

# DEPARTMENT OF COMMERCE

# RADIO SERVICE BULLETIN

ISSUED MONTHLY BY BUREAU OF NAVIGATION

Washington, December 31, 1926--No. 117

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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.
	FX=Point-to-point (fixed service).
	PG=General public.
	PR=Limited public.
	RC=Radiocompass station.
	AB=Aviation beacon.
	B=Beacon.
	P=Private.
	O=Government business exclusively.
Hours	= Hours of operation:
	N=Continuous service.
	X=No regular hours.
F. T. Co.	= Federal Telegraph Co.
I. R. T. Co.	= Intercity Radio Telegraph Co.
I. W. T. Co.	= Independent Wireless Telegraph Co.
K. & C.	= Kilbourne & Clark Manufacturing Co.
R. C. A.	= Radio Corporation of America.
T. R. T. Co.	= Tropical Radio Telegraph Co.
U. R. Corp.	= Universal Radio Corp.
W. S. A. Co.	= Wireless Specialty Apparatus Co.
C. w.	= Continuous wave.
I. c. w.	= Interrupted continuous wave.
Kc.	= Kilocycles.
Fy.	= Frequency.
A. c.	= Alternating current.
V. t.	= Vacuum tube.

## 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, 1926, and to the International List of Radiotelegraph Stations published by the Bureau.]

Station	Call signal	Wave lengths	Service	Hours	Station controlled by—
Baltimore, Md. <sup>1</sup> .....	WMH	770	P	X	City of Baltimore, Bureau of Harbors, Norfolk-Cape Charles Radio Telegraph Co.
Cape Charles, Va. <sup>1</sup> .....	WEP	69.0	FX	X	
Harrisburg, Pa. <sup>1</sup> .....	WBBX	1,090	FX	X	Pennsylvania National Guard, Headquarters Troop, One hundred and fourth Cavalry.
Norfolk, Va. <sup>1</sup> .....	WEI	105.2	FX	X	Norfolk-Cape Charles Radio Telegraph Co.
Rocky Point, N. Y. <sup>1</sup> .....	WNL	4,097	FX	X	American Telephone & Telegraph Co.

<sup>1</sup> Loc. (approximately)  $\text{O } 76^{\circ} 37' 09''$ ,  $\text{N. } 36^{\circ} 17' 00''$ ; range, 100; system, composite v. t. telegraph.

<sup>1</sup> Loc.  $\text{O } 75^{\circ} 54' 31''$ ,  $\text{N. } 37^{\circ} 07' 22''$ ; range, 10; system, composite v. t. telegraph.

<sup>1</sup> Loc.  $\text{O } 76^{\circ} 52' 45''$ ,  $\text{N. } 40^{\circ} 15' 44''$ ; range, 25; system, United States Army v. t. telegraph.

<sup>1</sup> Loc.  $\text{O } 76^{\circ} 17' 48''$ ,  $\text{N. } 36^{\circ} 45' 33''$ ; range, 50; system, composite v. t. telegraph.

<sup>1</sup> Loc. (approximately)  $\text{O } 72^{\circ} 50' 30''$ ,  $\text{N. } 40^{\circ} 45' 46''$ ; range, 2,500; system, Western Electric Co. v. t. telephone and telegraph. This station communicates with Rugby, England (GBT) by telephone; rates, \$25 per minute; minimum, \$75.

## Commercial ship stations, alphabetically by names of vessels

[Additions to the List of Radio Stations of the United States, edition of June 30, 1926, and to the International List of Radiotelegraph Stations published by the Bureau.]

Name of vessel	Call signal	Rates	Service	Hours	Owner of vessel	Station controlled by—
Atlantic Refining Co. (general call signal for all vessels of this company).	KGZZ				Atlantic Refining Co.	
Bering.....	KGDV	8	PG	X	Alaska Packers Association...	
Besantier.....	KIGT <sup>1</sup>	8	PG	X	Atlantic Refining Co.	R. C. A.
Faith <sup>1</sup> .....	KGDQ		P	X	Walden W. Shaw.....	Owner of vessel.
Fort Armstrong.....	KURF	8	PG	X	Charles Nelson Co.....	I. W. T. Co.
Four Winds.....	KGDU				Stanley O. Harris.....	
Glen White.....	KSIE	8	PG	X	Myrtle Steamship Co.....	R. C. A.
Jerreel.....	KGDT				Thomas L. Chadbourne.....	
John M. Connelly.....	KJEI	8	PG	X	United States Shipping Board.	Do.
Lake Galewood.....	KOIX	8	PG	X	Pennants State Steamship Corporation.	Do.
Egwall's Point.....	KGX	8	PG	X	Myrtle Steamship Co.....	R. C. A.
Sharon.....	KURK	8	PG	X	Atlantic Refining Co.....	Do.
Thames.....	KOXD	8	PG	X	Charles Nelson Co.....	I. W. T. Co.
Union Liberty <sup>1</sup> .....	KUNG	8	PG	X	Southern Steamship Co.....	Owner of vessel.
Vigilant.....	KGDS				Vigilant Towing Co.....	
Widgeon.....	KOSB				Charles Sebudd.....	
Wilkes.....	WEII	8	PG	X	American Merchant Marine Steamship Corporation.	

<sup>1</sup> System, composite v. t. telegraph; w. l., 20, 40, 80, 600.

<sup>1</sup> Range, 230; system, Navy-Simon, 1,600; w. l., 605, 700, 800.

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## Commercial land and ship stations, alphabetically by call signals

[b, Ship station; c, land station]

Call signal	Name of station	Call signal	Name of station
KODQ	Faith..... b	KOSH	Widgton..... b
KODS	Vigilant..... b	KOXD	Tushmos..... b
KODT	Jerbel..... b	KSIE	Glen White..... b
KODV	Bering..... b	KUEF	Fort Armstrong..... b
KODU	Four Winds..... b	KUNG	Union Liberty..... b
KGX	Bewick's Point..... b	WRI	Norfolk, Va..... c
EQZZ	General call signal for Atlantic Refining Co. vessels..... b	WKBX	Cape Charles, Va..... c
KIOT	Beesmer..... b	WKII	Harrisburg, Pa..... c
KIRK	Sharon..... b	WML	Willkono..... b
KJBI	John M. Connelly..... b	WMLI	Baltimore, Md..... c
KOJX	Lake Galewood..... b	WNL	Rocky Point, N. Y..... c

## Broadcasting stations, alphabetically by names of States and cities

[Additions to the List of Radio Stations of the United States, edition of June 30, 1926]

State and city	Call signal	State and city	Call signal
<b>California:</b>		<b>New York—Continued.</b>	
Los Angeles.....	KGEF	New York.....	WOL
San Francisco.....	KYA	Do.....	WMHA
Santa Barbara.....	KFCR	Osage Park.....	WAOK
<b>Colorado: Pueblo.....</b>	KODP	Rochester.....	WOKT
<b>Illinois:</b>		Woodside.....	WBMC
Atwood.....	WLDQ	<b>Ohio:</b>	
Belvidere.....	WLBR	Ashland.....	WLBP
Chicago (portable).....	WLBH	Cleveland.....	WLBV
East Wenona.....	WLBI	Mansfield.....	WLBV
Galesburg.....	WLBO	<b>Oregon:</b>	
Waukegan.....	WPEP	Eugene.....	KGEH
<b>Indiana: Crown Point.....</b>	WLBT	Medford.....	KMED
<b>Iowa: Decorah.....</b>	KGDZ	Portland.....	KEX
<b>Leadville: Shreveport.....</b>	KGDV	Do.....	KROW
<b>Maine: Dover (Foxcroft).....</b>	WLBZ	<b>Pennsylvania:</b>	
<b>Massachusetts:</b>		Newcastle (portable).....	WBU
Boston.....	WBET	Oil City.....	WLBW
Chelsea.....	WRSC	Philadelphia.....	WPKD
Wellesley Hills.....	WBBO	Do.....	WLBA
<b>Michigan:</b>		Rhode Island: Newport (portable).....	WMBA
Iron Mountain.....	WLBV	South Dakota: Oldham.....	KODY
Lapeer.....	WMPC	Texas: San Antonio.....	KODR
Nebraska: Humboldt.....	KGDW	<b>Virginia:</b>	
New Hampshire: Manchester.....	WCOM	Norfolk.....	WPAB
<b>New Jersey:</b>		Petersburg.....	WLBG
Midland Park.....	WTRJ	<b>Washington:</b>	
Newark.....	WMVM	Seattle.....	KFQX
<b>New York:</b>		Do.....	KKP
Canastota.....	WLBV	West Virginia: Wheeling.....	WVVA
Farmingdale (portable).....	WLBH	Wisconsin: Racine.....	WRBS
Long Island City.....	WLBX		

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## Broadcasting stations, alphabetically by call signals

Call signal	Location of station (address)	Owner of station
KEX	Portland, Oreg.	Western Broadcasting Co.
KFCB	Santa Barbara, Calif., Daily News Building	Santa Barbara Broadcasting Co.
KFQX	Seattle, Wash., 629 Washington Boulevard	Alfred M. Hubbard.
KGDF	Pueblo, Colo., 2977 High Street	Boy Scouts of America, Pueblo Council (John D. Price).
KODR	San Antonio, Tex., 315 West Travis Street	Radio Engineers.
KGDW	Humboldt, Nehr.	Frank J. Nist.
KGDY	Shreveport, La., 1515 Laurel Street	William E. Antony.
KGDZ	Oldham, S. Dak.	J. Albert Leesch (Hanson Hardware Co.).
KODZ	Desurah, Iowa	Norwegian Luther College.
KOEF	Los Angeles, Calif.	Trinity Methodist Church.
KGEH	Eugene, Oreg., Eugene Hotel	Eugene Broadcast Station (Harold H. Hanseth).
KKP	Seattle, Wash.	City of Seattle, Harbor Department.
KMED	Medford, Oreg., Sparta Building	W. J. Virgin.
KROW	Portland, Oreg., Sovereign Hotel	Oregon Broadcast Co.
KYA	San Francisco, Calif., Cliff Hotel	Pacific Broadcasting Corporation (Vincent J. Kraft).
WAOK	Orono Park, N. Y., 10317 One hundred and sixteenth Street, Richmond Hill, N. Y.	A. H. Anderson.
WBET	Boston, Mass., 324 Washington Street	Boston Transcript Co.
WBMC	Woodside, N. Y., 4128 Bellis Avenue	Malden Co. (Everett M. Roeder).
WBSC	Wellesley Hills, Mass.	Babson's Statistical Organization.
WCOM	Manchester, N. H.	New Hampshire National Guard, One hundredth and seventy-second Field Artillery Headquarters Battery.
WFKD	Philadelphia, Pa., 150 Oxford Street, Frankford, Pa.	Foulerod Radio Engineering Co.
WGL	New York, N. Y., 165 Broadway	International Broadcasting Co.
WKBU	Newcastle, Pa. (portable), 1057 Maryland Avenue	H. K. Armstrong.
WLBA	Philadelphia, Pa., 1533 Pine Street	Philadelphia School of Wireless Telegraphy (J. C. Van Horn).
WLHG	Petersburg, Va., 125-a North Sycamore Street	R. A. Gamble.
WLBI	Farmingdale, N. Y. (portable)	Joseph J. Lombardi.
WLBI	East Wrentham, Ill., 314 Elm Street	Alvystus Yara.
WLBJ	Cleveland, Ohio	Henry Grossman.
WLBK	Chicago, Ill. (portable), 339 South Howard Avenue	William E. Miller.
WLBO	Galveston, Ill., 526 Monmouth Boulevard	Frederick A. Treble, Jr.
WLBP	Ashland, Ohio, 25 College Avenue	Robert A. Fox.
WLBQ	Atwood, Ill.	E. Dale Trout.
WLSR	Belvidere, Ill.	Alford Radio Co. (W. A. Wallingford and George H. Allison).
WLBT	Crown Point, Ind., 317 East North Street	Harold Wendell.
WLBU	Catskill, N. Y.	Matthew B. Greiner.
WLBV	Mansfield, Ohio, 122 Park Avenue East	John F. Walner and D. A. Sajak.
WLBW	Oil City, Pa., 1 Sycamore Street	Petroleum Telephone Co.
WLBX	Long Island City, N. Y., 283 Crescent Street	John N. Reahy.
WLBZ	Iron Mountain, Mich., 1234 Carpenter Street	Almons Electric.
WLDZ	Dover, Mo. (portable)	Thompson L. Guernsey.
WMBA	Newport, R. I. (portable) 11 Robinson Street	Lo Roy J. Beebe.
WMHA	New York, N. Y., 975 St. Nicholas Avenue	Young Men's Hebrew Association of Washington Heights and Boy Scouts Troop 707.
WMFC	Lapeer, Mich.	First Methodist Protestant Church.
WMVM	Newark, N. J., 156 First Street	Edward J. Mahone, Jr.
WOKT	Rochester, N. Y., 710 Terminal Building	Titus-Eis Corporation.
WPAD	Norfolk, Va., 305 Plume Street	Radio Corporation of Virginia.
WPEP	Waukegan, Ill., 1437 North Avenue	Maurice Mayer.
WRIS	Racine, Wis., Arcade Building	Racine Radio Station.
WRSO	Chelsea, Mass., 56 Washington Avenue	The Radio Shop (William S. Fote).
WTRL	Midland Park, N. J., 28 Strong Avenue	Technical Radio Laboratory (H. C. Roggenkamp).
WWVA	Wheeling, W. Va., National Road	John C. Strobel, Jr.

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*Government ship stations, alphabetically by names of stations*

[Additions to the List of Radio Stations of the United States, edition of June 30, 1926, and to the International List of Radiotelegraph Stations published by the Berne Bureau]

Station	Call signal	Wave length	Service	Hours	Station controlled by—
Calumet.....	NIZL	.....	0	.....	U. S. Coast Guard.
Florence.....	NIZC	.....	0	.....	Do
Hudson.....	NIZK	.....	0	.....	Do
Harlan.....	NIZG	.....	0	.....	Do
Virginia I.....	NIZB	.....	0	.....	Do
Wissahickon.....	NIZD	.....	0	.....	Do

*Government land and ship stations, alphabetically by call signals*

[b, ship station; c, land station]

Call signal	Name of station	Call signal	Name of station
NIZB	Virginia.....b	NIZG	Harlan.....b
NIZC	Florence.....b	NIZK	Hudson.....b
NIZD	Wissahickon.....b	NIZL	Calumet.....b

*Special land stations, alphabetically by names of stations*

[Additions to the List of Radio Stations of the United States, edition of June 30, 1926]

Station	Call signal	Station controlled by—
California: Alma (Holy City).....	6XBH	W. E. Hiker.
Connecticut: Cos Cob.....	1XQ	Bell Telephone Laboratories (40 West Street, New York, N. Y.).
Minnesota: Anoka.....	9XL	Washburn-Crosby Co., R. F. D. No. 3.
New Hampshire: Hanover.....	1XP	Elliott A. White, 4 Parkway.
New York:		
New York (portable).....	2XBJ	Bell Telephone Laboratories, 463 West Street.
Rocky Point.....	2XA	American Telephone & Telegraph Co.
Rhode Island: Kingston.....	1YF	Rhode Island State College.

*Special land stations, grouped by districts*

Call signal	District and station	Call signal	District and station
1XP	First district:	2XA	Second district:
1XQ	Hanover, N. H.	2XBJ	Rocky Point, N. Y.
1YF	Cos Cob, Conn.	6XBH	New York, N. Y. (portable).
	Kingston, R. I.	9XL	Sixth district: Alma (Holy City), Callt.
			Ninth district: Anoka, Minn.

## 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, 1926, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

BAYTOWN, TEX.—System, strike out Thordson and Grebe spark, 240.  
 HOUSTON, TEX.—W. I., 44.03.  
 LAWRENCEVILLE, ILL.—Strike out all particulars.  
 PAMPA, TEX.—W. I., 43.52.  
 SPRINGDALE, PA.—W. I., strike out 90.56.

