co., 51 W. 3rd, N. Y. C.
Norwalk Transformer Corp., S. Norwalk, Conn.
Raytheon Mfg. Co., Waltham, Mass.
Standard Transformer Corp., 1500 N. Halsted, Chicago
Super Elect. Prod. Co., Jersey City, N. J.
Superior Elec. Co., Bristol, Conn.
Thermador Elect. & Mfg. Co., Riverside Dr., Los Angeles
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago
★ Utah Radio Prods. Co., 820 Orleans St., Chicago
★ United Transformer Co., 150 Varick St., N. Y. C.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

NEW YORK POLICE NEED FM

The Harlem riot in New York brought into sharp focus the lack of modern police radio communications in the Country's largest city. Police officials in other cities are now wondering why Mayor La Guardia has failed to provide much-needed 2-way FM equipment, and what this lack will cost the nation's No. 1 target in case of a bombing raid.

When it was installed, some ten years ago, the present 1-way AM system was the last word, but today it is rated as obsolete. This was shown during the Harlem riot when patrol cars surrounded and attacked by surging mobs, could not call for assistance, nor send out word as to what was taking place.

In this single incident, 2-way FM could have reduced the damage to public property by an amount far greater than the cost of modernizing the entire police radio system.

WHAT'S NEW THIS MONTH

(CONTINUED FROM PAGE 4)

clinging to methods and systems of signalling which date back to the need of cowcatchers on locomotives, they have merely added new tricks and improved details, but they have stood off improvements that would disrupt long-conditioned thinking habits and reactions, or require the learning of new techniques.

There is another aspect to this situation. Railroads do not manufacture their own signalling equipment. This is a separate business, controlled by the autocratic owners of patents carried on their books as chief assets. To introduce any signalling means not within the tightly-held patent structure would jeopardize such a company's financial set-up. There is a sales problem, too. As a group, railroad officials who handle the purchasing of signalling equipment are definitely thumbs down on any departure from conventional systems. The only hope of initiating changes lies in reaching the top executives. But what salesman would go over the head of an official whom his company considers as a customer of long standing?

To this combination of circumstances has been added the fact that radio equipment first offered the railroads was subject to natural static, and was rendered practically inoperative by interference from electrical equipment on Diesel engines.

Now, consider the War's contribution in this case. First, it has shown that FM radio equipment can render dependable service under conditions far more adverse than are ever encountered in railroad ap-

(CONTINUED ON PAGE 45)

TUBE MANUFACTURING MACHINES

Hilton Eng. Labs., Redwood City, Calif.
Eisler Eng. Co., 7518 13th St., Newark, N. J.

TUBES, Cathode Ray

Dumont Labs., Allen B., Passaic, N. J.
Farnsworth Tele. & Radio Corp., Ft. Wayne, Ind.
★ General Elec. Co., Schenectady, N. Y.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
Nat'l Union Radio Corp., Newark, N. J.
North Amer. Philips Co., Inc., Dobbs Ferry, N. Y.
Rauland Corp., Chicago, Ill.
RCA Mfg. Co., Camden, N. J.
★ Sylvania Elect. Prod., Inc., Emporium, Pa.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh, Pa.

TUBES, Current Regulating

Amperite Co., 561 Broadway, N. Y. C.
Champion Radio Works, Danvers, Mass.
★ Hytron Corp. & Hytronic Labs., Salem, Mass.
RCA Mfg. Co., Camden, N. J.
★ Sylvania Elec. Prod., Inc., Emporium, Pa.
Western Elec. Co., 195 B'dway, N. Y. C.

TUBES, Photo-Electric

Bradley Labs., New Haven, Conn.
Cont'l Elec. Co., Geneva, Ill.
De Jur-Amsco Corp., Shelton, Conn.
De Vry, Herman A., 1111 W. Center, Chicago
Electronic Laboratory, Los Angeles, Cal.
Emby Prods. Co., Los Angeles, Cal.
★ General Elec. Co., Schenectady, N. Y.
General Scientific Corp., 4829 S. Kedzie Av., Chicago
G-M Labs., 4313 N. Knox Av., Chicago
Leeds & Northrop Co., Philadelphia
Nat'l Union Radio Corp., Newark, N. J.
Photobell Corp., 123 Liberty St., N. Y. C.
RCA Mfg. Co., Camden, N. J.
Rectron Corp., 2159 Magnolia Av., Chicago
Westinghouse Lamp Div., Bloomfield, N. J.
Western Elec. Co., 195 B'way, N. Y. C.
Weston Elec. Inst. Corp., Newark, N. J.

