

**RADIO DIVISION**

# RADIO SERVICE BULLETIN

ISSUED MONTHLY

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**ABBREVIATIONS AND SYMBOLS**

The necessary corrections to the list of Commercial and Government 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. W=west longitude. N=north latitude. S=south latitude. E=east longitude.
- Call = Call signal (letters) assigned.
- Type = Type of wave classified as follows: A1=continuous wave, (tube), A, arc=continuous wave, A2=interrupted continuous wave, A3=phone, B=spark.
- Fy. = Frequency in kilocycles; normal frequency in italics; wave length in meters in parentheses.
- Service = Nature of service maintained: PG=general public, (ship to shore), PR=limited public, (limited to public correspondence between fixed stations), P=private, O=Government business exclusively.
- Class = FX=fixed station, (point-to-point service), RG=radio-compass station, FA=aeronautical station, AB=aviation station, RF=directional radio beacon, B=ship station, FC=coast station.
- Hours = Hours of operation: N=continuous service, X=no regular hour, Y=sunrise to sunset.
- Accounts = Message accounts settled by.
- I. R. T. Co. = Intercity Radio Telegraph Co.
- I. W. T. Co. = Independent Wireless Telegraph Co.
- M. R. T. Co. = Mackay Radio & Telegraph Co.
- R. C. A. = Radio Corporation of America.
- R. M. C. A. = Radiomarine Corporation of America.
- T. R. T. Co. = Tropical Radio Telegraph Co.
- O. w. = Continuous wave.
- I. c. w. = Interrupted continuous wave.
- A. c. = Alternating current.
- V. t. = Vacuum tube.
- M. a. = Meters-amperes.
- U. S. L. = Applies only to the list of Commercial and Government Radio Stations of the United States.
- Δ = Equipped with a radio compass (direction finder).

*This edition is the first supplement to the annual list of Commercial and Government Radio Stations of the United States, edition June 30, 1920.*

## NEW STATIONS

*Commercial land stations, alphabetically, by names of stations*

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

Station	Class	Call signal	Frequency in kilocycles, meters in parentheses	Service	Hours	Owner
Anaheim, Calif. <sup>1</sup>	FX	KGKJ	5,325 (51.502)	P		Minaret Mines Co. City of Cincinnati, police department.
Cincinnati, Ohio <sup>2</sup>	FX	WKDU	1,712 (175.23)	P	X	
Deal, N. J., radio <sup>3</sup>	FC	WOO	3,124 (96.03), 4,116, (72.886), 6,515, (46.05), 8,630 (34.76)	PG	X	American Telephone & Telegraph Co.
Detroit, Mich. <sup>4</sup>	FX	WKDT	1,596 (187.97)	P	N	Detroit fire department.
Guam, Guam	FC, FX	KDC	4,116 (72.896), 5,525, (54.298), 7,445, (40.30), 8,630 (34.76), 11,020 (27.22), 11- 050 (27.15), 14,890, (20.15), 16,575, (18.10), 16,900, (17.751), 18,820, (15.94), 22,600, (13.274)	PG, PR	N	Robert Dollar Co.
New York, N. Y. <sup>5</sup>	FX	WKDX	1,684 (178.15)	P	N	City of New York, department of plant and structures.
San Francisco, Calif. <sup>6</sup>	FC	KGKH	2,446 (122.649)	P	N	Harbor Tug & Barge Co.
Santa Barbara, Calif. <sup>7</sup>	FX	KGJY	2,518 (119.142)	P	X	Elwood Exploration Co.
Sierra Mountains, (Madera County), Calif. <sup>8</sup>	FX	KGKI	5,325 (51.502)	P		Minaret Mines Co.
Portable: Texas, Louisiana, and Oklahoma. <sup>9</sup>	FX	KGJZ	1,704 (17.606)	P		Wireless Service Corporation.

<sup>1</sup> Location (approximately) 117° 55' 00" W., 33° 50' 00" N., type, A1; hours, 7.30 to 8.30 a. m. and 2 to 3 p. m. daily.

<sup>2</sup> Type, A3.

<sup>3</sup> Type, A1-2.

<sup>4</sup> Type, A1; hours, 7.30 to 8.30 a. m. and 2 to 3 p. m. daily.

<sup>5</sup> Type, A1-3; hours, 8 a. m. to 6 p. m. except Sunday.

