DEPARTMENT OF COMMERCE

RADIO SERVICE BULLETIN

ISSUED MONTHLY BY BUREAU OF NAVIGATION

Washington, January 2, 1925—No. 93

CONTENTS

	Page
Abbreviations	1
New stations	2
Alterations and corrections	4
Miscellaneous:	
Details of time, weather, press, and hydrographic bulletin schedules transmitted by naval radio stations	9
Regulations governing the operation of amateur stations	11
Scope of work of Radio Service, Bureau of Navigation	11
Notices to mariners of Norwegian stations	11
Increase in rates for coast stations	12
Decrease in rates for stations in the Philippine Islands	12
Radio fog signal at Faerder Light Station, Christiania Fjord, changed	12
Radio fog signal at Marstenen Light Station, Kors Fjord, changed	12
Buffalo (N. Y.) station wave length changed for weather reports	13
Miscellaneous—Continued.	
Chicago (Ill.) station transmits hydrographic information	13
Massawa time signals transmitted on new wave length	13
Method of transmitting fog signals at Seal Island, Canada, changed	13
Method of transmitting fog signals at Larcher Shoal Light Vessel, Bay of Fundy, Canada, changed	13
Licensing of stations	13
Compass station established at Ferrol, Spain	14
Compass station established at Niton, England	14
The use of the electron tube peak voltmeter for the measurement of modulation	16
Standard frequency stations	16
References to current radio periodical literature	17

ABBREVIATIONS

The necessary corrections to the List of Radio Stations of the United States and to the International List of Radiotelegraph Stations, appearing in this bulletin under the heading "Alterations and corrections," are published after the stations affected in the the following order:

Name = Name of station.
Loc. = Geographical location. O = west longitude. N = north latitude. S = south latitude.
Call = Call letters assigned.
System = Radio system used and sparks per second.
Range = Normal range in nautical miles.
W. l. = Wave lengths assigned: Normal wave lengths in italics.
Service = Nature of service maintained.
PG = General public.
PR = Limited public.
RC = Radio compass station.
FS = Fog signal.
P = Private.
O = Government business exclusively.
Hours = Hours of operation:
N = Continuous service.
X = No regular hours.
F. T. Co. = Federal Telegraph Co.
I. W. T. Co. = Independent Wireless Telegraph Co.
K. & C. = Kilbourne & Clark Manufacturing Co.
R. C. A. = Radio Corporation of America.
S. O. R. S. = Ship Owners' Radio Service.
W. S. A. Co. = Wireless Specialty Apparatus Co.
C. w. = Continuous wave.
I. c. w. = Interrupted continuous wave.
V. t. = Vacuum tube.
FX = Fixed station.
U. S. L. = After operating company denotes that the change applies only to the List of Radio Stations of the United States.
Kc. = Kilocycles.
Fy. = Frequency.
A. c. = Alternating current.

NEW STATIONS

Commercial land stations, alphabetically by names of stations

[Additions to the List of Radio Stations of the United States, edition of June 30, 1924, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Station	Call signal	Wave lengths	Service	Hours	Station controlled by—
Glasgow, Mont.[1]	KEP	1686	FX		E. L. Wharton.
Iron Mountain, Mich.[2]	WDY	140, 1000, 1975	P	X	Ford Motor Co.
Jordan, Mont.[3]	KFO	1686	FX	X	T. A. Brick.
L'Anse, Mich.[4]	WCT	1600, 1875	P	X	Ford Motor Co.

[1] Loc. (approximately) O 106° 40′ 00″, N 48° 20′ 00″; range, 200; system, composite, 1000; hours, 10–11 a. m. and 4–5 p. m., daily except Sunday.
[2] Loc. (approximately) O 88° 04′ 00″, N 45° 50′ 00″; range, 150; system, composite, v. t. telegraph.
[3] Loc. (approximately) O 106° 55′ 00″, N 47° 15′ 00″; range, 200; system, Western electric v. t. telegraph.
[4] Loc. O 88° 27′ 30″, N 46° 45′ 20″; range, 200; system, v. t. telegraph.

Commercial ship stations, alphabetically by names of vessels

[Additions to the List of Radio Stations of the United States, edition of June 30, 1924, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Name of vessel	Call signal	Rates	Service	Hours	Owner of vessel	Station controlled by—
Beatrice[1]	KFSO	8	PG	X	A. H. Bull S. S. Co	I. W. T. Co.
Foam[2]	KFSR	8	PG	X	Anthony J. McAllister	Owner of vessel.
Jessie Fay	KFTH				Hollywood Boat & Transportation Co.	
New York Central No. 18.	KFTQ		PG	X	New York Central Railroad	
Osprey	KUJN		PG	X	Deep Sea Fisheries	Do.
Robert E. Lee.	WDT		PG		Robert E. Lee S. S. Corp	

[1] Range, 200; system, I. W. T. Co., 1000; w. l., 450, 600, 706, 800.
[2] Range, 150; system, R. C. A., 1000; w. l., 600.

Commercial land and ship stations, alphabetically by call signals

[b=ship station; c=land station]

Call signal	Name of station		Call signal	Name of station	
KEP	Glasgow, Mont	c	KFTQ	New York Central No. 18	b
KFO	Jordan, Mont	c	KUJN	Osprey	b
KFSO	Beatrice	b	WCT	L'Anse, Mich	c
KFSR	Foam	b	WDT	Robert E. Lee	b
KFTH	Jessie Fay	b	WDY	Iron Mountain, Mich	c

Broadcasting stations, alphabetically by names of States and cities

[Additions to the List of Radio Stations of the United States, edition of June 30, 1924]

State and city	Call signal
Arkansas: Hot Springs	KTHS
California:	
Pasadena	KPPC
San Francisco	KFUQ
Colorado:	
Colorado Springs	KFUM
Denver	KFUP
Do	KOA
Connecticut: Hartford	WTIC
District of Columbia: Washington	WRHF
Georgia: Atlanta	WDBE
Illinois:	
Batavia	WORD
Chicago	WBCN
Galesburg	WFBZ
Indiana:	
Evansville	WGBF
Fort Benjamin Harrison	WFBY
Seymour	WFBE
Kansas:	
Lawrence	KFKU
Manhattan	KSAC
Maryland: Baltimore	WCBM
Minnesota: Breckenridge	KFUJ
Missouri: St. Louis	KFUO
Montana: Helena	KFCC
Nebraska: Hartington	KFRZ
New Jersey: Atlantic City	WPG
New Mexico: State College	KFRY
New York:	
Freeport	WGBB
Jamestown	WOCL
Pennsylvania:	
Allentown	WSAN
Philadelphia	WFBD
Philippine Islands:	
Manila	KZRQ
Do	KZUY
South Carolina: Greenville	WGBT
Texas:	
Galveston	KFUL
Houston	WRAA
Virginia: Thrifton	WGBG

Stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signals

Call signal	Location of station	Station operated and controlled by—	Power (watts)	Wave length	Frequency (kilocycles)
KFCC	Helena, Mont	First Congregational Church	10	248	1,210
KFKU	Lawrence, Kans	University of Kansas	500	275	1,090
KFRY	State College, N. Mex	New Mexico College of Agriculture and Mechanic Arts.	50	266	1,130
KFRZ	Hartington, Nebr	Electric Shop (P. M. Thies)	15	222	1,350
KFUJ	Breckenridge, Minn., 120 North Fifth St.	Hoppert Plumbing & Heating Co.	50	242	1,240
KFUL	Galveston, Tex	Thomas Goggan & Bros. Music Co.	10	258	1,160
KFUM	Colorado Springs, Colo., Kiowa and Cascade Sts.	W. D. Corley	100	242	1,240
KFUO	St. Louis, Mo	Concordia College	500	545	550
KFUP	Denver, Colo	Fitzsimons General Hospital	50	234	1,280
KFUQ	San Francisco, Calif., 1380 Bush St.	Julius Brunton & Sons Co	5	234	1,280
KOA	Denver, Colo., 1370 Krameria St	General Electric Co	1,000	323	930
KPPC	Pasadena, Calif	Pasadena Presbyterian Church	50	229	1,310
KSAC	Manhattan, Kans	Kansas State Agricultural College.	500	341	880
KTHS	Hot Springs, Ark	New Arlington Hotel Co	500	375	800
KZRQ	Manila, P. I., Manila Hotel	Far Eastern Radio (Inc.)	500	222	1,360
KZUY	Manila, P. I., 600 M. H. del Pilar	F. Johnson Elser	500	370	812
WBCN	Chicago, Ill., 728 West Sixty-fifth St.	Foster & McDonnell	500	268	1,120
WCBM	Baltimore, Md., Charles St. and North Ave.	Hotel Chateau (Charles Schwartz).	50	229	1,310
WDBE	Atlanta, Ga., 22 Luckie St	Gilham-Schoen Electric Co	100	278	1,080
WFBE	Seymour, Ind., 208 West Second St.	John Van de Walle	20	226	1,330
WFBD	Philadelphia, Pa., Eighteenth St and Columbia Ave.	Gethsemane Baptist Church	5	234	1,280
WFBY	Fort Benjamin Harrison, Ind	U. S. Army, Fifth Corps Area	100	258	1,160
WFBZ	Galesburg, Ill	Knox College	10	254	1,180
WGBB	Freeport, N. Y., 217 Bedell St	Harry H. Carman	100	244	1,240
WGBF	Evansville, Ind., 307 South Seventh St.	Finke Furniture Co	50	217.3	1,380
WGBG	Thrifton, Va., 25 Franklin St	Breitenbach's Radio Shop	100	226	1,330
WGBT	Greenville, S. C	Furman University	15	236	1,270
WOCL	Jamestown, N. Y	Hotel Jamestown	15	275	1,090
WORD	Batavia, Ill	Peoples Pulpit Association	500	278	1,080
WPG	Atlantic City, N. J	Municipality of Atlantic City	500	296	1,010
WRAA	Houston, Tex	Rice Institute	100	256	1,170
WRHF	Washington, D. C., 525 Eleventh St.	Washington Radio Hospital fund.	50	256	1,170
WSAN	Allentown, Pa	Allentown Call Publishing Co	10	229	1,310
WTIC	Hartford, Conn	Travelers Insurance Co	500	349	860

Government land stations, alphabetically by names of stations

[Additions to the List of Radio Stations of the United States, edition of June 30, 1924, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Station	Call signal	Wave lengths	Service	Hours	Station controlled by—
Akiak, Alaska	WWF		O	X	Bureau of Education, Department of the Interior.
St. George, Alaska (Pribilof Islands.) [1]	WWD	598, 540, 600, 675, 952.	FX	X	Bureau of Fisheries, Department of Commerce.

