

DEPARTMENT OF COMMERCE

RADIO SERVICE BULLETIN

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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 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.
	m = a. m. (12 m = midday).
	s = p. m. (12 s = midnight).
Rates	= Ship or coast charges in cents: c. = cents. (The rates in the inter- national list are given in francs and centimes.)
I. W. T. Co.	= Independent Wireless Telegraph Co.
R. C. A.	= Radio Corporation of America.
S. O. R. S.	= Ship Owners' Radio Service.
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, 1923, and to the International List of Radiotelegraph Stations published by the Berns Bureau.]

Station.	Call signal.	Wave length.	Service.	Hours.	Station controlled by—
Dallas, Tex. ¹	WFAA	925.....	FX	X	Dallas News and Dallas Journal.
Parsons, Kans. ²	KZC	1996.....	FX	X	Kansas Gas & Electric Co.
Rocky Point, N. Y. ³	WQM	1541.....	FX	X	R. C. A.
Stevens Point, Wis. ⁴	WCP	1578.....	FX	X	Wisconsin Department of Markets and United States Bureau of Markets.
Waupaca, Wis. ⁵	WPAH	1578.....	FX	X	Do.
Wichita, Kans. ⁶	KYF	1996.....	FX	X	Kansas Gas & Electric Co.

¹ Loc. (approximately) 0.96° 48' 00", N. 32° 47' 00"; range, 150; system, Western Electric Co. v. t. telegraph.

² Loc. (approximately) 0.93° 03' 00", N. 37° 20' 00"; range, 150; system, composite v. t. telegraph.

³ Loc. 0.72° 56' 30", N. 40° 55' 45"; range, 200; system, R. C. A. v. t. telegraph.

⁴ Loc. (approximately) 0.89° 30' 00", N. 44° 15' 00"; range, 300; system, composite v. t. telegraph.

⁵ Loc. (approximately) 0.89° 00' 00", N. 44° 20' 00"; range, 100; system, composite v. t. telegraph.

⁶ Loc. (approximately) 0.97° 20' 30", N. 37° 41' 00"; range, 150; system, composite 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, 1923, and to the International List of Radiotelegraph Stations published by the Berns Bureau.]

Name of vessel.	Call signal.	Rate.	Service.	Hours.	Owner of vessel.	Station controlled by—
American Banker.....	WEG	8	PG	N	U. S. S. B.....	
American Farmer.....	WEG	8	PG	N	do.....	
American Merchant.....	WTF	8	PG	N	do.....	
American Shipper.....	WTS	8	PG	N	do.....	
American Trader.....	WTU	8	PG	N	do.....	
Angeline ¹	KFNX		PG	X	Presque Isle Transpn. Co.	Owner of vessel.
Aquidaban.....	KFOS		PG	X	International Products S. S. Co.	
Cadillac ¹	KFNN		PG	X	Cleveland Cliffs S. S. Co.	Do.
David C. Meyer.....	KFNK		PG	X	Wiggins-Meyer S. S. Co.	
Isthmian S. S. Co. vessels. ²	KFWW					
Marquette ¹	KFNP		PG	X	Cleveland Cliffs S. S. Co.	Do.
Munising ¹	KFNQ		PG	X	do.....	Do.
Nagawnee ¹	KFNR		PG	X	do.....	Do.
Oiga ³	KZAZ		PG	X	Halim Yamael, 7 M. del Banco Nacional, Manila, P. I.	Do.
Presque Isle ¹	KFNS		PG	X	Presque Isle Transpn. Co.	Do.
Robert J. Paisley ¹	KFNT		PG	X	Paisley S. S. Co.....	Do.
Sea Salvor.....	KFOM		PG	X	Ship Owners & Merchants Tugboat Co.	
Star of Alaska.....	KFOK	8	PG	X	Alaska Packers Assn.	
Star of England.....	KFOE	8	PG	X	do.....	
Star of Finland.....	KFOI	8	PG	X	do.....	
Stoelmotor ⁴	KFNO	8	PG	X	U. S. Steel Products Co.	I. W. T. Co.
Stoelvander ⁴	KFNW	8	PG	X	do.....	Do.
Thomas Britt ¹	KFNU		PG	X	Morrow S. S. Co.....	Owner of vessel.

¹ Range, 150; system, Navy-R. C. A. 1000; w. l., 300, 600, 700; rates, Great Lakes service, 2 cents per word.

² General call for all vessels of the Isthmian S. S. Co.

³ Range, 150; system, spark, 1000; w. l., 300, 450, 600.

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Commercial land and ship stations, alphabetically by call signals.

[b--ship station; c--land station.]

Call signal.	Name.	Call signal.	Name.		
KFNE	David C. Meyer.....	b	KFOS	Aquidaban.....	b
KFNM	Angeline.....	b	KFWW	General call for all Isthmian S. S. Co. vessels.....	b
KFNN	Cadillac.....	b	KYF	Wichita, Kans.....	c
KFNO	Stoelmotor.....	b	KZAZ	Olga.....	b
KFNP	Marquette.....	b	KZC	Parsons, Kans.....	c
KFNQ	Munising.....	b	WCP	Stevens, Wis.....	c
KFNR	Negasonic.....	b	WEC	American Banker.....	b
KFNS	Presque Isle.....	b	WRG	American Farmer.....	b
KFNT	Robert J. Paisley.....	b	WFAA	Dallas, Tex.....	c
KFNU	Thomas Britt.....	b	WPAH	Waipaca, Wis.....	c
KFNW	Steelvender.....	b	WQM	Rocky Point, N. Y.....	c
KPOE	Star of England.....	b	WTB	American Shipper.....	b
KPOI	Star of Finland.....	b	WTF	American Merchant.....	b
KPOK	Star of Alaska.....	b	WTU	American Trader.....	b
KPOM	Sea Savior.....	b			

Broadcasting stations, alphabetically by names of cities.

[Additions to the List of Radio Stations of the United States, edition of June 30, 1923.]

City.	Call signal.	City.	Call signal.
Burlingame, Calif.....	KFNE	New Orleans, La.....	WCBE
Charleston, S. C.....	WBBY	Norfolk, Va.....	WBBW
Corsicana, Tex.....	KFNC	Oxford, Miss. (near).....	WCBH
Dallas, Tex.....	KPOP	Pascagoula, Miss. (portable).....	WCBG
Helena, Mont.....	KFNY	Paso Robles, Calif.....	KFNL
Indianapolis, Ind.....	WBBZ	Peabody, Kans.....	KFNX
Johnstown, Pa.....	WBBV	Philadelphia, Pa.....	WBTT
Long Beach, Calif.....	KFON	Portland, Oreg.....	KFOH
Marengo, Iowa.....	KPOL	Santa Rosa, Calif.....	KPNV
Marshfield, Oreg.....	KFOF	Seattle, Wash.....	KFPB
Minneapolis, Minn.....	KFOJ	Shenandoah, Iowa.....	KFNF
Moberly, Mo.....	KFOB	Wallace, Idaho.....	KFOD
Monmouth, Ill.....	WBBU	Whittier, Calif.....	KFOC
New Orleans, LA.....	WBBS		

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

[Additions to the List of Radio Stations of the United States, edition of June 30, 1923.]

Call signal.	Location of station.	Operated and controlled by--	Wave length.	Power (watts).	Service.
KFNC	Corsicana (Tex.) First Methodist Church.	Alonson, Monk, jr.....	234	20	E.
KFNF	Shenandoah, Iowa.....	Henry Field Seed Co.....	266	500	E.
KFNL	Paso Robles, Calif.....	Radio Broadcast Association.....	240	10	E.
KPNV	Santa Rosa, Calif.....	L. A. Drake.....	234	5	E.
KFNX	Peabody, Kans.....	Peabody Radio Service.....	240	10	E.
KFNY	Helena, Mont.....	Montana Phonograph Co.....	261	5	E.
KFNE	Burlingame, Calif.....	Royal Radio Co.....	231	10	E.
KFOB	Minneapolis, Minn., 920 Fifth Ave. N.	Glenwood Technical Association.....	224	5	E.
KFOC	Whittier, Calif.....	First Christian Church.....	236	100	E.
KFOD	Wallace, Idaho.....	The Radio Shop.....	234	10	E.
KFOF	Marshfield, Oreg.....	Rohrer Electric Co.....	240	10	E.
KFOH	Portland, Oreg., 1209 Taggart St.	Radio Bungalow.....	283	15	E.
KFOI	Moberly, Mo.....	Moberly High School Radio Club.....	246	6	E.
KPOL	Marengo, Iowa.....	Leslie M. Schaffbuch.....	234	10	E.
KPON	Long Beach, Calif.....	Echophone Radio Shop.....	234	100	E.
KPOP	Dallas, Tex., 418 N. Texas Bldg.	Wilson Construction Co.....	268	100	E.
KFPB	Seattle, Wash.....	Edwin J. Brown.....	224		E.
WBBS	New Orleans, La.....	First Baptist Church.....	250	100	E.
WBTT	Philadelphia, Pa., 3157 Frankford Ave.	Lloyd Brothers.....	234	5	E.
WBBU	Monmouth, Ill.....	Lecky Motor Sales Co.....	261	10	E.

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Stations broadcasting market or weather reports, music, concerts, lectures, etc.,
alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by--	Wave length.	Power (watts).	Service.
WBBW	Norfolk, Va.	Huffner Junior High School	222	50	E.
WBBY	Charleston, S. C.	Washington Light Infantry	268	20	E.
WBBZ	Indianapolis, Ind., 233 Lowa St.	Noble B. Watson	227	50	E.
WCBE	New Orleans, La., 4521 Chestnut St.	Uhalt Radio Co.	263	5	E.
WCBG	Pascagoula, Miss. (port- able).	Howard S. Williams	254	10	E.
WCBH	Oxford, Miss. (near)	University of Mississippi	242	20	E.

Special land stations, alphabetically by names of stations.

[Additions to the List of Radio Stations of the United States, edition of June 30, 1923.]

Station.	Call signal.	Station controlled by--
Atlanta, Ga.	4XC	B. W. Beanning, 190 North Whiteford Ave.
Baltimore, Md.	3ZD	Ernest R. Bateman, 1507 Edmondson Ave.
Boston, Mass.	1ZR	Edith E. Rotch, 157 Bay State Road.
Bridgeport, Conn.	1ZL	Carlton A. Weidenhammer, 33 Washington Place.
Do.	1ZT	George E. Nothnagle, 176 Waldamore Ave.
Carthage, Ill.	9YAU	Carthage College.
Chicago, Ill.	9XBD	W. E. Schweitzer, 4264 Hazel Ave.
Cleveland, Ohio.	8XBR	Union Trust Co., 925 Euclid Ave.
Detroit, Mich.	8XBT	College of the City of Detroit.
East Lansing, Mich.	8XBU	Michigan Agricultural College.
Everett, Mass.	12M	Fullerton D. Webster, 12 Hampshire St.
Do.	1ZU	Ralph S. Davis, 11 Upland Road.
Frammingham, Mass.	1Z0	Everett H. Gibbs, 11 Virginia Ave.
Fullerton, Calif.	6ZBZ	Ray A. Hancock, R. D. 3, box 37.
Highland Park, Ill.	9XBG	Edmund T. Flewelling, 836 South St. Johns Ave.
Highland Park, Mich.	8XBQ	Clyde E. Darr, 137 Hill Ave.
La Crosse, Wis.	9XBE	Ott Radio (Inc.).
Los Angeles, Calif.	6XBO	Los Angeles County Forestry Department.
Do.	6XBP	Nicholas E. Brown, 2000 West Seventy-fifth St.
New Braunfels, Tex.	5XAV	Edgar A. Sahn, 702 San Antonio St.
Oakland, Calif.	6ZBV	Walter P. Bell, 5205 Cole St.
Los Angeles, Calif.	6ZBX	Hyman W. Fink, 1708 West Twenty-third St.
Do.	6ZBY	George S. Morris, 8234 Hayes Ave.
New York, N. Y.	2XBA	Russell S. Ohl, 2315 Andrews Ave.
Oakland, Calif.	6ZBW	Leslie B. Magoon, jr., 1967 Courtland Ave.
Do.	6ZCA	William A. Hammond, 3029 Champion St.
Savannah, Ga.	4XR	John E. Hodge, 128 East Forty-ninth St.
South Braintree, Mass.	1ZN	Malcom A. Garden, 1156 Washington St.
St. Petersburg, Fla.	4XQ	E. Richard Hall, 2801 Central Ave.
Toledo, Ohio.	8XBS	University of City of Toledo.

Special land stations, grouped by districts.

Call signal.	District and station.	Call signal.	District and station.
1ZL	First district:		Sixth district—Continued:
12M	Bridgeport, Conn.	6ZBV	Oakland, Calif.
12N	Everett, Mass.	6ZBW	Do.
12O	South Braintree, Mass.	6ZBX	Los Angeles, Calif.
12R	Frammingham, Mass.	6ZBY	Do.
12T	Boston, Mass.	6ZBZ	Fullerton, Calif.
12U	Bridgeport, Conn.	6ZCA	Oakland, Calif.
2XBA	Everett, Mass.		Eighth district:
3ZD	Second District: New York, N.Y.	8XBQ	Highland Park, Mich.
	Third district: Baltimore, Md.	8XBR	Cleveland, Ohio.
	Fourth district:	8XBS	Toledo, Ohio.
4XC	Atlanta, Ga.	8XBT	Detroit, Mich.
4XQ	St. Petersburg, Fla.	8XBU	East Lansing, Mich.
4XR	Savannah, Ga.		Ninth district:
5XAV	Fifth district: New Braunfels, Tex.	9XBD	Chicago, Ill.
6XBO	Sixth district:	9XBE	La Crosse, Wis.
6XBP	Los Angeles, Calif.	9XBG	Highland Park, Ill.
	Los Angeles, Calif.	9YAU	Carthage, Ill.

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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, 1923, and to the International List of Radiotelegraph Stations, published by the Berne bureau.]

- CAMP 60, CALIF.—System, De Forest v. t. telephone and telegraph; w. l., 1585, 1630, 1685.
 CAMP 61, CALIF.—W. l., 1585, 1630, 1685.
 CAMP 61-C., CALIF.—System, De Forest v. t. telephone and telegraph; w. l., 1585, 1630, 1685.
 CASCADA, CALIF.—System, De Forest v. t. telephone and telegraph; w. l., 1585, 1630, 1685.
 DETROIT, MICH. (KDPH).—System, General Electric Co. v. t. telephone and telegraph; w. l., 1621.
 ENSENADA, P. R.—Hours, 7 a. m.—1 a. m., local time.
 PORT ARTHUR, TEX.—W. l., 300, 600, 1630; service, PG and FX; 1630 meters used for FX service.
 PORT HURON, MICH.—System, General Electric Co. v. t. telephone and telegraph.
 ROCHESTER, N. Y.—W. l., 135, 143.
 SAN YSIDRO, CALIF.—W. l., 300, 600, 675; service P (communicates only with yacht Spray).
 SUPERIOR, MICH.—System, General Electric Co. v. t. telephone and telegraph; w. l., 1621.
 TRALEE, WIS. VA.—Strike out all particulars.

COMMERCIAL SHIP STATIONS ALPHABETICALLY BY NAMES OF VESSELS.

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1923, and to the International List of Radiotelegraph Stations, published by the Berne bureau.]