*Commercial ship stations, alphabetically, by name of vessels*

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

Name of vessel	Call signal	Rates, all serv-ices (cents)	Service	Hours	Owner	Message accounts settled by
Bambriana	WMDF		PG		Walter O. Briggs	R. M. C. A. Do.
Berwindvale	WKDY		PG		Willmore S. S. Co.	
Dream Girl	WKDV				Jo G. Roberts	
Haida	WKDS				Max C. Fleischmann	
Harriet	WBBS				Old National Loan & Mortgage Co.	
Humuula	WMDD				Inter-Island Steam Navigation Co.	
Jeanne	WMDI		P	X	Yacht Jeanne Co.	Maury McBae, M. D. R. M. C. A.
Nakhoda	WMDE		PG		Fred J. Fisher	
Neponset	WKDQ		PG		Merritt, Chapman & Scott Corporation.	
Olive K	WMDC		PG	X	O. F. Kettering	Do.
Reme	WKDZ	8	PG	X	Alfred P. Sloan	
Rustler	WKDW					
Santa Clara	WMDB	8	PG		Grace S. S. Co.	Do.
Spitfire	WKDE	8	PG	X	James H. Rand, 3d	Do.
W. B. Foshay	WMDG				Northern Transportation Co.	

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

Call signal	Name of station	Call signal	Name of station
KDC	Guam, Guam..... fc, fx	WKDV	Dream Girl..... b
KGJY	Santa Barbara, Calif..... fc	WKDW	Rustler..... b
KGJZ	Texas, Louisiana, and Oklahoma, (portable)..... fx	WKDX	New York, N. Y..... fc
KGKH	San Francisco, Calif..... fc, fx	WKDY	Berwindvale..... b
KGKI	Sierra Mountains, (Madera County), Calif..... fx	WKDZ	Reme..... b
KGKJ	Anaheim, Calif..... fx	WMDB	Santa Clara..... b
WBBS	Harriet..... b	WMDC	Olive K..... b
WKDQ	Neponset..... b	WMDD	Humuula..... b
WKDR	Spitfire..... b	WMDE	Nakhoda..... b
WKDS	Haida..... b	WMDF	Bambriona..... b
WKDT	Detroit, Mich..... fx	WMDG	W. B. Foshay..... b
WKDU	Cincinnati, Ohio..... fx	WOO	Deal, N. J. radio..... fc
		WMDI	Jeanne..... b

*Commercial aircraft stations, alphabetically, by names of craft*

[Additions to the List of Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Station	Call signal	Frequency in kilocycles, meters in parentheses	Service	Hours	Owner
NC147-H.....	KHFE	-----	P	X	Pan American Airways (Inc.).
NC197-H.....	KHFG	-----	P	X	Do.
NC811-H.....	KHFF	-----	P	X	Do.
NC812-H.....	KHFF	-----	P	X	Do.
X855E <sup>1</sup> .....	KHEH	333, (901), 375, (800), 500, (600), 1,608, (186.57), 2,302, (130.32), 5,510, (54.45), 6,155, (48.74).	P	X	Chicago Daily News (Inc.).

<sup>1</sup> Type A1, A2, A3.

*Commercial aircraft stations, alphabetically, by call signals*

Call signal	Name of station	Call signal	Name of station
KHEH	X855E.	KHFG	NC197-H.
KHFE	NC147-H.	KHFF	NC812-H.
KHFF	NC811-H.		

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

[Additions to the List of Radio Stations of the United States, edition of June 30, 1929]

State and city	Call signal	Frequency in kilocycles, meters in parentheses	Power (watts)
North Dakota: Minot.....	KLPM	1,420 (211.3).....	100

*Broadcasting stations, alphabetically, by call signals*

Call signal	Location of transmitter (mail address)	Owner	Frequency in kilocycles, meters in parentheses	Power (watts)
KLPM	Minot, N. Dak.....	E. C. Reineke.....	1,420, (211.3).....	100

## Government land stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Station	Class	Call signal	Frequency in kilocycles, meters in parentheses	Service	Hours	Owner
San Jose Field, (Mindoro), P. I.	fa, fx	WZX	5,850 (51.28)	O	Y	U. S. Army.

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

Call signal	Name of station	Call signal	Name of station
WZX	San Jose Field, (Mindoro), P. I.		

## RADIOBEACON STATIONS

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations published by the Berne bureau]

*Cristobal Mole, (Colon), Canal Zone.*—Loc. 79° 55' 05" W., 9° 21' 25" N.; transmits single dashes continuously for the first and fourth 10 minutes of each hour, seventy-fifth meridian time, on a frequency of 305 (984).

*Cape Mala Light Station, Panama.*—Loc. 79° 59' 30" W., 7° 27' 45" N.; transmits continuously for third and sixth 10 minutes of every hour groups of 2 dashes on a frequency of 290 (1,034).