[1] Loc. O 169° 32′ 40″, N 56° 36′ 10″; system, v. t. telephone.

Government land and ship stations, alphabetically by call signals

[b=ship station; c=land station]

Call signal	Name of station	Call signal	Name of station
WWD	St. George, Alaska c	WWF	Akiak, Alaska c

Special land stations, alphabetically by names of stations

[Additions to the List of Radio Stations of the United States, edition of June 30, 1924]

Station	Call signal	Station controlled by—
Buffalo, N. Y.	8XAB	Seneca Vocational School.
Canton, N. Y.	8XF	St. Lawrence University.
Davenport, Iowa	9XG	Palmer School of Chiropractic.
Eugene, Oreg.	7XG	University of Oregon.
Granville, Ohio	8XW	Denison University (Richard H. Howe).
Mason, Ohio	8XAA	United States Playing Card Co.
New York, N. Y.	2XH	Greeley Square Hotel Co. (Hotel McAlpin).
West Lafayette, Ind.	9XE	Purdue University.

Special land stations grouped by districts

Call signal	District and station	Call signal	District and station
2XH	Second district: New York, N. Y.		Eighth district—Continued.
7XG	Seventh district: Eugene, Oreg.	8XW	Granville, Ohio.
	Eighth district:		Ninth district:
8XAA	Mason, Ohio.	9XE	West Lafayette, Ind.
8XAB	Buffalo, N. Y.	9XG	Davenport, Iowa.
8XF	Canton, N. Y.		

ALTERATIONS AND CORRECTIONS

COMMERCIAL LAND STATIONS

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1924, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

BALABAC, P. I.—Hours, Sunday and holiday add 2–3.30 p. m.
BALTIMORE, MD. (WLL).—W. l., *600*, 875.
BOLINAS, CALIF. (KET).—System, add General Electric v. t. telegraph; w. l., add 99.
BOLINAS, CALIF. (KPH).—W. l., *600*, 2200.
BUFFALO, N. Y.—W. l., *600*, 730, 1764, 1800.
CEIBA, P. R.—Hours, Sunday and holiday 9–11 a. m. and 6.30 p. m.–midnight.

CHICAGO, ILL. (WGO).—W. l., *600*, 890, 1800.
CLEVELAND, OHIO (WTK).—W. l., *600*, 730, 1764, 1800.
DEARBORN, MICH.—W. l., 140, 143, *600*, 1713, 1875.
EAST PITTSBURGH, PA.—W. l., add 58.79.
JACKSON, OHIO—W. l., 1743
LUDINGTON, MICH.—System, R. C. A. arc and R. C. A., 1000; w. l., *600*, 1666.
MALABANG, P. I.—Hours, Sunday and holiday add 2-3.30 p. m.
MARTINSVILLE, ILL.—System, De Forest v. t. telephone and telegraph.
NEW YORK, N. Y. (WHI).—System, Federal arc and R. C. A., 1000; hours, X.
NORTHVILLE, MICH.—W. l., 1910.
PALM BEACH, FLA.—Range, 200-300; system, R. C. A., 1000 and composite, 1000; w. l., *600*, 650.
ROGERS, MICH.—Call signal changed to WLC.
SPRINGFIELD, OHIO.—W. l., 1910
SAN VINCENTE, P. I.—*Read* San Vicente, P. I., hours, Sunday and holiday change to 9-12 to 9-11 a. m.
SURIGAO, P. I.—Hours, ship schedule last 10 minutes of each hour.
Strike out all particulars of the following-named stations: Benton Harbor, Mich.; Dillard, Okla.; Newark, N. J.; Parsons, Kans.

COMMERCIAL SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS

[Alterations and corrections to be made to the List of Radio Stations of the United States, editions of June 30, 1924, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

A. C. BEDFORD.—W. l., 450, *600*, 706, 800.
ALBERT JEFFRESS.—W. l., 450, *600*, 706, 800.
ALGONQUIN.—W. l., 450, *600*, 706, 800.
AQUARIUS.—W. l., 450, *600*, 706, 800.
AQUIDABAN.—Name changed to Transford II.
BARWICK.—George H. Crofton owner of vessel.
BAYOU CHICO.—W. l., 450, *600*, 706, 800.
BIENVILLE.—Range, 300; system, R. C. A., 1000; w. l., *600*, 706, 800, 875; rates, 8 cents per word; station operated and controlled by owner of vessel.
BIRAN.—Name changed to Dorothy; A. H. Bull S. S. Co. owner of vessel.
CADARETTA.—Station operated and controlled by I. W. T. Co.
CARIBBEAN.—Range, 200; w. l., 300, 950; hours, N.
CAROLYN FRANCES.—H. Liebes & Co. owner of vessel.
CHARLES PRATT.—W. l., add 706, 800.
COKESIT.—W. l., 450, *600*, 730, 800, 875; station operated and controlled by I. W. T. Co. (U. S. L.).
DARIEN.—System, Navy v. t. telephone; w. l., 150, *600*; service, P; hours, N.
DOMINO.—W. l., 450, *600*, 706, 800.
EL CID.—System, R. C. A., 1000; w. l., *600*, 706, 800.
FAVORITE (KDNY).—Range, 300; system, Navy arc, Navy spark, 1000 and Navy v. t. telephone; w. l., 150, 450, *600*, 1800, 2400; service, P; hours, N.
GENESEE.—Sylvanus Stokes, jr. owner of vessel.
GLYMONT.—Station operated and controlled by I. W. T. Co.
GORGONA.—Range, 150; w. l., 300, 450, *600*; service, P; hours, N; station operated and controlled by owner of vessel.
HENRY D. WHITON.—Range, 150; w. l., *600*, 706, 800; station operated and controlled by I. W. T. Co.
HOLLYWOOD.—W. l., 450, *600*, 706, 800.
J. A. BOSTWICK.—I. W. T. Co. arc and Lowenstein 1000; w. l., *600*, 706, 730, 800, 2100, 2400.
KINGFISHER.—Wabash Transpn. Co. owner of vessel.
LAS VEGAS.—W. l., 450, *600*, 706, 800.
LUXPALILE.—W. l., 450, *600*, 706, 800.
MALABAR.—W. l., *600*, 706, 800, 2100, 2400.
MINNESOTA.—George S. Bennett, owner of vessel.
MUSKOGEE.—Range, 150; system, Navy-Lowenstein, 1000; w. l., *600*, 706, 800.
NEW BRITAIN.—W. l., 450, *600*, 706, 800.
NORLINA.—W. l., 450, *600*, 706.
NORMA.—System, Navy-R. C. A., 1000; w. l., *600*, 706, 800.
PARIA.—Station operated and controlled by I. W. T. Co.
PIONEER (KUSS).—Stuart Corp. owner of vessel.
POINT LOBOS.—Swayne & Hoyt owner of vessel; station operated and controlled by owner of vessel.
REPUBLIC (KSN).—W. l., 450, *600*, 706, 800, 1800, 2100, 2400.