- ABANGAREZ.—System, Wireless Specialty Apparatus Co., 1000; w. l., add 706.
 ADMIRAL FARRAGUT.—System, R. C. A., 1000 and R. C. A. v. t. telephone; w. l., 300, 600, 706, 870-870 used for limited commercial telephone service with the vessels H. F. Alexander, Dorothy Alexander, and Matsonia.
 ADMIRAL PEARY.—Range, 150.
 ADMIRAL SEBREE.—System, Wireless Specialty Apparatus Co., 1000.
 A. L. KENT.—Station operated and controlled by R. C. A.
 AMOLCO.—Range, 300; system, R. C. A., 1000; w. l., 300, 600, 706.
 ANSONIA.—System, Navy-Wireless Specialty Apparatus Co., 1000; w. l., add 450.
 ATLANTA CITY.—W. l., 300, 450, 600, 706.
 BETHELBRIDGE.—W. l., add 706.
 BIRD CITY.—W. l., add 706.
 BIRMINGHAM.—Range, 200; system, Navy-R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
 BLAKELEY.—Range, 150; system, Wireless Specialty Apparatus Co., 1000; w. l., 300, 450, 600, 706; hours, X; rates, 8 cents per word; station operated and controlled by owner of vessel.
 BREMERTON.—W. l., add 450.
 C. A. CANFIELD.—W. l., add 706.
 CADDO.—W. l., add 706.
 CAIRO.—Range, 300; system, R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
 CAMAGUEY.—System, R. C. A., 1000; w. l., add 706.
 CARABOBO.—Range, 300; system, R. C. A., 1000; w. l., 300, 450, 600, 706.
 CASIANA.—W. l., add 706.
 CHALLENGER.—System, Navy-Wireless Specialty Apparatus Co., 1000; w. l., 300, 450, 600, 706; Sun Shipbuilding & Drydock Co. owner of vessel.
 CHALMETTE.—Station operated and controlled by I. W. T. Co.
 CLIFFWOOD.—W. l., add 706.
 CLINCHO.—W. l., add 450.
 COAXET.—W. l., add 706.
 COELLEDA.—W. l., add 450.
 CORDOVA (KFMF).—Range, 300; system, R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
 CORSON.—System, Navy-Wireless Specialty Apparatus Co., 1000.
 CORSON.—System, R. C. A., 1000

- CUBA (KDRT).—W. l., 300, 600, 706.
DALLAS.—W. l., add 706.
DAVID MCKELVY.—W. l., add 450.
DELAWARE SUN.—W. l., add 706.
DEMOPOLIS.—Range, 200; system, Navy, 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
DEUEL.—Range, 150; system, Navy, 1000.
DONNA LANE.—W. l., add 450.
DOUGLAS.—Range, 150; system, Wireless Specialty Apparatus Co., 1000; w. l., 300, 450, 600, 706; service, PG; hours, X; rates, 8 cents per word; station operated and controlled by owner of vessel.
DRYDEN.—W. l., add 706.
E. A. MORSE.—Station operated and controlled by S. O. R. S. (U. S. L.).
EASTERN VICTOR.—W. l., add 706.
EDNA CHRISTENSON.—System, Wireless Specialty Apparatus Co., 1000; w. l., 300, 600, 706.
EDWARD PEIRCE.—Station operated and controlled by R. C. A.
EFFINGHAM.—W. l., add 706.
EGREMONT.—System, Navy—R. C. A., 1000.
E. J. EARLING.—Name changed to Robert B. Wallace; Kinney S. S. Co. owner of vessel.
E. L. DOHENY.—System, R. C. A., 1000; w. l., add 706.
EL LAGO.—W. l., add 706.
EL RIO.—System, R. C. A., 1000; hours, X.
EMIDIO.—W. l., add 450, 706; station operated and controlled by I. W. T. Co.
EMMA ALEXANDER.—System, R. C. A., 1000; w. l., 300, 600, 706; Pacific S. S. Co. owner of vessel.
EMPIRE ARROW.—W. l., add 450.
EURANA (KFDW).—Range, 200; system, I. W. T. Co., 1000; w. l., 300, 600.
EXCELSIOR.—Station operated and controlled by I. W. T. Co.
FELIX TAUSSIG.—Station operated and controlled by R. C. A.
FLORIDIAN.—System, R. C. A., 1000.
FLUOR SPAR.—System, Navy—Wireless Specialty Apparatus Co., 1000.
FREEPORT SULPHUR No. 6.—System, R. C. A., 1000; w. l., add 706.
GREAT CANTON.—Hours, X; Theodore C. Phelps owner of vessel.
GULFPORT.—Range, 200; system, R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
HELEN.—A. H. Bull S. S. Co. owner of vessel.
HERBERT L. PRATT.—W. l., 300, 450, 600, 706.
HOXBAR.—Malston Co. owner of vessel.
ILLINOIS (KFMC).—Range, 300; system, R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
INTREPID.—Transportation Products Co. owner of vessel.
IOWA.—Range, 200; system, Navy—Simon, 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
JACONA.—System, Navy—R. C. A., 1000; w. l., add 706.
JACOX.—W. l., add 706.
LAKE FAULK.—W. l., add 450.
LAKE FIELDING.—System, Navy—Liberty, 1000; w. l., 300, 450, 600, 706.
LEBORE.—System, R. C. A., 1000; w. l., 300, 450, 600, 706.
LEWIS K. THURLOW.—Station operated and controlled by R. C. A.
LEXINGTON.—Range, 150; system, Cutting & Washington, 1000; w. l., 300, 450, 600, 706.
LIEBRE.—System, Cutting & Washington, 1000; w. l., 300, 450, 600, 706.
LOUISIANA.—W. l., add 706.
MAKIKI.—Station operated and controlled by R. C. A. (U. S. L.).
MARNE (KEDJ).—W. l., add 706.
MEMPHIS.—Range, 300; system, R. C. A., 1000; w. l., 300, 600, 1100.
MIAMI.—System, R. C. A., 1000; w. l., 300, 450, 600.
MINEOLA.—W. l., add 706.
MOBILE.—Range, 200; system, Navy—R. C. A., 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
MONTANA.—W. l., add 450.
MONTGOMERY (KFMH).—Range, 200; system, Navy, 1000; w. l., 300, 600, 1100; station operated and controlled by owner of vessel.
MUNISLA.—W. l., add 450.
NARADA.—Range, 150; system, R. C. A., 1000; w. l., 300, 450, 600, 706.
NORFOLK.—Range, 200; system, R. C. A., 1000; w. l., 300, 600, 1100; station

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, 1923.]

- KDYL (Salt Lake City, Utah).—Station operated and controlled by Newhouse Hotel; power, 100.
 KFBC (San Diego, Calif.).—Power, 20.
 KFBC (Phoenix, Ariz.).—W. l., 238; frequency, kc. 1260.
 KFEC (Portland, Oreg.).—W. l., 248; frequency, kc. 1210.
 KFER (Fort Dodge, Iowa).—Power, 10.
 KFFV (Lamoni, Iowa).—Power, 100.
 KFGZ (Berrien Springs, Mich.).—Power, 250.
 KFKX (Hastings, Nebr.).—Power, 1000; w. l., 341; frequency, kc. 880.
 KFLZ (Atlantic, Iowa).—Power, 100.
 KYQ (Honolulu, Hawaii).—Power, 100; w. l., 270; frequency, kc. 1110.
 WABH (Sandusky, Ohio).—Power, 10.
 WABI (Bangor, Me.).—Power, 100.
 WBBA (Newark, Ohio).—Power, 10.
 WBBL (Richmond, Va.).—Power, 50.
 WBS (Newark, N. J.).—Power, 10.
 WCAR (San Antonio, Tex.).—Power, 100; station operated and controlled by Southern Radio Corp. of Texas, 120 E. Travis St.
 WCAS (Minneapolis, Minn.).—W. l., 280; frequency, kc. 1070.
 WDAP (Chicago, Ill.).—Power, 1000.
 WEAJ (Vermilion, S. Dak.).—Power, 100.
 WEB (St. Louis, Mo.).—W. l., 273; frequency, kc. 1110.
 WGAQ (Shreveport, La.).—W. l., 252; frequency, kc. 1190.
 WHAA (Iowa City, Iowa).—W. l., 484; frequency, kc. 620.
 WHAR (Atlantic City, N. J.).—Address 1215 Atlantic Ave.
 WHN (New York, N. Y.).—Power, 100-500.
 WIAD (Ocean City, N. J.).—Changed to Philadelphia, Pa., 6318 North Park Ave.; power, 100.
 WKAA (Cedar Rapids, Iowa).—W. l., 268; frequency, kc. 1120.
 WKY (Oklahoma, Okla.).—Power, 500.
 WLB (Minneapolis, Minn.).—Power, 25.
 WMAH (Lincoln, Nebr.).—Power, 50.
 WMAV (Auburn, Ala.).—Power, 250.
 WNAD (Norman, Okla.).—Power, 50.
 WNAP (Springfield, Ohio).—W. l., 275; frequency, kc. 1090.
 WNAW (Fort Monroe, Va.).—Station operated and controlled by Henry Kunzman, Box 167.
 WOAC (Lima, Ohio).—Station operated and controlled by Page Organ Co. (H. P. Maus).
 WOAV (Erie, Pa.).—Power, 50.
 WRAM (Galesburg, Ill.).—Power, 100.
 WRAO (St. Louis, Mo.).—Power, 20.
 WRAY (Scranton, Pa.).—Power, 10.
 WSAW (Providence, R. I.).—Power, 150.
 WSAW (Canandaigua, N. Y.).—Power, 5.
 WTAQ (Osseo, Wis.).—W. l., 254; frequency, kc. 1180.
 WTAY (Oak Park, Ill.).—W. l., 283; frequency, kc. 1060; power, 500.
 WWAE (Joliet, Ill.).—Station operated and controlled by Lawrence J. Crowley.
 Strike out all particulars of the following-named stations: KFGJ (St. Louis, Mo.), WBBK (Pittsburgh, Pa.), WOAL (Webster Groves, Mo.), WQAH (Lexington, Ky.), WTAN (Mattoon, Ill.), WPG (New Lebanon, Ohio).

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, 1923, and to the International List of Radiotelegraph Stations, published by the Berne bureau.]

- CAMP GRANT, ILL.—Strike out all particulars.
 FIRE ISLAND, N. Y. (NAH).—Loc. $0.73^{\circ} 13' 01''$, N. $40^{\circ} 37' 55''$.

GOVERNMENT SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS.

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1923, and to the International List of Radiotelegraph Stations, published by the Berne bureau.]

- Strike out all particulars of the following-named vessels: General A. M. Randall.

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GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS.

Strike out all particulars following the call signals: WUBB, WYAJ, WYAS, WYAW, WYAX.

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, 1923.]

CINCINNATI, OHIO (8XAY).—Station operated and controlled by Crosley Radio Corp.
 HARTFORD, CONN. (1XAQ).—Station operated and controlled by S. Kruse & Boyd Phelps.
 LOS ANGELES, CALIF. (6XAS).—Changed to Redlands, Calif., P. O. box 86.
 LOS ANGELES, CALIF. (6ZBC).—Changed to Monterey, Calif.
 PHILADELPHIA, PA. (3XC).—Address 6046 Market St.
 PONCA CITY, OKLA. (5ZQ).—Changed to Norman, Okla., 558 Boulevard St.
 PORTLAND, OREG. (7XBD).—Address 851 East Twenty-sixth St. South.
 ROCHESTER, N. Y. (8XQ).—Address 174 Front St.
 SAN ANTONIO, TEX. (5XY).—Station operated and controlled by Southern Radio Corp. of Texas, 120 East Travis St.
 STAPLETON, N. Y. (2XAC).—Address 80 Beaver St., New York, N. Y.
 VALPARISO, IND. (9XD).—Station operated and controlled by Dodge's Telegraph & Radio Institute.
 Strike out all particulars of the following-named stations: Birmingham, Ala. (5XC), Camp Hill, Pa. (3ZD), Cincinnati, Ohio (8XB), Collegeville, Minn. (9XT), Winthrop, Mass. (1XQ), Yaukton, S. Dak. (9YAK).

MISCELLANEOUS.

CHANGE IN EUREKA COMPASS STATION.

The calibrated sector of this station has been changed and now extends from 204° to 25°. Geographical location is 0.124° 16' 34" , N. 40° 41' 48" ; call letters NPW.

RADIO STATION ON NORDERNEY ISLAND (GERMANY) LIGHT VESSEL.

A radio station, call signal KAI, has been established on Norderney Light Vessel in latitude 53° 56' N., longitude 7° 14' E. The range of the station is 75 miles by day and 100 miles by night. The station operates on 300, 450, and 600 meters, the 600-meter wave being the wave generally used. The station is open to limited public service and will handle communications for a short period immediately after the hours of 9 a. m. and 12.30, 4, and 7.30 p. m. Only the vessel occupying the light vessel station during the winter period has the radio installation.—*Hydrographic Bulletin, January 18, 1924.*

COMPASS STATION AT VANCOUVER ISLAND.

A wireless compass station has been established on Vancouver Island, British Columbia, in latitude 48° 44' 00" , longitude 125° 06' 25" . Call signal, VAD; wave length, 800 meters; range, 200 miles.—*Admiralty Notice to Mariners, No. 102, 1924.*

RADIO FOG SIGNAL ESTABLISHED NORTH COAST OF FRANCE.

Beginning January 15 last an experimental radio fog signal was placed in operation at Cap Gris Nez Lighthouse, Pas de Calais, France, in latitude 50° 52' 10" , longitude 1° 35' 04" . Signals will be transmitted continuously during foggy weather.—*Admiralty Notice to Mariners, No. 101, 1924.*

NEW STATION AT SAIGON, INDO-CHINA.

A new high-power station has been completed in French Indo-China which communicates direct with Bordeaux, a distance of over 6,000 miles with the Himalayas in between. It has been reported that this station is part of a network of stations in Europe, America, and the Far East which shall be part of the Saigon-Bordeaux system. Fifteen such stations are contemplated in Indo-China, fifteen in Europe, and two in America.

FISHGUARD STATION WORKING ON 800 METERS.

In order to relieve congestion on 600 meters at the western entrance to the English Channel, Fishguard has been equipped for working on 800 meters in addition to 600 meters. The normal wave of this station is 600 meters, and communication should be established on that wave. Any subsequent change to 800 meters for the transmission and/or reception of traffic should be made by mutual agreement. On completion of the communication the stations should revert to 600 meters.

RADIO FOG SIGNAL IN HALIFAX HARBOR.

A radio fog signal has been established on Sambro Outer Bank Lightship in Halifax Harbor, Nova Scotia, latitude $44^{\circ} 20' 30''$, longitude $63^{\circ} 30' 20''$. During the winter months, in foggy weather, the station will transmit continuously on a wave length of 1,000 meters a series of groups of 4 dashes for 60 seconds followed by a silence of 4 minutes. The elapsed time from the beginning of one group of dashes to the beginning of the next group will be 4 seconds.

MEDICAL ADVICE BY RADIO FROM FAROE ISLANDS.

Vessels at sea, regardless of nationality, may obtain free medical advice from the Thorshavn radio station, call letters ÓXJ. The master of a vessel which may be in need of medical advice should address a radiogram in Danish, Norwegian, Swedish, German, French, or English to the Thorshavn station. This message will be forwarded to the Thorshavn hospital, the physicians of which will furnish the necessary advice.