TUBES, Receiving

★ General Elec. Co., Schenectady, N. Y.
★ Hytron Corp., Salem, Mass.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
Nat'l Union Radio Corp., Newark, N. J.
Raytheon Prod. Corp., 420 Lexington Av., N. Y. C.
RCA Mfg. Co., Camden, N. J
★ Sylvania Elect. Prod., Inc., Emporium, Pa.
Tung-Sol Lamp Works, Newark, N. J.

TUBES, Transmitting

Amperex Electronic Prods., Brooklyn, N. Y.
★ Eitel-McCullough, Inc., San Bruno, Cal.
★ Electronic Enterprises, Inc., 65 Sixth Av., N. Y. C.
Federal Telegraph Co., Newark, N. J.
★ General Elec. Co., Schenectady, N. Y.
Heintz & Kaufman, S. San Francisco, Cal.
★ Hytron Corp., Salem, Mass.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
Nat'l Union Radio Corp., Newark, N. J.
North Amer. Philips Co., Inc., Dobbs Ferry, N. Y.
Raytheon Prod. Corp., 420 Lexington Av., N. Y. C.
RCA Mfg. Co., Camden, N. J.
★ Sylvania Elect. Prod., Inc., Emporium, Pa.
Taylor Tubes, Inc., 2341 Wabansia, Chicago
United Electronics Co., Newark, N. J.
Western Elec. Co., 195 B'way, N. Y. C.
Westinghouse Lamp Div., Bloomfield, N. J.

TUBES, Voltage-Regulating

Amperite Co., 561 Broadway, N. Y. C.
Hytron Corp., Salem, Mass.
RCA Mfg. Co., Camden, N. J.
★ Sylvania Elec. Prod., Inc., Salem, Mass.

TUBING, Laminated Phenolic

Brandywine Fibre Prods. Co., Wilmington, Del.
Formica Insulation Co., Cincinnati, O.
★ General Electric Co., Pittsfield, Mass.
Insulation Mfgrs. Corp., 565 W. Washington Blvd., Chicago
Mica Insulator Co., 196 Varick, N. Y. C.
Nat'l Vulcanized Fibre Co., Wilmington, Del.
Richardson Co., Melrose Park, Ill.
Spaulding Fibre Co., 233 B'way, N. Y. C.
Synthane Corp., Oaks, Pa.
Taylor Fibre Co., Norristown, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wilmington Fibre Specialty Co., Wilmington, Del.

TUBING & SLEEVING, Varnished Cambric, Glass-Fibre, Spaghetti

Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 276 Fourth Av., N. Y. C.
Electro Tech. Prod., Inc., Nutley, N. J.
Endurette Corp. of Amer., Cliffwood, N. J.
★ General Elec. Co., Bridgeport, Conn.
Insulation Mfgrs. Corp., 565 W. Washington Blvd., Chicago
Irvington Var. & Ins. Co., Irvington, N. J.
Mica Insul. Co., 196 Varick St., N. Y. C.
Varflex Corp., Rome, N. Y.

VARNISHES, Insulating, Air-Drying

John C. Dolph Co., Newark, N. J.
Irvington Var. & Ins. Co., Irvington, N. J.
Stille-Young Corp., 2300 N. Ashland Av., Chicago
★ Zophar Mills, Inc., 112-26 St., Bklyn., N. Y.

VARNISHES, Insulating, Baking

John C. Dolph Co., Newark, N. J.
Irvington Var. & Ins. Co., Irvington, N. J.
Stille-Young Corp., 2300 N. Ashland Av., Chicago
Zophar Mills, Inc., 112-26 St., Bklyn., N. Y.

VIBRATION TEST EQUIPMENT

Vibration Specialty Co., 1536 Winter St., Philadelphia.

VIBRATORS, Power Supply

Amer. Telev. & Radio Co., St. Paul, Minn.
★ Electronic Labs., Indianapolis, Ind.
Mallory & Co., Inc., P. R., Indianapolis, Ind.
Radiart Corp., W. 62 St., Cleveland, O.
Turner Co., Cedar Rapids, Ia.
★ Utah Radio Prod. Co., Orleans St., Chicago

VOLTMETERS, Vacuum Tube

Ballantine Labs., Inc., Boonton, N. J.
General Radio Co., Cambridge, Mass.
Hewlett Packard Co., Palo Alto, Calif.
Measurements Corp., Boonton, N. J.
★ Radio City Prod. Co., Inc., 127 W. 26 St., N. Y. C.

WAXES & COMPOUNDS, Insulating

Irvington Varnish & Ins. Co., Irvington, N. J.
Western Elec. Co., 195 B'dway, N. Y. C.
★ Zophar Mills, Inc., 112-26 St., Bklyn., N. Y.