SAGADAHOC.—W. l., *600*, 706, 800.
SAN JOSE.—W. l., *600*, 706, 800; hours, N.
SANTA CLARA.—System, R. C. A., 1000; w. l., 450, *600*, 706, 800.
SANTA MALTA.—W. l., 450, *600*, 706, 800.
SANTA VERONICA.—Station operated and controlled by I. W. T. Co.
SAUGERTIES.—Station operated and controlled by S. O. R. S.
STEEL RANGER.—W. l., 450, *600*, 706, 800.
SUCARSECO.—Submarine Boat Corp. owner of vessel.
SUSANA II.—Call signal changed to KZAW, w. l., 300, *600*, 800.
TAVERNILLA.—Range, 150; system, Navy, 1000; w. l., 300, 450, *600*; service, P; hours, N; station operated and controlled by owner of vessel.
THALASSA.—Range, 75; system, Marconi, 1000; w. l., 300, 450, *600*, 800; Eugen Higgins, owner of vessel; station operated and controlled by owner of vessel.
VIKING.—W. l., *600*, 800.
VINCENT.—W. l., 450, *600*, 706, 800.
WESTBORO.—Correct call signal KDJH (U. S. L.).
WEST ISLETA.—W. l., 450, 600, 706, *800*, 875.
WEST NOHNO.—W. l., 450, *600*, 706, 800.
WEST NOMENTUM.—W. l., 450, *600*, 706, 800.
WEST NOSSKA.—W. l., 450, *600*, 706, 800, 875.
WEST SEGOVIA.—W. l., 450, *600*, 706, 800.
WILLIAM A. MCKENNEY.—W. l., *600*, 706, 800.
WILLIAM CAMPION.—W. l., *600*, 706, 800.
WM. ROCKEFELLER.—W. l., 450, *600*, 706, 800.
Strike out all particulars of the following-named vessels: Alicia, Alliance, Anniston, Avondale, Bacoi, Barrallton, Bathalum, Baton Rouge (KSG), Bernice, Blue Hill, Brabant, Brockton, Burnwell, Caino, Carib (KUZX), Charles L. O'Connor, City of Augusta, City of Dallas, Commercial Courier, Cora F. Cressy, Covalt, Covena, Craigsmere, Cricket, Cristina, Cushnet, Cuttyhunk, Director, Dochra, Dunmore, E. G. Crosby, Esperanza, Farnam, Fort Bragg, Fourth Alabama, General H. F. Hodges, Georgia (WFA), Gold Star, Hancock County, Hisko, Holbrook, Humboldt, Hutchinson, J. B. John, Jim Sid, John F. Hylan, Josiah Macy, Kaleen, Keshena, Kingfisher, Knoxville, Lackawanna Bridge, Lake Aurice, Lake Benbow, Lake Benton, Lake Berdan, Lake Callicoon, Lake Capens, Lake Conesus, Lake Dancey, Lake Daraga, Lake Desha, Lake Dymer, Lake Ellendale, Lake Ellijay, Lake Fairlie, Lake Fairport, Lake Falama, Lake Farlin, Lake Festina, Lake Festus, Lake Fithian, Lake Flagstaff, Lake Flynus, Lake Forkville, Lake Fossil, Lake Foxcraft, Lake Fraichur, Lake Franconia, Lake Frenchton, Lake Frio, Lake Furley, Lake Giltedge, Lake Gorin, Lake Govan, Lake Grama, Lake Granby, Lake Indian, Lakeland, Lake Lasang, Lake Linden, Lake Marion, Lake Ormoc, Lake Otsquago, Lake Sanford, Lake Superior, Lake Wimico, Lakewood, L. D. Potter, Leyden, Louisville Bridge, Maruba, Minnewawa, Moffitt, Moshico, Neptune, Nereus, Noddle Island, Northwestern Bridge, Nueces, Overbrook, Peconic, Pere Marquette 8, Phoenix, P. J. Reilly, Restless, Ripple (KDUN), St. Augustine, Sandcraft, Santanta, Sequoia, Silverbrook, Star 1, Tekoa, Thomas J Howard, Tollard, Tuladi, West Conob, West Shore, Wm. Boyce Thompson, Wyandotte (WJW).

COMMERCIAL LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS

KEMG, changed to KZAW; KFOS, *read* Transford II; KKOA, *read* Dorothy; KZAG, *read* San Vicente; WHT, changed to WLC; strike out all particulars following the call signals, KDAF, KDHS, KDIT, KDJC, KDME, KDMY, KDNJ, KDPZ, KDUN, KDYF, KEBM, KECV, KEFP, KEGL, KEH, KEJG, KEJL, KEMM, KEMP, KEPN, KEQP, KERM, KEVX, KEX, KFEA, KFGW, KFJ, KFSJ, KFTE, KFTX, KGL, KIBC, KIDB, KIDM, KIDP, KIDT, KIFP, KIGJ, KIGM, KIJN, KIKJ, KIMS, KINL, KINV, KIQT, KISP, KITB, KITR, KITV, KIVP, KIXJ, KIZM, KJU, KKAU, KLAE, KLEO, KLUA, KMA, KMUA, KOBL, KOBX, KOGC, KOGR, KOKV, KOKZ, KONB, KONC, KONK, KOPG, KOPV, KORT, KOXF, KOXL, KPG, KQIE, KRIA, KSAO, KSG, KSIU, KSOI, KSZ, KUJP, KUKK, KUN, KUSM, KUU, KUZB, KUZD, KUZX, KVAE, KVUA, KWJ, KWZ, KXAO, KXEE, KXEI, KZAE, KZAL, KZB, KZC, KZEE, KZEI, KZEO, KZIA, KZOO, KZR, KZS, WAK, WCUE, WCUO, WDI, WDL, WFA, WFUE, WIZ, WJEO, WJW, WJZ, WLEI, WLH, WMAA, WMD, WMEA, WNAO, WPY, WQD, WQII, WRIE, WRIO, WSEI, WTAE, WTOO, WVIU, WXOO, WZEE.

BROADCASTING STATIONS, BY CALL SIGNALS

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1924]

KDYL (Salt Lake City, Utah).—Power, 50; w. l., 250; frequency, kc. 1,200.
KFAU (Boise, Idaho).—Power, 500; w. l., 275; frequency, kc. 1,090.
KFBU (Laramie, Wyo.).—W. l., 270; frequency, kc. 1,110; station operated and controlled by Bishop N. S. Thomas, 301 Thornburg Street.
KFCF (Walla Walla, Wash.).—W. l., 256; frequency, kc. 1,170.
KFFV (Lamoni, Iowa).—W. l., 250; frequency, kc. 1,200.
KFGZ (Berrien Springs, Mich.).—Call signal changed to WEMC.
KFIF (Portland, Oreg.).—W. l., 248; frequency, kc. 1,210.
KFMQ (Fayetteville, Ark.).—Power, 500; w. l., 275; frequency, kc. 1,090.
KFNY (Helena, Mont.).—Power, 50; w. l., 248; frequency, kc. 1,210; station operated and controlled by V. Kemp Roberts, 40 Olive Street.
KFOJ (Moberly, Mo.).—Station operated and controlled by Moberly High School.
KFOY (St. Paul, Minn.).—W. l., 252; frequency, kc. 1,190.
KFQC (Taft, Calif.).—W. l., 231; frequency, kc. 1,300.
KFQG (Los Angeles, Calif.).—Power, 50; w. l., 229; frequency, kc. 1,310.
KFRC (San Francisco, Calif.).—Power, 50; w. l., 278; frequency, kc. 1,080.
KFRH (Grafton, N. Dak.).—Station operated and controlled by the Radio Shop (Martin L. Monson).
KGB (Tacoma, Wash.).—W. l., 250; frequency, kc. 1,200.
KFGC (Baton Rouge, La.).—W. l., 268; frequency, kc. 1,120.
KGO (Oakland, Calif.).—Power, 1,500.
KJS (Los Angeles, Calif.).—Power, 500; w. l., 252; frequency, kc, 1,190.
KOP (Detroit, Mich.).—W. l., 278; frequency, kc. 1,090.
KQW (San Jose, Calif.).—W. l., 240; frequency, kc. 1,250.
WAAW (Omaha, Nebr.).—W. l., 278; frequency, kc. 1,080.
WABM (Saginaw, Mich.).—Power, 20; w. l., 261; frequency, kc. 1,150.
WABO (Rochester, N. Y.).—Power, 100; wl., 278; frequency, kc. 1,080.
WABR (Toledo, Ohio).—W. l., 263; frequency, kc. 1,140.
WABW (Wooster, Ohio).—W. l., 206.8; frequency, kc. 1,450.
WABX (Mount Clemens, Mich.-near).—Power, 50; w. l., 254; frequency, kc. 1,180.
WBAO (Decatur, Ill.).—Power, 100.
WBAX (Wilkes-Barre, Pa.).—W. l., 256; frequency, kc. 1,170.
WBBA (Newark, Ohio).—W. l., 226; frequency, kc. 1,330.
WBBH (Port Huron, Mich.).—W. l., 205.4; frequency, kc. 1,460.
WBBP (Petoskey, Mich.).—Power 5-100; w. l., 214.2; frequency, kc. 1,400.
WCAH (Columbus, Ohio).—Power, 200; w. l., 266; frequency, kc. 1,130.
WCAR (San Antonio, Tex.).—W. l., 263; frequency, kc. 1,140.
WCAV (Little Rock, Ark.).—W. l., 263; frequency, kc. 1,140.
WCBI (Bemis, Tenn.).—Power, 150.
WCBR (Providence, R. I.-portable).—Power, 30.
WCBU (Arnold, Pa.).—W. l., 220; frequency, kc. 1,340.
WCK (St. Louis, Mo.).—W. l., 273; frequency, kc. 1,100.
WDBS (Dayton, Ohio).—W. l., 275; frequency, kc. 1,090.
WDZ (Tuscola, Ill.).—Power, 10-100.
WEAF (New York, N. Y.).—Power, 2,000.
WEAH (Wichita, Kans.).—W. l., 268; frequency, kc. 1,120.
WEAI (Ithaca, N. Y.).—W. l., 254; frequency, kc. 1,180.
WEAJ (Vermillon, S. Dak.).—W. l., 278; frequency, kc. 1,080.
WEBO (Hamilton, Ohio).—W. l., 252; frequency, kc. 1,190.
WEBT (Dayton, Ohio).—W. l., 256; frequency, kc. 1,170.
WEBZ (Savannah, Ga.).—W. l., 234; frequency, kc. 1,280.
WFBG (Altoona, Pa.).—W. l., 278; frequency, kc. 1,080.
WFBL (Syracuse, N. Y.).—W. l., 252; frequency, kc. 1,190.
WGY (Schenectady, N. Y.).—Power, 1,500.
WHAD (Milwaukee, Wis.).—Power, 500; w. l., 275; frequency, kc. 1,090.
WHAM (Rochester, N. Y.).—W. l., 278; frequency, kc. 1,080.
WJAD (Waco, Tex.).—Power, 500; w. l., 353; frequency, kc. 850.
WJAG (Norfolk, Nebr.).—W. l., 270; frequency, kc. 1,110.
WJAN (Peoria, Ill.).—W. l., 273; frequency, kc. 1,100.
WJAS (Pittsburgh, Pa.).—W. l., 275; frequency, kc. 1,090.
WJD (Granville, Ohio).—W. l., 217.3; frequency, kc. 1,380.
WMAK (Lockport, N. Y.).—W. l., 266; frequency, kc. 1,130.