*Poe Reef Light Station, Mich.*—Loc. 84° 21' 43" W., 45° 41' 41" N.; transmits every 180 seconds groups of 1 dot and 2 dashes for 60 seconds, silent 120 seconds, thus:

— — — — — etc.	Silent
60 seconds	120 seconds

Operates on a frequency of 286, (1,050), continuously during thick or foggy weather and daily in clear weather from 11.45 to 12 a. m., 1.30 to 2, and 7.30 to 8 a. m. and p. m., (central standard time).

## Experimental stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929]

Station	Call signal	Frequency in kilocycles, meters in parentheses	Power (watts)	Owner
Portable Hawaii: Honolulu	K6KAK	7,436, (40.88), 7,445, (40.29), 9,416, (31.88), 10,930, (27.45), 14,860, (20.19), 14,890, (20.15), 18,820, (15.94), 22,660, (13.239).	500	Robert Dollar Co.
Aircraft NC105-H	W10XG	1,608, (186.57), 2,302, (130.32), 3,076, (97.5), 4,108, (73.028), 5,610, (54.45), 6,155, (48.74).	300	American Aeronautical Corporation.

## Visual broadcasting stations, alphabetically, by names of stations

[Additions to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929]

Station	Call signal	Frequency in kilocycles, meters in parentheses	Power (watts)	Owner
Illinois: Chicago	W9XAA	6,080, (49.34), 11,840, (25.34), 17,780, (16.873).	500	Chicago Federation of Labor.

*Experimental, relay broadcasting, and visual broadcasting stations grouped by districts, alphabetically, by call signals*

Call signal	District and station	Call signal	District and station
K6XAK	Sixth district: Honolulu, Hawaii (portable).	W10XG	Aircraft: NC105-H.
W9XAA	Ninth district: Chicago, Ill.		

**ALTERATIONS AND CORRECTIONS**

**COMMERCIAL LAND STATIONS**

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

NOTE.—The approximate meters for the following frequencies should be substituted for those published heretofore for stations of all classes: 141 (2,130 m.); 159, (1,885 m.); 161, (1,865 m.); 163, (1,840 m.); 469, change to 468, (640 m.).

- ALTOONA, PA.—Loc. 74° 24' 7" W., 40° 30' 54" N.
- CAMIGUIN ISLAND, P. I.—Call changed to KZFJ.
- CAMP EUSTIS, VA.—Type, A arc; fy., 143, (2,100), 163, (1,840), 438, (685), 500, (600).
- CUYO, P. I., (Palawan), RADIO.—Fy., 267.9, (111.98), 500, (600).
- DETROIT, MICH., (WCK).—Loc., changed to Bell Isle, Mich.; fy., 3,166, (94.756).
- ILOILO, P. I., RADIO, (KPM).—Fy., 309, (971), 361, (831), 500, (600).
- KAWAIHAE, HAWAII.—Loc., changed to Lanai, Hawaii; loc. 157° 00' 00" W., 20° 45' 00" N.; type, A1; fy., 500, (600), 4,144, (72.393), 5,720, (52.447), service, PR; hours, 7.30 to 12.30 a. m., 1.30 to 5.30 p. m. daily; 8 to 10.30 a. m. Sunday.
- LUMARSO, P. I.—Correct name Lumarao, P. I.; call changed to KZFD.
- MARFA, TEX.—Correct orthography Marea, Tex.
- MARION, MASS. RADIO, (WCC).—Fy., add 5,525, (54.3), 6,455, (46.47), 6,470, (46.37), 8,350, (35.93), 11,050, (27.15), 12,640, (23.73), 12,580, (23.85), 16,575, (18.099), 16,700, (17.964), 21,860, (13.724), 21,900, (13.699), 22,100, (13.575).
- NAGA-NAGA, P. I.—Call changed to KZFT.
- NEW YORK, N. Y., RADIO, (Borough of Brooklyn), WNY.—Type, strike out A2; fy., 4,188, (71.63), 12,550, (23.90), 5,525, (54.298), 11,050, (27.15).
- NEW YORK, N. Y., (WPY).—Type, strike out A1.
- PORT ARTHUR, TEX., RADIO.—Loc. 93° 57' 50" W., 29° 50' 50" N.; type, A1; fy., 5,525, (54.298), 6,455, (46.47), 8,370, (35.84), 11,050, (27.15), 12,670, (23.68), 16,575, (18.10), 21,820, (13.749), 22,100, (13.575).
- PORTLAND, OREG., RADIO, (KPK).—Fy., add 143, (2,100), 163, (1,840).
- SWEETWATER, TEX.—Hours, N.
- WEST PALM BEACH, FLA., RADIO, (WMR).—Fy., strike out 16,580, (18.094), add 16,575, (18.099).