WELDING, Gas, Aluminum & Steel

Treitel-Gratz Co., 142 E. 32 St., N. Y. C.

WIRE, Bare

Amer. Steel & Wire Co., Cleveland, O.
Anaconda Wire & Cable Co., 25 B'dway, N. Y. C.
Ansonia Elec. Co., Ansonia, Conn.
Belden Mfg. Co., 4633 W. Van Buren, Chicago
Copperweld Steel Co., Glassport, Pa.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
★ General Elec. Co., Bridgeport, Conn.
Phosphor Bronze Smelting Co., Phila.
Rea Magnet Wire Co., Fort Wayne, Ind.
Roebling's Sons Co., John, Trenton, N. J.

WIRE, Glass Insulated

Owens-Corning Fiberglas Corp., Toledo, O.

WIRE, Hookup

Bentley, Harris Mfg. Co., Conshohocken, Pa.
Gavitt Mfg. Co., Brookfield, Mass.
Lenz Elec. Mfg. Co., 1751 N. W. Av., Chicago
Rockbestos Prod. Corp., New Haven, Conn.
Whitney Blake Co., New Haven, Conn.

WIRE, Magnet

Acme Wire Co., New Haven, Conn.
Amer. Steel & Wire Co., Cleveland, O.
Anaconda Wire & Cable Co., 25 B'dway, N. Y. C.
Ansonia Elec. Co., Ansonia, Conn.
Belden Mfg. Co., 4633 W. Van Buren, Chicago
Collyer Ins. Wire Co., Pawtucket, R. I.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
Elec. Auto-Lite Co., The, Port Huron, Mich.
General Cable Corp., Rome, N. Y.
★ General Elec. Co., Bridgeport, Conn.
Holyoke Wire & Cable Corp., Holyoke, Mass.
Hudson Wire Co., Winsted, Conn.
Rea Magnet Wire Co., Fort Wayne, Ind.
Rockbestos Prods. Corp., New Haven, Conn.
Roebling's Sons Co., John, Trenton, N. J.
Wheeler Insulated Wire Co., Bridgeport, Conn.

WIRE, Rubber Covered

Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., Rome, N. Y.
Hazard Ins. Wire Works, Wilkes-Barre, Pa.
Simplex Wire & Cable Co., Cambridge, Mass.

WOOD, Laminated & Impregnated

Canfield Mfg. Co., Grand Haven, Mich.
Formica Insulation Co., Cincinnati, O.

WOOD PRODUCTS, Cases, Parts

Hoffstatter's Sons, Inc., 43 Ave. & 24 St., Long Island City, N. Y.
Tillotson Furniture Co., Jamestown, N. Y.

WHAT'S NEW THIS MONTH

(CONTINUED FROM PAGE 43)

plications. Second, military uses of FM have shown its complete suitability for adaption to railway signalling. Finally, the tremendous load put upon the railroads has shown the need for dropping antiquated methods, however dearly cherished, in favor of improvements which represent the progress of modern science.

The first practical uses of radio by the railroads are described by W. S. Halstead in this issue. The conclusion of his article will appear in August. Later, he will describe other developments which point to the eventual replacement of conventional railway signalling equipment.

And this is only one example of new radio applications which, after the War, will cause virtual revolutions in many long-established methods and practices, and will quickly take up production facilities when they are made available by the cancellation of military contracts.

LET'S HAVE THE FACTS

(CONTINUED FROM PAGE 13)

These applications add up to the fact that the production of FM transmitters and receivers for the Armed Forces is now far in excess of pre-Pearl Harbor volume when the manufacture of broadcast station equipment and home radios was stopped.

Wartime FM Broadcasting ★ Where information is lacking, it is not surprising that misconceptions arise, but it seems inexcusable for publications to disseminate misinformation when the facts are readily at hand. For example, a recent issue of the Publishers Weekly carried the statement that there are only 2,000 FM receivers in all New York City.

While it is probably true that the last FM receivers in New York City stores were snapped up some time ago, accurate estimates of FM sets in use in this area place the total well over 80,000.

Looking back at our last pre-war issue, December, 1941, the first item on the Spot News page reads: "Rate of FM set production continues to increase. Total in use at the end of November is approximately 180,000, of which 35,000 are being used in New York City." During the five succeeding months, set manufacturers increased their rate of production on FM sets so greatly that the figure of 80,000 sets now used in New York City may be low by 20,000.