INTEREST IN RADIO INCREASING IN GREAT BRITAIN.

Use of radiotelephony is increasing in Great Britain, where at present there are about 580,000 licensed "listeners in." A large majority of these people own crystal sets which can be used with good results, since broadcasting stations are located in the populous districts throughout the country. There is, however, a good demand for tube sets.

BRAZILIAN RADIO ASSOCIATION FORMED.

Under the auspices of the Instituto de Engenharia de S. Paulo there has been organized the "Sociedade Radio de S. Paulo." Its principal purpose is the broadcasting of information, etc., by wireless telephone. It is planned to install a transmitting station with sufficient power to be heard from 500 to 1,000 miles.

BROADCASTING IN NORWAY TO BE PRIVATE ENTERPRISE.

Control of broadcasting by private limited companies under Government supervision is the subject of a proposal from the Norwegian director of State telegraphs to be submitted shortly to the Government for approval. The director states that no single company is being considered with the object of giving it a concession, but that all will be given an opportunity to participate by offering half of the share capital for public subscription.

BAN ON RADIO SETS IN CHINA.

The purchase or operation by Chinese citizens of radio sets has been prohibited by order of the Ministry of Communications, according to the Chinese Economic Bulletin of December 26, 1923. The order states that such sale or installation is against the country's law, and offenders will be severely punished. Foreigners living in Chinese territory come under this order, and steps are being taken to prevent the sale of radio apparatus or its installation by Chinese living in the foreign settlements.

NEW STATION IN LATVIA.

A new station which has been completed in Latvia consists of a receiving station in Riga and a transmitting station in Libau. Both stations are equipped with modern apparatus. Direct communication will be possible with France, England and other countries. The small station in Riga will continue its activity chiefly for communications with Danzig, Finland, and Sweden.

METHOD OF TRANSMITTING TIME SIGNALS CHANGED IN BRITISH ISLES.

In all messages giving bearings exchanged between Lizard, Berwick, and Flam-
borough direction-finding stations and ships at sea, the times signaled will be

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denoting the hour and the last two figures the minutes, with the day commencing at midnight and the hours reckoned from 00 to 23.—*Admiralty Notice to Mariners No. 179, 1924.*

NEW COMPASS STATION, BAY OF FUNDY.

On the eastern side of Yarmouth Sound, in the vicinity of Kelley Cove, latitude $43^{\circ} 46' 24''$, longitude $66^{\circ} 07' 20''$, there has been established a radio compass station. Call letters, VAU; wave length, 800 meters; hours, continuous.—*Hydrographic Bulletin, January 23, 1924.*

USE OF RADIO IN BRITISH HARBORS BY FOREIGN NAVAL VESSELS.

The following regulations for the use of radio telegraphy or telephony by foreign naval vessels in British harbors have been made in accordance with the British Radio Telegraphy (Foreign Ships) Regulations, 1908:

(a) Foreign naval vessels lying in a naval port or in any harbor which is close to a naval port (e. g., Leth, Southampton) shall obtain permission from the senior naval officer at the naval port to use their radio or telephony apparatus, stating system, wave lengths, and times of transmission proposed.

(b) Foreign naval vessels in any harbor which is not close to a naval port shall conform to the following regulations:

(i) Transmission on 600 meters is forbidden, except for the purpose of making or answering signals of distress.

(ii) Interference with naval, army, or air-force signaling, or any fixed shore station must be avoided.

(iii) Transmission must be discontinued on request from (1) any naval authority, (2) the port authorities, (3) any fixed shore station.

(iv) Protracted signaling using transmitting apparatus other than pure, continuous waves must be avoided.

(v) If there is a British fleet or warship lying in the harbor, the British senior naval officer should be consulted.

(c) In dealing with requests from foreign naval vessels for the use of radio telegraphy or telephony apparatus under paragraph (a) of these regulations, naval authorities should, when granting permission for the use of such apparatus, make certain that the provisos in paragraphs (b), (i), (ii), (iii), and (iv) are covered.

—*Hydrographic Bulletin, February 6, 1924.*

BROADCASTING STATION ESTABLISHED AT MARSEILLE, FRANCE.

Announcement has been made that weekly broadcasting of concerts, etc., will begin from the station at Ecole Modele de Telegraphic in Marseille. This station will be under the special patronage of the Petit Provençal, a local daily newspaper acting in conjunction with the National Congress of Wireless Telegraphy, located at No. 13 Aleees Leon Gambetta, which was formed during the Colonial Exposition of 1922. A wave length of 400 meters will be used.

BROADCASTING STATIONS IN BRAZIL.

The department has been informed that the Minister of Transportation and Public Works has conceded to the Companhia Radiotelegraphica permission to install and use four radio telephone broadcasting stations in the cities of Bahia, Bello Horizonte, Pernambuco, and Sao Paulo. These stations will transmit matter of general interest, concerts, etc.

BROADCASTING IN INDIA.

Issuance of its first private wireless transmitting and receiving license has been made by the Government of India to the Radio Club of Bengal. Under the terms of the license weather reports, concerts, and lectures, but not news items, can be transmitted to members of the club only.

List of British broadcasting stations.

Location.	Call signal.	Wave length.	Location.	Call signal.	Wave length.
London.....	2LO	365	Newcastle.....	5NO	400
Birmingham.....	6IT	475	Glasgow.....	5SC	420
Cardiff.....	5WA	350	Aberdeen.....	2BD	496
Bournemouth.....	6BM	385	Sheffield (relay station).....	6SL	303
Manchester.....	2ZY	375			

All of the above-named stations are operated by the British Broadcasting Co. The power normally used is $1\frac{1}{2}$ kilowatts (input to main high-frequency generator) but 3 kilowatts are allowed, except in the case of the Sheffield station, which

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List of French broadcasting stations.

Location.	Call signal.	Wave length.	Power.
Lyon.....	YN	740	250 watts in antenna.
Paris (Eiffel Tower).....	FL	2,600	5 kilowatts in antenna.
Paris.....	SAJ	1,780	6 kilowatts input.
Do.....	ESP	450	450 watts in antenna.

List of Cuban broadcasting stations (February 12, 1924).

Call signal.	Operated by—	Address.	City.	Wave length.	Power (watts).
PWX	Cuban Telephone Co.	Aguila 161.	Habana.	400	500
2DW	Pedro Zayas.	Obrapia 95.	do.	300	100
2AB	Alberto S. de Bustamante.	15 entre I y K.	do.	240	20
2OK	Mario Garcia Vélez.	3a., 286, Vedado.	do.	360	100
2BY	Frederick W. Borton.	25 No. 349, Vedado.	do.	250	100
2CX	Do.	Gallano 29.	do.	220	10
2EV	Westinghouse Elec. Co.	S. Francisco y Salud.	do.	220	50
2TW	Roberto E. Ramirez.	Obrapia 95.	do.	230	20
2HC	Heraldo de Cuba.	Ant. M. Lazcano 36.	do.	275	500
2LC	Luis Casas.	Neptuno 118.	do.	250	30
2KD	E. Sánchez de Fuentes.	Calle H. 93, Vedado.	do.	350	100
2MN	Fausto Simón.	Hotel Plaza.	do.	270	300
2MG	Manuel G. Salas.	San Rafael 14.	do.	280	20
2JQ	Raúl Pérez Falcón.	Baños 30, Vedado.	do.	150	10
2KP	Alvaro Daza.	S. Francisco y Salud.	do.	200	10
2HS	Julie Power.	Luce F. Layanó.	do.	180	20
2OL	Oscar Collado.	Neptuno 97.	do.	200	10
2WV	Amadeo Sáenz.	Milagros y J. Delgado.	do.	210	20
5EV	Leopoldo V. Figueroa.	Maril 19.	Colón.	360	100
6KW	Frank H. Jones.	Central Tuineá.	Tuineá.	340	100
6KJ	Do.	do.	do.	275	100
6CX	Antonio T. Figueroa.	Cristina 184.	Cienfuegos.	170	25
6DW	Eduardo Terry.	San Carlos 197.	do.	225	10
6BY	José Ganduxé.	Gacel y Argüelles.	do.	300	100
6AZ	Valentín Ullivarri.	Santa Elena 277.	do.	200	10
6EV	José Alvarez.	Céspedes 2.	Caibarién.	225	20
7AZ	Pedro Negreras.	Maceo 1.	Camaguey.	225	10
7BY	Salvador Rionda.	Central Elia.	do.	350	500
8AZ	Alfredo Brooks.	B. Masó alta 11.	Santiago de Cuba.	240	20
8BY	Alberto Ravelo.	Vista Alegre.	do.	250	100
8FU	Andrés Vinnet.	Heredia 25.	do.	225	15
8DW	Pedro C. Andax.	Hartman alta 10.	do.	275	50
8EV	Eduardo Mateos.	Hartman baja 4.	do.	180	75
8GT	Juan P. Chibas.	Gral Portuondo 12.	Santiago de Cuba.	250	50

United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal.

[E—Music, concerts, lectures, etc.; M—Market reports; W—Weather reports. (Complete to Feb. 29, 1924, inclusive).]

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
KDKA	East Pittsburgh, Pa.	Westinghouse Electric & Mfg. Co.	325	1,000	E. M. W.
KDPM	Cleveland, Ohio.	do.	270	500	E.
KDPT	San Diego, Calif.	Southern Electric Co.	244	50	E.
KDYL	Salt Lake City, Utah.	Newhouse Hotel.	360	100	E. W.
KDYM	San Diego, Calif.	Savoy Theater.	280	100	E.
KDYQ	Portland, Oreg.	Oregon Institute of Technology.	360	100	E. W.
KDYW	Phoenix, Ariz.	Smith Hughes & Co.	360	20	E.
KDYX	Honolulu, Hawaii.	Star Bulletin.	360	100	E. W.
KDZB	Bakersfield, Calif.	Frank E. Siefert.	240	100	E.
KDZE	Seattle, Wash.	Rhodes Co.	270	100	E.
KDZF	Los Angeles, Calif.	Automobile Club of Southern California.	278	500	E.
KDZI	Wenatchee, Wash.	Electric Supply Co.	360	50	E.
KDZQ	Denver, Colo.	Nichols Academy of Dancing.	360	10	E.
KDZR	Bellingham, Wash.	Bellingham Publishing Co.	281	50	E.
KPAD	Phoenix, Ariz.	McArthur Bros. Mercantile Co.	360	100	E.
KPAE	Pullman, Wash.	State College of Washington.	330	500	E.
KPAF	Denver, Colo.	Western Radio Corp.	360	50	E.
KPAJ	Denver, Colo.	University of Colorado.	360	100	E.
KPAN	Moscow, Idaho.	The Electric Shop.	360	50	E.

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United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
KFAW	Santa Ana, Calif.	The Radio Den.	280	10	E.
KFAY	Medford, Oreg.	Virgin's Radio Service.	283	50	E. W.
KFBB	Havro, Mont.	F. A. Buttrely & Co.	360	50	E. M. W.
KFBC	San Diego, Calif., 5038 Cliff Place.	W. K. Arvill.	278	20	E.
KFBE	San Luis Obispo, Calif.	Reuben H. Horn.	380	10	E.
KFBG	Tacoma, Wash.	First Presbyterian Church.	350	50	E.
KFBK	Sacramento, Calif.	Kimball-Upton Co.	283	100	E. W.
KFBL	Everett, Wash.	Loese Bros.	224	10	E.
KFBS	Trinidad, Colo.	Trinidad Gas & Electric Supply Co. and The Chronicle News.	360	10	E.
KFBU	Laramie, Wyo.	The Cathedral.	283	50	E.
KFCB	Phoenix, Ariz.	Nielsen Radio Supply Co.	258	10	E.
KFCF	Walla Walla, Wash., 707 Baker Bldg.	Frank A. Moore.	360	100	E.
KFUH	Billings, Mont.	Electric Service Station (Inc.).	360	10	E. M. W.
KFCM	Richmond, Calif.	Richmond Radio Shop.	360	100	E.
KFCP	Ogden, Utah, 2121 Jefferson Ave.	Ralph W. Fyggare.	360	25	E.
KFCV	Houston, Tex.	Fred Mahaffey, jr.	360	10	E.
KFCY	Le Mars, Iowa.	Western Union College.	252	50	E.
KPCZ	Omaha, Nebr.	Omaha Central High School.	258	100	E.
KPDA	Baker, Oreg.	Adler's Music Store.	360	5	E.
KPDD	Boise, Idaho.	St. Michael's Cathedral.	252	10	E.
KPDH	Tucson, Ariz.	University of Arizona.	360	150	E.
KPDJ	Corvallis, Oreg.	Oregon Agricultural College.	360	50	E.
KPDL	Denver, Colo.	Knight-Cannell Music Co.	360	5	E.
KPDO	Bozoman, Mont., 420 W. Koch St.	H. Everett Cutting.	248	50	E.
KPDR	York, Nebr.	Bullock's Hardware & Sporting Goods.	360	10	E.
KPDV	Fayetteville, Ark.	Gilbrech & Stinson.	360	200	E.
KPDX	Shreveport, La.	First Baptist Church.	360	100	E.
KPDY	Brookings, S. Dak.	South Dakota State College.	360	100	E. M.
KPDZ	Minneapolis, Minn., 2510 Thomas Ave. S.	Harry Q. Iverson.	231	5	E.
KPEB	Portland, Oreg.	Meier & Frank Co.	248	50	E. M. W.
KPEJ	Tacoma, Wash., 1724 S. Jay St.	Guy Orason.	360	10	E.
KPEL	Denver, Colo., 1435 Welton St.	Winner Radio Corporation.	360	50	E.
KPEQ	Oak, Nebr.	J. L. Scroggin.	360	150	E.
KPER	Fort Dodge, Iowa.	Auto Electric Service Co.	231	10	E.
KPEV	Casper, Wyo.	Felix Thompson Radio Shop.	253	250	E. W.
KPEK	Minneapolis, Minn.	Augsburg Seminary.	261	100	E.
KPEY	Kellogg, Idaho.	Bunker Hill & Sullivan Mining & Concentrating Co.	360	10	E.
KPEZ	St. Louis, Mo.	American Society of Mechanical Engineers.	360	100	E.
KFFB	Boise, Idaho.	Jenkins Furniture Co.	240	10	E.
KFFE	Pendleton, Oreg.	Eastern Oregon Radio Co.	360	10	E.
KFFO	Hillsboro, Oreg.	E. H. Smith.	229	5	E.
KFFQ	Colorado Springs, Colo.	Marksheffel Motor Co.	360	100	E. W.
KFFR	Sparks, Nev.	Nevada State Journal.	226	10	E.
KFFV	Lamoni, Iowa.	Graceland College.	360	100	E.
KFFX	Omaha, Nebr.	MetGraw Co.	278	100	E.
KFFY	Alexandria, La.	Pineau & Murphey.	275	100	E.
KFFZ	Dallas, Tex. (portable).	Al G. Barnes Amusement Co.	226	20	E.
KFGC	Baton Rouge, La.	Louisiana State University.	254	100	E.
KFGD	Chickasha, Okla.	Chickasha Radio & Electric Co.	248	200	E.
KFGH	Stanford University, Calif.	Leland Stanford University.	360	500	E.
KFGL	Arlington, Oreg.	Arlington Garage.	234	5	E.
KFGQ	Boone, Iowa.	Crary Hardware Co.	226	10	E.
KFGB	Utica, Nebr.	Heidbreder Radio Supply Co.	224	10	E.
KFOX	Orange, Tex.	First Presbyterian Church.	250	500	E.
KFGZ	Berrien Springs, Mich.	Emmanuel Missionary College.	268	250	E.
KFHA	Gunnison, Colo.	Western State College of Colorado.	252	50	E.
KFHB	Hood River, Oreg.	Rialto Theater.	280	5	E.
KFHD	St. Joseph, Mo.	Uta Radio & Electric Co.	226	100	E.
KFHF	Shreveport, La.	Central Christian Church.	266	130	E.
KFHH	Neah Bay, Wash.	Ambrose A. McCue.	261	60	E.
KFHI	Santa Barbara, Calif.	Fallon & Co.	360	100	E.
KFHR	Seattle, Wash.	Star Electric & Radio Co.	283	60	E.
KFHS	Lihue, Hawaii.	Clifford J. Dow.	275	30	E.
KFHX	Hutchinson, Kans., 407 E. First St.	Robert W. Nelson.	229	150	E.
KFI	Los Angeles, Calif., Tenth and Hope Sts.	Earle C. Anthony (Inc.).	469	500	E.
KFID	Iola, Kans.	Ross Arbuckle's Garage.	246	20	E.
KFIF	Portland, Oreg.	Benson Polytechnic Institute.	360	100	E.
KFIL	Louisburg, Kans.	Windisch Electric Farm Equipment.	234	30	E.