**COMMERCIAL SHIP STATIONS, ALPHABETICALLY, BY NAMES OF VESSELS**

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

- ALBATROSS, (KELD).—Owner, Consolidated Fisheries Co.
- ANACORTES.—Accounts, R. M. C. A., (U. S. L.).
- AVALON.—Accounts, M. R. T. Co.
- BALLENAS.—Owner, Ballenas Co., (Inc.).
- BARRYTON.—Owner, Barryton Co., (Inc.).
- BAYOU CHICO.—Accounts, R. M. C. A., (U. S. L.).
- BIBBCO.—Accounts, M. R. T. Co.
- CABRILLO.—Accounts, M. R. T. Co.
- CAMPEADOR.—Fy., 402.1, (745), 500, (600).
- CASEY.—Owner, Mississippi Shipping Co.; accounts, M. R. T. Co.
- CATALINA.—Accounts, M. R. T. Co.
- CITY OF ELWOOD.—Accounts, R. M. C. A.
- CLAIRTON.—Accounts, R. M. C. A., (U. S. L.).
- COAXET.—Accounts, R. M. C. A., (U. S. L.).

- CORONADO.**—Accounts, R. M. C. A., (U. S. L.).  
**DARTFORD.**—Name changed to E. J. Nicklos.  
**DODECA.**—Owner, Lincoln County Tug & Barge Co.  
**EDGEWOOD.**—Accounts, R. M. C. A., (U. S. L.).  
**EFFNA.**—Accounts, R. M. C. A., (U. S. L.).  
**EMMA H. COPPAGE.**—Name changed to Oregon; owner, Texas S. S. Co.  
**ESPERANZA.**—Fy., strike out 316, (952), add 429, (700).  
**FAIRFIELD.**—Owner, Quinnipiac Shipping Corporation.  
**F. A. WARNER.**—Name changed to Lumberman.  
**FISH HAWK.**—Owner, Consolidated Fisheries Co.  
**GALENA.**—Name changed to Arizona.  
**GOLDEN CROSS.**—Accounts, owner.  
**HUALALAI.**—Accounts, R. M. C. A.  
**ISLAS FILIPINAS.**—Fy., add 455 (660).  
**LEVIATHAN LIFEBOAT No. 31.**—Owner, United States Lines.  
**LEVIATHAN LIFEBOAT No. 32.**—Owner, United States Lines.  
**LIBERATOR.**—Accounts, R. M. C. A., (U. S. L.).  
**LORRAINE CROSS.**—Owner, Mississippi Shipping Co.; accounts, M. R. T. Co.  
**M. A. BRADLEY.**—Owner, Nicholson-Universal S. S. Co.  
**MOSELLA.**—Accounts, R. M. C. A., (U. S. L.).  
**MOUNT EVANS.**—Accounts, R. M. C. A., (U. S. L.).  
**MYSTIC.**—Owner, Munson S. S. Line.  
**NARCISSUS.**—Accounts, R. M. C. A., (U. S. L.).  
**NEIL MACLEOD.**—Fy., add 397, (755).  
**NEW ORLEANS.**—Accounts, R. M. C. A.  
**NORTH KING.**—Pacific American Fisheries.  
**OLDHAM.**—Accounts, R. M. C. A.  
**ORAN.**—Owner, Pacific-Atlantic S. S. Co.  
**ORIENT.**—Owner, Pacific-Atlantic S. S. Co.  
**ORINOCO.**—Owner, Pacific-Atlantic S. S. Co.  
**ORIOLE.**—Owner, Pacific-Atlantic S. S. Co.  
**POINT JUDITH.**—Name changed to Charles L. Wheeler.  
**REPUBLIC LIFEBOAT No. 1.**—Owner, United States Lines.  
**REPUBLIC LIFEBOAT No. 2.**—Owner, United States Lines.  
**SABINE SUN.**—Name changed to W. W. Bruce; owner, Gladstone Transportation Co.  
**SALVAGER.**—Fy., 425 (705); 500, (600), 5,555, (54), 5,585, (53.71), 5,615, (53.428), 5,645, (53.144).  
**SANTO DOMINGO.**—Fy., add 397, (755).  
**SCHOODIC.**—Owner, Mississippi Shipping Co., accounts, M. R. T. Co.  
**SIRIUS.**—Fy., add 429, (700).  
**SOBRE LOS OLAS.**—*Read Sobre las Olas.*  
**TONG YEK.**—Fy., add 425, (705).  
**VAGABONDIA.**—Owner, W. L. Mellon.  
**WARRIOR.**—Owner, Sydney S. Whalen.  
**WEST ALSEK.**—Accounts, R. M. C. A., (U. S. L.).  
**WEST CELINA.**—Accounts, R. M. C. A., (U. S. L.).  
**WEST DURFEE.**—Accounts, R. M. C. A., (U. S. L.).  
**WEST NOHNO.**—Accounts, R. M. C. A., (U. S. L.).  
**WEST SEGOVIA.**—Owner, Mississippi Shipping Co.; accounts, M. R. T. Co.  
**WESTWARD Ho.**—Accounts, R. M. C. A., (U. S. L.).  
**WICHITA.**—Accounts, R. M. C. A.  
**WILLBORO.**—Owner, Williams S. S. Co.  
**WILLKENO.**—Owner, Williams S. S. Co.  
**WIND RUSH.**—Owner, Shepard S. S. Co.  
**WM. BOYCE THOMPSON.**—Owner, Sinclair Navigation Co.  
 Strike out all particulars of the following-named vessels: Barbara, Cokato, Hartwood, Josefina, Laurel, Ntra. Sra. del Carmen, Paz, Rosario, Spray, (KDYB), Susanna II, Visayas.