Here is something else that can be found right on the record of FM progress, although it will be a surprise to many people:

Of the 19 broadcast station programs listed daily by the New York Herald Tribune, 9 are for FM transmitters. Of

(CONTINUED ON PAGE 46)

LET'S HAVE THE FACTS

(CONTINUED FROM PAGE 45)

these, only Major Armstrong's W2XMN and WOR's W71NY were on the air with regular schedules before Pearl Harbor! At that time, NBC's W2XWG had only an experimental set-up. The other six stations were completed and put into scheduled operation after the freeze order was issued. Two of these six stations, W39NY and W75NY, only started this year!

Still More Serious ★ The progress of FM, even under wartime restrictions, is all a part of the record, and available to those who will read it. What is most serious is the failure to grasp the significance of FM to the radio industry by men whose opinions will play a great part in future planning.

A typical example is a statement which appeared in Advertising Age, a publication widely read by advertising managers and account executives:

"There are manufacturers who think frequency modulation is so superior that the people will be satisfied with nothing less. But frequency modulation sets require more man-hours and materials. The lowest retail price of a complete frequency modulation set in 1943 was approximately $60, or almost double the average price paid for radio sets. So if everybody demanded FM sets, and their price did not drop sharply, and if the public had $880,000,000 to spend for home radios and radio phonographs, only a pitiful 15,000,000 could be bought."

Let us examine the thoughts behind this expression of opinion. They seem to be: 1) that there should be some limit on the man-hours put into a radio set, 2) that there should be some limit on the price of radio sets, 3) that the quality of radio reception should be limited by a $30 price, and 4) that the volume of radio sales should be limited to $880,000,000.

This is certainly very limited thinking, but a statement in such a publication as Advertising Age, circulated among men who will largely control the marketing of radio sets, cannot be disregarded. Then let us consider:

1) There is no reason to put a ceiling on the man-hours or materials entering into a radio set. On the other hand, there will be a surplus of both after the War — surpluses so great that all the abilities of our industrialists and marketing experts will be needed to prevent the dislocation of our national economy. The consumption of materials and man-hours by the radio industry will be the measure of its contribution to postwar reconstruction.

2) Before the advent of radio broadcasting, the piano was an almost essential accessory to social activities in the home. The music produced from it was generally of decidedly amateur quality. Many people who owned pianos couldn't even play

(CONTINUED ON PAGE 47)

LET'S HAVE THE FACTS

(CONTINUED FROM PAGE 46)

them, so they paid much higher prices for automatic pianos, the music of which is still painful to those who remember them.

Those pianos cost $500 to $1,500 or more. Why, then, should we put a $30 or $60 limit on the more versatile radio receiver, which provides the music of all instruments, and performs so many other services of which a piano is incapable.

3) And why should the quality of radio and phonograph music be limited to what can be obtained from a $30 junk box? Those who know nothing of radio design and manufacturing may say: "If modern manufacturing methods are applied to the radio industry, it should be possible to make the finest radio at that price."

But is it? We were turning out radios by mass-production methods before the War, and the models which retailed at $30 were junk, regardless of the advertising claims made for them.

Today, with enormously improved facilities and mass-production methods, the manufacturers' price of a military radio receiver, in a plain sheet-steel case, without loudspeaker, is $150 to $500. If such sets were sold through jobbers and retail stores, at the established trade discounts, the retail price would be $330 to $1,100.

How, then, can a manufacturer add a handsome cabinet, a high-fidelity speaker, and an automatic phonograph, and give a 50–10% discount from a retail price of $30? It is easy enough for advertising men to say that it *should* be possible, but *their* medium of expression is words and pictures.

The fact is that an FM-AM radio and an automatic phonograph capable of true reproduction of studio and recorded music, equipped with a high-fidelity speaker and installed in a well built cabinet, cannot be made to retail much under $350 if the price carries the regular trade discount.

4) Fifteen million sets at $350 each would cost the public $5,250,000,000. Well, why not? Why should the public spend only $880,000,000, the figure set by Advertising Age? Fifteen million pianos would cost more than the same number of fine radio sets, and deliver much less in entertainment value!

Whether the radio industry does a volume of $5,250,000,000 or only $880,000,000 depends not on the limits of the market, but on the limits imposed by the thinking of advertising, sales, and manufacturing executives.

Frequency Modulation provides high-quality entertainment for the industry to sell. It is the obligation of the industry to take every advantage of building sales volume on quality performance if for no other reason than to do its part in post-war re-employment and economic reconstruction. — *M. B. Sleeper*

LOCK THE DOOR BEFORE READING

BRING back again those happy days
Of Caesar, Brutus, Hector,
They bought and sold, they lived and died,
With never an Inspector.

In caveman days, to get a wife
Upon the bean you cracked her,
Then dragged her home, but nowadays
Both first see an Inspector.