## 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, 1926, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

ABBAROKA.—Station controlled by I. W. T. Co.  
 ALGONQUIN (KGDL).—Station controlled by I. W. T. Co.  
 ANN ARBOR No. 5.—System, R. C. A. v. t. telegraph; w. l., 715, 875.  
 ARA.—System, English Marconi spark, 1,000, English Marconi v. t. telegraph and General Electric v. t. telegraph; w. l., add 750, 900.  
 BARWICK.—W. I., add 800; owner of vessel, Barwick (Inc.).  
 BEACONLIGHT.—Owner of vessel, Beacon Transport Co.  
 BELLBUCKLE.—W. I., 600, 706, 800; station controlled by R. C. A. (U. S. L.).  
 CITY OF CHATTANOOGA.—W. I., add 1,900.  
 CITY OF FREEPORT.—W. I., 600, 706, 800.  
 CITY OF JOLIET.—Station controlled by R. C. A.  
 CITY OF LORDSBURG.—Station controlled by I. W. T. Co.  
 CITY OF OMAHA.—Station controlled by R. C. A.  
 COKEBIT.—W. I., 450, 600, 706, 800; station controlled by I. W. T. Co.  
 COMBER.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 CORONADO.—Station controlled by I. W. T. Co.  
 CRANFORD.—W. I., 600, 706, 800.  
 CRISTOBAL.—W. I., add 800.  
 EASTERN MARINER.—Owner of vessel, American Merchant Marine Steamship Corporation.  
 EASTERN SHORE.—Station controlled by I. W. T. Co.  
 EASTERN STATES.—W. I., add 1,578.  
 EDGEFIELD.—Station controlled by R. C. A.  
 EDGEHILL.—W. I., 600, 706, 800; station controlled by R. C. A. (U. S. L.).  
 EDMONT.—Station controlled by I. W. T. Co.  
 EDNA.—W. I., add 800.  
 ENGLEWOOD.—Station controlled by I. W. T. Co.  
 GAFFNEY.—W. I., 600, 706, 800; station controlled by I. W. T. Co.  
 GENERAL O. H. ERNST.—Owner of vessel, Commercial Courier Steamship Co.  
 GEORGE ALLEN.—W. I., 600, 706, 800.  
 GLOUCESTER (KFYQ).—System, Navy-Simon, 1,000.  
 GLOUCESTER (KQG).—W. I., 600, 706, 800.  
 HALF MOON.—Station controlled by I. W. T. Co.  
 HAMPTON ROADS (KESR).—W. I., strike out 1,900, 2,000.  
 HARVEY H. BROWN.—System, R. C. A. v. t. telegraph.  
 H. C. FOLGER.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 HOVEN.—Name changed to Beaconhill.  
 IOWA.—Owner of vessel, Inland Waterways Corporation.  
 JAMES MACNAUGHTON.—System, R. C. A. v. t. telegraph; w. l., 715, 800, 875.  
 JEFF DAVIS.—W. I., 600, 706, 800, 900, 1,900, 2,000, 2,100, 2,400.  
 KAIMILOA.—W. I., add 35, 38, 40, 80.  
 LEVANT ARROW.—W. I., 600, 706, 800.  
 LIO.—W. I., add 1,900, 2,000.  
 LOUISE (KFYP).—System, Navy-Simon, 1,000.  
 MANISTIQUE.—System, Marconi, 480; w. l., 715.  
 MILLER COUNTY.—Name changed to Aurora; owner of vessel, Standard Transportation Co.  
 NARBO.—W. I., 600, 706, 800, 1,800, 1,900, 2,000, 2,100, 2,400; station controlled by I. W. T. Co.  
 NARCISSE.—Station controlled by R. C. A.

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- NEMARA.—Station controlled by R. C. A.  
 OCEAN.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 OMONDAGA.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 800, 1,500.  
 OSHING.—Station controlled by R. C. A. (U. S. L.).  
 OVERBROOK.—Owner of vessel, Gladstone Transportation Co.  
 PALATKA.—Owner of vessel, New England, New York & Texas Steamship Co.  
 R. J. HANNA.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 ROBAMOND.—Owner of vessel, North American Fisheries (Inc.).  
 SAN JUAN (KGJ).—System, composite spark, 1,000 and I. W. T. Co. arc; w. l., 600, 706, 800, 1,800, 1,900, 2,000, 2,100, 2,400; hours, N.  
 SAHALE.—Station controlled by I. W. T. Co.  
 SANTA MARTA.—System; R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 1,800, 1,900, 2,000, 2,100, 2,400.  
 SINASTA.—System, Marconi, 1,000; w. l., 600, 706, 800.  
 SKAGWAY.—System, Cutting and Washington, 1,000; w. l., 600, 706, 800.  
 S. C. T. DEBB.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 STEENLOR.—Range 300; system, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 SUCROSA.—Name changed to Cities Service Fuel; owner of vessel, Henry L. Doherty & Co.  
 SUGILLENCO.—W. l., 600, 706, 800.  
 SURGE.—System, R. C. A. v. t. telegraph; w. l., 600, 706, 750, 800, 900.  
 TAMPA (KOVX).—W. l., 600, 706, 800.  
 TUSITALA.—W. l., add 800.  
 UNICOL.—Station controlled by R. C. A.  
 WEST AMARGOSA.—Station controlled by R. C. A.  
 WEST ARROW.—System, Marconi, 1,000; w. l., 600, 706, 800.  
 WEST CANON.—Name changed to Pacific Spruce.  
 WEST CELINA.—W. l., 600, 706, 800.  
 WESTCHESTER.—Station controlled by R. C. A.  
 WEST CORALT.—Range, 300; system, Navy-Marconi, 1,000; w. l., 600, 706, 800.  
 WEST COHAS.—W. l., 600, 706, 800.  
 WEST ELCASCO.—Station controlled by R. C. A.  
 WESTERN OCEAN.—Station controlled by I. W. T. Co.  
 WESTERN QUEEN.—Station controlled by R. C. A.  
 WESTERN STATES.—W. l., add 1,578.  
 WEST GOTOMSKA.—Station controlled by R. C. A. (U. S. L.).  
 WEST HARCUIVAR.—W. l., 600, 706, 800.  
 WEST JAFFREY.—W. l., 600, 706, 800.  
 WEST KYSKA.—Station controlled by R. C. A. (U. S. L.).  
 WESTLAKE.—Station controlled by R. C. A. (U. S. L.).  
 WEST LOQUASSUCK.—Station controlled by R. C. A.  
 WEST MADAKET.—Station controlled by R. C. A. (U. S. L.).  
 WESTMEAD.—Station controlled by I. W. T. Co.  
 WESTMOUNT.—Range, 300; system, Navy-K. & C., 1,000; w. l., 600, 706, 800; station controlled by I. W. T. Co.  
 WEST SEGOVIA.—W. l., 600, 706, 800.  
 WILLHILO.—W. l., 600, 706, 800.  
 WILLIAM N. PAGE.—Station controlled by R. C. A.  
 WILLIAM PENN.—W. l., add 800, 1,900, 2,000.  
 WINDING GULF.—W. l., 600, 706, 800; station controlled by R. C. A.  
 YAPALAGA.—Station controlled by I. W. T. Co.  
 Strike out all particulars of the following-named vessels: Alaskan, Chicago Bridge, Coloradan, Everett (KUQR), Georgia, Honolulu, Lake Flushing, Lake Gitano, Sierra (KFHM), Silverbrook, Undaunted.

## COMMERCIAL LAND AND SHIP STATIONS, ALPHABETICALLY, BY CALL SIGNALS

- KDCV, read Pacific Spruce; KERX, read Aurora; KEXV, read Beaconhill;  
 KNS, read Cities Service Fuel; strike out all particulars following the call signals  
 KDSJ, KEBV, KECG, KECM, KFHM, KGCO, KGCS, KIBC, KUQR, KUR.

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## 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, 1926]

- KFKZ (Kirksville, Mo.).—Owner of station, State Teachers College.  
 KGCL (Seattle, Wash.).—Owner of station, Louis Wasmer and Archie Taft.  
 KGCU (Mandan, N. Dak.).—Owner of station, Mandan Radio Association (A. W. Nordholm).  
 KGEA (Seattle, Wash.).—Call signal changed to KUJ.  
 KOMO (Seattle, Wash.).—Owner of station, Fisher's Blend Station (Inc.).  
 WABQ (Haverford, Pa.).—Changed to Philadelphia, Pa.; owner of station, United Broadcasting Co. (David E. Rolontz).  
 WAHG (Richmond Hill, N. Y.).—Call signal changed to WABC; owner of station Atlantic Broadcasting Co.  
 WHBG (Harrisburg, Pa.).—Call signal changed to WMBS; owner of station, Macks Battery Service.  
 WIBM (Chicago, Ill.) (portable).—Owner of station, C. L. Carrell, 1506 North American Building.  
 WIBW (Logansport, Ind.).—Changed to Chicago, Ill. (portable); owner of station, C. L. Carrell, 1506 North American Building.  
 WJAF (Ferndale, Mich.).—Call signal changed to WTHO; owner of station, W. T. Thomas Radio Co.  
 WJBY (Woodhaven, N. Y.).—Call signal changed to WSOM.  
 WTAD (Carthage, Ill.).—Changed to Quincy, Ill., owner of station, Illinois Stock Medicine Broadcasting Corporation.  
 WTAL (Toledo, Ohio).—Owner of station, Toledo Broadcasting Co., Hotel Waldorf.  
 Strike out all particulars of the following-named stations: KFGQ (Boone, Iowa), KFRW (Olympia, Wash.), KFUU (Oakland, Calif.), WIBH (New Bedford, Mass.), WTAB (Fall River, Mass.).

## 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, 1926, and to the International List of Radiotelegraph Stations, published by the Berns Bureau]

- CORDOVA, ALASKA.—W. I., strike out 2,100.  
 GUANTANAMO BAY, CUBA.—W. I., strike out 2,100; hours, strike out reference to footnote 10.  
 LITTLE SQUAW MINES, ALASKA.—W. I., 447.5.  
 SEWARD, ALASKA.—Rates, \*12 cents per word.

## GOVERNMENT LAND AND SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS

- NPF, notice of deletion in this publication for last month refers to Marshfield, Oreg. Empire, Oreg. is still in commission.

## 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, 1926]

- STANFORD UNIVERSITY, CALIF. (portable, 6XH).—Owner of station, Herbert Hoover, jr., and Frederick E. Terman.  
 Strike out all particulars of the following-named stations: Ames, Iowa (9XBB); Ames, Iowa (9XX); Bollnas, Calif. (6XI); Boston, Mass. (1XT); Bound Brook, N. J. (2XAR); Buffalo, N. Y. (8XAT); Burrwood, La. (5XE); Chicago, Ill. (9XY); Cincinnati, Ohio (8XAV); Cincinnati, Ohio (8XAY); Cleveland, Ohio (8XAR); Cleveland, Ohio (8XC); Columbus, Ohio (8SAI); Connellsville, Pa. (8XAP); Darby, Pa. (3XB); Dearborn, Mich. (8XD); Detroit, Mich. (8XAS); Detroit, Mich. (SXBT); Flint, Mich. (8XAZ); Fort Monmouth, N. J. (2XBB); Frackville, Pa. (8XBA); Gunnison, Colo. (9XC); Hazleton, Pa. (8XBC); Hialeah, Fla. (4XG); Iowa City, Iowa (8XAZ); Kahuku, Hawaii (8XO); Lone Tree, Iowa (9XK); Madison, Wis. (9XM); Minneapolis, Minn. (9XAX); New Orleans, La. (5XH); New York, N. Y. (2XAL); New York, N. Y. (2XAS); New York, N. Y. (2XBA); New York, N. Y. (portable, 2XBD); New York, N. Y. (2XR); New York, N. Y. (2XZ); Oakland, Calif. (6XAA); Oakland, Calif. (6XG); Omaha, Nebr. (9XAR); Philadelphia, Pa. (3XV); Portland, Oreg. (7XL); Rogers, Mich. (8XAU); San Francisco, Calif. (6XAG); Schenectady, N. Y. (2XAA); Trenton, N. J. (3XAN); Troy, N. Y. (2XAP); Tucson, Ariz. (6XAW); Underwood, Wash. (near 7XQ); Urbana, Ill. (9XJ);



## RADIO SERVICE BULLETIN

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## MISCELLANEOUS

## Broadcasting stations, alphabetically by call signals

[The power and wave lengths given in this table were compiled from applications for licenses furnished the department by the owners of the stations. Since the department does not make assignments in either respect, this list is not necessarily in conformity with wave lengths or power actually used. Complete up to Dec. 31, 1926.]

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilocycles)
KDKA	East Pittsburgh, Pa.....	Westinghouse Electric & Mfg. Co.	(1)	309.1	970
KDLR	Devils Lake, N. Dak.....	Radio Electric Co. and Wilson Insurance Agency.	5	230.6	1,300
KDYL	Salt Lake City, Utah, Ezra Thompson Building.....	Intermountain Broadcasting Corporation.	100	245.8	1,220
KEX	Portland, Oreg.....	Western Broadcasting Co.....	(1)	447	670.7
KFAB	Lincoln, Nebr.....	Nebraska Buick Auto Co.....	5,000	340.7	880
KFAD	Phoenix, Ariz., 312 North Central St.	Electrical Equipment Co.....	100	272.6	1,100
KFAF	San Jose, Calif., Montgomery Hotel.	Alfred E. Fowler.....	50	217.3	1,380
KFAU	Boise, Idaho.....	Boise High School.....	1,000	260.2	1,070
KFBB	Havre, Mont.....	F. A. Buttray Co.....	50	275.1	1,090
KFBC	San Diego, Calif., Balboa Theatre.	W. K. Ashill and Union League Club of San Diego County.	100	392	729
KFBK	Sacramento, Calif., 607 K St.	Kimball-Upson Co.....	100	515	560.4
KFBL	Everett, Wash., 2814 Rucker Ave.	Leese Bros.....	100	223.7	1,340
KFBS	Trinidad, Colo.....	School District No. 1.....	15	228	1,260
KFBU	Laramie, Wyo.....	St. Matthews Cathedral (Bishop N. S. Thomas).	1,000	374.8	800
KFCB	Phoenix, Ariz., 311 North Central Ave.	Nielsen Radio Supply Co.....	100	218	1,260
KFCR	Santa Barbara, Calif., Daily News Building.	Santa Barbara Broadcasting Co.	15	413	723
KFDD	Boise, Idaho.....	St. Michaels Episcopalian Church (Paul Roberts).	50	275.1	1,090
KFDM	Beaumont, Tex.....	Magnolia Petroleum Co.....	500	316.6	950
KFDX	Ehringport, La.....	First Baptist Church.....	100	226.1	1,270
KFDY	Brookings, S. Dak.....	South Dakota State College of Agriculture and Mechanic Arts.	500	299.8	1,000
KFDZ	Minneapolis, Minn., 2510 Thomas Ave., South.	Harry O. Iverson.....	10	230.6	1,300
KFEC	Portland, Oreg.....	Meier & Frank Co.....	150	252	1,190
KFEL	Denver, Colo., Argonaut Hotel.	Eugene P. O'Fallon (Inc.).....	250	254.1	1,180
KFEQ	Oak, Nebr.....	Seroggin & Co. Bank.....	2,000	267.7	1,120
KFEY	Kellogg, Idaho.....	Hunker Hill & Sullivan Mining & Concentrating Co.	10	232.4	1,290
KFFP	Moberly, Mo.....	First Baptist Church.....	50	241.8	1,240
KFFH	Wichita, Kans.....	Hotel Latham.....	500	267.7	1,120
KFHA	Gunnison, Colo.....	Western State College of Colorado.	50	202	1,190
KFHL	Oskaloosa, Iowa.....	Penn College.....	10	239.9	1,250
KFI	Los Angeles, Calif., Tenth and Hope Sts.	Earle C. Anthony (Inc.).....	5,000	467	643
KFIF	Portland, Oreg.....	Benson Polytechnic Institute.....	150	247.8	1,210
KFIO	Spokane, Wash.....	North Central High School.....	100	272.6	1,100
KFIQ	Yakima, Wash.....	Dr. I. M. Miller.....	100	226.3	1,170
KFIU	Juneau, Alaska.....	Alaska Electric Light & Power Co.	10	225.4	1,330
KFIZ	Fond du Lac, Wis.....	Fond du Lac Commonwealth Reporter.	100	272.6	1,100
KFJB	Marshalltown, Iowa.....	Marshall Electric Co.....	15	247.8	1,210
KFJP	Oklahoma, Okla., 405 North Hudson St.	National Radio Mfg. Co.....	1,000	260.7	1,150
KFJI	Astoria, Oreg.....	E. E. Marsh.....	15	245.8	1,220
KFJM	Grand Forks, N. Dak.....	University of North Dakota.....	100	272.6	1,080
KFJR	Portland, Oreg., 1329 East Thirti-sixth St.	Ashley C. Dixon & Son.....	100	263	1,140
KFJY	Fort Dodge, Iowa, 1004 Central Ave.	Tunwall Radio Co.....	100	245.8	1,220
KFJZ	Fort Worth, Tex., 3219 Avenue L.	W. E. Beach.....	50	254.1	1,180
KFKA	Greeley, Colo.....	Colorado State Teachers College.	100	272.6	1,100
KFKB	Midford, Kans.....	J. R. Brinkley, M. D.....	1,000	431.4	695
KFKC	Lawrence, Kans.....	University of Kansas.....	500	278.1	1,060
KFKX	Hastings, Nebr.....	Westinghouse Electric & Mfg. Co.	5,000	283.3	1,040
KFKZ	Kirkville, Mo.....	State Teachers College.....	15	225.4	1,330

<sup>1</sup> Variable.

## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
KFLR	Albuquerque, N. Mex.	University of New Mexico	100	254.1	1,180
KFLG	San Benito, Tex.	San Benito Radio Club	10	236.1	1,270
KFLV	Rockford, Ill.	Swedish Evangelical Mission Church	100	238.9	1,310
KFLX	Galveston, Tex., 3327 Avenue P.	George R. Clough	250	239.9	1,250
KFMR	Elmox City, Iowa	Morningside College	100	260.7	1,160
KFMX	Northfield, Minn.	Carlton College	500	258.9	820
KFNF	Shermandeak, Iowa	Henry Field Seed Co.	1,000	451.3	650
KFOA	Seattle, Wash.	Rhodes Department Store	1,000	454.3	650
KFOB	Burlingame, Calif.	KFOB (Inc.)	50	225.4	1,330
KFON	Long Beach, Calif., Jergens Trust Building	Nichols & Washner (Inc.)	500	232.4	1,290
KFOO	Salt Lake City, Utah	Latter Day Saints University	250	256.1	1,270
KFOR	David City, Nebr.	David City Tire & Electric Co. (Howard A. Shuman)	100	225.4	1,320
KFOT	Wichita, Kans.	College Hill Radio Club (College Hill Methodist Church)	50	230.6	1,300
KFOX	Omaha, Nebr.	Technical High School	100	257.8	1,210
KFOY	St. Paul, Minn., Fourth and Robert Sts.	Benson Radio Service	250	253	1,190
KFPL	Dublin, Tex., 365 Grafton St.	C. C. Baxter	15	252	1,190
KFPM	Greenville, Tex.	New Furniture Co.	10	241.8	1,240
KFPR	Los Angeles, Calif.	Los Angeles County Forestry Department	500	230.6	1,300
KPFW	Cartersville, Mo.	St. Johns M. E. Church, South (Rev. L. W. Stewart)	50	258.5	1,160
KFPY	Spokane, Wash.	Synnos Investment Co.	250	372.6	1,100
KFQA	St. Louis, Mo., 5532 Page Ave.	The Principia	100	260.7	1,180
KFQH	Fort Worth, Tex.	Searchlight Publishing Co.	1,000	528.2	1,140
KFQD	Anchorage, Alaska	Anchorage Radio Club	100	300	1,000.4
KFQP	Iowa City, Iowa	George S. Carson, Jr.	10	223.7	1,340
KFQU	Alma (Holy City), Calif.	W. E. Hiker	100	230.6	1,200
KFQW	Seattle, Wash., Fourth St. and Virginia Ave.	Carl F. Kiserim	100	215.7	1,290
KFQX	Seattle, Wash., 609 Washington Boulevard	Alfred M. Hubbard	15	210	1,423
KFQZ	Hollywood, Calif., 5633 De Longpre Ave.	L. E. Taft	50	225.4	1,330
KFRB	Beyville, Tex.	Hall Bros.	250	247.8	1,210
KFRG	San Francisco, Calif.	Don Leo (Inc.)	50	267.7	1,120
KFRU	Columbia, Mo.	Stephens College	500	499.7	600
KFRD	San Diego, Calif., U. S. Grant Hotel	Airhan Radio Corporation	1,000	245.8	1,220
KFSG	Los Angeles, Calif., 1100 Glendale Boulevard	Echo Park Evangelistic Association	500	375.1	1,000
KFUL	Galveston, Tex., 2120 Market St.	Thomas Goggan & Bros. Music Co.	750	258.5	1,160
KFUM	Colorado Springs, Colo., Nevada and Pikes Peak Ave.	W. D. Cooley	100	230.9	1,250
KFCO	St. Louis, Mo.	Concordia Seminary	500	345.1	550
KFUP	Denver, Colo.	Fitzsimons General Hospital	50	254.2	1,280
KFUS	Ogden, Utah, 420 Twenty-fifth St.	Peery Building Co.	50	223.7	1,340
KFUB	Oakland, Calif., 1444 Havenscourt Boulevard	Louis L. Sherman	50	250.3	1,170
KPUT	Salt Lake City, Utah	University of Utah	100	203	1,340
KPVD	Venture, Calif.	W. J. & C. L. McWhinnie	500	204	1,441
KFVE	St. Louis, Mo., 1111 Olive St.	Benson Broadcasting Corporation	5,000	239.9	1,250
KFVG	Independence, Kans.	First Methodist Episcopal Church (Ralph W. Elliott)	15	238.1	1,270
KFVI	Houston, Tex.	Fifty-sixth Cavalry Brigade, Headquarters Troop	10	209.9	1,250
KFVN	Fairmont, Minn.	Carl E. Bagley	50	227.1	1,320
KFVR	Denver, Colo. (near), 1075 Pennsylvania St.	The Olinger Corporation Broadcasting	50	243.9	1,220
KFVB	Cape Girardeau, Mo., 212 South Frederick St.	Hirsch Battery & Radio Co.	50	223.7	1,340
KVYV	Albuquerque, N. Mex., 407 West Central Ave.	Radio Supply Co.	10	340.9	1,300
KFWB	Hollywood, Calif., 2542 Sunset Boulevard	Warner Bros. Pictures (Inc.)	500	363	1,180
KFWC	San Bernardino, Calif.	Lawrence E. Wall	200	291.1	1,030
KFWF	St. Louis, Mo., 4000 Lindell Boulevard	St. Louis Truth Center	250	214.2	1,400
KFWH	Eureka, Calif., Hotel Vance	F. Wellington Morse, Jr.	100	254.1	1,180
KFWI	South San Francisco, Calif., 205 Wiley B. Allen Building	Radio Entertainments (Inc.)	300	249.9	1,200
KFWM	Oakland, Calif., 1126 Bella Vista Ave.	Oakland Educational Society	1000	323.9	920
KFWO	Los Angeles, Calif.	Lawrence Mott	500	211.1	1,420

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## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
KFWU	Pinville, La.	Louisiana College	100	238	1,290
KFWV	Portland, Oreg., 385 East Fifty-eighth St. south.	KFWV Broadcast Studios (Inc.)	100	212.6	1,410
KFXB	Big Bear Lake, Calif.	Bertram O. Heller	500	202.6	1,450
KFXD	Logan, Utah	Service Radio Co.	10	205.4	1,400
KFXF	Colorado Springs, Colo., 514 Mastelle Building.	Pikes Peak Broadcasting Co.	1,000	430.1	697.1
KFXH	El Paso, Tex., 113 South El Paso St.	Bledsoe Radio Co.	50	241.8	1,240
KFXJ	Edgewater, Colo. (near)	R. O. Howell (Olinger Gardens)	15	215.7	1,390
KFXR	Oklahoma, Okla., 1708 West Thirty-fifth St.	Clansen Film Finishing Co.	15	214.2	1,400
KFXY	Flagstaff, Ariz.	Miss Mary M. Costigan (Orphanum Theatre)	50	205.4	1,460
KFYF	Oxnard, Calif.	Carl's Radio Den (Nowcomb Radio Co.)	15	214.2	1,400
KFYJ	Houston, Tex. (portable)	Houston Chronicle Publishing Co.	10	238	1,200
KFYO	Tamkama, Tex.	Buchanan-Vaughan Co.	10	209.7	1,430
KFYR	Bismarck, N. Dak., 250 Fourth St.	Hockins-Meyer (Inc.)	15	247.8	1,210
KGAB	Tucson, Ariz., 80 South Stone Ave.	Tucson Citizen	100	243.8	1,230
KGAS	Seattle, Wash., 844 East Fifty-eighth St.	Arthur C. Dalley	100	227.1	1,321
KGBU	Ketchikan, Alaska	Alaska Radio & Service Co.	500	228.9	1,310
KGBX	St. Joseph, Mo., 1221 Fred Ave.	Foster-Hall Tire Co.	15	347.8	862
KGBY	Shelby, Nebr.	Albert C. Dunning	15	202.6	1,460
KGBZ	York, Nebr.	Federal Live Stock Remedy Co.	100	333.1	900
KGCA	Decorah, Iowa	Charles W. Greenloy	10	280.2	1,070
KGCB	Oklahoma, Okla., 105 West Thirtieth St.	Wallace Radio Institute	100	331	905.8
KGCC	Newark, Ark.	Moore Motor Co.	100	239.9	1,250
KGCH	Wayne, Nebr.	Wayne Hospital (S. A. Lutgen)	500	434.5	690
KGCI	San Antonio, Tex., 718 Gramercy St.	Soarey M. Rhodes	100	239.9	1,250
KGCL	Seattle, Wash., 609 Washington Boulevard.	Louis Wasmor and Archie Taft	15	220.6	1,300
KGCN	Copcoria, Kans.	Alva P. Smith	50	210	1,428
KGCR	Brookings, S. Dak., 415 Main St.	Cutler's Radio Broadcasting Service (Inc.)	15	252	1,190
KGCU	Mandan, N. Dak.	Mandan Radio Association (A. W. Nordholm)	100	285	1,052
KGCV	Vida, Mont.	First State Bank of Vida	10	240	1,240
KGDA	Deli Rapids, S. Dak.	Home Auto Co. (J. H. Nelson)	15	254.1	1,150
KGDE	Barrett, Minn.	Jaren Drug Co.	50	232.4	1,290
KODI	Seattle, Wash., 614 Terminal Sales Building.	Northwest Radio Service Co.	50	410.4	720
KGDJ	Cresco, Iowa, 316 Fifth Ave.	H. Rathert	10	202.6	1,450
KGDM	Stockton, Calif., 332 East Channel St.	Victor G. Keping	5	217.3	1,380
KGDO	Dallas, Tex., 2012 Main St.	C. H. and Henry Garrett	100	285	1,052
KGDP	Pueblo, Colo., 2927 High St.	Boy Scouts of America, Pueblo Council (John D. Price)	10	260.7	1,150
KGDR	San Antonio, Tex., 315 West Travis St.	Radio Engineers	15	240	1,240
KGDW	Humboldt, Nebr.	Frank J. Rist	100	241.5	1,240
KGDY	Shreveport, La., 1613 Laurel St.	William E. Antony	500	291.1	1,030
KGDZ	Oldham, S. Dak.	J. Albert Loesch (Hanson Hardware Co.)	15	210	1,428
KGEF	Decorah, Iowa	Norwegian Luther College	50	431	695.6
KGEH	Los Angeles, Calif.	Trinity Methodist Church	1,000	516.9	580
KGEI	Eugene, Oreg., Eugene Hotel	Eugene Broadcast Station (Harold H. Hanseth)	50	236	1,270
KGO	Oakland, Calif.	General Electric Co.	(?)	361.2	830
KGRS	Amarillo, Tex., 108 East Eighth St.	Gish Radio Service	100	234.2	1,280
KGTT	San Francisco, Calif.	Glad Tidings Temple and Bible Institute	50	209.8	1,450
KGU	Honolulu, Hawaii, 217 South King St.	Mexican A. Mulrony	500	270.1	1,110
KGW	Portland, Oreg.	Portland Morning Oregonian	1,000	401.5	610
KGY	Lacey, Wash.	St. Martin's College	50	277.6	1,080
KHJ	Los Angeles, Calif.	Times-Mirror Co.	500	405.2	740
KHQ	Spokane, Wash., Payton Building.	Louis Wasmor	1,000	394.5	760
KHCK	Anita, Iowa	Atlantic Automobile Co.	100	272.6	1,100
KJBS	San Francisco, Calif., 1350 Bush St.	Julius Brunton & Sons Co.	5	234.2	1,280

1 Variable.

## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
KJR	Seattle, Wash., 611 Terminal Sales Building.	Northwest Radio Service Co....	1,000	384.4	780
KKP	Seattle, Wash.....	City of Seattle, harbor department.	15	260	1,153
KLDS	Independence, Mo.....	Reorganized Church of Jesus Christ of Latter Day Saints.	1,000	442.9	680
KLS	Oakland, Calif., 2201 Telegraph Ave.	Warner Bros.....	250	242.9	1,200
KLX	Oakland, Calif.....	Oakland Tribune.....	500	508.2	590
KLZ	Denver, Colo., Seventeenth St. and Broadway.	Reynolds Radio Co.....	500	263.3	1,150
KMA	Ebensdosh, Iowa.....	May Seed & Nursery Co.....	500	461.3	650
KMED	Medford, Oreg., Sparta Building.	W. J. Virgin.....	50	220	1,350
KMJ	Fresno, Calif.....	Fresno Bee.....	50	234.2	1,280
KMJP	Kansas City, Mo.....	Journal Post.....	1,000	410.9	680
KMMJ	Clay Center, Neb.....	M. M. Johnson Co.....	1,000	228.9	1,310
KMO	Tacoma, Wash., 788 Pacific Ave.	KMO (Inc.).....	500	240.9	1,200
KMOX	Kirkwood, Mo.....	Voice of St. Louis (Inc.).....	5,000	280.2	1,070
KMTR	Los Angeles, Calif., 1025 North Highland Ave.	Ethophone Manufacturing Co.....	500	370.2	810
KNRC	Los Angeles, Calif., 1630 Los Angeles St.	Clarence B. Junco (Kierulff & Ravenscroft).	500	238	1,260
KNX	Los Angeles, Calif., 6116 Hollywood Boulevard.	Los Angeles Evening Express...	1,000	356.9	800
KOA	Denver, Colo., 1370 Krameria St.	General Electric Co.....	Variable.	322.4	930
KOAC	Corvallis, Oreg.....	Oregon Agricultural College.....	500	280.2	1,070
KOB	State College, N. Mex.....	New Mexico College of Agriculture and Mechanic Arts.	1,000	348.6	800
KOCH	Omaha, Neb.....	Omaha Central High School.....	500	258.5	1,160
KOCW	Chickasha, Okla.....	Oklahoma College for Women.....	200	232	1,190
KOIL	Council Bluffs, Iowa.....	Mons Motor Oil Co.....	5,000	305.9	960
KOIN	Sylvan, Oreg.....	KOIN (Inc.).....	1,000	319	960
KOMO	Seattle, Wash.....	Fisher's Band Station (Inc.).....	1,000	335.9	940
KOWW	Walla Walla, Wash., 711 Baker Building.	Frank A. Moore.....	500	285	1,062
KPJM	Prescott, Ariz., Journal Miner Building.	Wilburn Radio Service.....	15	215	1,365
KPO	San Francisco, Calif., Fifth and Market Sts.	Hale Bros. and The Chronicle...	1,000	428.3	700
KPPC	Pasadena, Calif.....	Pasadena Presbyterian Church...	50	228.6	1,310
KPRC	Houston, Tex.....	Post Dispatch.....	500	298.9	1,010
KPSN	Pasadena, Calif.....	Pasadena Star News.....	1,000	318.6	950
KQV	Pittsburgh, Pa., 719 Liberty Ave.	Doubladay-Hill Electric Co.....	100	274.1	1,090
KQW	San Jose, Calif.....	First Baptist Church.....	500	333.1	900
KRAC	Shreveport, La., Fair Grounds.....	Caddo Radio Club.....	50	220	1,363
KRR	Berkeley, Calif.....	Berkeley Daily Gazette (C. E. Duracomb).	100	268.3	1,170
KRLD	Dallas, Tex., 308 North St. Paul St.	Dallas Radio Laboratories.....	500	357.1	829.6
KROW	Portland, Oreg., Sovereign Hotel.	Oregon Broadcast Co.....	50	231	1,296
KRSC	Seattle, Wash., 1202 Fifth Ave.....	Radio Sales Corporation.....	50	479.7	600
KSAC	Manhattan, Kans.....	Kansas State Agricultural College.	500	340.7	880
KSBA	Shreveport, La., Youree Hotel.....	W. O. Patterson.....	1,000	260.7	1,150
KSD	St. Louis, Mo.....	St. Louis Post Dispatch.....	500	345.1	850
KSEI	Pocatello, Idaho.....	KSEI Broadcasting Association.	500	260.7	1,150
KSL	Salt Lake City, Utah, Vermont Building.	Radio Service Corporation of Utah.	1,000	290.8	1,000
KSMR	Santa Maria, Calif.....	Santa Maria Valley R. R. Co.....	100	282.8	1,000
KSO	Clarinda, Iowa.....	Berry Seed Co.....	500	408.2	740
KSOO	Sioux Falls, S. Dak., 609 Minnesota Building.	Sioux Falls Broadcast Association.	100	360	822.8
KTAB	Oakland, Calif., Tenth Ave. and East Fourteenth St.	Associated Broadcasters.....	1,000	302.8	990
KTAP	San Antonio, Tex., 2412 Main Ave.	Robert R. Baldo.....	19	263	1,140
KTBI	Los Angeles, Calif., 536 South Hope St.	Bible Institute of Los Angeles...	750	293.9	1,070
KTBR	Portland, Oreg., 322½ Yamhill St.	M. E. Brown.....	50	263	1,140
KTBS	Hot Springs, Ark.....	New Arlington Hotel Co.....	500	374.8	800
KTNT	Muscatine, Iowa.....	Norman Baker.....	1,000	333.1	900
KTUE	Houston, Tex., 614 Fannin St.	Umat Electric (W. J. Uhalt).....	5	268	1,140
KTW	Seattle, Wash., Seventh Ave. and Spring St.	First Presbyterian Church.....	1,000	454.3	650
KUJ	Seattle, Wash., 6811 Fifth Ave. NE.	Puget Sound Radio Broadcasting Co.	15	352.5	850.6
KUOA	Fayetteville, Ark.....	University of Arkansas.....	750	290.8	1,000
KUOM	Missoula, Mont.....	University of Montana.....	500	243.8	1,226
KUSD	Vermillion, S. Dak.....	University of South Dakota.....	100	277.6	1,080

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## Broadcasting stations, alphabetically by call signals—Continued.