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

KBM, *read* KZFD, Lumarao, P. I.; KDAV, *read* E. J. Nicklos; KGSQ, *read* Marea, Tex.; KHN, *read* Lanai, Hawaii; KODR, *read* Arizona; KPAA, *read* Charles L. Wheeler; KUJZ, *read* Oregon; KTX, *read* KZFI, Camiguin Island, P. I.; KUQ, *read* KZFT; WCDO, *read* W. W. Bruce; WCK, *read* Belle Isle, Mich.; WJDR, *read* Sobre las Olas; WMEO, *read* Lumberman; strike out all particulars following the call signals KDYB, KEVR, KOXS, KZAI, KZAW, KZCG, KZCR, KZCV, KZDK, WMUE, WOBH.

## COMMERCIAL AIRCRAFT STATIONS, ALPHABETICALLY, BY NAMES OF CRAFT

[Alterations and corrections to be made to the List of Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

810-H.—*Read* NC810-H.

NC8043.—Type, A1 and A3; fy., 2,506, (119.71), 2,734, (109.72).

NC9137.—Fy., 333, (900), 375, (800), 457, (655), 500, (600), 2,302, (130.32), 3,076, (97.5), 4,124, (72.74).

NC9151.—Fy., strike out 4,108, (73.028), add 4,124, (72.744).

NC9664.—Fy., strike out 4,108, (73.028), add 4,124, (72.744).

NC9685.—Fy., strike out 4,108, (73.028), add 4,124, (72.744).

WASHINGTON.—Type, A1 and A3; fy., 333, (900), 375, (800), 457, (655), 500, (600).

## BROADCASTING STATIONS, BY CALL SIGNALS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929]

KCRC (Enid, Okla.).—Power, 100 night, 250 day.

KFUL (Galveston, Tex.).—Power, 1,000 day, 500 night, 1,000 night experimentally.

KGKO (Wichita Falls, Tex.).—Power, 250 night, 500 day.

KGKX (Sandpoint, Idaho).—Owners, C. E. Twiss and F. H. McCann.

WDSU (New Orleans, La.).—Fy., 1,250 (240).

WEEI (Boston, Mass.).—Location changed to Weymouth, Mass.; power 1,000.

WKBE (Webster, Mass.).—Location changed to Auburn, Mass.; call changed to WORC.

WKBF (Indianapolis, Ind.).—Owner, Indianapolis Broadcasting, (Inc.).

WOL (Ames, Iowa).—Power, 5,000, (temporary from July 24 to September 24, 1929).

WPSW (Philadelphia, Pa.).—Call changed to WPEN; power, 100 normally, 250 experimentally.

WRVA (Richmond, Va.).—Location changed to Mechanicsville, Va.; power, 5,000.

WSAI (Harrison, Ohio).—Location changed to Mason, Ohio.

WSAZ (Huntington, W. Va.).—Owner, WSAZ, (Inc.).

WSMK (Dayton, Ohio).—Location changed to Dayton, Ohio, (near); fy., 1,380, (217.4); power, 200.

WTIC (Avon, Conn.).—Location 72° 46' 35" W., 41° 48' 20" N.

Strike out all particulars of the following-named stations: WAFD, (Detroit, Mich.), WHBW, (Philadelphia, Pa.).

## GOVERNMENT LAND STATIONS, ALPHABETICALLY, BY NAMES OF STATIONS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

QUARRY HEIGHTS, CANAL ZONE.—Fy., strike out 749 (400).

ST. LOUIS, MO. (WZK).—Fy., strike out 2,607 (115).

## GOVERNMENT SHIP STATIONS, ALPHABETICALLY, BY NAMES OF STATIONS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations, published by the Berne bureau]

AMMEN.—Owner, United States Coast Guard.