United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
KPIO	Spokane, Wash.....	North Central High School.....	252	50	E.
KFIQ	Yakima, Wash.....	Yakima Valley Radio Broadcasting Association.....	242	50	E.
KPIU	Juneau, Alaska.....	Alaska Electric Light & Power Co....	225	10	E.
REIX	Independence, Mo.....	Reorganized Church of Jesus Christ of Latter Day Saints.....	240	250	E.
KFIZ	Fondulac, Wis.....	Daily Commonwealth and Oscar A. Huesman.....	273	160	E. W
KFJB	Marshalltown, Iowa.....	Marshall Electric Co.....	248	10	E.
KFJC	Seattle, Wash.....	Seattle Post-Intelligencer.....	270	100	E.
KFJF	Oklahoma City, Okla.....	National Radio Manufacturing Co.....	252	20	E.
KFJI	Astoria, Oreg.....	Liberty Theater.....	252	10	E.
KFJK	Bristow, Okla.....	DeLano Radio & Electric Co.....	233	160	E.
KFJL	Ottumwa, Iowa.....	Hardsag Manufacturing Co.....	242	10	E.
KFJM	Grand Forks, N. Dak.....	University of North Dakota.....	280	100	E.
KFJQ	do.....	Electric Construction Co., valley radio division.....	280	5	E.
KFJR	Stevensville, Mont. (near).....	Ashley C. Dixon & Son.....	258	5	E.
KFJV	Dexter, Iowa.....	Thomas H. Warren.....	224	10	E.
KFJW	Towanda, Kans.....	Le Grand Radio Co.....	225	10	E.
KFJX	Cedar Falls, Iowa.....	Iowa State Teachers College.....	220	50	E.
KFJY	Fort Dodge, Iowa.....	Tunwall Radio Co.....	245	50	E.
KFJZ	Fort Worth, Tex.....	Texas National Guard, One hundred and twelfth Cavalry.....	254	20	E.
KFKA	Greeley, Colo.....	Colorado State Teachers College.....	248	50	E.
KFKB	Milford, Kans.....	Brinkley-Jones Hospital Association.....	295	500	E.
KFKQ	Conway, Ark.....	Conway Radio Laboratories.....	224	150	E.
KFKV	Butte, Mont., 3200 Richardson St.....	F. F. Gray.....	283	50	E.
KFKX	Hastings, Nebr.....	Westinghouse Electric & Mfg. Co.....	341	1,000	E.
KFKZ	Colorado Springs, Colo.....	Nassour Bros. Radio Co.....	284	10	E.
KFLA	Butte, Mont., 1323 W. Platinum St.....	Abner R. Wilson.....	283	5	E.
KFLB	Menominee, Mich.....	Signal Electric Manufacturing Co.....	248	5	E.
KFLD	Franklinton, Ia.....	Paul E. Greenlaw.....	234	20	E.
KFLE	Denver, Colo.....	National Education Service.....	258	25	E.
KFLH	Salt Lake City, Utah.....	Erickson Radio Co.....	261	50	E.
KFLP	Cedar Rapids, Iowa.....	Everette M. Foster.....	240	20	E.
KFLQ	Little Rock, Ark.....	Bizzell Radio Shop.....	261	20	E.
KFLR	Albuquerque, N. Mex.....	University of New Mexico.....	254	100	E.
KFLU	San Benito, Tex.....	Rio Grande Radio Supply House.....	236	20	E.
KFLV	Rockford, Ill., 1503 Fourth Ave.....	A. T. Frykman.....	220	100	E.
KFLW	Missoula, Mont.....	Missoula Electric Supply Co.....	234	10	E.
KFLX	Galveston, Tex., 1214 Fort-tenth St.....	George R. Clough.....	240	10	E.
KFLY	Fargo, N. Dak.....	Fargo Radio Supply Co.....	231	20	E.
KFLZ	Atlantic, Iowa.....	Atlantic Automobile Co.....	273	100	E.
KFMB	Little Rock, Ark.....	Christian Churches of Little Rock.....	254	.....	E.
KFMQ	Payetteville, Ark.....	University of Arkansas.....	263	100	E.
KFMR	Siox City, Iowa.....	Morningside College.....	261	10	E.
KFMS	Duuth, Minn.....	Freimuth Department Store.....	275	100	E. W.
KFMT	Minneapolis, Minn., 2219 N. Bryant St.....	George W. Young.....	231	5	E.
KFMU	San Marcos, Tex.....	Stevens Bros.....	240	20	E.
KFMW	Houghton, Mich., 127 Blanche St.....	M. G. Sateren.....	266	50	E.
KFMX	Northfield, Minn.....	Carleton College.....	283	500	E.
KFMY	Long Beach, Calif.....	Boy Scouts of America.....	229	20	E.
KFMZ	Roswell, N. Mex.....	Roswell Broadcasting Club.....	250	500	E.
KFNC	Corsicana, Tex., First Methodist Church.....	Alonso Monk, Jr.....	234	20	E.
KFNF	Shenandoah, Iowa.....	Henry Field Seed Co.....	266	500	E.
KFNG	Coldwater, Miss.....	Wooten's Radio Shop.....	254	10	E.
KFNH	Springfield, Mo.....	State Teachers College.....	236	20	E.
KFNJ	Warrensburg, Mo.....	Warrensburg Electric Shop.....	234	50	E.
KFNL	Paso Robles, Calif.....	Radio Broadcast Association.....	240	10	E.
KFNV	Santa Rosa, Calif.....	L. A. Drake.....	234	5	E.
KFNX	Peabody, Kans.....	Peabody Radio Service.....	240	10	E.
KFNY	Helena, Mont.....	Montana Phonograph Co.....	261	5	E.
KFNZ	Burlington, Calif.....	Royal Radio Co.....	231	10	E.
KFOA	Seattle, Wash.....	Rhodes Co.....	455	500	E.
KFOB	Minneapolis, Minn., 920 Fifth Ave. N.....	Glenwood Technical Association.....	234	5	E.
KFOC	Whittier, Calif.....	First Christian Church.....	228	100	E.
KFOD	Wallace, Idaho.....	The Radio Shop.....	224	10	E.
KPOF	Marshfield, Oreg.....	Rohrer Electric Co.....	240	10	E.
KPOH	Portland, Oreg.....	Radio Bunselow.....	283	15	E.

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United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
KFON	Long Beach, Calif.....	Echophone Radio Shop.....	234	100	E.
KFOP	Dallas, Tex.....	Wilson Construction Co.....	268	100	E.
KFPB	Seattle, Wash.....	Edwin J. Brown.....	224	.....	E.
KFSO	Los Angeles, Calif.....	Echo Park Evangelistic Assn.....	278	500	E.
KGB	Tacoma, Wash.....	Tacoma Daily Ledger.....	252	50	E.
KGG	Portland, Oreg., 192 Park St.	Hallock & Watson Radio Service.....	360	50	E.
KGN	Portland, Oreg., 1556 E. Taylor St.	Northwestern Radio Mfg. Co.....	360	100	E.
KGO	Oakland, Calif.....	General Electric Co.....	312	1,000	E.
KGU	Honolulu, Hawaii, Waikiki Beach.	Marion A. Muirony.....	360	500	E.
KGW	Portland, Oreg.....	Portland Morning Oregonian.....	492	500	E. M. W.
KGY	Lacey, Wash.....	St. Martins College.....	258	5	E.
KHJ	Los Angeles, Calif.....	Times-Mirror Co.....	395	500	E. W.
KHQ	Seattle, Wash., 2020 Thirteenth Ave.	Louis Wazmer.....	360	100	E.
KJQ	Stockton, Calif., 615 E. Main St.	C. O. Gould.....	360	5	E.
KJR	Seattle, Wash., 1328 Sixth Ave.	Northwest Radio Service Co.....	283	50	E. W.
KJS	Los Angeles, Calif., 536 S. Hope St.	Bible Institute of Los Angeles.....	360	750	E.
KLS	Oakland, Calif., 2301 Telegraph Ave.	Warner Bros. Radio Supplies Co.....	360	250	E.
KLX	Oakland, Calif.....	Tribune Publishing Co. (Oakland Tribune).	509	500	E.
KLZ	Denver, Colo., 1534 Glenarm Place.	Reynolds Radio Co.....	360	500	E. M. W.
KMJ	Fresno, Calif.....	San Joaquin Light & Power Corporation.	273	50	E. W.
KMO	Tacoma, Wash., 818 N. L. St.	Love Electric Co.....	360	10	E.
KNT	Aberdeen, Wash.....	Grays Harbor Radio Co.....	263	250	E.
KNV	Los Angeles, Calif., 815 S. Main St.	Radio Supply Co.....	266	100	E.
KNX	Los Angeles, Calif., 216 W. Third St.	Electric Lighting Supply Co.....	360	100	E.
KOB	State College, N. Mex.....	New Mexico College of Agriculture and Mechanic Arts.	360	500	E. W.
KOP	Detroit, Mich.....	Detroit Police Department.....	286	500	E.
KPO	San Francisco, Calif.....	Hale Bros.....	423	500	E.
KQP	Hood River, Oreg.....	Apple City Radio Club.....	360	10	E.
KQV	Pittsburgh, Pa., 719 Liberty Ave.	Doubleday-Hill Electric Co.....	380	250	E.
KQW	San Jose, Calif., 467 First St.	Charles D. Herrold.....	360	50	E. W.
KRE	Berkeley, Calif.....	Berkeley Daily Gazette.....	275	50	E.
KSD	St. Louis, Mo.....	Post-Dispatch.....	548	500	E. W.
KSS	Long Beach, Calif.....	Prest & Dean Radio Co. and Radio Research Society of Long Beach, Calif.	360	20	E.
KTW	Seattle, Wash.....	First Presbyterian Church.....	360	750	E.
KUO	San Francisco, Calif.....	Examiner Printing Co.....	360	150	E. M. W.
KUS	Los Angeles, Calif.....	City Dye Works & Laundry Co.....	360	100	E.
KUY	El Monte, Calif.....	Coast Radio Co.....	256	50	E.
KWG	Stockton, Calif., 530 E. Market St.	Portable Wireless Telephone Co.....	360	100	E.
KWH	Los Angeles, Calif.....	Los Angeles Examiner.....	360	500	E. M. W.
KXD	Modesto, Calif.....	Modesto Herald Publishing Co.....	252	5	E.
KYQ	Honolulu, Hawaii.....	The Electric Shop.....	270	100	E.
KYW	Chicago, Ill.....	Westinghouse Electric & Mfg. Co.....	536	1,000	E. M. W.
KZM	Oakland, Calif., Thirteenth and Harrison Sts.	Preston D. Allen.....	360	50	E.
KZN	Salt Lake City, Utah.....	The Deseret News.....	360	500	E. W.
KZV	Wenatchee, Wash.....	Wenatchee Battery & Motor Co.....	360	50	E. W.
WAAB	New Orleans, La., 137 S. St. Patrick St.	Valdemar Jensen.....	268	100	E.
WAAC	New Orleans, La.....	Tulane University.....	360	400	E.
WAAD	Cincinnati, Ohio.....	Ohio Mechanics Institute.....	380	25	E.
WAAP	Chicago, Ill.....	Chicago Daily Drivers Journal.....	286	200	E. M. W.
WAAM	Newark, N. J., Bond St.....	I. B. Nelson Co.....	263	250	E. M. W.
WAAN	Columbia, Mo.....	University of Missouri.....	254	50	E. W.
WAAW	Omaha, Nebr.....	Omaha Grain Exchange.....	360	200	E. M.
WABA	Lake Forest, Ill.....	Lake Forest College.....	395	100	E.
WABB	Harrisburg, Pa.....	John B. Lawrence.....	266	10	E.
WABD	Dayton, Ohio.....	Parker High School.....	283	10	E.
WABE	Washington, D. C.....	Y. M. C. A.....	283	100	E.