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
KVI	Tacoma, Wash., Ninth and A Sts.	Puget Sound Radio Broadcast- ing Co. (H. W. Winningham).	15	342.5	875.4
KVOO	Bristow, Okla.	Southwestern Sales Corporation.	1,000	374.8	800
KVOS	Seattle, Wash., 1208 Tenth Ave.	L. L. Jackson and L. Kessler.	500	331.1	900
KWCR	Cedar Rapids, Iowa, 1444 Second Ave., East.	Harry F. Paar.	500	356	1,013
KWG	Stockton, Calif., 530 East Market St.	Portable Wireless Telephone Co.	50	247.8	1,210
KWKC	Kansas City, Mo., Thirty-ninth and Main Sts.	Wilson Duncan Studios.	100	235.1	1,270
KWKH	Shreveport, La., Spring and Fan- ning Sts.	W. K. Henderson Iron Works & Supply Co.	1,000	312.3	900
KWBC	Pullman, Wash.	State College of Washington.	500	348.6	800
KWTC	Santa Ana, Calif., 1101 North Ross St.	Dr. John W. Hancock.	5	263	1,140
KWUC	Le Mars, Iowa.	Western Union College.	1,500	252	1,100
KWVG	Brownsville, Tex.	City of Brownsville, Board of City Development.	500	277.6	1,080
KXL	Portland, Oreg., 501 Pantage Building.	KXL Broadcasters (Love Elec- tric Co.).	50	400	749.8
KXRO	Seattle, Wash., 609 Washington Boulevard.	Brott Laboratories.	85	240	1,249
KYA	San Francisco, Calif., Clift Hotel.	Pacific Broadcasting Corpora- tion (Vincent I. Kraft).	1,000	302.8	750
KYW	Chicago, Ill., 72 West Adams St.	Westinghouse Electric & Mfg. Co.	4,500	534.4	560
KZIB	Manila, P. I., 20 Plaza Moraga.	I. Beck (Inc.).	20	249.9	1,200
EZKZ	Manila, P. I., 109 Plaza Moraga.	Electrical Supply Co.	100	270.1	1,110
KZM	Oakland, Calif., Thirteenth and Harrison Sts.	Preston D. Allen.	100	239.9	1,250
EZRQ	Manila, P. I., Manila Hotel.	Far Eastern Radio (Inc.).	500	400	749.8
NAA	Arlington, Va.	United States Navy.	1,000	434.5	690
WAAD	Cincinnati, Ohio.	Ohio Mechanics Institute.	25	228.5	1,180
WAAP	Chicago, Ill., 534 Exchange Ave.	Chicago Daily Drivers Journal.	500	277.6	1,080
WAAM	Newark, N. J., 1 Bond St.	I. R. Nelson.	200	263	1,140
WAAT	Jersey City, N. J., 210 Jackson Ave.	Frank V. Bremer.	500	215	1,270
WAAW	Omaha, Nebr., Grain Exchange Building.	Omaha Grain Exchange.	500	354.4	780
WABH	Harrisburg, Pa., 424 Market St.	Harrisburg Radio Co.	10	204	1,470
WABC	Richmond Hill, N. Y.	Atlantic Broadcasting Co.	5,000	315.6	950
WABF	Kingston, Pa.	Marble Broadcasting Corpora- tion.	500	410.7	730
WABI	Bangor, Me.	First Universalist Church.	100	239.0	1,250
WABO	Rochester, N. Y.	Lake Avenue Baptist Church (Hickson Electric Co.).	100	277.6	1,080
WABQ	Philadelphia, Pa., Broad and Wood Sts.	United Broadcasting Co. (David E. Rokontz).	500	300.7	1,150
WABR	Toledo, Ohio.	Scott High School.	50	263	1,140
WABW	Wooster, Ohio.	College of Wooster.	50	206.8	1,450
WABX	Mount Clemens, Mich. (near), 1830 Penobscot Building, De- troit, Mich.	Henry B. Joy.	500	345.8	1,220
WABY	Philadelphia, Pa., 600 South Eighth St.	John Magaldi, jr.	50	241.8	1,240
WAZC	New Orleans, La.	Coliseum Place Baptist Church.	50	275.1	1,090
WADC	Akron, Ohio.	Allen Theater (Allen T. Sim- mons).	1,000	258.5	1,160
WAFD	Port Huron, Mich., 1432 Military Road.	Albert B. Parfet Co.	500	276.1	1,090
WAGM	Royal Oak, Mich., 726 Kayser St.	Robert L. Miller.	50	225.4	1,330
WAOS	Somerville, Mass., 131 Willow Ave.	Willow Garages (Inc.), W. E. Hartwell and J. Smith Dodge.	5	250	1,199
WAIT	Taunton, Mass., 32 Weir St.	A. H. Waite & Co.	10	228.9	1,310
WAIU	Columbus, Ohio.	American Insurance Union.	750	293.9	1,020
WAMD	Minneapolis, Minn., Radisson Hotel.	Radisson Radio Corporation.	500	243.8	1,230
WAOK	Orton Park, N. Y. (16317 One hundred and sixteenth St., Richmond Hill, N. Y.).	A. H. Andreasen.	100	247.8	1,210
WAPI	Auburn, Ala.	Alabama Polytechnic Institute.	1,000	461.3	650
WARC	Medford Hills, Mass.	American Radio & Research Corporation.	100	260.7	1,150
WARS	Brooklyn, N. Y. (77 Cortlandt St., New York, N. Y.).	Amateur Radio Specialty Co....	500	295	1,018
WASH	Grand Rapids, Mich.	Baxter Launderers & Cleaners.	500	256.3	1,170
WATT	Boston, Mass. (portable), 39 Boylston.	Edison Electric Illuminating Co. of Boston.	100	243.8	1,230

## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
WBAL	Glen Morris, Md. (near).....	Consolidated Gas, Electric Light & Power Co.	5,000	245.8	1,220
WBAO	Decatur, Ill.....	James M. McKim University.....	100	270.1	1,110
WBAP	Fort Worth, Tex., 400 West Seventh St.	Waltham-Carter Publishing Co. (Star-Telegram).	(?)	475.9	630
WBAW	Nashville, Tenn., Seventh Ave., South and Broad St.	Braid Electric Co. and Waldrum Drug Co.	100	256.1	1,170
WBAX	Wilkes-Barre, Pa., 60 Gildersleeve St.	John H. Stenger, Jr.....	100	256.3	1,170
WBBC	Brooklyn, N. Y., 2123 Troy Ave.	Peter J. Testan.....	100	249.9	1,200
WBBL	Richmond, Va.....	Grace Covenant Presbyterian Church.	100	238.9	1,210
WBBM	Chicago, Ill., 1534 Howard St.	Atlas Investment Co.....	(?)	225.4	1,330
WBIP	Peterboro, Mich.....	Peterboro High School.....	200	238	1,260
WBBR	Rossville, N. Y., 174 Columbia Heights, Brooklyn, N. Y.	Peoples Pulpit Association.....	500	416.4	720
WBBW	Norfolk, Va.....	Ruffner Junior High School.....	50	222.1	1,350
WBBY	Charleston, S. C.....	Washington Light Infantry.....	15	267.7	1,120
WBBZ	Chicago, Ill. (portable), 26 South State St.	C. L. Carroll.....	100	215.7	1,390
WBCN	Chicago, Ill., 728 West Sixty-fifth St.	Poster & McDonnell.....	100	265.3	1,130
WBES	Takoma Park, Md.....	Bliss Electrical School.....	100	222.1	1,350
WBET	Boston, Mass., 324 Washington St.	Boston Transcript Co.....	100	384.4	780
WBKN	Brooklyn, N. Y., 1515 Eastern Parkway.	Arthur Peske.....	100	291.1	1,030
WBMC	Woodside, N. Y., 4128 Betts Ave.	Mulbrack Co. (Everett M. Roeder).	200	293.9	1,020
WBMS	North Bergen, N. J., 837 Thirty-fourth St.	George J. Schowarr.....	10	225.7	1,310
WBNY	New York, N. Y., 145 West Forty-fifth St.	Baruchrome Corporation.....	750	322.4	930
WBRC	Birmingham, Ala., 1915 Fifth Ave.	Birmingham Broadcasting Corporation.	250	247.8	1,219
WBRE	Wilkes-Barre, Pa., 17 West Northampton St.	Baltimore Radio Exchange.....	100	230.6	1,300
WBRL	Tifton, N. H., 23 Sumner St.....	Both Radio Laboratories.....	500	365	821.4
WBRS	Brooklyn, N. Y., 1002 Broadway.	Universal Radio Manufacturing Co.	100	391	761
WBSS	Wellesley Hills, Mass.....	Babson's Statistical Organization.	100	242	1,239
WBT	Charlotte, N. C.....	Charlotte Chamber of Commerce (C. C. Coddington).	250	275.1	1,090
WBZ	Springfield, Mass.....	Westinghouse Electric & Manufacturing Co.	5,000	331.1	900
WBZA	Boston, Mass., Brunswick Hotel.	do.	500	331.1	900
WCAO	Mansfield, Conn.....	Connecticut Agricultural College.	500	275.1	1,090
WCAD	Canton, N. Y.....	St. Lawrence University.....	500	293	1,149
WCAE	Pittsburgh, Pa.....	Kaufmann & Baer Co.....	500	461.3	650
WCAH	Columbus, Ohio, 321 West Tenth Ave.	Entrekin Electric Co.....	500	265.3	1,130
WCAJ	University Place, Nebr.....	Nebraska Wesleyan University.....	500	251.1	1,180
WCAL	Northfield, Minn.....	St. Olaf College.....	500	330.9	890
WCAM	Camden, N. J.....	City of Camden.....	1,000	230.9	890
WCAO	Baltimore, Md., 848 North Howard St.	Monumental Radio (Inc.).....	100	275.1	1,090
WCAR	San Antonio, Tex., 191 West Pecan St.	Southern Radio Corporation of Texas.	500	293	1,140
WCAT	Rapid City, S. Dak.....	South Dakota State School of Mines.	50	229.9	1,250
WCAU	Philadelphia, Pa., Hotel Pennsylvania.	Universal Broadcasting Co. (Durham & Co.).	500	277.6	1,090
WCAV	Burlington, Vt.....	University of Vermont.....	100	252	1,190
WCAZ	Charlottesville, Va.....	Charlottesville College.....	50	245.8	1,220
WCBA	Allentown, Pa., 1015 Allen St.....	Charles W. Heimbach (Queen City Radio Station).	150	254.1	1,150
WCBD	Zion, Ill.....	Wilbur G. Voliva.....	5,000	241.6	870
WCBE	New Orleans, La., 1219 North Rampart St.	Uhalt Brod. Radio Co.....	5	293	1,140
WCBH	Oxford, Miss. (near).....	University of Mississippi.....	50	241.8	1,240
WCBM	Baltimore, Md., Charles St. and North Ave.	Hotel Chateau (Charles Schwarz).	100	238.9	1,310
WCBR	Providence, R. I. (portable), 42 Doyle Ave.	Charles H. Mesler.....	100	234.2	1,250
WCBS	Providence, R. I. (portable), 6 North Main St.	Harold L. Dewing and Charles H. Mesler.	250	242	1,229



## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
WFAV	Lincoln, Nebr.	University of Nebraska	250	275.1	1,090
WFBC	Knoxville, Tenn.	First Baptist Church	50	249.9	1,200
WFBE	Cincinnati, Ohio	Gasfield Place Hotel Co.	500	232.4	1,290
WFBG	Altoona, Pa.	William F. Gayle Co.	100	277.6	1,080
WFBH	Collegeville, Minn.	St. John's University	100	256.1	1,270
WFBL	Syracuse, N. Y.	The Onondaga Co.	1,000	252	1,190
WFBM	Indianapolis, Ind., 2 West Wash- ington St.	Merchants Heat & Light Co.	250	247.7	1,159
WFBR	Baltimore, Md., Fifth Regiment Armory.	Fifth Infantry Maryland Na- tional Guard.	100	254.1	1,180
WFBZ	Galesburg, Ill.	Knox College	50	254.1	1,180
WFOI	Pawtucket, R. I., 103 Exchange St.	Frank Crook (Inc.)	100	258.5	1,169
WFDP	Flint, Mich., Police Building	Frank D. Fallain	100	234.2	1,250
WFI	Philadelphia, Pa.	Scravbridge & Clothier	500	294.5	700
WFKB	Chicago, Ill., 436 Woodlawn Ave.	Francis K. Bridgman (Inc.)	500	217.3	1,380
WFKD	Philadelphia, Pa., 1510 Oxford St. (Frankford).	Foultrod Radio Engineering Co.	10	249.9	1,200
WFRL	Brooklyn, N. Y., 1421 East Tenth St.	Flatbush Radio Laboratories	100	123.5	950
WGAL	Lancaster, Pa., 23 East Orange St.	Lancaster Electric Supply & Construction Co.	10	247.8	1,210
WGBB	Fresport, N. Y., 217 Bedford St.	Harry H. Carman	100	243.8	1,230
WGBD	Memphis, Tenn.	First Baptist Church	40	277.6	1,080
WGBP	Evansville, Ind., 537 South Sev- enth St.	Finka Furniture Co.	500	291.1	1,270
WGBI	Scranton, Pa., Adams and Lin- den Sts.	Scranton Broadcasters (Inc.)	50	279.9	1,250
WGBR	Marshfield, Wis., 407 South Cen- tral Ave.	George S. Ives	15	228.9	1,310
WGBS	New York, N. Y.	Gimbel Bros.	500	315.6	950
WGBU	Pulford-by-the-Sea, Fla.	Florida Cities Finance Co.	500	277.6	1,080
WGBX	Orono, Me.	University of Maine	500	234.2	1,280
WGCP	Newark, N. J., 319 Central Ave.	May Radio Broadcast Corpora- tion.	500	252	1,190
WGES	Chicago, Ill., 123 North Craw- ford Ave.	Oak Leaves Broadcasting Cor- poration (Coyne Electrical School).	1,000	315.6	950
WGHD	Clearwater, Fla.	Fort Harrison Hotel (Ed. A. Haley).	500	265.3	1,120
WGHP	Mount Clemens, Mich. (2761 Jefferson Ave., Detroit, Mich.).	George H. Phelps (Inc.)	1,500	270.1	1,110
WGL	New York, N. Y., 153 Broadway	International Broadcasting Co.	1,000	442.4	675
WGM	Jennette, Pa., 501 Cowart Ave.	Verne and Elton Spencer	10	209	1,315
WGMU	Richmond Hill, N. Y. (portable)	A. H. Grebs & Co.	100	235.1	1,270
WGN	Chicago, Ill.	Chicago Tribune	1,500	302.8	900
WGR	Buffalo, N. Y., 1738 Elmwood Ave.	Federal Radio Corporation (Federal Telephone Manu- facturing Corporation).	750	310	940
WGST	Atlanta, Ga.	Georgia School of Technology	500	270.1	1,110
WGWB	Milwaukee, Wis., 144 Broadway	Radioast Corporation of Wis- consin.	1,000	354.4	790
WOY	Schenectady, N. Y.	General Electric Co.	(?)	379.5	790
WHA	Madison, Wis.	University of Wisconsin	750	335.4	850
WHAD	Milwaukee, Wis.	Marquette University and Mil- waukee Journal.	500	275.1	1,090
WHAM	Rochester, N. Y.	University of Rochester (East- man School of Music).	100	277.6	1,080
WHAP	New York, N. Y., 406 West Thirty-first St.	William H. Taylor Pinoben Corporation.	1,000	431	695.0
WHAR	Atlantic City, N. J.	Beaflde Hotel (P. P. Cook Sons)	1,000	275.1	1,090
WHAS	Louisville, Ky., 326 West Liberty St.	Courier-Journal and Louisville Times.	500	399.5	750
WHAZ	Troy, N. Y.	Rensselaer Polytechnic Institute	500	379.5	790
WHB	Kansas City, Mo., Sweeney Building.	Sweeney School Co.	500	345.6	820
WHBA	Oil City, Pa.	Shaffer Music House (C. C. Shaffer).	10	249.9	1,200
WHBC	Canton, Ohio, 627 McKinley Ave. NW.	Rev. E. P. Graham	15	254.1	1,160
WHBD	Bellefontaine, Ohio	Chamber of Commerce	100	222.1	1,350
WHBF	Rock Island, Ill., 217 Eighteenth St.	Beardsley Specialty Co.	100	222.1	1,350
WHBL	Chicago, Ill. (portable), 36 South State St.	O. L. Carroll	50	215.7	1,290
WHBM	Do.	do.	50	215.7	1,290
WHBN	St. Petersburg, Fla.	First Avenue Methodist Church	10	235	1,270
WHBP	Johnstown, Pa., 191 Main St.	Johnstown Automobile Co.	100	254.9	1,170
WHBQ	Memphis, Tenn., Bellevue and	Men's Fellowship Class of St.	50	232.4	1,200