In other days, out in the park
We loved our girl and necked her,
Today you try it in the car
And quick, comes an Inspector.

We send our little girl to school
To teach her and correct her,
But all the day it seems that they
Examine and Inspect her.

They fix her eyes, her teeth, her nose
Until they've almost wrecked her;
You'd be surprised, the things that she
Must show to some Inspector.

The little hen once laid her eggs
As nature did expect her,
But now each step, from nest to nest,
Is checked by an Inspector.

Her coop, her rooster, everything
With which they can connect her;
The farmer, dealer, grocer, all
Are bossed by some Inspector.

The cow may only give her milk,
For beef you can't dissect her;
Unless the smell of all her parts
Suits some darn fool Inspector.

When all is ended and old Nick
Has got each malefactor,
We hope that in each seat in H— —
There sizzles an Inspector.

Via the Grapevine

CADMIUM PLATING STEEL

(CONTINUED FROM PAGE 17)

be wiped dry. It should be done promptly.

Caution should be observed in handling the plating solution as it is a deadly poison. No operator should do this plating if he has any cuts or other skin abrasions. Rubber gloves can be employed, but they are short lived in contact with the solution.

Fresh plating solutions should be made frequently. A deteriorated plating solution is indicated when it becomes gray in color. The anode requires some attention from time to time. The cheesecloth covering should be replaced and the anode, if used too long, will be found to have a brown coating. It should be cleaned by brushing with a steel scratch brush.

One other caution must be observed. Panels which are very cold will chip upon plating. This is not the fault of the finish but is the fault of the temperature of the panel. Warming the panels will invariably result in clean cut characters.

AN ADDED SERVICE

a complete Roster of Radio Station Chief Engineers will be published in August, and semi-annually thereafter

Looking toward the tremendous postwar engineering activities in FM and standard broadcasting, television, and facsimile, *FM* RADIO-ELECTRONICS will inaugurate a semi-annual Roster of Chief Engineers of stations in these service groups.

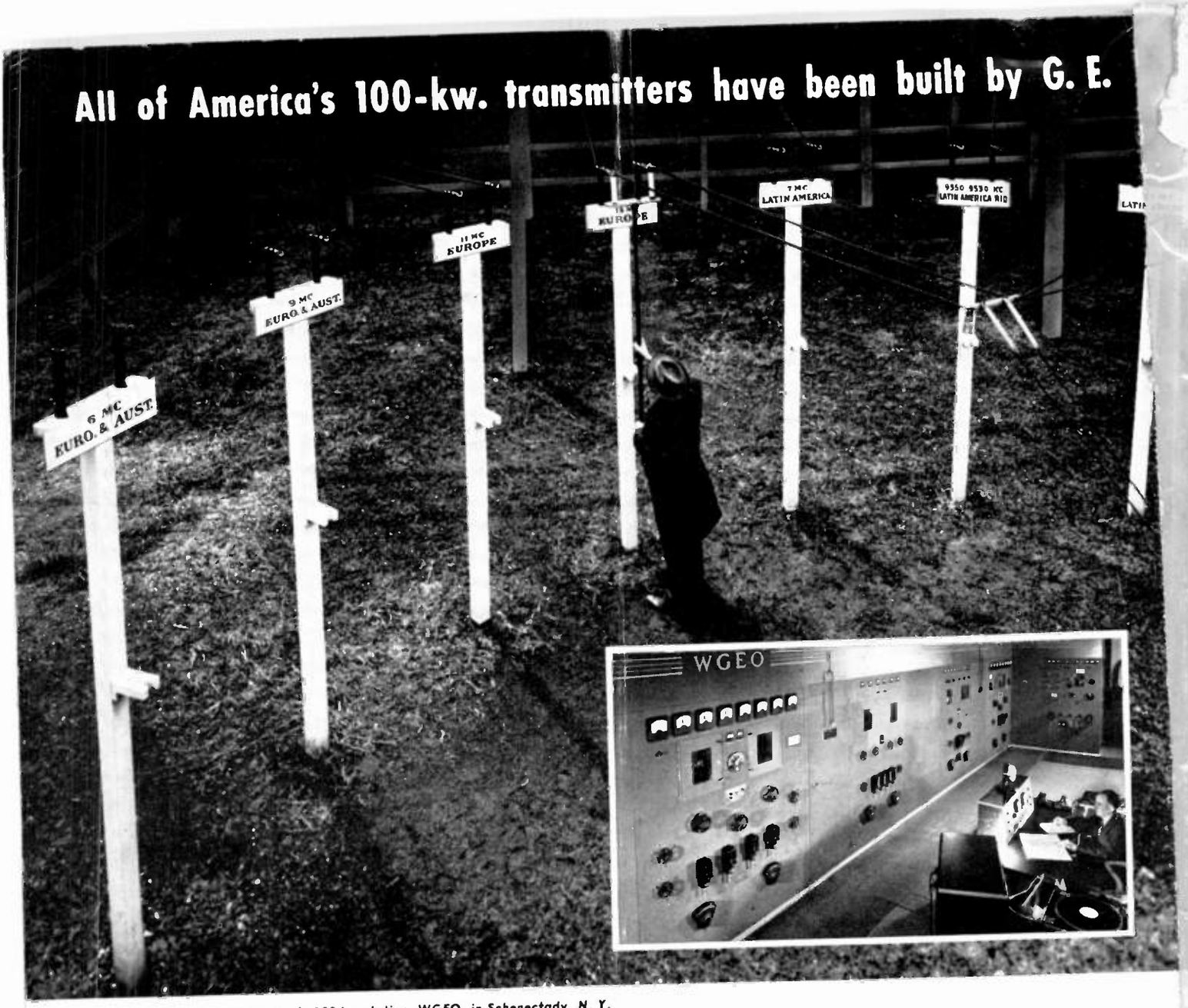
Because of the international cooperation implied by the great strides that will be made after peace, and the important markets which will be opened, this Roster will include listings for all stations in North and South America, insofar as the information is available.