United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
WABI	Bangor, Me.	Bangor Railway & Electric Co.	240	100	E.
WABK	Worcester, Mass.	First Baptist Church.	252	10	E.
WABL	Storrs, Conn.	Connecticut Agricultural College.	283	100	E.
WABM	Saginaw, Mich.	F. A. Doherty Automotive & Radio Equipment Co.	254	100	E. W.
WABN	La Crosse, Wis.	Ott Radio (Inc.)	244	250	E.
WABO	Rochester, N. Y.	Lake Avenue Baptist Church.	252	10	E.
WABP	Dover, Ohio, 322 Wooster Ave.	Robert F. Weinig.	266	100	E.
WABQ	Haverford, Pa.	Haverford College Radio Club.	261	50	E.
WABR	Toledo, Ohio.	Scott High School.	270	50	E.
WABS	Newark, N. J., 117 Mulberry St.	Essex Mfg. Co.	244	50	E.
WABT	Washington, Pa.	Holidays Hall.	252	100	E.
WABU	Camden, N. J.	Victor Talking Machine Co.	236	100	E.
WABV	Nashville, Tenn., 1812 Fifteenth Ave. S.	John H. De Witt.	263	20	E.
WABW	Wooster, Ohio.	College of Wooster.	234	20	E.
WABX	Mount Clemens, Mich. (near).	Henry B. Joy.	270	150	E.
WABY	Philadelphia, Pa., 815 Kimball St.	John Magaldi, jr.	242	50	E.
WABZ	New Orleans, La.	Coliseum Place Baptist Church.	263	50	E.
WBAA	West Lafayette, Ind.	Purdue University.	260	250	E.
WBAD	Minneapolis, Minn., 31 S. Fifth St.	Sterling Electric Co.	360	100	E.
WBAH	Minneapolis, Minn., Seventh St. and Nicollet Ave.	The Dayton Co.	417	500	E.
WBAN	Paterson, N. J., 193 Ellison St.	Wireless Phone Corporation.	244	100	E.
WBAO	Decatur, Ill.	James Millikin University.	360	50	E.
WBAP	Fort Worth, Tex.	Wortham-Carter Publishing Co. (Star Telegram).	475	500	E. M. W.
WBAV	Columbus, Ohio, 146 N. Third St.	Erner & Hopkins Co.	300	500	E. W.
WBAX	Wilkes-Barre, Pa., 66 Gildersleeve St.	John H. Stenger, jr.	360	20	E.
WBAY	New York, N. Y., 463 West St.	Western Electric Co.	492	500	E.
WBBA	Newark, Ohio.	Newark Radio Laboratories.	240	10	E.
WBBD	Reading, Pa., Fourth and Walnut Sts.	Barbey Battery Service.	234	50	E.
WBBE	Syracuse, N. Y., 113 W. Haynor Ave.	Alfred R. Marcy.	246	10	E.
WBBF	Atlanta, Ga.	Georgia School of Technology.	270	500	E.
WBBG	Mattapoisett, Mass., 24 Vermilya St.	Irving Vermilya.	240	100	E.
WBBH	Port Huron, Mich., 1511 Gordon St.	J. Irving Bell.	246	50	E.
WBBI	Indianapolis, Ind., 1721 N. Somerset St.	Indianapolis Radio Club.	234	20	E.
WBBJ	West Palm Beach, Fla.	Neel Electric Co.	258	50	E.
WBBL	Richmond, Va.	Grace Covenant Church.	283	50	E.
WBBM	Lincoln, Ill., 110 Park Place.	Frank Atlas Produce Co.	226	200	E.
WBBN	Wilmington, N. C., 225 N. Front St.	A. B. Blake.	275	10	E.
WBBO	Rogers, Mich.	Michigan Limestone & Chemical Co.	250	500	E.
WBBP	Petoskey, Mich.	Petoskey High School.	246	10	E.
WBBQ	Pawtucket, R. I., 150 Exchange St.	Frank Crook.	252	50	E.
WBBR	Rossville, N. Y.	Peoples Pulpit Associations.	244	500	E.
WBBE	New Orleans, La.	First Baptist Church.	260	100	E.
WBBT	Philadelphia, Pa., 3157 Frankford Ave.	Lloyd Bros.	234	5	E.
WBBU	Mountmouth, Ill.	Jenks Motor Sales Co.	224	10	E.
WBBV	Johnstown, Pa., 324 Market St.	Johnstown Radio Co.	248	5	E.
WBBW	Norfolk, Va.	Ruffner Junior High School.	222	50	E.
WBBY	Charleston, S. C.	Washington Light Infantry.	268	20	E.
WBBZ	Indianapolis, Ind.	Noble S. Watson.	227	50	E.
WBL	Anthony, Kans.	T. & H. Radio Co.	261	100	E.
WBS	Newark, N. J., 323 Central Ave.	D. W. May (Inc.)	360	10	E.
WBT	Charlotte, N. C., 1116 Realty Bldg.	Southern Radio Corporation.	360	500	E. M. W.
WBZ	Springfield, Mass.	Westinghouse Electric & Mfg. Co.	337	1000	E.
			240	250	E. W.

RADIO SERVICE BULLETIN.

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United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal.

Call signal.	Location of station.	Operated and controlled by--	Wave length.	Power (watts).	Service.
WCAG	New Orleans, La., 2813 Calhoun St.	Clyde R. Randall.....	268	50	E.
WCAH	Columbus, Ohio, 321 W. Tenth St.	Entrekin Electric Co.....	285	100	E.
WCAJ	University Place, Nebr....	Nebraska Wesleyan University.....	360	500	E. W.
WCAK	Houston, Tex., 2504 Bagby St.	Alfred P. Daniel.....	263	50	E.
WCAL	Northfield, Minn.....	St. Olaf College.....	350	500	E.
WCAM	Villanova, Pa.....	Villanova College.....	350	150	E.
WCAN	Baltimore, Md.....	Sanders & Stayman Co.....	350	50	E. W.
WCAP	Washington, D. C.....	Chesapeake & Potomac Telephone Co.....	459	500	E.
WCAR	San Antonio, Tex., 120 E. Travis St.	Southern Radio Corporation of Texas.....	360	100	E.
WCAS	Minneapolis, Minn.....	William Hood Dunwoody Industrial Institute.....	280	100	E.
WCAT	Rapid City, S. Dak.....	South Dakota State School of Mines.....	240	100	E.
WCAU	Philadelphia, Pa., 1928 Market St.	Durham & Co.....	285	100	E. W.
WCAV	Little Rock, Ark., 113 W. Capitol Ave.	J. C. Dice Electric Co.....	360	20	E. W.
WCAX	Burlington, Vt.....	University of Vermont.....	350	50	E.
WCAY	Milwaukee, Wis., 547 Grand Ave.	Kesselman O'Driscoll Co.....	261	250	E. W.
WCAZ	Carthage, Ill.....	Carthage College.....	246	50	E.
WCBA	Allentown, Pa., 1015 Allen St.	Charles W. Heimbach.....	280	10	E.
WCBC	Ann Arbor, Mich.....	University of Michigan.....	280	200	E.
WCBD	Zion, Ill.....	Wilbur G. Voliva.....	345	500	E.
WCBE	New Orleans, La., 4324 Chestnut St.	Uhalt Radio Co.....	263	5	E.
WCBG	PascAGOOLA, Miss. (portable).	Howard S. Williams.....	254	10	E.
WCBH	Oxford, Miss. (near).....	University of Mississippi.....	242	20	E.
WCK	St. Louis, Mo.....	Stir-Baer & Fuller Dry Goods Co.....	350	100	E.
WCM	Austin, Tex.....	University of Texas.....	350	500	E. M.
WCX	Detroit, Mich.....	Detroit Free Press.....	517	500	E. M. W.
WDAE	Tampa, Fla.....	Tampa Daily Times.....	350	250	E. M. W.
WDAF	Kansas City, Mo.....	Kansas City Star.....	411	500	E. M. W.
WDAG	Amarillo, Tex.....	J. Laurance Martin.....	263	100	E.
WDAH	El Paso, Tex.....	Trinity Methodist Church (South).....	268	50	E.
WDAK	Hartford, Conn.....	The Courant.....	261	100	E.
WDAO	Dallas, Tex., Ervay and Corsicana Sts.	Automotive Electric Co.....	360	50	E.
WDAP	Chicago, Ill.....	Board of Trade.....	360	1,000	E. M. W.
WDAR	Philadelphia, Pa.....	Lit Brothers.....	395	500	E.
WDAS	Worcester, Mass., 592a Main St.	Samuel A. Waite.....	360	5	E.
WDAU	New Bedford, Mass., 23 N. Water St.	Slocum & Kilburn.....	360	100	E.
WDAY	Fargo, N. Dak., 117 Broadway.	Radio Equipment Corporation.....	244	50	E. W.
WDBC	Lancaster, Pa.....	Kirk, Johnson & Co.....	258	50	E. M.
WDM	Washington, D. C.....	Church of the Covenant.....	234	50	E.
WDZ	Tuscola, Ill.....	James L. Bush.....	278	10	E.
WEA	Flint, Mich., Police Bldg.	Frank D. Fallain.....	250	10	E.
WEAF	New York, N. Y., 24 Walker St.	American Telephone & Telegraph Co.....	492	500	E.
WEAH	Wichita, Kans.....	Wichita Board of Trade.....	280	50	E. M. W.
WEAI	Ithaca, N. Y.....	Cornell University.....	286	500	E.
WEAJ	Vermillion, S. Dak.....	University of South Dakota.....	283	100	E.
WEAM	North Plainfield, N. J.....	Borough of North Plainfield.....	252	100	E.
WEAN	Providence, R. I.....	Shepard Co.....	273	100	E. W.
WEAO	Columbus, Ohio.....	Ohio State University.....	300	500	E. M. W.
WEAP	Mobile, Ala., O'Gwinn Bldg.	Mobile Radio Co.....	350	100	E. M. W.
WEAR	Baltimore, Md.....	Baltimore American and News Publishing Co.....	350	50	E. W.
WEAS	Washington, D. C.....	Hecht Co.....	360	100	E.
WEAU	Sioux City, Iowa.....	Davidson Bros. Co.....	360	100	E. W.
WEAY	Houston, Tex.....	Iris Theater.....	360	500	E. W.
WEB	St. Louis, Mo., 1110 Olive St.	Beaewood Co.....	273	500	E.
WEV	Houston, Tex., McKinley Ave. and San Jacinto St.	Hurlburt-Still Electrical Co.....	360	50	E. W.
WEW	St. Louis, Mo.....	St. Louis University.....	261	100	E. M. W.
WFAA	Dallas, Tex.....	Dallas News and Dallas Journal.....	476	500	E. M. W.
WFAB	Syracuse, N. Y., 802 McBride St.	Carl F. Woose.....	234	100	E.

United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
WFAH	Port Arthur, Tex., 637 Proctor St.	Electric Supply Co.....	236	150	E.
WFAJ	Asheville, N. C., 25 Hanover St.	Hi-Grade Wireless Instrument Co.....	360	50	E.
WFAM	St. Cloud, Minn.....	Times Publishing Co.....	360	20	E. W.
WFAN	Hutchinson, Minn.....	Hutchinson Electric Service Co.....	360	100	E. M. W.
WFAQ	Cameron, Mo.....	Missouri Wesleyan College.....	300	10	E.
WFAT	Sioux Falls, S. Dak.....	New Columbus College.....	258	50	E.
WFAV	Lincoln, Nebr.....	University of Nebraska.....	275	500	E. M. W.
WFI	Philadelphia, Pa.....	Strawbridge & Clothier.....	395	500	E. M.
WGAL	Lancaster, Pa., 23 E. Orange St.	Lancaster Electric Supply and Construction Co.....	248	10	E.
WGAN	Pensacola, Fla., 216 W. Romana St.	Oecil E. Lloyd.....	360	50	E.
WGAQ	Shreveport, La., 900 Texas Ave.	Glenwood Radio Corporation.....	262	150	E.
WGAW	Altoona, Pa., 1918 W. Chestnut St.	Ernest C. Albright.....	261	100	E.
WGAZ	South Bend, Ind.....	South Bend Tribune.....	360	250	E.
WGI	Medford Hillside, Mass.....	American Radio and Research Corporation.	360	500	E. M. W.
WQL	Philadelphia, Pa., 2363 N. Broad St.	Thomas F. J. Howlett.....	360	500	E.
WGR	Buffalo, N. Y.....	Federal Telephone & Telegraph Co.....	319	500	E. M. W.
WGV	New Orleans, La., 356 Barrone St.	Interstate Electric Co.....	242	100	E. M.
WGY	Schenectady, N. Y.....	General Electric Co.....	380	1000	E. W.
WHA	Madison, Wis.....	University of Wisconsin.....	360	500	E. M. W.
WHAA	Iowa City, Iowa.....	State University of Iowa.....	484	100	E.
WHAB	Galveston, Tex.....	Clark W. Thompson.....	360	200	E. W.
WHAD	Milwaukee, Wis.....	Marquette University.....	260	100	K.
WHAG	Cincinnati, Ohio.....	University of Cincinnati.....	222	100	E.
WHAH	Joplin, Mo., 112 W. Sixth St.	Hafer Supply Co.....	288	250	E.
WHAJ	Clarksburg, W. Va.....	Roberts Hardware Co.....	258	15	E.
WHAM	Rochester, N. Y.....	University of Rochester (Eastman School of Music).	283	100	E. M. W.
WHAP	Decatur, Ill., 160 S. Water St.	Otta and Kuhns.....	300	50	E.
WHAR	Atlantic City, N. J., 1215 Atlantic Ave.	Paramount Radio & Electric Co.....	231	10	E.
WHAS	Louisville, Ky.....	Courier-Journal and Louisville Times.	400	500	E. W.
WHAU	Wilmington, Del., 405 Delaware Ave.	Wilmington Electrical Specialty Co.....	360	50	E.
WHAZ	Troy, N. Y.....	Rensselaer Polytechnic Institute.....	380	500	E.
WHB	Kansas City, Mo., Sweeney Bldg.	Sweeney School Co.....	411	500	E. M. W.
WHK	Cleveland, Ohio, 5005 Euclid Ave.	Radiovox Co.....	283	100	E.
WHN	New York, N. Y., 1540 Broadway.	George Schubel.....	360	100-500	E. W.
WIAB	Rockford, Ill., 320 Church St.	Jaslyn Automobile Co.....	262	50	E.
WIAC	Galveston, Tex.....	Galveston Tribune.....	360	100	E. W.
WIAD	Philadelphia, Pa., 6318 N. Park Ave.	Howard R. Miller.....	254	100	E.
WIAF	New Orleans, La., 139 N. Alexander St.	Gustav A. DeCortin.....	234	10	E.
WIAI	Springfield, Mo.....	Heer Stores Co.....	252	20	E. W.
WIAJ	Neesah, Wis., 425 Sherry St.	Fox River Valley Radio Supply Co.....	234	20	E.
WIAK	Omaha, Nebr.....	Journal-Stockman Co.....	278	200	E. M. W.
WIAO	Milwaukee, Wis., 415 Marshall St.	School of Engineering of Milwaukee.....	360	100	E.
WIAQ	Marion, Ind., 413 S. Washington St.	Chronicle Publishing Co.....	226	10	E.
WIAR	Paducah, Ky.....	Paducah Evening Sun.....	360	100	E.
WIAS	Burlington, Iowa, 315 N. Third St.	Home Electric Co.....	360	100	E.
WIAU	Le Mars, Iowa.....	American Trust & Savings Bank.....	360	20	E.
WIK	McKeesport, Pa., 427 Olive St.	K. & L. Electric Co.....	234	100	E.
WIL	Washington, D. C., 808 Ninth St.	Continental Electrical Supply Co.....	360	10	E.
WIP	Philadelphia, Pa.....	Gimbel Bros.....	509	500	E. W.
WIAD	Waco, Tex., 801 Austin St.	Jackson's Radio Engineering Laboratories.	360	150	E.
WIAP	Muncie, Ind.....	Muncie Press and Smith Electric Co.....	360	10	E.
WIAP	Muncie, Ind.....	Muncie Press and Smith Electric Co.....	242	250	E. W.

RADIO SERVICE BULLETIN.