WMAN (Columbus, Ohio).—W. l., 278; frequency, kc. 1,080; station operated and controlled by First Baptist Church (W. E. Heskett).
WNAP (Springfield, Ohio).—W. l., 248; frequency, kc. 1,210.
WPAB (State College, Pa.).—Call signal changed to WPSC; W. l., 261; frequency, kc. 1,150.
WPAK (Agricultural College, N. Dak.).—W. l., 275; frequency, kc. 1,090.
WPAZ (Charleston, W. Va.).—W. l., 268; frequency, kc. 1,120.
WQAS (Lowell, Mass.).—W. l., 252; frequency, kc. 1,190.
WRAF (Laporte, Ind.).—Power, 15.
WRAV (Yellow Springs, Ohio).—W. l., 263; frequency, kc. 1,140.
WREO (Lansing, Mich.).—W. l., 286; frequency, kc. 1,050.
WRR (Dallas, Tex.).—Power, 200; w. l., 261; frequency, kc. 1,150.
WTAC (Johnstown, Pa.).—W. l., 209.7; frequency, kc. 1,430.
WTAY (Oak Park, Ill.).—W. l., 250; frequency, kc. 1,200.
WWI (Dearborn, Mich.).—W. l., 266; frequency, kc. 1,130.
Strike out all particulars of the following-named stations: KDZR, Bellingham, Wash.; KFAY, Medford, Oreg.; KFBE, San Luis Obispo, Calif.; KFBS, Trinidad, Colo.; KFKZ, Colorado Springs, Colo.; KFOF, Marshfield, Oreg.; KFPN, Jefferson City, Mo.; KFPO, Denver, Colo.; KFQK, Fayette, Mo.; KFQO, Russell, Kans.; KFRG, St. Louis, Mo.; KFRI, Denver, Colo.; KGG, Portland, Oreg.; KQP, Hood River, Oreg.; KYF, Wichita, Kans.; WABP, Dover, Ohio; WBL, Anthony, Kans.; WEBU, De Land, Fla.; WIAB, Rockford, Ill.; WPAR, Beloit, Kans.; WQAF, Sandusky, Ohio; WQAX, Peoria, Ill.

GOVERNMENT LAND STATIONS, ALPHABETICALLY BY NAMES OF STATIONS

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1924, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

BAR HARBOR, ME. (R. C.).—Call signal changed to NQC., effective February 1, 1925.
BIRD ISLAND, CALIF.—Strike out all particulars.
COLUMBIA RIVER LIGHT VESSEL (fog signal).—Transmission of fog signal changed to 3 dashes for 60 seconds, silent 30 seconds.
DEER ISLAND, MASS.—Call signal changed to NWM, effective February 1, 1925.
DETOUR POINT, MICH.—W. l., add *600*.
EUREKA, CALIF.—W. l., 3039 changed to 3156.
FIRE ISLAND, N. Y.—Call signal changed to NJY, effective February 1, 1925.
FOURTH CLIFF, MASS.—Call signal changed to NWM, effective February 1, 1925.
GUANTANAMO BAY, CUBA.—W. l., 2701 changed to 2726.
KEY WEST, FLA. (regular station, NAR).—W. l., 5757 changed to 5657.
MANASQUAN, N. J.—Call signal changed to NJY, effective February 1, 1925.
NORTH TRURO, MASS.—W. l., add *600*.
PRICES NECK, R. I.—Call signal changed to NGO, effective February 1, 1925.
SANDY HOOK, N. J.—Call signal changed to NJY, effective February 1, 1925.
TATOOSH, WASH.—W. l., add *600*.
THATCHER ISLAND, MASS.—Call signal changed to NWM, effective February 1, 1925.
WASHINGTON, D. C. (Arlington, Va., NAA).—W. l., 2653 changed to 2655.

GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS

NAD, changed to NWM (Deer Island, Mass., Fourth Cliff, Mass., Thatcher Island, Mass.); NAF, changed to NGO; NAH, changed to NJY (Fire Island, N. Y.; Manasquan, N. J., Sandy Hook, N. J.); NBB, changed to NQC; NLD, strike out all particulars. The changes in the naval call signals are effective February 1, 1925.

SPECIAL LAND STATIONS, BY NAMES OF STATIONS

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1924]

BUFFALO, N. Y. (8XN).—Station operated and controlled by Federal Telephone Mfg. Co.
EAST PITTSBURGH, PA. (8XAU).—Call signal changed to 8XK.
PORTLAND, OREG. (7YK).—Station operated and controlled by Benson Polytechnic School.

STEVENSVILLE, MONT. (near-7XAF).—Changed to Portland, Oreg., address care of Ralp Schneeloch, Lumberman's Building.

Strike out all particulars of the following-named stations: Buffalo, N. Y. (8YP); El Monte, Calif. (6XAX); Granville, Ohio (8YM); Houghton, Mich. (9XAY); New York, N. Y. (2XK); St. Louis, Mo. (9YAB); Springdale, Conn. (1XAK); West Lafayette, Ind. (9YB).

MISCELLANEOUS

Details of time, weather, press, and hydrographic bulletin schedules transmitted by naval radio stations

Name of station	Call signal	Wave length	Type of emission	Time (75th meridian)	Nature of service
Annapolis, Md. (Washington, D. C.).	NSS	17,130	Arc	1155	Time.
				1700	Ice report.
				2155	Time, press.
Arlington, Va. (Washington, D. C.).	NAA	2,665	V. t. c. w.	1030	Weather, hydrographic.
				1155	Time, storm warnings.
				2155	Time, weather, hydrographic, press.
Balboa, Canal Zone	NBA	6,663	Arc	0455	Time, press, hydrographic.
				1255	Time, hydrographic.
Boston, Mass	NAD	1,383	V. t. c. w.	1100	Weather, hydrographic.
				1155	Time, if Arlington fails.
				1700	Weather, hydrographic.
Brownsville, Tex	NAY	2,234	Spark	0000	Weather.
				1200	Do.
				1900	Do.[1]
		4,997	Arc	0000	Do.
				1200	Do.
				1900	Do.[1]
Cavite, P. I	NPO	5,260	do	0100	Press.
				0855	Time, weather, hydrographic.
				1400	Press.
				2155	Time, weather, hydrographic.
		2,701	Spark	0855	Do.
				2155	Do.
Charleston, S. C	NAO	2,607	V. t. c. w.	1030	Weather, hydrographic.
				1155	Time, if Arlington fails.
				1800	Weather, hydrographic.
Colon, Canal Zone	NAX	1,817	Spark	0455	Time, hydrographic, press.
				1255	Time, hydrographic.
Detour Point, Mich	NZU	600	do	1100	Hydrographic.
				1715	Do.
Dutch Harbor, Alaska	NPR	2,254	do	0030	Weather.
				1230	Do.
Eureka, Calif	NPW	3,156	V. t. c. w.	1200	Weather, hydrographic.
				1455	Time.
				1700	Weather, hydrographic.
				2030	Do.
Great Lakes, Ill	NAJ	4,685	Arc	1045	Hydrographic.
				1700	Do.
		1,956	V. t. c. w.	1045	Weather.
				1100	Hydrographic.
				1155	Time.
				1715	Hydrographic.
				2300	Weather.
Guantanamo Bay, Cuba	NAW	2,726	Spark		Hurricane warnings as issued and repeated every 4 hours.
Honolulu, Hawaii (Pearl Harbor).	NPM	2,254	do	0130	Weather, hydrographic.
				1330	Do.
				1730	Do.
				1855	Time.
		11,490	Arc	1855	Do.
Jupiter, Fla	NAQ	1,304	Spark	1130	Weather.
				1800	Do.[1]
Key West, Fla	NAR	1,463	V. t. c. w.	1155	Time.
				1200	Weather.
				2200	Do.
		5,857	Arc	2200	Do.
New Orleans, La	NAT	2,607	V. t. c. w.	1100	Weather, hydrographic.[1]
				1155	Time.
				1700	Weather, hydrographic.
				1080	Weather.
Newport, R. I	NAF	2,607	Arc	1155	Time, if Arlington fails.
New York, N. Y	NAH	1,538	V. t. c. w.	1080	Weather, hydrographic.
				1155	Time, if Arlington fails.
				1700	Weather, hydrographic.