The Roster will appear each August and February, and will replace the Radio-Electronic Products Directory in those issues. Published every six months with revisions and corrections, this will provide the most up-to-date and authoritative information available in any radio publication.

We hope sincerely that the Roster of Radio Station Chief Engineers will contribute toward the exchange of information between the men occupying these key positions in the broadcasting field.

FM RADIO-ELECTRONICS

All of America's 100-kw. transmitters have been built by G. E.



Switchyard at General Electric's 100-kw station, WGEO, in Schenectady, N. Y.

Forceful Allied propaganda is today beamed to all the Axis world by G-E international short-wave transmitters.

G-E pioneering in international short wave, begun in 1923, led to the development of nine American international stations of varying outputs up to 75 kw. Recently, G.E. added four more, two of them of 100 kw, the highest signal output of any American-built stations of that type. G.E. is now building three more giant 100-kw transmitters for the expanding American war needs.

General Electric is the only American manufacturer ever to have successfully designed and built international transmitters of such great power.

The G-E 100-kw and 50-kw transmitters for Station WGEO-WGEA, shown in the insert above, have their programs beamed by special panel-type antennae backed by ingenious dipole reflectors that step up the radiation efficiency.

In the main illustration is another G-E development, adding greatly to the flexibility and efficiency of international equipment. This antenna-feeder hook-up gives quick manual switching from one directional beam to another—from one overseas work area to another. Day and night, this powerful station is working for a shorter war, a better peace.

What G-E Leadership Means to You

Informed thinking today points to changes in post-war broadcasting. It looks for a big increase in local FM stations. It foresees fewer but more powerful AM stations, and that television will grow, becoming an important factor in consumer markets.

General Electric offers any broadcaster a complete service in all three fields of FM, AM, television!

1. G.E.'s unmatched achievements in international transmitters are ample evidence of G-E ability to build new high-power AM transmitters and improved receivers after the war.

2. The fact that G.E. has built over a third of all FM broadcast transmitters and a large percentage of FM receivers is positive evidence of its continued leadership in the post-war FM field.

3. And four years of live-talent programming experiment in its own non-commercial television station, WRGB, plus its full line of television transmitters, relay transmitters, studio apparatus, and receivers provide a sum total of television equipment and experience that will be of immense value to the post-war broadcasting industry. . . . *Electronics Department, General Electric, Schenectady, N. Y.*

Tune in "THE WORLD TODAY" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E. W. T. over CBS. On Sunday listen to "The Hour of Charm" at 10:00 P. M. E. W. T. on NBC.*