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United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
WIAM	Cedar Rapids, Iowa, 332 Third Ave. West.	D. M. Perham.....	268	30	E.
WIAN	Peoria, Ill.....	Peoria Star.....	280	100	E. W.
WJAO	Topeka, Kans.....	Capper Publications.....	300	100	E.
WJAR	Providence, R. I.....	The Outlet Co.....	360	500	E. W.
WJAS	Pittsburgh, Pa., 963 Liberty Ave.	Pittsburgh Radio Supply House.....	250	500	E.
WJAT	Marshall, Mo.....	Kelley-Yawter Jewelry Co.....	300	10	E.
WJAX	Cleveland, Ohio.....	Union Trust Co.....	300	500	E. M. W.
WJAZ	Chicago, Ill., 332 S. Michigan Ave.	Chicago Radio Laboratory.....	448	1000	E.
WJD	Granville, Ohio.....	Denison University.....	220	50	E.
WJH	Washington, D. C., 812 Thirteenth St. N. W.	William P. Boyer Co.....	273	50	E. M.
WJX	New York, N. Y., 1381 Sedgwick Ave.	Deforest Radio Telephone & Telegraph Co.	360	500	E.
WJY	New York, N. Y.....	Radio Corporation of America.....	405	500	E.
WJZ	do.....	do.....	455	500	E.
WKAA	Cedar Rapids, Iowa.....	H. F. Paar.....	268	100	E.
WKAD	East Providence, R. I.....	Charles Looff (Crescent Park).....	240	10	E.
WKAF	Wichita Falls, Tex., 725 Tenth St.	W. S. Radio Supply Co.....	360	100	E.
WKAN	Montgomery, Ala.....	United Battery Service Co.....	226	15	E.
WKAP	Cranston, R. I.....	Dutce W. Flint.....	300	200	E.
WKAQ	San Juan, P. R.....	Radio Corporation of Porto Rico.....	360	100	E.
WKAH	East Lansing, Mich.....	Michigan Agricultural College.....	280	500	E. W.
WKAU	Laconia, N. H.....	Laconia Radio Club.....	254	50	E.
WKAY	Gainesville, Ga.....	Brenau College.....	280	10	E.
WKY	Oklahoma, Okla.....	WKY Radio Shop.....	300	500	E. W.
WLAG	Minneapolis, Minn., 18 W. Franklin St.	Cutting & Washington Radio Corporation.	417	500	E. M. W.
WLAH	Syracuse, N. Y., 425 Brownell St.	Samuel Woodworth.....	234	100	E.
WLAJ	Waco, Tex., 516 Austin Ave.	Waco Electrical Supply Co.....	360	150	E. M.
WLAO	Bellevue Falls, Vt.....	Vermont Farm Machine Corporation.....	360	100	E.
WLAL	Tulsa, Okla., 24 W. Second St.	Naylor Electrical Co.....	360	100	E.
WLAP	Louisville, Ky.....	W. V. Jordan.....	300	15	E.
WLAQ	Kalamazoo, Mich., 108 Elm St.	Arthur E. Schilling.....	283	10	E.
WLAV	Pensacola, Fla., 30 S. Palatka St.	Electric Shop.....	254	15	E.
WLAW	New York, N. Y.....	Police Department, city of New York.	360	500	E.
WLAX	Greencastle, Ind.....	Putnam Electric Co. (Greencastle community broadcasting station).	231	10	E.
WLB	Minneapolis, Minn.....	University of Minnesota.....	360	25	E. M. W.
WLW	Cincinnati, Ohio.....	Crosley Mfg. Co.....	300	500	E. M. W.
WLAB	Oklahoma, Okla., 707 N. Broadway.	Radio Supply Co.....	300	100	E.
WMAO	Cazenovia, N. Y., Fernwood St.	Clive B. Meredith.....	261	200	E.
WMAF	Dartmouth, Mass.....	Round Hills Radio Corporation.....	360	100-500	E.
WMAH	Lincoln, Nebr., 144 N. Thirteenth St.	General Supply Co.....	254	50	E.
WMAJ	Kansas City, Mo.....	Drivers Telegram Co.....	275	250	E. M. W.
WMAK	Lockport, N. Y.....	Norton Laboratories.....	350	500	E. W.
WMAL	Trenton, N. J., 35 E. State St.	Trenton Hardware Co.....	256	50	E.
WMAN	Columbus, Ohio.....	First Baptist Church.....	226	10	E.
WMAO	Easton, Pa., 665 Northampton St.	Utility Battery Service.....	246	150	E.
WMAQ	Chicago, Ill.....	Chicago Daily News.....	448	500	E.
WMAV	Auburn, Ala.....	Alabama Polytechnic Institute.....	250	250	E. M. W.
WMAW	Wahpeton, N. Dak.....	Wahpeton Electric Co.....	254	50	E.
WMAZ	St. Louis, Mo.....	Kingshighway Presbyterian Church.....	280	100	E.
WMAZ	Macon, Ga.....	Mercer University.....	268	50	E.
WMC	Memphis, Tenn.....	Commercial Appeal.....	500	500	E. M. W.
WMU	Washington, D. C.....	Doubleday-Hill Electric Co.....	261	50	E.
WNAC	Boston, Mass.....	Shepard Stores.....	278	100	E.
WNAD	Norman, Okla.....	University of Oklahoma.....	360	50	E.
WNAL	Omaha, Nebr., 8019 Capitol Ave.	R. J. Rockwell.....	266	20	E.
WNAN	Syracuse, N. Y., 207 E. Jefferson St.	Syracuse Radio Telephone Co.....	286	100	E.
WNAP	Springfield, Ohio.....	Wittenberg College.....	276	100	E.

United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
WNAS	Austin, Tex.	Texas Radio Corporation and Austin Statesman.	360	100	E.
WNAT	Philadelphia, Pa., 827 Spring Garden.	Lennig Brothers Co.	360	250	E.
WNAV	Knoxville, Tenn.	Peoples Telephone & Telegraph Co.	236	500	E. W.
WNAW	Fort Monroe, Va.	Henry Kunzman, box 187.	360	5	E.
WNAX	Yankton, S. Dak.	Dakota Radio Apparatus Co.	244	100	E. W.
WNI	Albany, N. Y.	Shotton Radio Mfg. Co.	360	65	E.
WOAC	Lima, Ohio, 404 N. Main St.	Page Organ Co. (H. P. Maus)	266	50	E.
WOAD	Sigourney, Iowa.	Friday Battery & Electric Corporation	360	20	E.
WOAE	Fremont, Nebr.	Midland College.	360	20	E.
WOAF	Tyler, Tex.	Tyler Commercial College.	360	10	E.
WOAG	Belvidere, Ill.	Apollo Theatre.	273	100	E.
WOAH	Charleston, S. C., 267 King St.	Palmetto Radio Corporation.	360	100	E.
WOAI	San Antonio, Tex.	Southern Equipment Co.	385	500	E. W.
WOAN	Lawrenceburg, Tenn.	James D. Vaughn.	360	150	E.
WOAO	Mishawaka, Ind.	Lyradion Mfg. Co.	360	50	E.
WOAP	Kalamazoo, Mich.	Kalamazoo College.	281	50	E.
WOAR	Kenosha, Wis., 1066 Sheridan Road.	Henry P. Lundsckow.	229	50	E.
WOAT	Wilmington, Del., 245 Market St.	Boyd M. Hamp.	360	50	E.
WOAV	Erie, Pa.	Pennsylvania National Guard, One hundred and twelfth Infantry.	242	50	E.
WOAW	Omaha, Nebr.	Woodmen of the World.	526	500	E. W.
WOAX	Trenton, N. J., 600 Ingham Ave.	Franklyn J. Wolff.	240	500	E.
WOC	Davenport, Iowa.	Palmer School of Chiropractic.	484	500	E. W.
WOL	Ames, Iowa.	Iowa State College.	360	100	E. M. W.
WOK	Pine Bluff, Ark.	Fine Bluff Co.	360	500	E.
WOO	Philadelphia, Pa.	John Wanamaker.	500	500	E. M. W.
WOQ	Kansas City, Mo.	Western Radio Co.	360	500	E. M. W.
WOR	Newark, N. J.	L. Bamberger & Co.	405	500	E.
WOS	Jefferson City, Mo.	Missouri State Marketing Bureau.	441	500	E. M. W.
WPAB	State College, Pa.	Pennsylvania State College.	283	500	E.
WPAC	Okmulgee, Okla., 210 Tiger Bldg.	Donaldson Radio Co.	360	200	E.
WPAH	Waupaca, Wis.	Wisconsin Department of Markets.	360	500	E. M. W.
WPAJ	New Haven, Conn.	Doclittle Radio Corporation, 39 Center St.	268	10	E.
WPAK	Agricultural College, N. Dak.	North Dakota Agricultural College.	360	50	E. W.
WPAL	Columbus, Ohio, 114 N. Third St.	Avery & Loeb Electric Co.	286	100	E.
WPAM	Topeka, Kans., 709 Kansas Ave.	Auerbach & Guettel.	360	100	E.
WPAP	Winchester, Ky., 222 Lexington Ave.	Theodore D. Phillips.	360	35	E.
WPAQ	Frostburg, Md.	General Sales & Engineering Co.	360	10	E.
WPAT	El Paso, Tex.	St. Patricks Cathedral.	360	20	E.
WPAU	Moorhead, Minn.	Concordia College.	360	20	E. W.
WPAZ	Charleston, W. Va.	John R. Koch.	273	10	E.
WQAA	Parkesburg, Pa.	Horace A. Beale, jr.	360	500	E.
WQAC	Amarillo, Tex., 108 E. Eighth St.	E. B. Gish.	360	100	E.
WQAD	Waterbury, Conn., 50 W. Maine St.	Whitall Electric Co.	242	50	E.
WQAE	Springfield, Vt.	Moore Radio News Station.	275	50	E.
WQAF	Sandusky, Ohio.	Sandusky Register.	240	5	E.
WQAL	Mattoon, Ill.	Coles County Telephone & Telegraph Co.	258	10	E.
WQAM	Miami, Fla.	Electrical Equipment Co.	281	100	E.
WQAN	Scranton, Pa.	Scranton Times.	280	50	E. W.
WQAO	New York, N. Y.	Calvary Baptist Church.	360	100	E.
WQAQ	Arlene, Tex.	West Texas Radio Co. (Arlene Daily Reporter).	360	100	E.
WQAS	Lowell, Mass., 108 Merrimack St.	Prince-Walter Co.	266	100	E.
WQAV	Greenville, S. C.	Huntington & Guerry (Inc.).	258	15	E. W.
WQAW	Washington, D. C.	Catholic University.	236	5	E.
WQAX	Peoria, Ill.	Radio Equipment Co.	360	100	E.
WRAA	Houston, Tex.	Rice Institute.	360	200	E.
WRAD	Marion, Kans.	Taylor Radio Shop.	248	10	E.
WRAP	Laporte, Ind.	The Radio Club.	224	20	E.
WRAH	Providence, R. I., 191 Albama Ave.	Stanley N. Read.	231	15	E.
WRAL	St. Croix Falls, Wis.	Northern States Power Co.	248	100	E.

RADIO SERVICE BULLETIN.

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United States stations broadcasting market or weather reports, music, concerts, lectures, etc., alphabetically by call signal—Continued.

Call signal.	Location of station.	Operated and controlled by—	Wave length.	Power (watts).	Service.
WRAO	St. Louis, Mo., 5735 Bartmer Ave.	St. Louis Radio Service Co.	360	20	E.
WRAV	Yellow Springs, Ohio.	Antioch College.	242	100	E.
WRAW	Reading, Pa.	Avenue Radio Shop.	238	10	K.
WRAX	Gloucester City, N. J.	Flexon's Garage.	268	100	E.
WRAY	Scranton, Pa., 110 Spruce St.	Radio Sales Corporation.	280	10	E. W.
WRAZ	Newark, N. J., 89 Lehigh Ave.	Radio Shop of Newark.	233	50	E.
WRC	Washington, D. C.	Radio Corporation of America.	469	500	E.
WRK	Hamilton, Ohio.	Doron Bros. Electrical Co.	360	200	E.
WRL	Schenectady, N. Y.	Union College.	360	500	E.
WRM	Urbana, Ill.	University of Illinois.	360	500	E.
WRR	Dallas, Tex.	City of Dallas, Police and Fire Signal Department.	360	20	E. W.
WRW	Tarrytown, N. Y.	Tarrytown Radio Research Laboratory.	273	150	E.
WSAB	Cape Girardeau, Mo.	Southeast Missouri State Teachers College.	360	100	F.
WSAC	Clemson College, S. C.	Clemson Agricultural College.	360	500	E.
WSAD	Providence, R. I., 69 Dorrance St.	J. A. Foster Co.	261	150	E.
WSAG	St. Petersburg, Fla.	Loren V. Davis and George Prestman, Sr.	244	10	E.
WSAH	Chicago, Ill., 4801 Woodlawn Ave.	A. G. Leonard, Jr.	248	500	E.
WSAI	Cincinnati, Ohio.	United States Playing Card Co.	308	500	F.
WSAJ	Grove City, Pa.	Grove City College.	360	250	E.
WSAL	Brookville, Ind.	Franklin Electric Co.	246	50	E.
WSAN	Allentown, Pa.	Allentown Radio Club.	229	10	E.
WSAR	Fall River, Mass.	Doughty & Welch Electrical Co.	254	10	E.
WSAT	Plainview, Tex.	Donohoo-Ware Hardware Co.	268	20	E.
WSAW	Canandaigua, N. Y.	John J. Long, Jr.	275	5	E.
WSAX	Chicago, Ill.	Chicago Radio Laboratory.	268	20	E.
WSAY	Port Chester, N. Y.	Port Chester Chamber of Commerce.	233	100	E.
WBAZ	Pomeroy, Ohio.	Chase Electric Shop.	258	50	E.
WSB	Atlanta, Ga.	Atlanta Journal.	429	500	E. M. W.
WSL	Utica, N. Y., 26 Bank Place.	Z. & M. Electric Co.	273	100	E. M.
WSY	Birmingham, Ala.	Alabama Power Co.	360	500	E. W.
WTAB	Fall River, Mass.	Fall River Daily Herald Publishing Co.	245	10	E.
WTAC	Johnstown, Pa., Washington St.	Penn Traffic Co.	360	150	E.
WTAF	New Orleans, La., 2222 Lapeyrouse St.	Louis J. Gallo.	268	20	E.
WTAG	Providence, R. I., 84 Weybosset St.	Kern Music Co.	258	10	E.
WTAH	Bolvidere, Ill.	Carmon Ferro.	235	10	E.
WTAJ	Portland, Me.	The Radio Shop.	235	10	E.
WTAL	Toledo, Ohio.	Toledo Radio & Electric Co.	252	10	E.
WTAM	Cleveland, Ohio.	Willard Storage Battery Co.	360	1,000	E.
WTAP	Cambridge, Ill.	Cambridge Radio & Electric Co.	242	50	E.
WTAQ	Osseo, Wis.	S. H. Van Gorden & Son.	254	100	E.
WTAR	Norfolk, Va.	Reliance Electric Co.	280	100	E.
WTAS	Elgin, Ill. (near), R. F. D. No. 6, Box 75.	Charles E. Erbstein.	286	500	E.
WTAT	Boston, Mass. (portable), 39 Boylston St.	Edison Electric Illuminating Co.	344	100	E.
WTAU	Tecumseh, Nebr.	Ruegg Battery & Electric Co.	360	10	E.
WTAW	College Station, Tex.	Agricultural and Mechanical College of Texas.	290	50	E.
WTAX	Streator, Ill.	Williams Hardware Co.	231	50	E.
WTAY	Oak Park, Ill.	Iodan-Oak Leaves Broadcasting Station.	283	500	E.
WTAZ	Lambertville, N. J.	Thomas J. McGuire.	283	15	E.
WTG	Manhattan, Kans.	Kansas State Agricultural College.	360	1,000	W.
WWAB	Trenton, N. J.	Hoening, Swert & Co.	236	10	E.
WWAC	Waco, Tex.	Sanger Bros.	320	50	E.
WWAD	Philadelphia, Pa., 2315 N. Broad St.	Wright & Wright (Inc.)	360	100	E.
WWAE	Joliet, Ill.	Lawrence J. Crowley.	227	500	E.
WWAF	Camden, N. J., 521 Market St.	Galvin Radio Supply Co.	236	100	E.
WWAO	Houghton, Mich.	Michigan College of Mines.	244	250	E.
WWI	Dearborn, Mich.	Ford Motor Co.	273	500	E.
WWJ	Detroit, Mich.	Detroit News.	517	500	E. M. W.
WWL	New Orleans, La.	Loyola University.	280	100	E.