[1] Hurricane warnings are issued and repeated every 2 hours

Details of time, weather, press, and hydrographic bulletin schedules transmitted by naval radio stations—Continued

Name of station	Call signal	Wave length	Type of emission	Time (75th meridian)	Nature of service
Norfolk, Va	NAM	1,368	V. t. c. w	0830	Weather.
				1045	Weather, hydrographic.
				1155	Time, if Arlington fails.
				1600	Weather, hydrographic.
				2000	Weather.
		1,396	do	2030	Do.[1]
North Head, Wash	NPE	2,726	Spark	0830	Do.
				1230	Do.
				1435	Time.
				1630	Weather, hydrographic.
				2030	Weather.
				2330	Weather, hydrographic.
North Truro, Mass	NZU	600	do	0800	Hydrographic.
				1700	Do.
Pensacola, Fla	NAS	1,333	V. t. c. w	1145	Weather.
				1800	Do.[1]
Philadelphia, Pa	NAI	1,300	do	1045	Weather, hydrographic.
				1700	Do.
Port au Prince, Haiti	NSC	2,254	Spark		Hurricane warnings as issued and repeated every 4 hours.
Portland, Me. (Cape Elizabeth).	NAB	1,090	do	1200	Weather.
				2000	Do.
Puget Sound, Wash	NPC	2,499	V. t. c. w	0800	Do.
				1200	Weather, hydrographic.
				1800	Do.
				2000	Weather.
				2200	Hydrographic.
				2300	Weather.
San Diego, Calif	NPL	9,798	Arc	0500	Press.
				1455	Time.
		1,538	V. t. c. w	0100	Hurricane warnings (also at other times upon receipt).
				1100	Do.
				1130	Weather.
				1500	Hurricane warnings (also at other times upon receipt).
				1455	Time.
				1700	Weather.
				2300	Do.
San Francisco, Calif	NPG	4,836	Arc	0055	Time.
				0415	Press.
				1455	Time.
		7,005	do	1200	Weather, hydrographic.
				2230	Do.
		1,333	V. t. c. w	0055	Time.
				0100	Weather, hydrographic.
				0300	Bonita Channel weather.
				0415	Press.
				0700	Bonita Channel weather.
				1100	Do.
				1455	Time.
				1800	Bonita Channel weather.
				1900	Do.
				2230	Weather, hydrographic.
				2300	Bonita Channel weather.
San Juan, P. R	NAU	4,836	Arc	1945	Weather.
		2,855	Spark	2100	Do.[1]
Savannah, Ga	NEV	1,428	do	1100	Do.
				1800	Do.[1]
St. Augustine, Fla	NAP	2,342	do	1130	Do.
St. Croix, Virgin Islands	NNI	450	do		Hurricane warnings as issued and repeated every 4 hours.
St. Thomas, Virgin Islands	NBB	1,655	do		Do.
Tatoosh, Wash	NPD	600	do	0800	Weather.
				1200	Do.
				1600	Do.
				2000	Do.
				2300	Do.
Tutuila, Samoa	NPU	2,254	do	0230	Hydrographic.
				1430	Do.
				1830	Do.
				2230	Do.

[1] Hurricane warnings are issued and repeated every 2 hours.

NOTE.—All naval time signals are made in a standard manner, which is as follows: The signals begins 5 minutes before the hour to be marked and consists of a dot for each second. The dot for the twenty-ninth second of each minute is omitted, and also the last 5 seconds of the first 4 minutes. The last 10 seconds of the fifth minute are omitted, this silence being followed by a 1-second dash, the beginning of which marks the time signal.

COLUMBIA RIVER LIGHT VESSEL FOG SIGNAL TRANSMISSION CHANGED

The method of transmission of the signal at this station has been changed to 3 dashes for 60 seconds, silent 30 seconds.

REGULATIONS GOVERNING THE OPERATION OF AMATEUR STATIONS

[General letter No. 265, December 24, 1924, to supervisors of radio and owners of amateur radio stations]

Wave lengths.—150 to 200, 75 to 85.7, 37.5 to 42.8, 18.7 to 21.4, and 4.69 to 5.35 meters are allocated to amateur stations.

Spark transmitters.—Amateur spark transmitters produce considerable interference and consequently are responsible for many complaints. Amateur owners of such transmitters should abandon their use as early as possible and adopt a system producing less interference. Until such change is made they will be permitted in the wave length band between 170 and 180 meters and should have a decrement not exceeding 0.1.

Phone and ICW transmitters.—Phone and ICW (interrupted continuous wave) transmitters will be permitted in the band from 170 and 180 meters. ICW shall be defined as the type of wave produced by mechanically interrupting one or more of the radio frequency circuits or the type of wave produced by any transmitting set which produces an equivalent effect.

CW transmitters.—CW (continuous wave) transmitters will be permitted in all of the bands allocated for amateur use.

Coupled circuits.—Amateur stations must use circuits loosely coupled to the radiating system, or devices that will produce equivalent effects to minimize key impacts, harmonics, and plate supply modulations, except in cases where loops are used as radiators. Conductive coupling, even though loose, will not be permitted.

Power supply.—No restrictions will be imposed relative to the character of power supply, provided the emitted wave is sharply defined.

Quiet hours.—Amateur stations when using wave lengths between 150 and 200 meters are required to observe a silent period from 8 to 10.30 p. m. daily, standard time, and on Sundays while church services are being broadcast. Such stations when using wave lengths below 85 meters and having a pure continuous wave or where a full wave rectification is employed are not required to observe a silent period, provided no interference is caused other services.

Station licenses.—Licenses issued for amateur stations will authorize the use of any or all of the wave lengths allocated for amateur use, provided the transmitter meets the requirements of the above regulations. No alternation in the apparatus will be permitted which results in changing the character of the emitted wave, except under authority granted by the supervisor of radio.

Intercommunication.—Amateur stations are not permitted to communicate with commercial or Government stations unless authorized by the Secretary of Commerce, except in an emergency or for testing purposes. This restriction does not apply to communication with small pleasure craft, such as yachts and motor boats, which may have difficulty in establishing communication with commercial or Government stations.

Special amateur station licenses.—There being no further need for special amateur station licenses, owners of stations holding such licenses will be permitted to continue the use of their "Z" calls under regular amateur station licenses. No new "Z" calls will be issued. The privilege of using the wave lengths from 105 to 110 meters is withdrawn.

A. J. Tyrer, *Acting Commissioner.*

Approved:
S. B. Davis,
Acting Secretary of Commerce.

SCOPE OF WORK OF RADIO SERVICE, BUREAU OF NAVIGATION

The following table shows the inspection and licensing work performed yearly from 1914 to 1924, inclusive, and the number of persons employed in the field force:

June 30—	American ships equipped	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Number of commercial and special land stations	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6,484	339	83	2,137	1,172	20
1915	585	362	6,152	1,653	115	3,547	3,067	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,303	28
1918	1,478	392	5,575	1,816	----------	----------	----------	29
1919	2,812	976	5,160	1,645	----------	----------	----------	27
1920	2,808	1,158	5,419	4,452	254	5,719	6,103	25–45
1921	2,978	921	5,591	2,722	491	7,351	6,207	26
1922	2,773	1,174	6,071	3,136	1,086	9,525	8,920	35
1923	2,723	945	6,933	2,860	1,375	7,821	9,908	53
1924	2,741	1,382	7,727	3,370	1,802	8,205	9,545	53

NOTICES TO MARINERS BY NORWEGIAN STATIONS

Important notices to mariners covering areas located outside the regular pilot districts will be broadcast either by Bergen radio station immediately after the weather bulletins at $15^h\ 30^m$, or by Tjomo radio station immediately after the

weather bulletins at 19h 30m. Notices may also be broadcast occasionally by Utsire, Ingoy, and Vardo stations. The notices are sent in plain language (English) and commence with the phrase "Urgent notices to mariners." In the case of the two first-mentioned stations, the notices are broadcast on the wave used for the weather bulletins, while the other stations use a wave length of 600 meters. The notices will be repeated daily for as long a period as may be found expedient.—*From Efterretninger for Sjofarende 11 (485), Kristinia, November 30, 1924.*

INCREASE IN RATES FOR COAST STATIONS

Effective March 1, 1925, the rates for the stations named hereunder will be 52 centimes (gold) per word for ship-to-shore traffic:

Operated by R. C. A.	Operated by T. R. T. Co.	Operated by F. T. Co.
Chatham, Mass. (WIM).	Boston, Mass. (WBF).	Clearwater, Calif. (KOK).
Marion, Mass. (WCC).	Burrwood, La.	Hillsboro, Oreg. (KEK).
New York, N. Y. (WNY).	Fort Morgan, Ala.	San Francisco, Calif. (KFS, Beach Station).
San Francisco, Calif. (KPH).	Miami Beach, Fla.	
Tuckerton, N. J. (WSC).	Mobile, Ala. (WNN).	
Wilmington, Calif. (KSE).	New Orleans, La.	

DECREASE IN RATES FOR STATIONS IN THE PHILIPPINE ISLANDS

The following-named stations of the Philippine insular government, open to general public service, now charge 6 cents (gold) per word for ship-to-shore traffic: Aparri, Balabac, Basco, Batangas, Bongao, Cagayan de Sulu, Calapan, Cebu, Cullon, Cuyo, Davao, Iloilo, Isabela de Basilan, Jolo, Port Lebak, Legaspi, Malabang, Malangas, Malita, Mati, Puerto Princesa, San Francisco (Camotes), San Jose, San Vicente, Siasi, Surigao, Virac, and Zamboanga.