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## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
WHBU	Anderson, Ind., 1002 Meridian St.	Riviera Theatre and Bing's Clothing.	15	218.8	1,370
WHBW	Philadelphia, Pa., 4816 Chestnut St.	D. R. Kienle.....	100	215.7	1,330
WHBY	West De Pere, Wis.....	St. Norbert's College.....	50	242.0	1,200
WHDI	Minneapolis, Minn., 818 Superior Boulevard.	William Hood Dunwoody Industrial Institute.	1,500	277.6	1,080
WHFC	Rochester, N. Y., 36 South Ave....	Hickson Electric Co.....	100	258.5	1,160
WHPC	Chicago, Ill., Hotel Flunders.....	Triangle Broadcasters.....	200	258.5	1,160
WHK	Cleveland, Ohio, 1220 Huron Road.	Radio Air Service Corporation..	1,000	272.6	1,100
WHN	New York, N. Y., 1540 Broadway.	George Schobel.....	500	361.2	830
WHO	Des Moines, Iowa.....	Bankers Life Co.....	5,000	526	570
WHOG	Huntington, Ind., 459 North Jefferson St.	Huntington Broadcasters Association.	15	241.8	1,240
WHT	Duerrfield, Ill. (610 North Michigan Boulevard, Chicago, Ill.)	Radiophone Broadcasting Corporation.	5,000	238	1,260
WIAD	Philadelphia, Pa., 6318 North Park Ave.	Howard R. Miller.....	100	249.9	1,200
WIAS	Burlington, Iowa, 315 North Third St.	Home Electric Co.....	100	254.1	1,180
WIHA	Madison, Wis., 16 East Millin St.	Capital Times Studio and Strand Theatre Corporation.	100	236.1	1,270
WIBO	Elkins Park, Pa.....	St. Paul's Protestant Episcopal Church.	50	222.1	1,350
WIBI	Flushing, N. Y., 49 Boerum Ave.	Frederick B. Zittel, Jr.....	500	218.8	1,370
WIBJ	Chicago, Ill. (portable), 36 South State St.	C. L. Carrell.....	50	215.7	1,390
WIBM	Do.....	do.....	100	215.7	1,390
WIBO	Chicago, Ill., 6310 Broadway.....	Nelson Bros. (Hanson and Florito Orchestral Exchange).	1,000	225.4	1,330
WIBR	Staubenville, Ohio.....	Thurman A. Owings.....	50	215.8	1,220
WIBS	Elizabeth, N. J. (portable), 921 Edgewood Road.	Lieut. Thomas F. Hunter.....	150	202.6	1,480
WIBU	Poynette, Wis.....	The Electric Farm (William C. Forrest).	20	222.1	1,350
WIBW	Chicago, Ill. (portable), 36 South State St.	C. L. Carrell.....	100	215.7	1,390
WIBX	Utica, N. Y., 102 Lafayette St.....	WIBX (Inc.).....	150	234.2	1,280
WIBZ	Montgomery, Ala., 217 Catons St.	Alexander D. Trum.....	15	230.6	1,300
WICC	Bridgeport, Conn., 1188 Main St.	Bridgeport Broadcasting Station (Harold D. Feuser and Charles W. Selen).	500	285	1,052
WIL	St. Louis, Mo., 918 Pine St.....	St. Louis Star and Benson Radio Co.	250	258	1,162
WIOD	Miami Beach, Fla.....	Carl G. Fisher Co.....	1,000	247.8	1,210
WIP	Philadelphia, Pa.....	Oimbel Bros.....	500	508.3	590
WJAD	Waco, Tex., 801 Austin St.....	Frank P. Jackson.....	750	352.7	850
WJAG	Norfolk, Nebr.....	Norfolk Daily News.....	600	370.1	1,110
WJAK	Kokomo, Ind.....	Kokomo Tribune (J. A. Kautz).	50	254.1	1,180
WJAM	Cedar Rapids, Iowa, 322 Third Ave., West.	D. M. Perham.....	100	257.7	1,120
WJAR	Providence, R. I.....	The Outlet Co. (J. Samuels & Bro.).	500	483.6	620
WJAS	Pittsburgh, Pa., 953 Liberty Ave.	Pittsburgh Radio Supply House.	500	275.1	1,090
WJAX	Jacksonville, Fla.....	City of Jacksonville.....	1,000	336.9	890
WJAZ	Mount Prospect, Ill. (312 South Michigan Ave., Chicago, Ill.)	Zenith Radio Corporation.....	5,000	320.5	910
WJBA	Joliet, Ill., 301 Whitley Ave.....	D. H. Lentz, Jr.....	50	296.8	1,450
WJBB	St. Petersburg, Fla., 125 Thirteenth St., North.	Financial Journal.....	10	254.1	1,180
WJBC	La Salle, Ill., Second and Joliet Sts.	Hammer Furniture Co.....	100	234.2	1,280
WJBI	Red Bank, N. J., 63 Broad St.....	Robert S. Johnson.....	250	218.8	1,370
WJBK	Ypsilanti, Mich., 803 Congress St.	Ernest F. Goodwin.....	15	232.4	1,290
WJBL	Deeratur, Ill., 301 North Water St.	William Gushard Dry Goods Co.	500	270.1	1,110
WJBO	New Orleans, La., 119 South St. Patrick St.	Valdemar Jensen.....	100	267.7	1,120
WJBR	Omro, Wis.....	Gensch & Stearns.....	100	227.1	1,320
WJBT	Chicago, Ill., 5454 Howard St.....	John S. Boyd.....	500	468.5	640
WJBU	Lewisburg, Pa.....	Bucknell University.....	100	211.1	1,420
WJBW	New Orleans, La., 2743 Dumaine St.	C. Carlson, Jr.....	30	270.1	1,110
WJBY	Gadsden, Ala., 517 Broad St.....	Electric Construction Co. (T. G. Erwin).	15	260	1,153
WJBZ	Chicago Heights, Ill., 144 East Sixteenth St.	Roland O. Pamler and A. Copnatelli.	100	419.3	715

## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilocycles)
WJJD	Mooseheart, Ill.	Loyal Order of Moose, Supreme Lodge.	1,000	379.2	810
WJR	Pontiac, Mich.	Jewett Radio & Phonograph Co.	5,000	315.9	580
WJUG	New York, N. Y., 30 Park Place.	Ida B. Ross.	500	316.9	580
WJY	New York, N. Y.	B. C. A.	1,000	405.2	740
WJZ	Hound Brook, N. J.	do.	(5)	454.3	650
WKAF	Milwaukee, Wis., 130 Second St.	WKAF Broadcasting Corporation.	500	290.7	1,150
WKAQ	San Juan, P. R., Telephone Building.	Radio Corporation of Porto Rico.	500	340.7	880
WKAH	East Lansing, Mich.	Michigan State College.	1,000	285.5	1,050
WKAU	Laconia, N. H.	Laconia Radio Club.	100	223.7	1,340
WKBA	Chicago, Ill., 1217 South Wabash Ave.	Arrow Battery Co. (Joseph Silverstein).	500	200.7	1,450
WKBB	Joliet, Ill., 607 Jefferson St.	Sanders Bros. (J. Sanders).	150	282.8	1,000
WKBC	Birmingham, Ala., 1428 North Twelfth Ave.	H. L. Ansley.	50	225	1,333
WKBE	Webster, Mass.	K. & B. Electric Co.	100	270.1	1,110
WKBF	Indianapolis, Ind., 233 Iowa St.	Noble B. Watson.	100	244	1,229
WKBG	Chicago, Ill. (portable), 25 South State St.	C. L. Carroll.	100	215.7	1,350
WKBH	La Crosse, Wis., 221 Main St.	Callaway Music Co.	500	249.9	1,200
WKBI	Chicago, Ill., 1917 Warner Ave.	Fred L. Schoenquoff.	50	220.4	1,360
WKBJ	St. Petersburg, Fla., Fifth Ave. and Tenth St. South.	Gospel Tabernacle (Inc.).	250	280	1,071
WKBL	Monroe, Mich., 19 South Monroe St.	Monroe Radio Manufacturing Co.	15	252	1,190
WKBM	Newburgh, N. Y., Academy of Music Building.	John W. Jones.	100	285.5	1,050
WKBN	Youngstown, Ohio, 26 Auburndale Ave.	Radio Electric Service Co. (W. P. Williamson, Jr.).	50	260	831.8
WKBO	Jersey City, N. J., Jersey Observer Building.	Camith Corporation.	500	303.9	986.9
WKBP	Battle Creek, Mich.	Battle Creek Enquirer and News.	50	295	1,131
WKBQ	New York, N. Y., 1100 East One hundred and seventy-seventh St.	Starlight Amusement Park (Inc.).	10	235	1,052
WKBR	Auburn, N. Y., 55 Francoe St.	Charles J. Helser.	100	225	1,333
WKBS	Galesburg, Ill., 227 DuBois Ave.	Perrill N. Nelson.	200	261.2	850
WKBT	New Orleans, La.	First Baptist Church.	50	252	1,150
WKBU	New Castle, Pa. (portable), 1057 Maryland Ave.	H. K. Armstrong.	50	238	1,260
WKBV	Brookville, Ind., 628 Main St.	Kear Battery & Electric Co.	75	226.1	1,270
WKBW	Buffalo, N. Y., 1420 Main St.	Churehill Evangelistic Association.	1,000	322.5	827
WKBY	Danville, Pa. (portable), 347 Mill St.	Fernwood Quick.	50	250	1,303
WKDZ	Ludington, Mich., First National Bank Building.	Karl L. Ashbecker.	15	269.3	1,170
WKDR	Kenosha, Wis. (656 North Michigan Ave., Chicago, Ill.).	Edward A. Dato.	5	498.3	700
WKJC	Lancaster, Pa., 16 West King St.	Kirk Johnson & Co.	50	224.5	1,160
WKRC	Cincinnati, Ohio, 507 East Pearl St.	Kodak Radio Corporation.	1,000	225.9	920
WKY	Oklahoma, Okla., 1911 West Ash St.	E. O. Hull and H. S. Richards.	100	222.3	710
WLAC	Nashville, Tenn.	Life and Casualty Insurance Co.	150	225.4	1,330
WLAL	Tulsa, Okla.	First Christian Church.	100	249.9	1,200
WLAP	Louisville, Ky., 2900 Virginia Ave.	Virginia Avenue Baptist Church	20	275.1	1,090
WLR	Minneapolis, Minn.	University of Minnesota.	500	277.6	1,080
WLBA	Philadelphia, Pa., 1533 Pine St.	Philadelphia School of Wireless Telegraphy (J. C. Van Horn).	50	235.1	1,270
WLBC	Muncie, Ind., 224 South Jefferson St.	D. A. Burton.	50	221.7	1,340
WLBE	Brooklyn, N. Y., 2029 Sixty-fifth St.	J. Henri Fruitman.	15	230.6	1,300
WLBF	Kansas City, Mo., 300-a East Thirty-third St.	Everett L. Dillard.	25	211.1	1,420
WLBG	Petersburg, Va., 125-a North Sycamore St.	R. A. Gamble.	100	322.3	902.2
WLBH	Farmingdale, N. Y. (portable).	Joseph J. Lombardi.	30	230	1,304
WLBI	East Wagona, Ill., 314 Elm St.	Aloysius Yara.	250	261.9	1,010
WLBJ	Cleveland, Ohio.	Henry Grossman.	100	300	1,000
WLBL	Stevens Point, Wis.	Wisconsin Department of Markets.	750	277.6	1,080
WLBN	Chicago, Ill. (portable), 339 South	William E. Hjer.	5	225.4	1,330

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Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
WLBO	Galesburg, Ill., 526 Monmouth Boulevard.	Frederick A. Trebbe, jr.	100	243	1,234
WLBP	Ashtland, Ohio, 25 College Ave.	Robert A. Fox	15	220.4	1,380
WLBO	Atwood, Ill.	E. Dale Trout	25	230.6	1,300
WLBR	Belvidere, Ill.	Alford Radio Co. (W. A. Wallingford and George H. Allison)	15	335	895
WLBT	Crown Point, Ind., 317 East North St.	Harold Wendell	100	230	1,304
WLBU	Canastota, N. Y.	Matthew B. Greiner	5	220	1,368
WLBV	Mansfield, Ohio, 122 Park Ave., East.	John F. Welmer and D. A. Snick	50	230.6	1,300
WLBW	Oil City, Pa., 1 Sycamore St.	Petroleum Telephone Co.	250	321	954
WLBX	Long Island City, N. Y., 253 Crescent St.	John N. Braby	250	230.6	1,300
WLBZ	Iron Mountain, Mich., 1206 Carpenter St.	Almons Electric	50	249.9	1,200
WLBZ	Dover, Me. (Fovercroft)	Thompson L. Guernsey	250	299	1,003
WLCI	Ithaca, N. Y.	Lutheran Association of Ithaca, N. Y.	.50	265	1,127
WLIB	Egira, Ill. (near)	Liberty Weekly	(0)	302.8	960
WLIT	Philadelphia, Pa.	Lit Bros	500	394.5	763
WLS	Crete, Ill.	Sears, Roebuck & Co.	5,000	344.5	870
WLSI	Cranston, R. I. (335 Westminster St., Providence, R. I.)	Lincoln Studios (Inc.)	200	440.9	690
WLTS	Chicago, Ill.	Lake Technical High School	100	253.5	1,100
WLW	Harrison, Ohio	Crosley Radio Corporation	5,000	422.3	710
WLWL	New York, N. Y., 415 West Fifty-ninth St.	Missionary Society of St. Paul the Apostle	5,000	354.4	780
WMAA	Cazenovia, N. Y.	Clive B. Meredith	500	275.1	1,080
WMAF	Dartmouth, Mass.	Round Hills Radio Corporation	1,000	442.9	680
WMAF	Lockport, N. Y.	Norton Laboratories	1,000	325.3	1,150
WMAZ	Washington, D. C., 712 Eleventh St.	M. A. Loebe Co.	100	293.9	1,020
WMAN	Columbus, Ohio	First Baptist Church (W. E. Heskett)	50	277.5	1,060
WMAQ	Chicago, Ill.	Chicago Daily News Co.	1,000	447.5	670
WMAZ	St. Louis, Mo.	Kingshighway Presbyterian Church	100	247.8	1,210
WMAZ	Macon, Ga.	Mercer University	500	260.7	1,100
WMBA	Newport, R. I. (portable), 13 Robinson St.	Le Roy J. Beebe	100	249.9	1,200
WMBB	Chicago, Ill., 6201 Cottage Grove	American Bond & Mortgage Co.	500	249.9	1,200
WMBB	Detroit, Mich., Hotel Savoy	Michigan Broadcasting Co. (Inc.)	100	260.3	1,173
WMBF	Miami Beach, Fla.	Fleetwood Hotel Corporation	500	384.4	780
WMBI	Chicago, Ill.	Moody Bible Institute of Chicago	500	281.3	1,040
WMBS	Harrisburg, Pa., 60 South Cameron St.	Mecca Battery Service	500	360	823.8
WMC	Memphis, Tenn.	Commercial Appeal	1,000	492.7	600
WMCA	Hoboken, N. J.	Hotel McAlpin (Greerley Square Hotel Co.)	500	340.7	880
WMHA	New York, N. Y., 975 St. Nicholas Ave.	Young Men's Hebrew Association of Washington Heights and Boy Scout Troop 707	30	230	1,304
WMPC	Lapeer, Mich.	First Methodist Protestant Church	20	222	1,351
WMRJ	Jamaica, N. Y., 10 New York Ave.	Peter J. Prinz	10	227.1	1,320
WMSG	New York, N. Y., 319 West Forty-ninth St.	Madison Square Garden Broadcast Corporation	500	302.8	960
WMVM	Newark, N. J., 126 First St.	Edward J. Malone, jr.	500	475.9	630
WNAB	Boston, Mass.	Shepard Sterns	100	280.2	1,070
WNAC	Do.	do.	500	430.1	697.1
WNAD	Norman, Okla.	University of Oklahoma	500	254.1	1,180
WNAL	Omaha, Nebr., 5019 Capitol Ave.	R. J. Brockwell	500	254.5	1,162
WNAT	Philadelphia, Pa., 827 Spring Garden	Lennig Radio Co.	100	249.9	1,200
WNAX	Yankton, S. Dak.	Dakota Radio Apparatus Co.	100	243.8	1,220
WNBI	New Bedford, Mass.	Irving J. Vermilya and A. J. Lopez (New Bedford Hotel)	250	247.5	1,210
WNJ	Newark, N. J., 89 Lehigh Ave.	Herman Lubinsky	500	350	850.0
WNOX	Knoxville, Tenn., 313 Commerce Ave.	Peoples Telephone & Telegraph Co.	5,000	267.7	1,120
WNRC	Greensboro, N. C., 7 West Fourth St.	Wayne M. Nelson	10	221.7	1,340
WNYO	New York, N. Y.	City of New York, Department of Plant and Structures	1,000	325	570

## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo-cycles)
WOAI	San Antonio, Tex., Romana and Oakland Sts.	Southern Equipment Co.	5,000	394.5	760
WOAN	Lawrenceburg, Tenn.	James D. Vaughn	500	354.4	841.2
WOAX	Trenton, N. J., 600 Ingham Ave.	Franklyn J. Wolf	500	230.9	1,250
WOBB	Chicago, Ill., 127 North Dearborn St.	Longacre Engineering and Construction Co.	5	553.2	540
WOC	Davenport, Iowa, 1002 Brady St.	Palmer School of Chiropractic	5,000	453.8	620
WOCB	Orlando, Fla., 19 South Main St.	Orlando Broadcasting Co.	50	267.7	1,021
WOCL	Jamestown, N. Y.	A. E. Newton	25	273.1	1,090
WODA	Peterson, N. J., 115 Edison St.	O'Dea Temple of Music (Richard E. O'Dea)	1,000	390.9	767
WOI	Ames, Iowa	Iowa State College	750	270.1	1,110
WOK	Hornewood, Ill.	Neutrowand Radio Manufacturing Co.	5,000	217.3	1,380
WOKO	Peekskill, N. Y.	Harold E. Smith	50	232.4	1,290
WOKT	Rochester, N. Y., 710 Terminal Building	Titus-Rts Corporation	1,000	340	891.6
WOMT	Mantowoc, Wis.	Mikadow Theatre (Francis M. Kadow)	50	254.1	1,180
WOO	Philadelphia, Pa.	John Wanamaker	500	508.2	590
WOOD	Grand Rapids, Mich., 241 Diamond Ave. SE.	Grand Rapids Radio Co.	500	241.5	1,240
WOQ	Kansas City, Mo.	Unity School of Christianity	1,000	277.6	1,080
WOR	Newark, N. J.	L. Bamberger & Co.	500	405.2	740
WORD	Batavia, Ill.	Peoples Pulpit Association	5,000	273.1	1,090
WOS	Jefferson City, Mo.	Miscouri State Marketing Bureau	500	440.9	680
WOW	Omaha, Nebr.	Woodmen of the World	1,000	526	570
WOWO	Fort Wayne, Ind., 215 West Main St.	Main Auto Supply Co.	1,000	227.1	1,320
WPAB	Norfolk, Va., 305 Plums St.	Radio Corporation of Virginia	100	319	940
WPAK	Fargo, N. Dak.	North Dakota Agricultural College	50	273.1	1,090
WPAF	Cliffside, N. J.	Palisades Amusement Park	500	361.2	830
WPCO	Chicago, Ill.	North Shore Congregational Church	500	258.5	1,160
WPOH	New York, N. Y., Park Central Hotel	Concourse Radio Corporation	1,000	272.6	1,100
WPDQ	Buffalo, N. Y., 3163 Bailey Ave.	Hiram L. Turner	250	203.4	1,460
WPEP	Waukegan, Ill., 1432 North Ave.	Maurice Mayer	500	212.6	1,410
WPG	Atlantic City, N. J.	Municipality of Atlantic City	5,000	292.8	1,090
WPRC	Harrisburg, Pa., Fifth and Keizer Sts.	Wilson Printing & Radio Co.	100	218.7	1,390
WPSC	State College, Pa.	Pennsylvania State College	500	260.7	1,150
WQAA	Parkesburg, Pa.	Horace A. Beale, jr.	500	231.4	1,350
WQAE	Springfield, Vt.	Moore Radio News Station (Edmund B. Moore)	50	245.8	1,220
WQAM	Miami, Fla., 42 Northwest Fourth St.	Electrical Equipment Co. of Florida	750	285.5	1,050
WQAN	Scranton, Pa.	Scranton Times	100	249.9	1,200
WQAO	Cliffside, N. J.	Calvary Baptist Church	500	361.2	830
WQJ	Chicago, Ill., Rainbo Gardens	Calumet Rainbo Broadcasting Co.	500	447.5	670
WRAF	Laporte, Ind., 710 Michigan Ave.	The Radio Club (Inc.)	100	223.7	1,340
WRAH	Providence, R. I., 191 Alabama Ave.	Stanley N. Read	450	235	1,270
WRAK	Escanaba, Mich., 1105 Ludington St.	Economy Light Co.	100	256.3	1,170
WRAM	Galesburg, Ill.	Lambard College	100	243.8	1,230
WRAV	Yellow Springs, Ohio	Antloch College	100	263	1,140
WRAW	Reading, Pa., 460 Schuylkill Ave.	Avenue Radio & Electric Shop (Horace D. Good)	10	238	1,290
WRAX	Philadelphia, Pa., 1608 Alleghany Ave.	Berachab Church (Inc.)	500	267.7	1,120
WRBC	Valparaiso, Ind.	Immanuel Lutheran Church	500	277.6	1,080
WRC	Washington, D. C., 3308 Fourteenth St. N.W.	Radio Corporation of America	1,000	468.5	640
WRCO	Raleigh, N. C., 8 West Hargett St.	Wynns Radio Co.	100	252	1,190
WREC	Coldwater, Miss.	Wooten's Radio & Electric Co.	10	234.1	1,160
WREO	Lansing, Mich.	Reo Motor Car Co.	500	285.5	1,050
WRES	Wollaston, Mass., 335-a Newport Ave.	Larry L. Sawyer	100	300	999.4
WRHF	Washington, D. C., Colorado Building	Washington Radio Hospital Fund	50	250.3	1,170
WRHM	Minneapolis, Minn.	Rosedale Hospital	50	252	1,190
WRK	Hamilton, Ohio, 329 North C St.	Doron Bros. Electric Co.	100	270.1	1,110
WRM	Urbana, Ill.	University of Illinois	1,000	272.6	1,100
WRMU	MU-1 (yacht) (Richmond Hill, N. Y.)	A. H. Grube & Co.	100	236.1	1,270

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## Broadcasting stations, alphabetically by call signals—Continued

Call signal	Location of station	Owner of station	Power (watts)	Wave length	Frequency (kilo cycles)
WRRS	Racine, Wis., Arcade Building...	Racine Radio Station	10	360	832.8
WRSC	Chelsea, Mass., 56 Washington Ave.	The Radio Shop (William S. Pote)	15	270.1	1,110
WRST	Bay Shore, N. Y., 5 First Ave.	Radotel Manufacturing Co.	500	215.7	1,380
WRVA	Richmond, Va., Twenty-second and Cary Sts.	Larrin & Bro. Co.	1,000	256.3	1,170
WSEI	Mason, Ohio (Cincinnati, Ohio)	United States Playing Card Co.	5,000	325.9	920
WSEJ	Grove City, Pa.	Grove City College	250	228.9	1,310
WSEAN	Allentown, Pa.	Allentown Call Publishing Co.	100	228.9	1,310
WSEAR	Fall River, Mass., 45 North Main St.	Doughty & Welch Electrical Co.	100	322	931.1
WSAX	Chicago, Ill., 3620 Iron St.	Zenith Radio Corporation	100	267.7	1,120
WBAZ	Pomeroy, Ohio	Chase Electric Shop (Glenn E. Chase)	50	241.8	1,250
WBB	Atlanta, Ga.	Atlanta Journal	1,000	428.8	700
WBBG	Chicago, Ill., 1219 South Wabash Ave.	World Battery Co.	2,000	288.3	1,040
WBBF	St. Louis, Mo.	Stitz, Beer & Fuller	250	272.6	1,100
WBBT	South Bend, Ind.	South Bend Tribune	500	315.6	950
WBSDA	New York, N. Y., 122 West Seventy-sixth St.	The City Temple (Seventh Day Adventist Church)	250	263	1,140
WBJC	Bay City, Mich.	World's Star Knitting Co.	500	290.7	1,150
WBSM	Nashville, Tenn.	National Life & Accident Insurance Co.	1,000	282.8	1,060
WSMB	New Orleans, La., Maison Blanche Building	Saenger Amusement Co. & Maison Blanche Co.	500	319	980
WBMH	Owosso, Mich., 237 Washington St.	Stattuck Music House	20	299.9	1,250
WSMK	Dayton, Ohio, Ludlow and West Third Sts.	S. M. K. Radio Corporation (Stanley M. Krohn, Jr.)	500	275.1	1,090
WBOE	Milwaukee, Wis., 467 Jackson St.	School of Engineering of Milwaukee	1,000	343.8	1,220
WSOM	Woodhaven, N. Y., 604 Seventy-eighth St.	Union Course Laboratories	500	288.3	1,040
WBRO	Hamilton, Ohio, 421 High St.	Radio Company (Harry W. Fahrlander)	100	252	1,190
WSSH	Boston, Mass.	Tramont Temple Baptist Church	100	262.7	1,160
WSUI	Iowa City, Iowa	State University of Iowa	500	483.6	620
WBSV	Buffalo, N. Y., 666 E. Delavan Ave.	Seneca Vocational School (City of Buffalo)	50	218.8	1,370
WBWS	BATAVIA, Ill. (Strauss Building, Chicago, Ill.)	Richmond Harris & Co. (Illinois Broadcasting Corporation)	1,000	278.1	1,090
WFYR	Syracuse, N. Y., Hotel Syracuse	Clive B. Meredith	500	362.7	850
WTAD	Quincy, Ill.	Illinois Stock Medicine Broadcasting Corporation	500	236.1	1,270
WTAG	Worcester, Mass.	Worcester Telegram Publishing Co.	500	548.1	550
WTAL	Toledo, Ohio, Hotel Waldorf	Toledo Broadcasting Co.	100	252	1,190
WTAM	Cleveland, Ohio	Willard Storage Battery Co.	3,500	382.4	770
WTANQ	Fau Claire, Wis.	C. B. Van Garden	100	254.1	1,180
WTAH	Norfolk, Va., 819 West Twenty-first St.	Reliance Electric Co.	100	269.7	1,150
WTAW	College Station, Tex.	Agricultural and Mechanical College of Texas	500	270.1	1,110
WTAX	Streator, Ill., 115 South Vermillion St.	Williams Hardware Co.	50	230.6	1,300
WTAZ	Lambertville, N. J., 48 North Main St.	Thomas J. McGuire	15	260.7	1,160
WTHO	Ferndale, Mich., 187 East Woodland Ave.	W. J. Thomas Radio Co.	750	407	736.7
WTIC	Hartford, Conn.	Travelers Insurance Co.	500	472.9	630
WTRC	Brooklyn, N. Y., 62 Woodbine St.	Twentieth Assembly District Regular Republican Club (Inc.)	50	238.9	1,250
WTRL	Midland Park, N. J., 28 Sicomac Ave.	Technical Radio Laboratory (H. C. Hogenkamp)	15	282.2	1,070
WWAE	Plainfield, Ill.	Lawrence J. Crowley	(0)	284.4	780
WWJ	Detroit, Mich.	Detroit News	1,000	352.7	850
WWL	New Orleans, La.	Loyola University	100	275.1	1,060
WWNC	Asheville, N. C.	Chamber of Commerce	20	234.1	1,180
WWPR	Detroit, Mich.	Detroit Police Department	500	300	992.4
WWRL	Woodside, N. Y., 4130 Fifty-eighth St.	Woodside Radio Laboratories (W. J. Reuman)	100	268.8	1,160
WWVA	Wheeling, W. Va., National Road	John C. Strobel, Jr.	100	394.0	800

## CHARACTERISTIC OF SOUTH PASS JETTY (LA.) RADIO BEACON CHANGED

The characteristic of this beacon has been changed to groups of 2 dashes for 60 seconds, silent 120 seconds, thus:

— — — — etc.	Silent
60 seconds	120 seconds

## CHANGE IN LOCATION OF NAVAL STATION AT EMPIRE, OREG.

The following changes should be made in the annual list of Commercial and Government Radio Stations, edition June 30, 1926: page 115, change Empire, Oreg., lat. 42-23-03 to read Empire, Oreg., lat. 43-23-03. On page 116, radio transmitter table, under "Pacific Coast," insert, Empire, Oreg.; MPF; lat. 43-22-54.96 N., long. 124-18-29.30 W.; C. W. & I. C. W.

## CHANGES IN FOREIGN STATIONS

*Sweden.*—The Karlsborg station now transmits weather bulletins for shipping on 4,200 meters, c. w., in lieu of 2,200 meters.

*Germany.*—Vessels when in the Weser above Weser Light Vessel and in the Jade above Minsener Sand or when proceeding from and to the Weser or Jade, east of the meridian of Norderney, outside the Elbe, should use the Bremerhaven station for communication. Vessels when in the Elbe above Elbe No. 1 Light Vessel and in the Kiel Canal west of Rendsburg or when proceeding from and to the Elbe, east of the meridian of Norderney, outside the Jade and Weser, should use the Cuxhaven station for communication.

## NORDERNEY LIGHT VESSEL (GERMANY) FOG SIGNAL CHANGED

*Radio fog signal.*—This signal consists of the letters NNNN (— — — — —), the transmitting time being 8 seconds. This is followed by a silent interval of 1.253 seconds, after which 15 dashes are sent, each of one second's duration. The silent interval between the dashes is 0.253 second. After the last dash there is a silent interval of 2.205 seconds. The period of the complete signal is 30 seconds. The complete signal is given seven times in 3.5 minutes, after which there is a silent interval of 4 minutes; total period for the group of seven signals, 7.5 minutes. This group of seven signals is given six times every hour from 18 m. 45 s. to 59 m. 45 s. The wave length is 940 meters.

*Submarine fog signal.*—This signal is sounded on a submarine oscillator and consists of the letters NN (— — —); transmitting time 9 seconds, silent 21 seconds, period 30 seconds. The submarine fog signal is sounded from 59 m. 45 s. to 18 m. 45 s. during the silent interval of the radio fog signal.

*Air fog signal.*—This signal is sounded on a nautophone and consists of the letters NN (— — —), thus: blast 2 seconds, silent 1 second, blast 1 second, silent 1 second, blast 2 seconds, silent 1 second, blast 1 second, silent 21 seconds, period 30 seconds. The air fog signal commences 1 second after the final sound of the submarine fog signal. If the nautophone is disabled, a group of three blasts will be sounded on a steam foghorn every minute, blast 2.5 seconds, silent 4.5 seconds, blast 2.5 seconds, silent 4.5 seconds, blast 2.5 seconds, silent 43.5 seconds.