IMPORTANT EVENTS IN RADIO— PEAKS IN THE WAVES OF WIRELESS PROGRESS.

1827.—Savary found that a steel needle could be magnetized by the discharge from a Leyden jar.

1831.—Farady discovered electromagnetic induction between two entirely separate circuits.

1837.—The first patent for an electric telegraph was taken out by Cooke and Wheatstone (London) and by Morse (United States).

1838.—Steinheil discovered the use of the earth return.

1840.—Henry first produced high frequency electric oscillations and pointed out that the discharge of a condenser is oscillatory.

1842.—Morse made wireless experiments by electric conduction through water.

1843.—Lindsay suggested that if it were possible to provide stations not more than 20 miles apart all the way across the Atlantic there would be no need of laying a cable.

1845.—Lindsay made experiments in transmitting messages across the River Tay by means of electricity or magnetism without submerging wires, using the water as a conductor.

1849.—Wilkins revived the same suggestions for wireless telegraphy.

Dr. O'Shaughnessy succeeded in passing intelligible signals without metallic conduction across a river 4,200 feet wide.

1862.—Heyworth patented a method of conveying electric signals without the intervention of any continuous artificial conductor.

1867.—Maxwell read a paper before the Royal Society in which he laid down the theory of electromagnetism, which he developed more fully in 1873 in his great treatise on electricity and magnetism. He predicted the existence of the electric waves that are now used in wireless telegraphy.

1870.—Von Bezold discovered that oscillations set up by a condenser discharge in a conductor give rise to interference phenomena.

1872.—Highton made various experiments across the River Thames with Morse's method.

1879.—Hughes discovered the phenomena on which depend the action of coherer. The coherer was later used practically by Marconi.

1880.—Trowbridge found that signaling might be carried on over considerable distances by electric conduction through the earth or water between places not metallically connected.

1882.—Bell's experiments with Trowbridge method on the Potomac River resulted in the detection of signals at a distance of $1\frac{1}{2}$ miles.

Professor Dolbear was awarded a United States patent in March, 1882, for wireless apparatus in connection with which he made the statement that "electrical communication, using this apparatus, might be established between points certainly more than one-half mile apart, but how much farther I can not say." It appeared that Professor Dolbear made an approach to the method that was, subsequently in the hands of Marconi, to be crowned with success.

1883.—Fitzgerald suggested a method of producing electromagnetic waves in space by the discharge of a conductor.

1885.—Edison, assisted by Gilliland, Phelps and Smith worked out a system of communication between railway stations and moving trains by means of induction and without the use of conducting wires. Edison took out only one patent on long-distance telegraphy without wires. The application was filed May 23, 1885, at the time he was working on induction telegraphy, but the patent (No. 465971) was not issued until December 29, 1891. In 1903 it was purchased from him by the Marconi Wireless Telegraph Co.

Prece made experiments at Newcastle-on-Tyne which showed that in two completely insulated circuits of square form, each side being 440 yards, placed a quarter of a mile apart, telephonic speech was conveyed from one to the other by induction.

1886.—Dolbear patented a plan for establishing wireless communication by means of two insulated elevated plates, but there is no evidence that the method proposed by him did, or could, effect the transmission of signals between stations separated by any distance.

1887.—Hertz showed that electromagnetic waves are in complete accordance with the waves of light and heat, and founded the theory upon which all modern radio signaling devices are based.

Heaviside established communication by telephonic speech between the surface of the earth and the subterranean galleries of the Broomhill Collicries, 350 feet deep, by laying above and below ground two complete metallic circuits each

1889.—Thompson suggested that electric waves were particularly suitable for the transmission of signals through fogs and material objects.

1891.—Trowbridge suggested that by means of magnetic induction between two separate and completely insulated circuits communication could be effected between distances.

1892.—Preece adopted a method which united both conduction and induction as the means of affecting one circuit by the current in another. In this way he established communication between two points on the Bristol Channel and at Lochness in Scotland.

Stevenson of the Northern Lighthouse Board, Edinburgh, advocated the use of an inductive system for communication between the mainland and isolated lighthouses.

Branly devised an appliance for detecting electromagnetic waves, which was known as a coherer.

1894.—Rathenau experimented with a conductive system of wireless telegraphy and signalled through 3 miles of water.

1895.—Smith established communication by conduction with the lighthouse on the Fastnet.

Marconi's investigations led him to the conclusion that Hertzian waves could be used for telegraphing without wires.

1896.—Marconi lodged his application for the first British patent for wireless telegraphy. He conducted experiments in communicating over a distance of $1\frac{1}{2}$ miles successfully.

The first demonstration of directional wireless using reflectors was given in England. Experiments were conducted to determine the relative speed of propagation of light waves and the electric vibrations which actuated a receiver at a distance of $1\frac{1}{2}$ miles between reflectors.

1897.—March: Marconi demonstrated communication being established over a distance of 4 miles.

March 17: Balloons were first used for the suspension of wireless aerials.

July 10-18: Marconi maintained communication between the shore and a ship at sea at distances up to 10 miles.

September and October: Apparatus was erected at Bath, England, and signals received from Salisbury, 34 miles distant.

November 1: First Marconi station erected at the Needles, Alum Bay, Isle of Wight. Experiments were conducted covering a range of $14\frac{1}{2}$ miles.

December 6: Signals transmitted from shore to a ship at sea, 18 miles distant.

December 7: First floating wireless station was completed.

1898.—June 3: The first paid radiogram was transmitted from the Needles (Isle of Wight) station.

July 20-22: Events of the Kingstown regatta in Dublin reported by wireless for Dublin newspaper from steamer *Flying Huntress*.

1899.—April 22: The first French gunboat was fitted with wireless telegraph apparatus at Boulogne.

July: During the naval manoeuvres three British warships equipped with Marconi apparatus interchanged messages at distances up to 74 nautical miles (about 85 land miles).

The international yacht races which took place in September and October were reported by wireless telegraphy for the New York Herald. At the conclusion of the races series of trials were made between the United States cruiser *New York* and the battleship *Massachusetts*, signals being exchanged between the vessels at distances up to 36 miles. On the return journey from America Marconi fitted the steamship *St. Paul* with his apparatus, and on November 15 established communication with the Needles station when 36 miles away. Reports of the progress of the war in South Africa were telegraphed to the vessel and published in a leaflet entitled "The Transatlantic Times," printed on board.

1900.—February 18: The first German commercial wireless station was opened on Borkum Island.

February 28: The first German liner fitted with wireless apparatus communicated with Borkum Island over a range of 60 miles.

November 2: The first wireless land station in Belgium was finished at Lapanne.

Between 1900 and 1905 Dr. De Forest was granted numerous patents in the United States and other countries for inventions connected with wireless telegraphy.

1901.—January 1: The bark *Medora* was reported by wireless as waterlogged on Ratel Bank. Assistance was immediately sent.

January 19: The *Princesse Clementine* ran ashore, and news of the accident was

February 11: Communication was established between Niton Station, Isle of Wight, and the Lizard station, a distance of 196 miles.

March 1: A public wireless telegraph service was inaugurated between the five principal islands of the Hawaiian group, viz, Oahu, Kauai, Molaki, Maui, and Hawaii.

October 15: The first fan aerials were erected for experiments between Poldhu and Newfoundland.

December 12: The letter "S" was received by Marconi from Poldhu, England, at St. Johns, Newfoundland, a distance of 1,800 miles.

Prof. R. A. Fessenden applied for United States patent on September 28 for "Improvements in apparatus for the wireless transmission of electromagnetic wave, said improvements relating more especially to the transmission and reproduction of words or other audible signals." It appears that in connection with this apparatus there was contemplated the use of an alternating-current generator having a frequency of 50,000 cycles per second. Professor Fessenden was granted a number of United States patents between 1899 and 1905 covering devices used in connection with radiotelegraphy.

1901-1904.—During this period Dr. John Stone was granted more than 70 United States patents covering radiotelegraphy.

1901-1905.—More than 40 United States patents were granted to Harry Shoemaker covering certain apparatus used for radio communication.

1902.—February: Steamship *Philadelphia*, American Line, received messages a distance of 1,551½ statute miles and received Morse signals up to a distance of 2,099 statute miles from Poldhu station, Cornwall, England.

June 25: The first moving wire magnetic detector actuated by clockwork was installed on the Italian cruiser *Carlo Alberto*.

July 14-18: Marconi received messages from Poldhu on the Italian cruiser *Carlo Alberto*, lying at Cape Skagen, a distance of 800 miles; and at Kronstadt, 1,600 miles.

December: On the 17th the first wireless message was transmitted across the Atlantic. On the 18th wireless messages were despatched from Cape Breton station to King Edward VII.

1903.—January 19: President Roosevelt sent a trans-Atlantic radiogram to King Edward via Cape Cod and Poldhu stations.

March 30: First transoceanic radiogram was published in the London Times.

August 4: First International Radiotelegraphic Conference was held at Berlin.

Poulsen patented the improved arc oscillation generator, using a hydrocarbon atmosphere and a magnetic field.

1904.—January 20: The first press message was transmitted across the Atlantic.

August 15: The wireless telegraph act of Great Britain was passed.

November 16: Dr. J. Ambrose Fleming took out his original patent No. 24850 for thermionic valves.

1905.—In October of this year erection of Clifden, Ireland, high-power radio station was commenced.

1906.—Doctor De Forest was granted a patent on January 18 for a vacuum rectifier, commercially known as the audion.

Second International Radiotelegraphic Convention was held at Berlin, and a convention was signed by a majority of the principal countries of the world.

Dunwoody discovered the rectifying properties of carborundum crystals and Pickard discovered the similar properties of silicon crystals. These discoveries formed the basis of the widely used crystal detectors.

1907.—October 17: Trans-Atlantic stations at Clifden and Glace Bay were opened for limited public service.

1908.—February 3: Trans-Atlantic radio stations were opened to the general public for the transmission of messages between the United Kingdom and the principal towns in Canada.

In carrying out his invention Professor Fessenden constructed a high-frequency alternator with an output of 2.5 kilowatts at 225 volts and with a frequency of 70,000 cycles per second. Later Professor Fessenden reported successful wireless telephonic communication between his station located at Brant Rock, Mass., and Washington, D. C., a distance of about 600 miles.

1909.—The steamship *Republic*, after colliding with the steamship *Florida* off the coast of the United States on January 23, succeeded in calling assistance by wireless, with the result that all her passengers and crew were saved before the vessel sank.

1910.—The steamship *Principessa Mafalda* received messages from Clifden at

June 24: Act approved by the United States Government requiring radio equipment and operators on certain passenger-carrying vessels.

1911.—July 1: Radio service organized in Department of Commerce and Labor to enforce the act of June 24, 1910.

1912.—F. A. Kolster, of the Bureau of Standards, invented and developed the Kolster decimeter, which is used to make direct measurements of wave length and logarithmic decrement. This instrument has been used by the radio service of the Department of Commerce since it was invented.

Early in the year the American Marconi Co. absorbed the United Wireless Co., of the United States.

In February the Marconi Co. procured the patents of Bellini and Tosi, including those for the wireless direction finder.

On February 9 the Australian Commonwealth station was opened.

On April 15 the steamship *Titanic*, on her maiden voyage, struck an iceberg and sank, but, owing to the prompt wireless call for assistance, the lives of more than 700 of her passengers were saved.

The International Radiotelegraphic Conference opened in London on June 4 and approved important regulations to have uniformity of practice in wireless telegraph services. On July 5 the International Radiotelegraphic Convention was signed at London.

July 23: Act approved by the United States Government extending act of June 24, 1910, to cover cargo vessels and requiring auxiliary source of power, efficient communication between the radio room and the bridge, and two or more skilled radio operators in charge of the apparatus on certain passenger-carrying vessels.

August 13: Act approved by the United Government licensing radio operators and transmitting stations.

1913.—F. A. Kolster submitted to the Government a paper pointing out the advantages of certain applications of radio signaling for use at lighthouses, light-ships, and life-saving stations, especially in time of fog.

During this year the Governments of France and the United States experimented between the Eiffel Tower station and Washington by wireless to procure data for comparing the velocity of electro-magnetic waves with that of light.

In June a wireless telegraph bill was presented to the Ottawa Parliament and passed under the title "Radiotelegraph act of Canada."

On October 11 the *Volturno* was burned in mid-Atlantic, and in response to the wireless appeal 10 vessels came to the rescue, 521 lives being saved.

On November 24 the first practical trials with wireless apparatus on trains were made on a train belonging to the Delaware, Lackawanna & Western Railroad.

The station at Macquerie Island was the means of keeping Doctor Maason the Australian explorer, in touch with the outer world. Radio despatches were published in a small journal which was established, called the *Adelle Blizzard*.

November 12: Safety at Sea Conference held in London. At this conference the use of radio received appropriate consideration.

November 24: The first practical trials with wireless apparatus on trains were made, messages having been received and transmitted on board trains.

1914.—Experiments in wireless telephony were carried out between several vessels lying at anchor five-eighths of a mile apart, ordinary receivers being used with success. The wireless telephone experiments were continued between two warships on the high seas, and the reception was consistently good over a distance of $18\frac{1}{2}$ miles. Successful wireless telephone communications were effected later, using only very limited energy between vessels on the high seas 44 miles apart. These experiments were repeated where land intervened between the communicating vessels, and in this case again excellent results were obtained. On this day radiotelephonic communication was constantly maintained for 12 hours.

On April 15, at Godalming, a memorial was unveiled to the memory of Jack Philips, chief radio operator of the ill-fated *Titanic*, who died at his post when the vessel foundered in mid-Atlantic on the 15th of April, 1912.

A new departure in the application of radiotelegraphy to the safety of life at sea was the equipment of the motor lifeboats of the steamship *Aquitania* with radio apparatus.

High-powered transoceanic stations were completed at Carnarvon, Wales, Belmar, Honolulu, and San Francisco during the autumn of 1914. The Honolulu-San Francisco stations were opened to public service September 24. The Tuckerton-Eilvesco and Sayville-Nauen stations were in operation about this time.

Most of these stations made use of the latest developments in the art, using

On October 6 E. H. Armstrong was issued a patent covering the regenerative circuit also known as the feed-back and the self-heterodyne circuit.

1915.—During this year F. A. Kolster, of the Bureau of Standards, developed a radiocompass said to be more effective than that which was being used.

On February 20 the Panama-Pacific Exhibition at San Francisco was officially opened by President Wilson at Washington, through the medium of wireless telegraphy.

On May 12, in Battery Park, New York City, the mayor unveiled the monument in memory of wireless operators who had lost their lives at the post of duty.

On July 27 wireless communication between the United States and Japan was effected. Two terminal stations were located at San Francisco and Funabashi, near Tokio, and the messages were relayed through Honolulu.

On July 28 the American Telephone & Telegraph Co., working in conjunction with the Western Electric Co., succeeded in telephoning the wireless across the American continent from Arlington to Hawaii, a distance of nearly 5,000 miles.

On October 26 the wireless telephone experiments were continued, communication being effected across the Atlantic from Arlington to the Eiffel Tower, Paris.