• • •

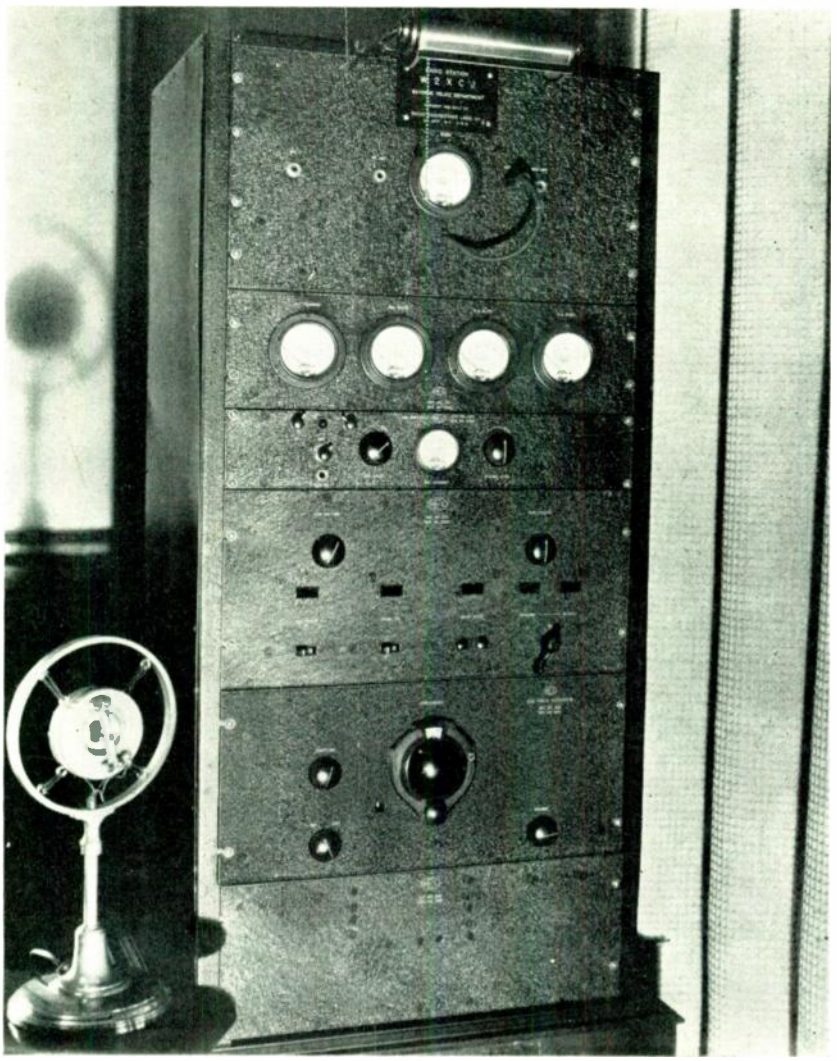
42,000 hours of international service and still going strong! At WGEO, a G-E mercury-vapor rectifier tube — Type 857-B — has given faultless service since 1934.

GENERAL ELECTRIC 160-86-6916

G-E employees are now purchasing over $1,000,000 in War Bonds weekly

FM · TELEVISION · AM

WRH



1932

First 2-Way Police Ever Installed

REL in October 1932 set up another milestone of radio engineering, this time completely revolutionizing police patrol methods. At that time, REL engineers completed the famous station W2XCJ at Bayonne, N. J. — the first 2-way police radio system ever put into service.

So successful and efficient was this system that police officials from all parts of North and South America came to listen and marvel that, at last, the seemingly impossible had been accomplished.

Although the output of the headquarters transmitter was only 25 watts, and 4½ watts from the car transmitters, REL proved that the dead spots which plagued the lower-frequency 1-way systems then in use were entirely eliminated at 34.6 mc., the channel used for W2XCJ.

Orders for similar headquarters and patrol car equipment were placed by East Chester, N. Y., Union City, N. J., Brookline, Mass., and other cities in rapid succession. Making constant improvements based on this pioneering experience, REL was ready to make the most effective use of FM circuits, contributing further to the advantages of 2-way communication for police service.

This is another instance where REL's efforts have shown the way which others have followed.

LOOK TO REL FOR PEACETIME LEADERSHIP

Engineering improved equipment for War today, REL is planning further improvements for Peace tomorrow. Among these will be REL "packaged" FM broadcast stations, low in cost and easy to erect, for communities which now lack adequate, enjoyable, static-free radio entertainment.