RADIO FOG SIGNAL AT FAERDER LIGHT STATION, CHRISTIANIA FJORD CHANGED

The radio fog signal at Faerder Light Station has been changed and is now as given below:

TRW, TRW, TRW, V. V. V. . . . . ., TRW, TRW, TRW (silent 5 seconds),
35 seconds

TRW, TRW, TRW, V. V. V. . . . . ., TRW, TRW, TRW (silent 1 minute).
35 seconds

The above-mentioned signal is made in thick or foggy weather in addition to the signal made on the fog siren. Vessels desiring the signal under other weather conditions may request through Tjome radio station that the signal be made and it will be transmitted for one-half hour. Approximate position, lat. 59° 01′ 36″ N., long. 10° 31′ 54″ E.—*From Bekjentgjorelse fra Fyrdirektoren No. 23, Kristinia, November 21, 1924.*

RADIO FOG SIGNAL AT MARSTENEN LIGHT STATION, KORS FJORD CHANGED

The radio fog signal at Marstenen Light Station has been changed and is now as given below:

TSY, TSY, TSY, V. V. V. . . . . ., TSY, TSY, TSY (silent 2 seconds),
30 seconds

TSY, TSY, TSY, V. V. V. . . . . ., TSY, TSY, TSY (silent 1 minute).
30 seconds

The above-mentioned signal is made in thick or foggy weather in addition to the signal made on the fog siren. Vessels desiring the signal under other weather conditions may request through Rundemannen radio station that the signal be made. After such request the signal will be transmitted for one-half hour. Approximate position lat. 60° 07′ 48″ N., long. 5° 01′ 00″ E.—*From Bekkentgjorelsefra Fyrdirektoren No. 23, Kristinia, November 21, 1924.*

BUFFALO (N. Y.) STATION WAVE LENGTH CHANGED FOR WEATHER REPORTS

The wave length of the Inter City Radio Telegraph Co.'s station at Buffalo, N. Y. (WAM), has been changed to 730 meters, and hereafter all general broadcasting of weather forecasts and hydrographic information to lake vessels will be transmitted on this wave length. The general call to vessels when transmitting weather and hydrographic information is first made on 600 meters, and then the wave length is shifted to 730 meters.

CHICAGO (ILL.) STATION TRANSMITS HYDROGRAPHIC INFORMATION

The Chicago (Ill.) station (WGO) of the Radio Corporation of America transmits hydrographic information on 890 meters, continuous wave, at 11 a. m. and 4 and 9 p. m., central standard time. This station will receive any message regarding hydrographic information addressed to "Gov. Hydro., Chicago," from any vessel without charge. The message will then be forwarded to the branch hydrographic office at Chicago. Masters of vessels are requested to make reports of their observations by this means.

MASSAWA TIME SIGNALS TRANSMITTED ON NEW WAVE LENGTH

The radio time signals transmitted daily by Massawa on the western shore of the Red Sea (Eritrea), located in approximately lat. 15° 37′ N., long. 39° 29′ E., are transmitted at $17^h.\ 00^m.\ 00^s.$, G. M. T. (astronomical) on 3,500 meters, spark. These signals are repeated at $22^h.\ 00^m.\ 00^s.$, G. M. T. (astronomical) on a wave length of 9,400 meters, continuous wave.

METHOD OF TRANSMITTING FOG SIGNALS AT SEAL ISLAND, CANADA, CHANGED

The radio fog signal station located at the southern end of Seal Island, Nova Scotia, in approximately lat. 43° 23′ N., long. 66° 01′ W., has been changed in that the phase of the automatic signal has been altered to a series of groups, each consisting of two dots and two dashes (. . - -), emitted for two minutes, followed by a silent interval of three minutes, thus:

. . - - . . - - etc.	Silent
2 minutes	3 minutes

METHOD OF TRANSMITTING FOG SIGNALS AT LURCHER SHOAL LIGHT VESSEL, BAY OF FUNDY, CANADA, CHANGED

The phase of the automatic radio fog signal transmitted by this vessel, located in approximately lat. 43° 48′ N., long. 66° 32′ W., has been changed to a series of groups, each consiting of one dot and three dashes (. - - -), emitted for two minutes, followed by a silent interval of three minutes, thus:

. - - - . - - - etc.	Silent
2 minutes	3 minutes

LICENSING OF STATIONS

The attention of all concerned is called to the fact that application for new ship radio station license should be filed with the branch offices of this service when a change in ownership is made or when a change is made to the apparatus of the station. In the case of renewal of license application for renewal should be filed in ample time for the renewal to be issued by the time the outstanding license expires. Attention is also called to the fact that the station licenses should be returned to the bureau when stations are dismantled or closed for any other reason, in order that the call letters may be canceled and the stations dropped from the list of radio ship stations. This also applies to operators of broadcasting and all other stations.

COMPASS STATION ESTABLISHED AT FERROL, SPAIN

A radio compass station, known as Ferrol-Caranza, has been established at El Prado, situated at the head of Ensenada de Caranza on the eastern side of the town of Ferrol, in lat. 43° 29′ 04″ N., long. 8° 13′ 06″ W., call signal EBAW, wave length 450 meters. The method of procedure is as follows:

1. A ship desiring to obtain her bearing calls the D/F station on the 450-meter wave, and transmits

QTE? = What is my true bearing with respect to you.

2. The D/F station prepares to observe a bearing, and, when ready, replies with its call signal followed by K (— . —), together with a number which expresses the intensity of the signals received, according to the undermentioned scale:

code	meaning	code	meaning
1.	Hardly audible.	6.	Moderately good.
2.	Very faint, illegible.	7.	Good.
3.	Hardly legible.	8.	Strong.
4.	Weak.	9.	Very strong.
5.	Somewhat weak.		

3. The ship repeats her call signal for 50 seconds and awaits the result. These signals should be made slowly, the dashes being considerably prolonged.

4. The D/F station then gives the result of the observations in degrees (0°—359° true), preceded by the time expressed in four figures—the first two of which indicate the hours and the last two the minutes.

5. If the D/F station is not satisfied with the observation, it will request the ship, by means of the signal $\overline{\text{UD}}$, to repeat the signals.

Example

6. Caranza D/F station (call signal EBAW) listens-out on the 450-meter wave. A ship (call signal EBC) requests it to take a bearing and signals in the following manner:

$\overline{\text{VE}}$ EBAW EBAW V EBC QTE $\overline{\text{AR}}$.

When ready to observe the bearing, EBAW replies:

$\overline{\text{VE}}$ EBC V EBAW K7.

EBC then transmits:

$\overline{\text{VE}}$ EBAW V EBC EBC, etc. (repeated for 50 sec.) EBC $\overline{\text{AR}}$.

If EBAW is not satisfied with the observation, it requests EBC to repeat, making:

$\overline{\text{VE}}$ EBC V EBAW $\overline{\text{UD}}$.

(Whereupon EBC repeats as before.)

If the observation is satisfactory and the result 315°, EBAW transmits:

$\overline{\text{VE}}$ EBC V EBAW 1BT 0905 QTE 315 EBAW $\overline{\text{AR}}$.

(1BT 0905 signifies that one bearing has been taken at 9.5 a. m.)

$\overline{\text{VE}}$ EBAW V EBC R $\overline{\text{VA}}$.

EBAW does not reply, and both stations resume their normal routine.

COMPASS STATION ESTABLISHED AT NITON, ENGLAND

A radio compass station has been established at Niton, Isle of Wight, England, in approximately lat. 50° 35′ N., long. 1° 17′ W., call signal GNI, wave length 600 meters, range 100 miles. This station is open for service under the following conditions:

1. The charge for each bearing will be 5 shillings.

2. The reliable range of the station for D/F purposes is 100 miles; up to this range and within the sectors 060°–080°, 120°–260°, 280°–290°, an accuracy within 2° may be expected.

The accuracy with which the bearings can be taken depends on the conditions outlined below; but, although all necessary precautions are taken in order that the bearings may be determined as accurately as possible, the administration can not accept any responsibility for the consequences of a bearing being inaccurate. The conditions which should be fulfilled for obtaining a bearing are to transmit consistently clear, steady signals, on a sharply tuned wave.

3. Bearings at distances exceeding 100 miles will be given if required, but the degree of reliability decreases as the range increases, especially at night.

4. Bearings in sectors other than those enumerated in (2) will be given, but will be definitely stated as "unreliable," because variable errors are experienced in such sectors.

5. Bearings at night are subject to variation and should be accepted with caution.

6. If a bearing is not of the highest order, it will be specified as "approximate."

7. If a satisfactory bearing can not be obtained, the station will inform the ship that conditions are unfavorable and that another call should be made later.

8. Procedure: (*a*) The ship calls Niton (GNI) on 600 meters, making the abbreviation "QTE?"=What is my true bearing from you? (*b*) Niton, when ready, answers the ship and sends K(— . —). (*c*) The ship makes her call signal for 60 seconds and awaits the result. (*d*) Niton replies, either by asking the ship to repeat, if not satisfied with the bearing, or by making the abbreviation "QTE"=Your bearing from me was ——— degrees, followed by a group of three figures (000—359) indicating the bearing in degrees from true north, measured clockwise, of the ship from Niton. (*e*) In all messages giving bearings the time is expressed in G. M. T. (civil) by the four-figure notation, the first two figures denoting the hour and the last two figures the minutes, with the day commencing at midnight and the hours reckoned from 00 to 23. (*f*) The ship on receiving the result repeats back the message to Niton, who will then acknowledge or repeat if necessary, and when satisfied that the ship has received the message correctly will make the "end of work" sign. This sign is repeated by the ship, indicating that the operation is finished.

Example 1

A ship, whose call signal is XYZ, requires a bearing from Niton. The following signals are exchanged on 600 meters:

Ship: $\overline{\text{CT}}$ GNI GNI de XYZ QTE? $\overline{\text{AR}}$.
Niton: $\overline{\text{CT}}$ XYZ de GNI K $\overline{\text{AR}}$.
Ship: $\overline{\text{CT}}$ GNI de XYZ XYZ XYZ etc. (for 60 seconds), XYZ $\overline{\text{AR}}$.