The radio fog signal and the submarine fog signal may be used to determine the distance of a vessel from the light vessel. The number of dashes of the radio fog signal received before receiving the first sound of the submarine fog signal indicates the distance in nautical miles from the light vessel.

Approximate position, lat. 53° 50' N., long. 7° 14' E.—*Nachrichten für Seefahrer 47 (5188), Berlin, November 6, 1926.*

## PUBLIC RESOLUTION—NO. 47—69TH CONGRESS

[S. J. Res. 125]

Joint resolution, limiting the time for which licenses for radio transmission may be granted, and for other purposes

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That until otherwise provided by law, no original license for the operation of any radio broadcasting station and no renewal of a license of an existing broadcasting station, shall be granted for longer periods than

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ninety days and no original license for the operation of any other class of radio station and no renewal of the license for an existing station of any other class than a broadcasting station, shall be granted for longer periods than two years; and that no original radio license or the renewal of an existing license shall be granted after the date of the passage of this resolution, unless the applicant therefor shall execute in writing a waiver of any right or of any claim to any right, as against the United States, to any wave length or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof.

Approved, December 8, 1926.

## New wave lengths of European broadcasting stations

Meters	Station	Power (watts)	Meters	Station	Power (watts)
4,000	Berlin (Königs-Wusterhausen)	10,000	375	Madrid, EAJ7	4,000
2,600	AFF		378.4	Oslo, Norway	1,500
2,620	Paris (Eiffel Tower) FL	5,000	368	Tampere, Finland	
2,400	Lyngby, Denmark	500	365.5	Graz, Austria	500
2,424	Amsterdam, PCFF	2,000	361.4	London, England, 1LO	1,000
2,000	Kovno, Lithuania		357.1	Lepzig, Germany	2,000
1,800	Narddeleb, Germany		353	Cardiff, Wales, SWA	1,500
1,770	Paris, CPH	3,000	350	Paris, France, LL	250
1,600	Daventry, 5XX	23,000	348.9	Prague, Czechoslovakia	5,000
1,500	Riga, Latvia	2,000	344.8	Seville, EAJ3	1,000
1,325	Karlberg, Sweden	5,000	340.9	Paris, France (Petit Parisien)	500
1,300	Berlin (Königs-Wusterhausen)	10,000	337	Copenhagen, Denmark	2,000
	AFT		333.3	Reykjavik, Iceland	500
1,200	Boden, Sweden, SASE	1,500	330	Bordeaux, France	200
1,150	Ryvang, Denmark	500	328.7	Nuremberg, Germany	700
1,150	Sora, Denmark	1,500	325.1	Belfast, Ireland, 2BE	1,500
1,110	Kbely, Czechoslovakia	1,000	322.6	Breslau, Germany	1,000
1,100	De Bilt, Holland		318.1	Dublin, Germany, 2RN	1,500
1,050	Hilversum, Holland, HDO	5,000	315.5	Milan, Italy, IMI	1,500
1,000	Basel, Switzerland	1,500	315	Uppsala, Sweden	250
850	Lauterne, Switzerland, HB2	1,500	312.5	Newcastle, England, 5NO	1,000
760	Geneva, Switzerland	1,500	309.3	Marseilles, France, PTT	500
720	Ostersund, Sweden	1,000	306.1	Bournemouth, England, 6BM	1,500
577	Vienna, Austria (Radio-Wien)	1,500	303	Casablanca, Morocco	600
577	Madrid (Radio Iberica), EAJ6	1,000	303	Königsberg, Germany	1,000
560	Berlin (Magdeburger Platz)	2,000	300	Bratislava, Czechoslovakia	500
560	Burgos, Spain, EAJ2	1,000	297	Cartagena, Spain, EAJ14	1,000
560	Bloemendaal, Holland	40	297	Leeds, England, 2LS	200
565.6	Budapest, Hungary	2,000	297	Hanover, Germany	1,500
545.6	Bundevall, Sweden, SARD	500	297	Varberg, Sweden	
535.7	Munich, Germany	1,500	297	Jyväskylä, Finland	500
528.3	Riga, Latvia	2,500	297	Agde, France	250
517.2	Rosenburg, Austria	5,000	294.1	Lige, Belgium	
508.5	Brussels, Belgium	1,500	294.1	Dresden, Germany	1,500
500	Helsingfors, Finland	1,000	294.1	Bradford, England, 2BS	200
500	Lindköping, Sweden	200	294.1	Bilbao, Spain, EAJ11	2,000
500	Barcelona, Spain, EAJ13	1,000	294.1	Uddevalla, Sweden	
500	Zurich, Switzerland	1,000	294.1	Lyons, France	500
491.8	Aberdeen, England, 2RD	1,500	288.5	Hull, England, 6KH	200
491.8	Birmingham, England, 5IT	1,500	288.5	Liverpool, 6LV	200
483.9	Berlin, Germany (Witzleben)	4,000	288.5	Plymouth, England, 6PY	200
476.2	Lyons, France (La Doua)	1,000	288.5	Stoke, England, 6ST	200
468.5	Elberfeld, Germany	1,500	288.5	Swansea, Wales, 6SX	200
461.5	Bergen, Norway	1,500	288.5	Edinburgh, Scotland, 2EH	200
454.5	Stockholm, Sweden, SASA	1,500	288.5	Nottingham, England, 5NO	2,000
447.8	Paris, PPTT	450	288.5	Dundee, Scotland, 2DE	200
445	Rjukan, Norway	50	288.5	Sheffield, England, 6VL	200
441.2	Brinn, Czechoslovakia	2,400	288	Dortmund, Germany	1,500
434.8	Bilbao, Spain, EAJ9	1,600	284.4	Barcelona, Spain, EAJ1	1,000
434	Porsgrund, Norway	700	277.8	Seville, Spain, EAJ17	1,000
428.6	Frankfurt, Germany	10,000	277.8	Caen, France	500
422.6	Rome, Italy (IRO)	3,000	277.8	Trollhättan, Sweden, 5MXQ	120
416.7	Goteborg, Sweden, SASH	1,000	275.2	Zagreb, Yugoslavia	150
411	Berne, Switzerland	1,200	275.2	Madrid, Spain, EAJ4	3,000
405.4	Glasgow, Scotland (SBC)	1,500	275.2	Norrköping, Sweden, 5MVV	250
400	Brno, Germany	1,500	275.2	Angers, France	500
400	Cadix, Spain, EAJ5	550	272.7	Cassel, Germany	1,500
400	Falun, Sweden, 5MLZK	1,500	272.7	San Sebastian, Spain, EAJ6	2,000
400	Koee, Czechoslovakia	2,000	272.7	Dantzig, Germany	1,500
400	Mont de Marzan, France	300	265.5	Antwerp, Belgium	500
400	Warsaw, Poland	1,500	260.9	Malmö, Sweden, SASC	500
394.7	Hamburg, Germany	10,000	254.2	Malaga, Spain, EAJ25	1,000
389.6	Toulon, France (Radio des Alpes)	2,000	254.2	Kalmar, Sweden, 5MEN	250
			254.7	Hiel, Germany	1,500
384.6	Manchester, England, 2ZY	1,500	252.1	Montpellier, France	1,000
373.7	Stuttgart, Germany	1,500	252.1	Stettin, Germany	450

## New wave lengths of European broadcasting stations—Continued

Meters	Station	Power (watts)	Meters	Station	Power (watts)
222.1	Saffle, Sweden, SMTR.....	500	222.2	Strasbourg.....	100
250	Eskilstuna, Sweden.....	250	221	Karlstadt, Sweden.....	250
250	Gletzlitz, Germany.....	1,500	219	Kovno, Lithuania.....	
245	Toulouse, France, PTT.....	2,000	218	Orhro, Sweden.....	
243.9	Tromsø, Norway.....		217.4	Luxembourg, Luxembourg.....	250
241.9	Moenster, Germany.....	3,000	204.1	Gavle, Sweden, SMXF.....	250
240	Helsingfors, Finland.....	7,000	204.1	Salamanca, Spain, EAJZ.....	500
238.1	Bordeaux, France (relays Paris, PTT).....	500	202.7	Kristinehamn, Sweden, SMTY.....	100
233	Uleaborg, Finland.....	300	201.3	Jonkoping, Sweden, SNZD.....	500
229	Umea, Sweden.....		196	Karlskrona, Sweden, BMEM.....	250
225.6	Belgrade, Serbia.....	3,000	95	Beziers, France.....	100

### 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. Faraday 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.

Doctor 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 by the discharge of a conductor.



**1885.** Edison, assisted by Gillaud, 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.

Preece 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 signalling devices are based.

Heaviside established communication by telephonic speech between the surface of the earth and the subterranean galleries of the Broomhill Collieries, 350 feet deep, by laying above and below ground two complete metallic circuits, each about  $2\frac{1}{4}$  miles in length, and parallel to each other.

**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 signaled 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  $1\frac{1}{4}$  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 aeriels.

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 Brest.

July: During the naval maneuvers 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 80 miles.

November 2: The first wireless land station in Belgium was finished at Lapanne. Between 1900 and 1905 Doctor 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 telegraphed to Ostend by wireless.

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 aeriols 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 14-16: 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 dispatched 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

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 Masalda* received messages from Clifden at a distance of 4,000 miles by day and 6,735 miles by night. On April 23 the Marconi trans-Atlantic (Europe-America) service was opened.

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 States 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, lightships, 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 electromagnetic 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 Rail-

The station at Macquerie Island was the means of keeping Doctor Mauson, the Australian explorer, in touch with the outer world. Radio dispatches 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 18½ 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 Phillips, 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, Belman, Honolulu, and San Francisco during the autumn of 1914. The Honolulu-San Francisco stations were opened to public service September 24. The Tucker-Elvase and Sayville-Nauen stations were in operation about this time.

Most of these stations made use of the latest developments in the art, using undamped and long waves as produced by the Poulsen arc and the radiofrequency alternator.

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 Tokyo, 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 particu-

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 trans-Atlantic 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.

On June 30, 1919, there were 2,312 ship stations of the United States, having increased from 1,478 on June 30, 1918. At this time new ship stations were 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, Argentina, call letters LPZ.

Amateur radio work in this and other countries progressed steadily during the year with the gradual removal of war-time 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 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 license for broadcasting stations was issued in September of this year.

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

First Annual Radio Conference held in Washington, D. C., February 27.

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 superregenerative circuit.

Experiments in radiotelephony 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. Hazeltine, of Stevens Institute of Technology, presented a paper before the Radio Club of America on tuned radio-frequency amplification with neutralization of capacity coupling. Professor Hazeltine was granted a patent for the nonradiating neutrodyne receiver.

On March 4 the Cleveland, Ohio (KDPM), station of the Westinghouse Electric & Manufacturing Co. successfully repeated short waves from the East Pittsburgh, Pa. (KDKA), station for the first time in history.

Second Annual Radio Conference held in Washington, D. C., March 20.

The Marconi Co. made a tender, which was accepted, for the erection of a transmitting station in Australia of a power of 1,000 kilowatts with 20 steel masts, 800 feet high. Corresponding stations were to be provided in England and Canada. The receiving arrangements would permit simultaneous reception from five stations.

The construction of a large radio station in a valley between the Herzogstand and the Stein, two of the foothills in the Bavarian Alps, was undertaken. The aerial will be suspended by wire cables stretched between the tops of the two hills, the aerial wires being suspended from these cables.

The increase in traffic on some of the large liners of the Atlantic route led to the installation of apparatus for high-speed automatic transmission and reception on several lines.

Successful tests on wireless-controlled airplanes were carried out at the Etampes Aerodrome in France. Flights were made without a pilot. Flights were also made with a pilot using a gyroscopic stabilizer and special steering motors which could be controlled from the ground.

The International Commission for Aerial Navigation agreed, as a general principle, that all aircraft engaged in public transport must carry radio apparatus.

The General Electric Co. developed a tube capable of delivering 20 kilowatts of high-frequency energy to an aerial. Using six of these tubes in parallel with 15,000 volts on the anode, a current of 310 amperes in an Alexanderson multiple tuned aerial was obtained. A tube of the magnetron type was developed by the same company, capable of giving 1,000 kilowatts at 20,000 cycles with an efficiency of 70 per cent.

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, *Bowdoin*, 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 the United States heard in England. British stations also heard in the United States.

On December 31 East Pittsburgh, Pa. (KDKA), transmitted a program to Great Britain on a short wave.

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

The high-power station at Monte-Grande, Argentina, was opened in January for direct communication with New York, Paris, and Berlin. The service will be extended to Great Britain when a corresponding transmitting station is available. The power of the station is 800 kilowatts, the aerial being carried on 10 masts, each 690 feet high. The receiving station is at Villa Eliza, 30 kilometers from Buenos Aires, the actual control being effected from a central office in Buenos Aires.

On February 5 a radio program broadcasted in the United States from the East Pittsburgh, Pa. (KDKA), station of the Westinghouse Electric & Manu-

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

In July an agreement was concluded between the British Government and the Marconi Wireless Telegraph Co. (Ltd.) for the construction of a wireless station on the beam system, capable of communicating with Canada and of being extended to India, South Africa, and Australia, the transmitting station to have an input of at least 20 kilowatts and the receiving station to have an aerial designed to focus the received waves within an angle of 30°.

The short-wave direction system of radiotelegraphy and the results obtained in tests made on it were described in a lecture before the Royal Society of Arts, in July, by Senatore Marconi.

During the period from August 5 to September 24 the East Pittsburgh, Pa. (KDKA), station maintained communication with the ship *Arctic* while on its expedition to the Arctic regions. Upon the ship's return it was reported that messages sent on short waves by the East Pittsburgh station were received at Cape Sabine within 11° of the North Pole. This is the farthest north radio messages have been received.

On October 11 signals from the East Pittsburgh station were successfully repeated from a station in Cape Town, Africa.

Third National Radio Conference held in Washington, D. C., October 6.

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 sciences in general, will have radio as their only means of communication.

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.

1925. Considerable progress was made during 1925 in working with short waves. Several transoceanic stations are working foreign stations at great distances on wave lengths varying from 22 to 103 meters.

In an experiment between the Hastings (Nebr.) station and the East Pittsburgh (Pa.) station the Westinghouse Electric & Manufacturing Co. demonstrated that a 64-meter wave could be picked up, and by placing it on a short transmission line to the transmitting station, increasing the strength of the signals to their original power or greater, if necessary, the amplified wave could be transmitted onward. This experiment shows that repeater stations can be constructed in different parts of the world and be fairly certain of transmitting a strong signal.

A number of short-wave transmissions were made by East Pittsburgh (KDKA) transmitting to South Africa and Australia.

Amateur operators by their interest have made considerable achievements in the development of short waves.

During July programs were broadcast to the American naval fleet in Australian waters.

Radiocompass (direction finder) came into greater use on board vessels. Over 100 American vessels are equipped.

The Lighthouse Service, Department of Commerce, established several new radio fog signal stations on all coasts of the United States.

The practical use of the telephone and radio for the transmission of photographs was more clearly demonstrated during the year.

As a means of eliminating interference, the transmitters of high-powered broadcasting stations were moved to the outlying districts of several large cities, the studios remaining in the cities.

Broadcasting programs from airplanes was done in a few instances.

The General Electric Co., the Radio Corporation of America, and the Westinghouse Electric & Manufacturing Co. conducted experiments in broadcasting, using as high as 50 kilowatts.

The Department of Commerce placed in commission a "radio test car" which is equipped with an assortment of radio instruments used in conducting tests and investigations.

The Fourth National Radio Conference was held in Washington, D. C., November 9, 1925.

The Radio Corporation of America began the operation of a high-powered broadcasting station at Round Brook, N. J., for transmission of programs to

One of the large electrical companies conducted experiments to determine the characteristics and peculiarities inherent in the piezo crystals. Several stations are now using this quartz crystal to maintain a constant frequency which eliminates to a great extent the "beat notes" resulting from two stations heterodyning at an audio-frequency. The radio-inspection service of this department has been supplied with these crystals to insure accuracy in frequency or wave-length measurements.

1926. During this year directional or beam transmission developed to a point where it may now be considered as practical for commercial usage.

The use of quartz plates for maintaining constant frequency or radio transmitters advanced considerably during the year.

Successful radiotelephone experiments were conducted between New York and London. This service will be used commercially in the near future.

With the development of transmitting pictures by radio it is now practical to transmit weather maps to vessels at sea.

Considerable progress was made in the perfection of receiving sets. The single-dial receiver came into greater use for reception of programs from broadcasting stations.