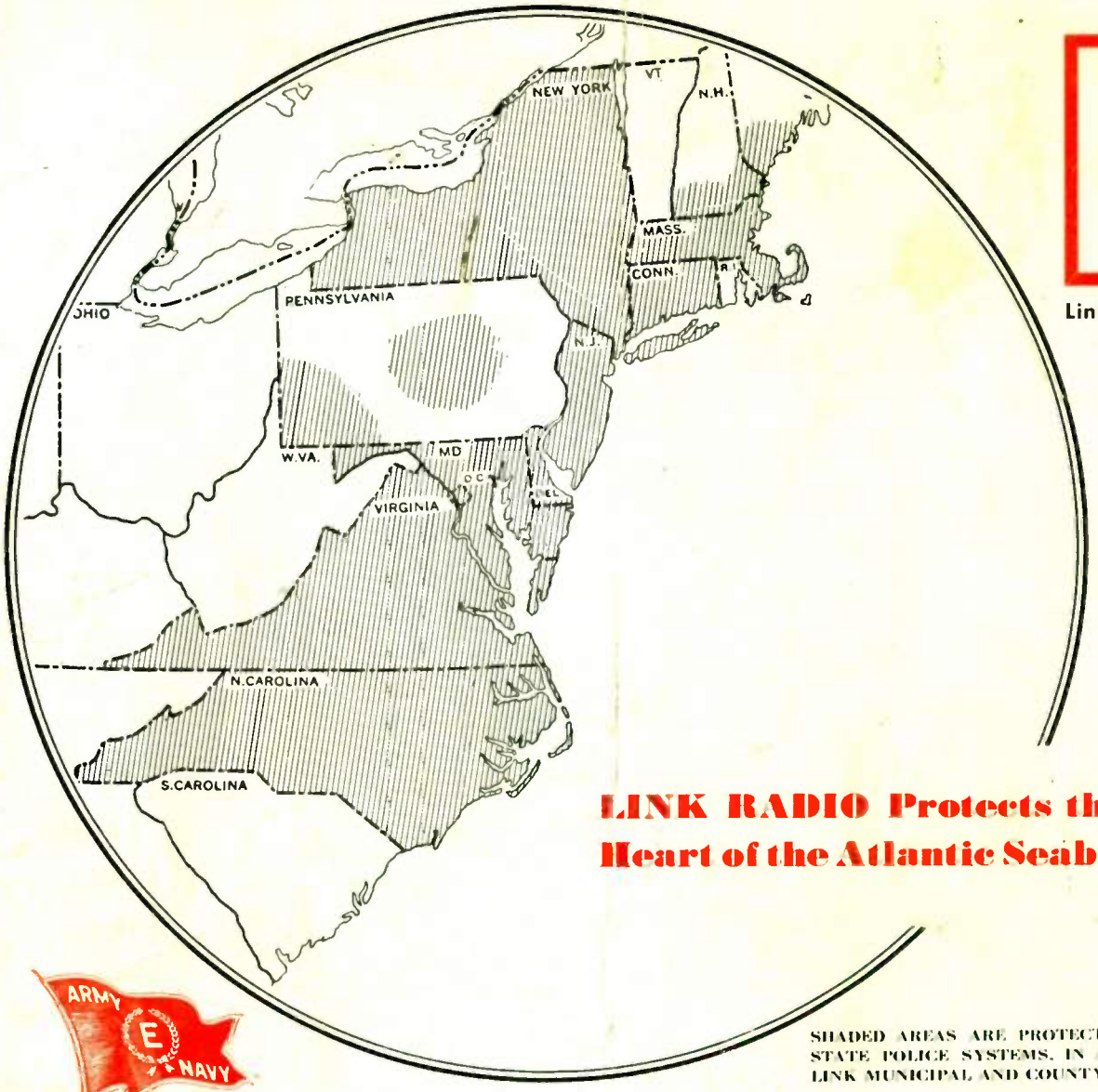
REL

RADIO ENGINEERING LABS., Inc
Long Island City 1 New York

Sales Offices:

5334 Hollywood Blvd., Hollywood, California
2040 Grand River Ave. W., Detroit, Michigan
310 Fifteenth St., Denver, Colorado

RUMFORD PRESS
CONCORD, N. H.



SHADED AREAS ARE PROTECTED BY LINK STATE POLICE SYSTEMS, IN ADDITION TO LINK MUNICIPAL AND COUNTY SYSTEMS

137

Link Men in Service

LINK RADIO Protects the Heart of the Atlantic Seaboard

ARMY E NAVY

Not guns but quiet voices speak when emergencies call for fast action in protecting the great stretch of our Atlantic sea coast.

Statewide LINK FM networks, extending from Maine to South Carolina, have raised the effectiveness of police patrols to the hard-hitting efficiency that assures safety and security for millions of citizens exposed to direct attack from our European enemies.

Because of the strategic location of these states, they have selected and have had first call on such F.M. LINK equipment as could be diverted from military service.

But the growing success of our Armed Forces is bringing nearer the time all State, County, and Municipal police organizations will be able to obtain LINK equipment without difficulty.

Then LINK FM equipment will bring a proud reputation and a high record of fine performance on every battle front of this global War For Freedom to the maintenance of peace, and law and order at home.

The best-equipped police and fire departments use F. M. Link equipment exclusively

FM BY Link

Fred M. Link

Engineer • Manufacturer

125 WEST 17th ST., NEW YORK,

Telephone: CHELSEA 2-3838