Niton being satisfied that the true bearing is 235° makes:

$\overline{\text{CT}}$ XYZ XYZ de GNI 1 0945 (time) $\overline{\text{BT}}$ QTE 235 $\overline{\text{AR}}$ GNI.
Ship: $\overline{\text{CT}}$ GNI de XYZ 1 0945 $\overline{\text{BT}}$ QTE 235 $\overline{\text{AR}}$ XYZ.
Niton: XYZ de GNI R SK.
Ship: GNI de XYZ $\overline{\text{SK}}$.

If GNI is not satisfied with the bearing, GNI asks XYZ to repeat thus:

$\overline{\text{CT}}$ XYZ de GNI $\overline{\text{UD}}$ $\overline{\text{AR}}$.

XYZ complies by making:

$\overline{\text{CT}}$ GNI de XYZ XYZ etc. (for 60 seconds), XYZ $\overline{\text{AR}}$.

Niton now being satisfied that the true bearing is 235° makes:

CT XYZ XYZ de GNI 1 0947 $\overline{\text{BT}}$ QTE 235 $\overline{\text{AR}}$ GNI.
Ship: $\overline{\text{CT}}$ GNI de XYZ 1 0947 $\overline{\text{BT}}$ QTE 235 AR XYZ.
Niton: $\overline{\text{CT}}$ XYZ de GNI R $\overline{\text{SK}}$.
Ship: $\overline{\text{CT}}$ GNI de XYZ $\overline{\text{SK}}$.

Example 2

A ship, call signal XYZ, desires a bearing from Niton. The procedure described in (8) (*a*), (*b*), (*c*) is followed.

Niton finds that the bearing is apparently 072°, but does not consider that the bearing obtained is of the highest order, and transmits:

$\overline{\text{CT}}$ XYZ XYZ de GNI 1 2208 $\overline{\text{BT}}$ QTE 072 approximate $\overline{\text{AR}}$ GNI.

The procedure detailed in (8) (*f*) follows.

Example 3

A ship, call signal XYZ, desires a bearing from Niton. The procedure shown in (8) (*a*), (*b*), (*c*) is followed.

Niton finds that the bearing is apparently 269° and, as this is in one of the sectors in which variable errors are experienced, transmits:

$\overline{\text{CT}}$ XYZ XYZ de GNI 1 1428 $\overline{\text{BT}}$ QTE 269 unreliable $\overline{\text{AR}}$ GNI.

The procedure detailed in (8) (*f*) follows.

Example 4

A ship, call signal, XYZ, desiring a bearing from Niton. The procedure described in (8) (*a*), (*b*), (*c*) is followed.

Niton, however, is unable to obtain a satisfactory bearing, so transmits:

$\overline{\text{CT}}$ XYZ XYZ de GN 1 0623 $\overline{\text{BT}}$ QTE conditions unfavorable, make another call later $\overline{\text{AR}}$ GNI.

Ship: $\overline{\text{CT}}$ GNI de XYZ R $\overline{\text{SK}}$.

Niton: $\overline{\text{CT}}$ XYZ de GNI $\overline{\text{SK}}$.

THE USE OF THE ELECTRON TUBE PEAK VOLTMETER FOR THE MEASUREMENT OF MODULATION

In an article by Dr. C. B. Jolliffe, of the Bureau of Standards, which appeared in the December issue of the Journal of the Optical Society of America and Review of Scientific Instruments, under the title "The use of the electron tube peak voltmeter for the measurement of modulation," a method of using the electron tube voltmeter for the measurement of the per cent modulation of a radio-frequency current is given. In using this instrument it is necessary to measure the peak values of the unmodulated and modulated radio-frequency current. The per cent modulation can then be calculated. Data are given to show the reliability of the method. The primary use of this device is for making measurements for scientific studies, but it should also prove useful in a radio telephone transmitting station.

STANDARD FREQUENCY STATIONS

As a result of measurements by the Bureau of Standards upon the transmitted waves of a limited number of radio transmitting stations, data are given in each month's RADIO SERVICE BULLETIN on such of these stations as have been found to maintain a sufficiently constant frequency to be useful as frequency standards. There may be many other stations maintaining their frequency just as constant as these, but these are the only ones which reached the degree of constancy shown among the stations upon whose frequencies measurements were made in the bureau's laboratory. There is, of course, no guaranty that the stations named below will maintain the constancy shown. As a means of maintaining constant frequency the high-power, low-frequency alternator station listed below have speed regulators. Most of the broadcasting stations listed use frequency indicators (one-point wave meters) and maintain a maximum deflection of the frequency indicator throughout the transmission. These broadcasting stations with rare exceptions vary not more than 2 kilocycles from the assigned frequency. The transmitted frequencies from these stations can be utilized for standardizing wave meters and other apparatus by the procedure given in Bureau of Standards

Letter Circular No. 92, Radio Signals of Standard Frequencies and Their Utilization. A copy of that letter circular can be obtained by a person having actual use for it upon application to the Bureau of Standards, Washington, D. C.

Station	Owner	Location	Assigned frequency (kilocycles)	Period covered by measurements (months)	Number of times measured	Deviations from assigned frequencies noted in measurements	
						Average	Greatest since Nov. 20, 1924
						Per ct.	*Per ct.*
NSS	U. S. Navy	Annapolis, Md.	17.50	16	118	0.2	0.1
WGG	Radio Corporation of America.	Tuckerton, No. 1, New Jersey	18.86	16	125	.2	.2
WII	Do.	New Brunswick, N. J.	22.04	15	108	.2	.1
WSO	Do.	Marion, Mass.	25.80	16	97	.3	.4
WWJ	Detroit News	Detroit, Mich.	580	16	49	.1	.2
WCAP	Chesapeake & Potomac Telephone Co.	Washington, D. C.	640	15	74	.1	.2
WRC	Radio Corporation of America.	do.	640	12	47	.1	.0
WSB	Atlanta Journal	Atlanta, Ga.	700	15	61	.2	.1
WGY	General Electric Co.	Schenectady, N. Y.	790	18	104	.1	.1
WBZ	Westinghouse Electric & Manufacturing Co.	Springfield, Mass.	800	8	20	.0	.0
KDKA	Do.	East Pittsburgh, Pa.	920	15	130	.1	.1

REFERENCES TO CURRENT RADIO PERIODICAL LITERATURE

This is a monthly list of references prepared by the Radio Laboratory of the Bureau of Standards, and is intened to cover the more important papers of interest to the professional radio engineer which have recently appeared in technical periodicals. The number at the left of each reference classifies the reference by subject, in accordance with the scheme presented in "A Decimal Classification of Radio Subjects—An Extension of the Dewey System," Circular No. 138, a copy of which may be obtained for 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C. Further information about these lists, availabilities of previous lists, and of the several periodicals is contained in the extended statement preceding the early lists as published in the RADIO SERVICE BULLETIN prior to April, 1923, and also in May and September, 1923.

R000.—*Radio communication*

R007.1 Third National Radio Conference (amateur bands definitely confirmed with some extensions and slight shifting—all short waves now allocated). QST, 8, pp. 16–17, December, 1924.

R007.1 Kennelly, A. E. The conference, in relation to amateur activities. QST, 8, pp. 18–19, December, 1924.

R100.—*Radio principles*

R112.1 Ballantine, S. On the optimum transmitting wave length for a vertical antenna over perfect earth. Proc. Inst. of Radio Engrs., 12, pp. 833–839, December, 1924.

R113 Barfield, R. H. Unsolved problems of wireless. Wireless World and Radio Review, 15, pp. 215–218, November 12; pp. 254–256, November 19; pp. 283–284, November 26, 1924.

R113.7 Diagramme des forces electromotrices mesurées a Meudon pour les emissions de Bordeaux, Nantes et Rocky Point pendant le 2e trimestre 1924. L'Onde Electrique, 3, pp. 551–553, November, 1924.

R116 Hund, A. Correction factor for the parallel wire system used in absolute-radio frequency standardization. Proc. Inst. of Radio Engrs., 12, pp. 817–821, December, 1924.

R124 Harper, W. W. Low-loss loops? QST, 8, pp. 21–22, December, 1924.

R125.1 Lyot B. Etude d'un cas particulier d'effet antenne sur un cadre de radiogoniometre. L'Onde Electrique, 3, pp. 530–534, November, 1924.

R125.1 Gherzi, E. Relevements radiogoniometriques a Changhai. L'Onde Electrique, 3, pp. 542–547, November, 1924.

R125.6 MacIlvain, K. M. The beam system. Wireless Age, 12, pp. 44–47, December, 1924.

R127 Ballantine, S. On the radiation resistance of a simple vertical antenna at wave lengths below the fundamental. Proc. Inst. of Radio Engrs., 12, pp. 823–832, December, 1924.

R131 Courtines. L'influence de la temperature sur les tubes thermioniques. L'Onde Electrique, 3 pp. 521–529, November, 1924.

R131 Vogdes, F. B. and Elder, F. R. Formulas for the amplification constant for 3-element tubes in which the diameter of grid wires is large compared to the spacing. Physical Review, 24, pp. 683–689, December, 1924.