A committee representing the departments of the United States Government directly concerned studied our radio problems and prepared proposals for consideration by the International Radiotelegraph Conference which is contemplated being held in Washington during 1927.

Commercial pictoradiogram services are now in operation between New York and London and between San Francisco and Hawaii.

The use of the radiocompass (direction finder) on shipboard increased materially. At the close of the year about 300 merchant vessels of this country were so equipped. A very large number of naval vessels are also equipped with this apparatus.

On July 8 the Attorney General of the United States rendered a decision to the effect that the Secretary of Commerce has no jurisdiction as to the wave length, with the exception of the band between 600 and 1,600 meters reserved for Government stations, or the power used by commercial stations, including broadcasting stations.

Since July the number of broadcasting stations increased 155, making the total number licensed on December 31, 871. A large number of the stations in this class increased their power and changed their wave lengths during this period.

The joint resolution of Congress approved December 8 requires the applicant for a radio-station license to waive any right or any claims of right against the United States to any wave length or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof.

Radiotelephone was used for the first time in directing the filming of a naval scene, off the coast of California, for a photoplay.

#### STANDARD FREQUENCY STATIONS

As a result of measurements by the Bureau of Standards upon the transmitted waves of a limited number of radio transmitting stations, data are given in each month's RADIO SERVICE BULLETIN on such of these stations as have been found to maintain a sufficiently constant frequency to be useful as standards.

As shown by the list of "constant frequency stations," there may be many other stations not measured in the bureau's laboratory which maintain their frequencies just as constant as the stations listed below. There is, of course, no actual guaranty that these stations will maintain the constancy shown, but the data indicate the high degree of confidence that can be placed in them. The transmitted frequencies from the standard frequency stations can be utilized for calibrating frequency meters and other apparatus by the procedure given in Bureau of Standards Letter Circular No. 171, which may be obtained by a person having actual use for it upon application to the Bureau of Standards, Department of Commerce, Washington, D. C.



## RADIO SERVICE BULLETIN

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Station	Owner	Location	Frequency (kilocycles)	Period covered by measurements (months)	Number of times measured	Deviations from assigned frequencies noted in measurements	
						Average	Greatest since Nov. 25, 1926
NBS	United States Navy	Annapolis, Md.	17.50	7	37	Per cent 0.1	Per cent 0.8
WCI	Radio Corporation of America	Tuckerton, N. J.	17.95	22	99	.1	.1
WSS	Do.	Rocky Point, N. Y.	18.60	3	0	.1	.0
WGG	Do.	Tuckerton, No. 1, N. J.	18.80	40	275	.1	.3
WII	Do.	New Brunswick, N. J.	21.80	20	125	.1	(5)
WVA	United States Army	Annapolis, Md.	100	21	169	.2	.2
NAA	United States Navy	Arlington, Va.	112	14	71	.2	.3
WEAF	National Broadcasting Co.	New York, N. Y.	610	24	147	.0	.0
WRC	Radio Corporation of America	Washington, D. C.	640	35	171	.1	.0
WJZ	Do.	Bound Brook, N. J.	650	7	28	.2	.3
NAA	United States Navy	Arlington, Va.	650	7	33	.0	.1
WGY	General Electric Co.	Schenectady, N. Y.	790	42	187	.1	.0
WBZ	Westinghouse Electric & Manufacturing Co.	Springfield, Mass.	900	30	54	.1	.2
KDKA	Do.	East Pittsburgh, Pa.	970	7	33	.1	.1
KDKA <sup>1</sup>	Do.	do.	4,711	7	21	.1	.0

<sup>1</sup> Not measured since October.<sup>2</sup> High-frequency telephone transmitting station.

## CONSTANT FREQUENCY STATIONS

The list of "constant frequency stations" given below supplements the list of "standard frequency stations." The transmitted waves from the stations in either list should be of value to the public as frequency standards because of their constancy and close adherence to the licensed values. The Bureau of Standards makes regular measurements of the transmitted frequencies of the standard frequency stations only. The constant frequency stations in the following supplementary list do not carry the same assurance of reliability as if the transmitted waves were regularly measured by the Bureau of Standards, but it is probable that if measurement data were available many of them would show the same constancy as the standard frequency stations.

The fundamental requirement of a broadcasting station for inclusion in the following list is the employment of a special device for controlling or checking the frequency, the calibration of such a device being in agreement with the bureau's frequency standards. This special device may be automatic piezo control, a piezo oscillator, piezo resonator, or frequency indicator. Stations not included in this list nor in the list of standard frequency stations, which use one of the special devices for frequency regulation, are invited to communicate with the Bureau of Standards requesting a copy of Letter Circular 214, Requirements of Constant Frequency Stations.

Station	Owner	Location	Frequency (kilocycles)	Wave length (meters)	Apparatus for frequency regulation
WHO	Bankers Life Co.	Des Moines, Iowa	570	525	Piezo oscillator.
KFRTU	Stephens College	Columbia, Mo.	600	497.7	Frequency indicator.
WCO	Palmer School of Chiropractic	Davenport, Iowa	630	483.6	Piezo oscillator.
WTIC	Travelers' Insurance Co.	Hartford, Conn.	630	475.9	Do.
WMAQ	Chicago Daily News	Chicago, Ill.	670	447.5	Frequency indicator, type B.
KLDB	Reorganized Church of Jesus Christ of Latter Day Saints	Independence, Mo.	680	440.9	Frequency indicator.

Station	Owner	Location	Frequency (kilocycles)	Wave length (meters)	Apparatus for frequency regulation
WLW	Crosley Radio Corporation	Harrison, Ohio.....	710	422.3	Frequency indicator and piezo oscillator.
WCCO	Washburn-Crosley Co.....	St. Paul-Minneapolis, Minn.	720	416.4	Piezo oscillator.
WTAM) WEAR) KTHS	Willard Storage Battery Co. New Arlington Hotel Co....	Cleveland, Ohio..... Hot Springs, Ark.....	770 800	389.4 374.8	Do. Frequency indicator type B.
WJJD	Loyal Order of Moose.....	Mooseheart, Ill.....	810	370.2	Piezo oscillator.
WGO	General Electric Co.....	Oakland, Calif.....	830	361.2	Do.
WJAD	Frank P. Jackson.....	Waco, Tex.....	850	352.7	Frequency indicator.
WWJ	Detroit News.....	Detroit, Mich.....	850	352.7	Do.
WLS	Sears, Roebuck & Co.....	Crete, Ill.....	870	344.6	Piezo oscillator.
KFAB	Nebraska Buick Motor Co.	Lincoln, Nebr.....	880	340.7	Frequency indicator, type B.
WKAQ	Radio Corporation of Porto Rico.	San Juan, P. R.....	880	340.7	Do.
KOA	General Electric Co.....	Denver, Colo.....	930	322.4	Piezo oscillator.
WEAO	Ohio State University.....	Columbus, Ohio.....	1,020	293.9	Frequency indicator, type B.
WFBO	Wm. F. Gable Co.....	Altoona, Pa.....	1,060	277.6	Frequency indicator.
KFKA	Colorado State Teachers' College.	Greeley, Colo.....	1,100	272.6	Piezo oscillator.
WBAA	Purdue University.....	W. Lafayette, Ind.....	1,100	272.6	Piezo oscillator.
WOI	Iowa State College.....	Ames, Iowa.....	1,110	270.1	Automatic piezo control (checked with type B frequency indicator).
KFH	Hotel Lassen (Rigby-Gray Hotel Co.).	Wichita, Kans.....	1,120	267.7	Frequency indicator, type B.
WENR	All American Radio Corporation.	Chicago, Ill.....	1,180	265.3	Piezo oscillator.
WCAD	St. Lawrence University...	Canton, N. Y.....	1,140	263	Frequency indicator.
WAAM	I. B. Nelson.....	Newark, N. J.....	1,140	263	Piezo oscillator.
WOWO	Main Auto Supply Co.....	Fort Wayne, Ind.....	1,320	227.1	Do.
WBMM	Atlas Investment Co.....	Chicago, Ill.....	1,330	225.4	Do.
WEDQ	Tate Radio Co.....	Harrisburg, Ill.....	1,330	225.4	Piezo oscillator, type N.
KFVS	Hirsch Battery & Radio Co.	Cape Girardeau, Mo....	1,340	223.7	Frequency indicator, type B.
WOK	Neutrowound Radio Manufacturing Co.	Homewood, Ill.....	1,380	217.3	Piezo oscillator.
WPDQ	Hiram L. Turner.....	Buffalo, N. Y.....	1,460	205.4	Frequency indicator, type B.

## A PORTABLE RADIO DIRECTION FINDER FOR 90 TO 770 KILOCYCLES

The Bureau of Standards has just issued a paper which describes the development of a portable radio-direction finder with but two controls—one for tuning, one for balancing. This direction finder operates over the frequency band from 90 to 7,700 kilocycles (3,300 to 39 meters). The direction finder is of the simple rotating coil type. The receiving set is of the superheterodyne type with the controls reduced to one by the use of a cam-operated condenser. The wide frequency range is made possible by a set of 7 interchangeable plug-in direction-finder coils each with a corresponding heterodyne generator coil and cam for operating the auxiliary tuning condenser.

This paper is Bureau of Standards Scientific Papers No. 536, A Portable Radio Direction Finder for 90 to 7,700 Kilocycles, by F. W. Dunmore, and is obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents per copy.

## RESISTANCE OF CONDUCTORS OF VARIOUS TYPES AND SIZES AS WINDINGS OF SINGLE-LAYER COILS AT 150 TO 6,000 KILOCYCLES

A paper just issued by the Bureau of Standards gives resistance data, in the form of curves, for coils wound with various sizes of solid wire, litz wire, and copper tubing. The purpose of the measurements was to obtain data which would assist in the selection of the conductors of lowest resistance for the coils of a standard frequency meter or wave meter. The measurements were made by the resistance-variation method. The curves for the various sizes of wires are directly comparable because the coils has approximately the same inductance owing to the fact that they were wound in succession on the same form. The

given frequency within the range from 150 to 6,000 kilocycles. For coils of this type at frequencies below 1,500 kilocycles the superiority of litz wire of a large number of strands is shown, while above that limit a coil of large size solid copper wire or copper tubing is preferable.

This paper is known as Bureau of Standards Technologic Paper No. 330, Resistance of Conductors of Various Types and Sizes as Windings of Single-Layer Coils at 150 to 6,000 Kilocycles, by E. L. Hall. A copy of this paper may be obtained for 5 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

## REFERENCES TO CURRENT RADIO 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 professional radio engineers which have recently appeared in periodicals, books, etc. The number at the left of each reference classifies the reference by subject, in accordance with the scheme presented in A Decimal Classification of Radio Subjects—An Extension of the Dewey System, Bureau of Standards Circular No. 138, a copy of which may be obtained for 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C. The various articles listed below are not obtainable from the Bureau of Standards. The various periodicals can be consulted at large public libraries.

## R000.—Radio communication

- R000 Hazeltine, L. A. Preferred numbers (standardization). Proc. Inst. of Radio Engrs., 14, pp. 785-787, December, 1926.

## R100.—Radio principles

- R113.5 Austin, L. W., and Wymore, I. J. Radio signal strength and temperature. Proc. Inst. of Radio Engrs., 14, pp. 781-784, December, 1926.
- R113.6 Bouthillon, L. Optique et radioléctricité (reflection). L'Onde Electrical, 5, pp. 577-592, November, 1926.
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- R114 Baumler, M. Simultaneous atmospheric disturbances in radiotelegraphy. Proc. Inst. of Radio Engrs., 14, pp. 765-771, December, 1926.
- R114 Lelaj, P. Les perturbations orageuses du champ électrique et leur propagation à grande distance. L'Onde Electrical, 5, pp. 557-576, November, 1926.
- R120 Esau, A. Richtcharakteristiken von Antennenkombinationen. Jahrbuch der drahtlosen Telegraphie, 28, pp. 147-157, November, 1926.
- R125.1 Kolster, F. A. Radio apparatus (direction finder). United States Patent No. 1600366, issued December 7, 1926.
- R125.1 Blatterman, A. S. Apparatus for controlling the directional reception characteristics of loop or coil antennas. United States Patent No. 1609974, issued November 30, 1926.
- R125.6 Tatarineff, W. W. Zur Konstruktion der radiospiegel (2 meter reflector). Jahrbuch der drahtlosen Telegraphie, 28, pp. 117-120, October, 1926.
- R125.6 Jaquet, L. British wireless beam binds Dominion. (Canada and Great Britain.) Radio News of Canada, 5, pp. 16-17, December, 1926.
- R129 Jones, F. C. Radio frequency transmission lines. Radio (San Francisco), 8, pp. 56, December, 1926.
- R131 Taylor, J. Introducing sodium and potassium into discharge tubes (practical method and applications). Experimental Wireless (London), 2, pp. 762-764, December, 1926.
- R132 Smith, L. P. Detector action in high-vacuum tubes. QST, 19, pp. 14-17, December, 1926.
- R134 Hammond, J. H., Jr. Gaseous detector of radiant energy and method of control thereof. United States Patent No. 1610371, issued December 14, 1926.
- R134.75 Jones, L. R. A versatile super-heterodyne (hookups). Radio News, 8, pp. 816-817, January, 1927.
- R134.75 Diehl, W. F. Radio receiving apparatus. United States Patent No. 1609162, issued November 30, 1926.
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- R142 Seelen, D. Über induktiv Kopplung in Empfangskreisen (coupling in receiving circuits). Jahrbuch der drahtlosen Telegraphie, 28, pp. 114-117, October, 1926.
- R150 Plesch, J. The "singing crystal"—the familiar Zincite detector as a speaker and microphone. Radio News, 8, pp. 788-789, January, 1927.

## R200.—Radio measurements and standardization

- R201 Harris, S. A LCR measuring box (convenient means for measuring wave length, capacity, inductance, coupling coefficient, or resistance at any frequency). Radio (San Francisco), 8, pp. 47-48, December, 1926.
- R201.6 Bagrally, W. The valve bridge—new method of measuring the anode impedance and voltage factor (a. c. bridge with triode occupying one arm). Jour. Sci. Instruments (London), 4, pp. 46-49, November, 1926.
- R214 Dow, M. T. Piezo-electric crystals (how quartz crystals are used to maintain constant frequencies accurate to within 1/50 of 1 per cent). Radio Broadcast, 19, pp. 263-265, January, 1927.
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- R334 Zwirner, K. Von der Anodenschutzschaltung der Doppelgitterröhre. *Der Radio Handler*, pp. 744-746, Dec. 7, 1926.
- R342 Forstmann, A. Über die Verstärkung von im Hörbereich liegenden Schwingungen mit Widerstandsverstärkern. *Jahrbuch der drahtlosen Telegraphie*, 29, pp. 156-151, November, 1926.
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- R342.6 Griffies, D. Developments in tuned inverse duplex. *QST*, 11, pp. 9-12, January, 1927.
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- R342.5 Biles, L. G. The "H-Q" receiver (Hammarslund-Roberts with shielded radio-frequency and detector stages). *Radio Broadcast*, 10, pp. 274-276, January, 1927.
- R342.7 Forstmann, A. Die Röhre im Niederfrequenzverstärker. *Die Radio Handler*, pp. 700-702, November 23, 1926.
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- R344 Hairy, L. W. An oscillator that holds calibration (constructional details). *Radio (San Francisco)*, 8, p. 40, December, 1926.
- R344.3 Blunweg, A. A complete 20-meter ham installation (transmitter and receiver). *Radio News*, 5, p. 810, January, 1927.
- R344.3 Schaffer, W. Arrangement for maintaining anode voltage constant in tube transmitters. *United States Patent No. 1610615*, issued December 14, 1926.
- R344.3 Goyder, C. W. A new method of obtaining frequency stabilization of a transmitter by means of an oscillating quartz crystal. *Experimental Wireless (London)*, 3, pp. 717-724, December, 1926.
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- R385.1 Weichert, F. Aufnahme-Mikrophone für der Rundfunk. *Jahrbuch der drahtlosen Telegraphie*, 28, pp. 170-128, October, 1926.

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- R470 Cartier, E. F. Carrier current communication over transmission lines (single frequency duplex equipment—intersystem communication). *General Electric Review*, 29, pp. 823-843, December, 1926.

## R500.—Applications of radio

- R420 Dellinger, J. H. Applications of radio in air navigation. *Lefax*, 16, pp. 25-32, December, 1926.
- R430 West, A. G. How short-wave radio communication is being employed as an aid to aviation. *Radio News of Canada*, 5, pp. 10-11, December, 1926.
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