CONNOR.—*Read* Connor.

FANNING.—Owner, United States Coast Guard.

PORTER.—Owner, United States Coast Guard.

WILMETTE.—*Read* Willmette.

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

NAVD, *read* Willmette; NIDR, *read* Connor.

## RADIOBEACON STATIONS

[Alterations and corrections to be made to the List of Commercial and Government Radio Stations of the United States, edition of June 30, 1929, and to the International List of Radiotelegraph Stations published by the Berne bureau]

Five Fathom Bank Lightship, N. J.—Hours, operated the second 15 minutes of each third hour, 3, 6, and 9 a. m., 12 noon, 3, 6, and 9 p. m.

## EXPERIMENTAL 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, 1929]

MARYLAND: Baltimore (W3XE).—Fy., 1,604, (187.03), 2,398, (125.1), 3,256, (92.5), 4,795, (62.57), 6,425, (46.7), 8,650, (34.68), 12,850, (23.35), 17,300 (17.341).  
 NEW YORK: S. Schenectady (W2XAW).—Fy., variable from and above 23,000 (13.043).

AIRCRAFT: X7654 (W8XC).—Fy., add 3,076, (97.5), 6,155, (48.74).

## VISUAL BROADCASTING 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, 1929]

ILLINOIS: Downers Grove (W9XR).—Fy., strike out 2,100 (142.9) to 2,200 (136.4).

## MISCELLANEOUS

VISUAL BROADCASTING (TELEVISION) STATIONS MAY BE OPERATED BY OPERATORS HOLDING A BROADCAST LICENSE OR ONE OF A HIGHER GRADE

The regulations governing the issuance of radio operators' licenses published in the December, 1928, and the January, 1929, editions of this publication are amended, effective August 12, 1929, to authorize the operation of television transmitters by persons holding a broadcast class license-limited operator license, as well as licenses of a higher grade.

## RADIO LAWS OF THE UNITED STATES AVAILABLE FOR DISTRIBUTION

A pamphlet, entitled "Radio Laws of the United States," compiled by the House of Representatives document room, containing laws of this country passed during the years 1910 to 1929, inclusive, is now available for distribution by the Superintendent of Documents, Government Printing Office, this city, at 10 cents a copy. *Do not send remittances to this department.*

ANNUAL LISTS OF RADIO STATIONS OF THE UNITED STATES NOT AVAILABLE FOR DISTRIBUTION UNTIL ABOUT OCTOBER 15, 1929

The annual lists, as of June 30, 1929, of Commercial and Government Radio Stations of the United States and Amateur Radio Stations of the United States will not be available for distribution by the Superintendent of Documents, Government Printing Office, this city, until about October 15, next. The price of these publications has not been determined at this time; however, when it is known notice will be given in this bulletin.

## CHANGES IN LIST OF CANADIAN RADIOBEACON STATIONS

*Seal Island, N. S.*—Now operates on a frequency of 310 kilocycles, (968 m.), i. c. w. Transmits its call signal VGY (.....) for a period of 60 seconds, followed by a silent period of 120 seconds. Operates continuously during thick or foggy weather and hourly for 4 minutes during clear weather, commencing on the hour.

*Cape Whittle, Quebec.*—Beacon established. Transmits its call signal VGZ (.....) for a period of 60 seconds, followed by a silent period of 120 seconds, on a frequency of 295 kilocycles, (1,017 m.), i. c. w. Operates continuously during thick or foggy weather and hourly for 4 minutes during clear weather, commencing on the hour. Location, 50° 09' 52" N., 60° 02' 05" W.

*Anticosti Island, Quebec.*—Beacon established. Transmits its call signal VGW (.....) for a period of 60 seconds, followed by a silent period of 120 seconds. Operates continuously during thick or foggy weather and hourly for 4 minutes during clear weather, commencing on the hour, on a frequency of 305 kilocycles, (984 m.), i. c. w. Location, 49° 52' 30" N., 64° 31' 40" W.

*Pointe des Monts, Quebec.*—Beacon established. Transmits its call signal VGQ (.....) for a period of 60 seconds, followed by a silent period of 120 seconds, on a frequency of 310 kilocycles, (968 m.), i. c. w. Operates continuously during thick or foggy weather and hourly for 4 minutes during clear weather, commencing at 7 minutes and 30 seconds past the hour. Location, 49° 19' 1" N., 67° 23' 8" W.



*Michipicoten Island, Ontario.*—Beacon established. Transmits its call signal VGM (— — — — —) for a period of 60 seconds, followed by a silent period of 120 seconds, on a frequency of 295 kilocycles, (1,017 m.), i. c. w. Operates continuously during thick or foggy weather and hourly for 4 minutes during clear weather, commencing on the hour. Location, 47° 45' 40" N., 85° 33' 45" W.