During this year ship service was greatly improved through the installation of new equipment, embodying features of great practical value, by various operating companies. Efficient emergency radio transmitters came into wider use, owing considerably to the efforts of the radio service of the Department of Commerce and its refusal to pass inefficient equipment. Such installations considered as essential are safeguards to shippers and the seagoing public.

1916.—During the course of a severe blizzard in the United States during February wireless telegraphy was extensively used for train dispatching, as the telegraph wires were down.

The determination of the difference in longitude between Paris and Washington with the aid of radio which had been in progress since October, 1913, was completed during May, the result, expressed in terms of time, being 5 hours 17 minutes 35.67 seconds, and has a probable accuracy of the order of 0.01 second.

The initiation of the newly established trans-Pacific wireless service between the United States and Japan was celebrated on November 5, by an interchange of messages between the Mikado and President Wilson.

1917.—June 2 marked the "coming of age" of wireless telegraphy in England, that is, that 21 years had elapsed since the registration of patent 12039 in 1896.

1918.—The trend of progress toward continuous-wave communication as distinct from that by damped waves was very marked during this year, a particular impetus being given by the continued development of the electron tube as an efficient receiver and generator of undamped oscillations. Steady improvement was also evident in the arc form of generator which was installed in many new high-power stations.

Wireless telephony also progressed to a marked extent, particularly in the direction of reliability and increase of range, due mainly to the development of valve generator and receivers.

In the equipment of aircraft with wireless great progress was made, both in radiotelegraphy and radiotelephony.

At the end of the year a high-power station, erected by the United States Government, was opened at Croix d'Hins, near Bordeaux.

In the Argentine the erection of a station destined for direct communication with the North American continent was commenced in the vicinity of Buenos Aires.

The extension in the application of wireless telegraphy to merchant vessels continued, and at the close of the year some 2,500 to 3,000 vessels of the British Merchant Marine carried installations.

On July 31 the United States Government took over all wireless land stations in the United States, with the exception of certain high-power stations, which remained under the control of commercial companies.

On September 22 messages transmitted from Carnarvon were received in Sydney, 12,000 miles away. Cable confirmations of these messages were sent forward at the same time but were received some hours later than the corresponding radiotelegrams.

In April a high-power station was opened at Stavanger, Norway, for the use of the Norwegian Government. The station communicates with the United States.

1919.—The successful transatlantic flights of Alcock and Brown, of the American *NC4*, and of the British dirigible *R34*, during the summer of the year focused attention upon the application of radio for aviation purposes and its great value for aerial navigation.

increasing at the rate of 100 a month. This increase was due to the great number of vessels built during the war period.

The temporary war measures relative to the installation of wireless telegraph apparatus on all merchant vessels of 1,600 tons or over under the British flag was made permanent by a bill passed by the British Parliament.

In February a Spanish decree was issued to the effect that all sailing vessels of 500 tons or over and carrying 50 or more passengers must be equipped with wireless apparatus.

During the year the Radio Corporation took over the radio interests of the American Marconi Co.

The war-time ban on private and experimental wireless stations was removed.

1920.—The steady development of continuous-wave wireless work was continued during the year and some further progress made in the commercial application of tube apparatus.

On January 14 a law was passed in Greece making the carrying of wireless apparatus obligatory on all Greek merchant ships of 1,600 tons gross and over, or having 50 or more persons aboard, including crew.

On January 25 a new high-power station was opened at Monte Grande, Argentine, call letters LPZ.

Amateur radio work in this and other countries progressed steadily during the year with the gradual removal of wartime restrictions.

Bordeaux, France, high-power station opened.

1921.—Experiments were carried out in France with successful results in the application of Baudot and similar high-speed telegraph apparatus to radio work.

The Noble Prize for physics was awarded this year to Prof. Edouard Branly for his researches in radio.

The progress made in amateur and experimental wireless is exemplified by the attempts made in February and December of this year to effect communication on short wave lengths between the wireless amateurs of the United States and Great Britain. The first attempt was unsuccessful, but during the second test signals from many American amateur stations were heard both by British radio amateurs and by the representative of the American Radio Relay League who was sent over for the tests. The signals were also heard in Holland.

The American Radio Relay League held its first annual convention in Chicago, August 30-September 3, at which many thousands of amateurs of the United States were present.

The first licenses for broadcasting stations were issued in September of this year.

New York radio central station opened on Long Island.

1922.—During this year broadcasting stations increased rapidly in keeping with the great interest taken in the art.

On June 7 E. H. Armstrong read a paper before the Institute of Radio Engineers on some recent developments by him of regenerative circuits. Professor Armstrong was granted a patent for the super-regenerative circuit.

Experiments in radiotelephoning from ship to shore were conducted during this year. In tests from the steamship *America* it was proved possible to communicate with land telephone stations more than 400 miles distant from the ship.

1923.—On March 2 L. A. Hezelstine, of Stevens Institute of Technology, presented a paper before the Radio Club of America on tuned radiofrequency amplification with neutralization of capacity coupling. Professor Hezelstine was granted a patent for the nonradiating retrodyne receiver.

Great progress was made during the year in the development of vacuum tubes.

Short wave lengths were used to greater advantage than heretofore.

The McMillan expedition to the polar regions had radio for their only means of direct communication. Using low power and short wave lengths their vessel, *Boudoin*, communicated with several stations in the United States while they were frozen in thousands of miles away. Broadcasting concerts from United States stations were heard during the long dark nights of the arctic zone.

During the year foreign countries became interested in radiotelephone broadcasting.

Broadcasting in United States heard in England, and vice versa.

1924.—In January radio was used in the region of the Great Lakes during a blizzard for dispatching trains.

An expedition from the United States, under the leadership of Hamilton Rice, which will explore the Amazon and Orinoco Rivers in Brazil and Venezuela in the interest of geographical science in general, will have radio as their only means of communication.

On February 5 a radio program broadcast in the United States from Pitts-

On February 23 a concert broadcast by the same station and relayed from London was heard clearly in Calcutta, India.

Roger Babson, economist, estimates that during this year the American people will spend approximately \$350,000,000 for radio equipment. Sales of radio equipment are running nearly twice as large as all kinds of sporting goods.

A wireless lighthouse has been set up on an island in the Firth of Forth, Scotland. Wireless waves are concentrated by reflectors into a beam which can be sent 100 miles, giving ships their position in a fog.

RADIO INSPECTION SERVICE.

The first act requiring radio apparatus on certain passenger-carrying vessels was approved June 24, 1910. Under this act the Secretary of Commerce and Labor organized on July 1, 1911, the radio service of the Bureau of Navigation.

The second act, approved July 23, 1912, amended the above act so as to cover all vessels navigating the ocean or the Great Lakes and licensed to carry or carrying 50 or more persons, including passengers or crew or both, with the exception of steamers plying between ports or places less than 200 miles apart. The act to regulate radio communication was approved August 13, 1912. Under this act transmitting stations and radio operators are licensed by the Secretary of Commerce. Transmitting stations are inspected to determine if they comply with the requirements of the law. Radio operators are examined in order to determine their qualifications. In addition to the above-mentioned acts the department also enforces the London International Radiotelegraphic Convention rules of 1912, to which the United States is a party.

Copies of the Radio Communication Laws of the United States and the London Convention may be purchased from the Superintendent of Documents, Government Printing Office, this city, price 15 cents. The list of Commercial and Government Radio Stations of the United States, including broadcasting stations, price 15 cents, and the list of Amateur Radio Stations of the United States, price 25 cents, is also for sale by the Superintendent of Documents. The Radio Service Bulletin sells for 5 cents per copy or 25 cents per year, subscription price.

The department has established for the purpose of enforcing, through radio inspectors and others, the acts relating to the above-cited laws, the following districts:

1. Headquarters, supervisor of radio, customhouse, Boston, Mass.: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
2. Headquarters, supervisor of radio, customhouse, New York, N. Y.: New York (county of New York, Staten Island, Long Island and counties on the Hudson River to and including Schenectady, Albany, and Rensselaer) and New Jersey (counties of Bergen, Passaic, Essex, Union, Middlesex, Monmouth, Hudson, and Ocean).
3. Headquarters, supervisor of radio, customhouse, Baltimore, Md.: New Jersey (all counties not included in second district), Pennsylvania (counties of Philadelphia, Delaware, all counties south of the Blue Mountains, and Franklin County), Delaware, Maryland, Virginia, District of Columbia.
4. Headquarters, supervisor of radio, Federal Building, Atlanta, Ga.: North Carolina, South Carolina, Georgia, Florida, Porto Rico.
5. Headquarters, supervisor of radio, customhouse, New Orleans, La.: Alabama, Mississippi, Louisiana, Texas, Tennessee, Arkansas, Oklahoma, New Mexico.
6. Headquarters, supervisor of radio, customhouse, San Francisco, Calif.: California, Hawaii, Nevada, Utah, Arizona.
7. Headquarters, supervisor of radio, 2301 L. C. Smith Building, Seattle, Wash.: Oregon, Washington, Alaska, Idaho, Montana, Wyoming.
8. Headquarters, supervisor of radio, Federal Building, Detroit, Mich.: New York (all counties not included in second district), Pennsylvania (all counties not included in third district), West Virginia, Ohio, Michigan (lower peninsula).
9. Headquarters, supervisor of radio, Federal Building, Chicago, Ill.: Indiana, Illinois, Wisconsin, Michigan (upper peninsula), Minnesota, Kentucky, Missouri, Kansas, Colorado, Iowa, Nebraska, South Dakota, North Dakota.

NEW RADIO BILL INTRODUCED IN HOUSE OF REPRESENTATIVES.

On February 28, 1924, Representative Wallace H. White, jr., introduced a new bill, H. R. 7357, to regulate radio communication and for other purposes

RADIO SERVICE BULLETIN.

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DISTRIBUTION OF WEATHER BULLETINS, FORECASTS, AND WARNINGS, FOR BENEFIT OF SHIPPING IN CARIBBEAN SEA.

Effective on and after February 18, 1924, the weather bulletin issued by the United States Weather Bureau for the benefit of shipping in the Caribbean Sea and transmitted by radio from New Orleans, La., by the Tropical Radio Telegraph Co., station WNU, to Swan Island, call letters US, for broadcasting from that point, will be on the following daily schedule: New Orleans, La., (WNU); #3,331 meters, continuous wave, 10.30 a. m., and 10.30 p. m. ninetieth meridian time.

Any ship or shore station is at liberty to intercept and repeat these messages. Information relative to these bulletins and the schedule from Swan Island is contained in Weather Bureau circular dated September 15, 1922, which may be obtained upon application to the Chief of the Weather Bureau, Washington, D. C., or to the Weather Bureau Office, New Orleans, La.

ANNOUNCEMENT OF STANDARD FREQUENCY TRANSMISSIONS.

The Bureau of Standards is transmitting special signals of standard frequency about twice a month. The last previously announced schedule was published in the December (1923) issue of the Radio Service Bulletin. The next schedule is announced below. The signals, which are transmitted from the bureau's laboratory in Washington, D. C., can be heard and utilized in general east of the Mississippi River. Arrangements are being made for the transmission of similar signals for the bureau by Stanford University, Palo Alto, Calif., which will make the frequency standard available in the same way in the western part of the country. Definite schedules for the California transmissions will be announced later.

These special signals of standard frequency are of use to testing laboratories, transmitting station operators, and others in standardizing wavemeters and adjusting transmitting and receiving apparatus. Their accuracy is better than three-tenths of 1 per cent. Information on how to use the signals was given in the February (1923) issue of the Radio Service Bulletin. More detailed information is given in Bureau of Standards letter circular No. 92, which may be obtained on application from the Bureau of Standards, Washington, D. C.

All transmissions are by unmodulated continuous-wave telegraphy. A complete frequency transmission includes a "general call," a "standard frequency signal," and "announcements." The "general call" is given at the beginning of the eight-minute period and continues for about two minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letters WWV intervening. This signal continues for about four minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted, and contain a statement of the measured frequency. An announcement of the next frequency to be transmitted is then given. There is then a four-minute interval while the transmitting set is adjusted for the next frequency.

The schedule of standard frequency signals from the Bureau of Standards is as follows:

Schedule of frequencies in kilocycles.

[Approximate wave lengths in meters in parentheses.]

Eastern standard time.	Mar. 5.	Mar. 20.	Apr. 4.	Apr. 21.
11 to 11.08 p. m.	500 (600)	1,300 (231)	166.5 (1,800)	500 (600)
11.12 to 11.30 p. m.	600 (500)	1,400 (214)	265 (1,453)	600 (500)
11.34 to 11.32 p. m.	700 (428)	1,500 (200)	280 (1,153)	700 (428)
11.35 to 11.44 p. m.	833 (350)	1,600 (187)	315 (952)	833 (350)
11.48 to 11.56 p. m.	900 (333)	1,700 (176)	375 (800)	900 (333)
12 to 12.08 a. m.	1,000 (300)	1,800 (167)	425 (705)	1,000 (300)
12.12 to 12.30 a. m.	1,200 (250)	1,900 (158)	500 (600)	1,200 (250)
12.34 to 12.32 a. m.	1,400	2,000	570	1,400

STANDARD FREQUENCY STATIONS.

As a result of measurements by the Bureau of Standards upon the transmitted waves of radio transmitting stations, data are given in each month's Radio Service Bulletin on stations which 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 stations 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 instrument on the frequency indicator throughout the transmission. The broadcasting stations included in the list below have, with rare exceptions, attained the goal of varying not more than 2 kilocycles from the assigned frequency as recommended by the Second National Radio Conference (reported in April (1923) Radio Service Bulletin). 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 this 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 (1923-24).	Number of times measured.	Great-est deviation from assigned frequency since Jan. 16, 1924.	Average deviation from assigned frequency.
						<i>Per ct.</i>	<i>Per ct.</i>
WQL	Radio Corporation of America.	Coram Hill, Long Island, N. Y.	17.13	Oct. 8-Jan. 31 ¹ ...	37	0.1	0.2
NBS	U. S. Navy.....	Annapolis, Md.....	17.50	Aug. 24-Jan. 31..	64	1.2	.2
WQK	Radio Corporation of America.	Rocky Point, Long Island, N. Y.	18.21	.....60.....	34	(²)	.3
WGG	.....do.....	Tuckerton, No. 1, N. J.	18.85	.....do.....	93	.1	.2
WII	.....do.....	New Brunswick, N. J.	22.04	Oct. 1-Jan. 31....	60	.5	.3
WBO	.....do.....	Marion, Mass.....	25.80	Aug. 21-Jan. 31..	76	1.2	.3
WWJ	Detroit News.....	Detroit, Mich.....	590	Aug. 27-Feb. 15..	25	.0	.1
WCAP	Chesapeake & Potomac Telephone Co.	Washington, D. C.	640	Sept. 11-Feb. 15..	27	.2	.1
WSE	Atlanta Journal...	Atlanta, Ga.....	700	Sept. 14-Feb. 15..	35	.0	.1
WGY	General Electric Co.	Schenectady, N. Y.	790	June 25-Feb. 15..	64	.1	.2
KDKA	Westinghouse Electric & Manufacturing Co.	East Pittsburgh, Pa.	920	Sept. 8-Feb. 15... ³	78	.3	.1

¹ No measurements were made on the high-power stations between Feb. 1 to 15, inclusive.

² Only one measurement since Jan. 16.

³ Not heard between Jan. 16 to 31, inclusive.

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 intended 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 schemes 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 published in the Radio Service Bulletin prior to April 1923 and also in May

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