R131 Janmoulle, M. E. An indirect method of determining the grid characteristic. Wireless World and Radio Review, 15, pp. 240-241, November 19, 1924.
R132 Crisson, G. Measuring instrument for vacuum tubes. United States Patent No. 1515660, issued November 18, 1924.
R134.4 Roberts, W. Van B. Principles of feed back circuits. Radio Broadcast, 6, pp. 517-519, January, 1925.
R134.4 Carpenter, R. E. H. Radio signaling system and apparatus therefor. United States Patent No. 1518633, issued December 9, 1924.
R134.75 Edwards, P. S. Capt. How to build a non-radiating 7-tube superheterodyne receiver. Popular Radio, 6, pp. 580-591, December, 1924.
R134.8 Grimes, D. Inverse duplex vacuum tube circuit. United States Patent No. 1517058, issued November 25, 1924.
R140 Colebrook, F. M. The graphical analysis of composite impedances. Experimental Wireless (London), 2, pp. 140-145, December, 1924.
R150 Pickard, G. W. The discovery of the oscillating crystal. Radio News, 6, p. 1166, January 1925.

R200.—*Radio measurements and standardization*

R214 Cady, W. G. An international comparison of radio wave-length standards by means of piezo-electric resonators. Proc. Inst. of Radio Engrs., 12, pp. 805-816, December, 1924.
R230 Hall, E. L. Inductance coils: How their characteristics are measured. Popular Radio, 7, pp. 60-68, January, 1925.
R240 Hoffman, R. J. A measurement chart for simple calculation of combined resistances. Popular Radio, 7, pp. 58-59, January, 1925.
R250 McLachlan, N. W. Measurement of aerial current: Description of an important method. Wireless World and Radio Review, 15, pp. 273-275, November 26; pp. 315-317, December 3, 1924.
R251.2 Cayrel, J. Sur les precautions qu'il convient de prendre dans l'utilisation des thermocouples a fils croises en radiotechnique. L'Onde Electrique, 3, pp. 542-550, November, 1924.
R261 Jolliffe, C. B. The use of the electron tube peak voltmeter for the measurement of modulation. Journal Optical Society of America and Review of Scientific Instruments, 9, pp. 701-704, December, 1924.
R270 Austin, L. W. Field intensity measurements in Washington on the radio corporation stations at New Brunswick and Tuckerton, N. J. Proc. Inst. of Radio Engrs., 12, pp. 681-691, December, 1924.
R281 Guthrie, R. V., jr. Electrical constants of dielectrics for radio-frequency currents. Proc. Inst. of Radio Engrs., 12, pp. 841-847, December, 1924.
R281.47 Directions for the study of electrical insulating varnishes, paints, and enamel paints (Report of British Electrical and Allied Industry Research Association). Journal Institution of Electrical Engrs. (London), 62, pp. 936-940, November, 1924.

R300.—*Radio apparatus and equipment*

R328 Alexanderson, E. F. W. Radio transmitting system. United States Patent No. 1517816 issued December 2, 1924.
R330.2 The new Sodion D-21 detector. QST, 8, pp. 23-26, December, 1924.
R331 Mullard, S. R. Suspension of incandescent filaments. United States Patent No. 1519412 issued December 16, 1924.
R342 Grimes, D. Vacuum tube amplifier. United States Patent No. 1517057, issued November 25, 1924.
R342.15 Marsten, J. How to select your audio-frequency transformer. Popular Radio, 6, pp. 600-606, December, 1924.
R342.15 Superheterodyne transformers. QST, 8, pp. 9-13, December, 1924.
R342.6 Emigh, F. N. A reflexed neutrodyne. Radio (San Francisco), 6, pp. 24-25, December, 1924.
R342.7 White, W. C. Amplifying system. United States Patents Nos. 1518624 and 1518625, issued December 9, 1924.
R344 van Ryn, K. C. The Numans oscillator. Experimental Wireless (London), 2, pp. 134-136, December, 1924.
R344.3 Albersheim, W. Oberschwingungen des Rohrensenders. Archiv fur Electrotechnik, 14, pp. 43-74, November 7, 1924.
R344.3 Baker, W. G. R. Signaling system. United States Patent No. 1518682, issued December 9, 1924.
R352 Marriott, R. H. Spark gap. United States Patent No. 1517586, issued December 2, 1924.
R353 Elliott, H. F. Arc converter. United States Patent No. 1519398, issued December 16, 1924.
R354 Chiba, S. Note on polyphase high-frequency alternators. Journal Institution of Electrical Engrs. (London), 62, pp. 947-954, November, 1924.
R357 Meissner, A. Arc transmitter for wireless telegraphy. United States Patent No. 1518439, issued December 9, 1924.
R360 Jolliffe, C. B. Selecting a radio receiver. New York Herald-Tribune radio section, p. 10, December 14, 1924.
R374 Strachan, J. Some interesting experiments with single point detectors. Wireless World and Radio Review, 15, pp. 200-202, November 12, 1924.
R376.3 Martin, W. H. Loudspeaker unit. United States Patent No. 1519211, issued December 16, 1924.
R377 Carlson, W. L. and Hanson, E. C. Radiotelegraph system. United States Patent No. 1518655, issued December 9, 1924.
R377 Hanson, E. C. Radiotelegraph system. United States Patent No. 1518656, issued December 9, 1924.
R381 Marbury, R. E. Radio condenser. United States Patent No. 1517370, issued December 2, 1924.
R381 Cage, J. M. Condenser. United States Patent No. 1518688, issued December 9, 1924.
R384.1 Macvie, J. G. A combined buzzer wave meter, wave trap, and crystal receiver (300 to 700 meters). Wireless World and Radio Review, 15, pp. 238-240, November 19, 1924.
R386 Marsten, J. Electric filters. Radio (San Francisco), 6, pp. 27-28, December, 1924.

R400.—*Radio communication systems*

R402 Winters, S. R. The Shenandoah short wave transmitter. Radio News, 6, p. 1170, January, 1925.
R402 Breit, G. A method of producing short wave lengths oscillations in electron tubes. Jour. Opt. Soc. of America and Review of Scientific Instruments, 9, pp. 709-722, December, 1924.
R402 Bruno, W. A. Experimenting with 5 meters. Radio News, 6, pp. 1158-59, January, 1925.
R412 Dacy, G. H. Better radio transmission by zero carrier wave. Radio News, 6, p. 1160, January, 1925.

R413 Heising, R. A. Signaling system. United States Patent No. 1519615, issued December 16, 1924.

R420 Round, H. J., and McLellan, A. Wireless signaling system. United States Patent No. 1517654, issued December 2, 1924.

R422 Buchanan, O. B. Signaling system. United States Patent No. 1517277, issued December 2, 1924.

R430 Marriott, R. H. A kit for the radio detective (how to use a sensitive, portable receiver to find interference of all sorts—Some radio tests of great value and interest to the experimenter). Radio Broadcast, 6, pp. 463–469, January, 1925.

R430 Russell, A. Inductive interference with communication circuits. Journal Institution of Electrical Engineers (London), 62, pp. 941–946, November, 1924.

R490 Mauborgne, J. O., and Hill, G. System of radio transmission. United States Patents Nos 1517568 and 1517569, issued December 2, 1924.

R490 Mauborgne, J. O., and Hill, G. System of radio communication. United States Patent No. 1517576, issued December 2, 1924.

R500.—*Applications of radio*

R550 Conrad, F. Short-wave radio broadcasting and discussion. Proc. Inst. of Radio Engrs., 12, pp. 723–744, December, 1924.

R600.—*Radio stations: Equipment, operation, and management*

R610 LPZ—The high-power station, Buenos Aires. Wireless World and Radio Review, 15, pp. 294–297, December 3, 1924.

R610 Weinberger, J. Broadcast transmitting stations of the Radio Corporation of America. Proc. Inst. of Radio Engrs., 12, pp. 745–803, December, 1924.

R610 Warren, A. C. Northolt radio station (abstract). Journal Institution of Electrical Engineers (London), 62, pp. 967–969, November, 1924.

R611 High-power station at Malabar, Java. Proc. Inst. of Radio Engrs., 12, pp. 693–722, December, 1924.

R613 Trogner, A. M. Antenna safety link. United States Patent No. 1517602, issued December 2, 1924.

R800.—*Nonradio subjects*

347.7 The German radio patents: History of certain important patents seized during the war and now released for general use. Radio Broadcast, 6, pp. 515–518, January, 1925.

347.7 Moncroft, J. H. The march of radio: What has happened to important radio patents. Radio Broadcast, 6, pp. 470–479, January, 1925.

534 Miessner, B. F. Sound: First and last in radio. Radio Broadcast, 6, pp. 435–441, January, 1925.

534.83 Lawther, H. P., jr. Exciting means for electrodynamical oscillators. United States Patent No. 1518123, issued December 2, 1924.

535.3 Case, T. W. Photo-electric cell. United States Patent No. 1517103, issued November 25, 1924.

621.313.25 Millen, J. A motor-generator unit for radio-battery charging. Radio Broadcast, 6, pp. 449–453, January, 1925.

621.327.7 Toussey, S. X-ray film carrier. United States Patent No. 1517767, issued December 2, 1924.

621.353 Benner, R. C. Apparatus for radio communication. United States Patent No. 1519699, issued December 16, 1924.

621.354 Cole, T. S. Radio telephone and telegraph apparatus. United States Patent No. 1518564, issued December 9, 1924.

621.385 Crisson, G. Electrical transformer. United States Patent No. 1516519, issued November 25, 1924.

623.731 Winters, S. R. The black-light radio (secret communication system that uses infra-red rays). Popular Radio, 6, pp. 392–396, December, 1924.

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.

AT

5 CENTS PER COPY

SUBSCRIPTION PRICE, 25 CENTS PER YEAR