NOTE.—Masters of vessels are requested to have their operators listen out when in the vicinity of these stations and report the result of their reception to the Director of Radio, Department of Marine and Fisheries, Ottawa, Canada.

BRITISH PUBLIC DEPARTMENTS WILL NOT RENDER ASSISTANCE TO VESSELS SENDING PRIVATE DISTRESS MESSAGES

Notice to wireless telegraph operators No. 7, June 25, 1929, promulgated by the Mercantile Marine Department, Board of Trade, London, states, "if a vessel in distress sends a message asking for assistance as a private message, bearing a specific address, and no general distress message is sent out, the public departments concerned will be unable to render assistance to the vessel in question or to take steps to make the need generally known in order that other ships or persons may render assistance.

METEOROLOGICAL AND WEATHER FORECASTS TRANSMITTED BY VANCOUVER AND MERRY ISLAND, CANADIAN STATIONS

Vancouver, call VAB, transmits the forecast of the Canadian meteorological service free of charge upon request, on 500 kilocycles, (600 m.), i. c. w. Merry Island, call VGL, broadcasts weather forecasts on 1,510 kilocycles, (198.7 m.), phone, daily at 0420, 1620, and 1820; Sundays at 0420 and 1730.

DOUBTFUL SECTORS OF CHERBOURG, (FRANCE), RADIOCOMPASS STATION

The doubtful sectors, (arc of calibration), are as follows: 060°-090, 110°-125, 185°-230, 240°-290.

RADIO-BEACON AND TIME SIGNAL SERVICE BY CALLAO, (PERU), STATION

Time signals are transmitted daily, except on Sundays, beginning at 1355 and ending at 1400, standard time, seventy-fifth meridian, on a frequency of 250 kilocycles, (1,200 m.). These signals are from the station of the Peruvian naval school on the La Punta Peninsula at Callao, and the United States system of transmitting time signals is used.

This station, call OBE, has also established a radio-beacon service for the convenience of vessels making Callao in foggy or thick weather. The operator stands watch during the first 10 minutes of each hour, (day and night), seventy-fifth meridian time, and the procedure is as follows: The station transmits its call, OBE OBE OBE OBE QGT? QGT?, on a frequency of 287 kilocycles, (1,045 m.), spark, followed by DE OBE OBE QGT MO MO MO MO MO OBE for a duration of 1 minute. Location, (approximately), 12° 04' 35" S., 77° 10' 40" W.

RATIFICATIONS OF THE INTERNATIONAL RADIOTELEGRAPH CONVENTION

The following-named countries deposited their ratification of the International Radiotelegraph Convention and General Regulations, Washington, 1927, on the dates shown: Syro-Libanes Territories, March 11, 1929; Estonia, March 25, 1929; Mexico, March 28, 1929; Australia, April 3, 1929; Siam, July 1, 1929; Bulgaria, July 22, 1929; and Portugal, July 25, 1929. It is reported that on June 2, 1929, China ratified and that the ratification was being forwarded to Washington. For names of other countries which have adhered see the February, March, April, May, and June, 1929, additions of this publication.

DISTRIBUTION OF WEATHER INFORMATION, FORECASTS, ETC.

The following-described circulars are available for distribution by the Weather Bureau, this city, free of charge, upon application: Circular No. 13—Radio, August 1, 1929, Distribution of Weather Information, Forecasts, and Warnings by Radio for the Benefit of Marine Interests on the North Atlantic Ocean and Coast. Circular No. 14—Radio, August 15, 1929, Distribution of Weather Forecasts, Information, and Warnings by Radio in the Gulf of Mexico, Caribbean Sea, and Adjacent Waters of the North Atlantic Ocean. Circular No. 16—Radio, August 1, 1929, Broadcasts for the Benefit of Aviation and Commercial Interests.

CIVIL-SERVICE EXAMINATION FOR ASSISTANT RADIO INSPECTOR (RADIO ENFORCEMENT)

Applications must be on file with the United States Civil Service Commission at Washington, D. C., not later than September 10, 1929.

Persons who enter this examination will not be admitted to any other examination for which the receipt of applications closes on the above date. The date for assembling of competitors will be stated on their admission cards and will be about 15 days after the close of receipt of applications.

The United States Civil Service Commission announces an open competitive examination for the position named above, to be held at any of the places listed hereon at which examination is requested in applications received by the commission at Washington, D. C., not later than the date stated above. Vacancies in the field service of the Department of Commerce throughout the United States, including Hawaii, Alaska, and Porto Rico, at \$2,400 a year, and in positions requiring similar qualifications, at approximately the same rate of pay, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

*Promotion.*—A probationary period of six months is required; advancement after that depends upon individual efficiency, increased usefulness, and the occurrence of vacancies in higher positions.

*Certification.*—In filling vacancies in this position certification will be made of the highest eligibles on the register who have not expressed unwillingness to accept appointment where the vacancy exists.

*Citizenship and sex.*—This examination is open to all citizens of the United States who meet the requirements; the department or office requesting certification of eligibles has the legal right to specify the sex desired. For this position the Department of Commerce wishes men.

*Duties.*—The duties of the assistant radio inspector will be primarily to assist the radio inspector in the enforcement of the radio act. The assistant radio inspector will be required to inspect radio equipment on vessels and at land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments; to make high-frequency and field-intensity measurements; to assist in the examination of radio operators, and to perform such office work as is required. The performance of these duties will involve considerable traveling, for which necessary traveling expenses will be allowed.

*Subjects and weights.*—Competitors will be rated on the following subjects, which will have the relative weights indicated:

Subjects:	Weights
1. Theoretical and practical questions on radio and electrical engineering.....	60
2. Education, training, and experience.....	40
<b>Total.....</b>	<b>100</b>

*Ratings required.*—In the first subject, nonpreference competitors must attain a rating of at least 65, competitors entitled to military preference a rating of at least 60 exclusive of military preference credit, and competitors entitled to disability preference a rating of at least 55, exclusive of military preference credit. In addition, all competitors must attain in the entire examination an eligible average of at least 70, inclusive of military preference credit, if any.

*Education and experience.*—Except as indicated below, applicants must show that they have been graduated with a degree in electrical or radio engineering from a college or university of recognized standing, or that they are senior students in such course. The names of senior students who attain eligibility may be certified for appointment, but they may not enter upon duty until they have furnished proof of actual graduation, which proof should consist of a certified or photostat copy of diploma, or letter or brief certificate from the proper college officer.

*Substitution of experience for education.*—Provided the applicant has completed a standard high-school course or received 14 units of credit acceptable for college entrance, for each year lacking completion of the collegiate requirement he may substitute one year of radio engineering experience (ordinary amateur or radio operator experience is not considered as qualifying). Such substitute experience must have been in strictly technical work of such grade and nature as to give evidence of the possession by the applicant of a broad knowledge of the theory and practice of radio engineering.

**License.**—In addition to meeting the above requirements, applicants must present a commercial operator's license, or must pass an appropriate examination in the International Morse Code during their probationary period.

Statements as to education, training, and experience are accepted subject to verification.

**Age.**—Applicants must not have reached their 45th birthday on the date of the close of receipt of applications. This age limit does not apply to persons entitled to preference because of military or naval service, but such applicants must not have reached the retirement age.

**Retirement.**—Classified employees who have reached the retirement age and have served 15 years are entitled to retirement with an annuity. A deduction of 3½ per cent is made from the monthly salary to provide for this annuity, which will be returned to persons leaving the service before retirement with 4 per cent interest, compounded annually.

**Photographs.**—Applicants must submit to the examiner on the day of the examination their photographs, taken within two years, with their names written thereon, and securely pasted in the space provided on the admission cards sent them after their applications are filed. Proofs or group photographs will not be accepted. Photographs will not be returned to applicants.

**Applications.**—Form 2600, which is required, may be secured from the following (the title of the examination desired should be stated): The United States Civil Service Commission, Washington, D. C., or the secretary of the United States Civil Service Board at any examination place listed hereon.

Form 2600 should be properly executed, excluding the medical certificate and the officer's certificate of residence, and must be on file with the United States Civil Service Commission at Washington, D. C., not later than the date indicated above.

The exact title of the examination desired, as given at the head of this announcement, should be stated in the application form.

**Preference.**—Applicants claiming preference because of military or naval service should attach to their applications the papers relative to such service called for in the application form.

The examination described in the accompanying announcement will be given at the places named below. A resident of any State or Territory may be examined in any city named in the list. A request for examination on a date other than that given on admission cards sent applicants after their applications are filed or at a place not included in the list can not be granted. Except where otherwise indicated, application blanks may be obtained from the local secretary of the United States Civil Service Board at the post office. Where the letters "C. H." occur, the secretary of the board is located at the customhouse. Boards of pension examining surgeons are located at all places in the list, except those marked thus: \*

#### Alabama

Anniston, Birmingham, \*Decatur, \*Demopolis, \*Dothan, Florence, Huntsville, Mobile, (C. H.), Montgomery, \*Opelika, \*Tuscaloosa.

#### Alaska

\*Anchorage, \*Fairbanks, \*Juneau, \*Ketchikan, \*

#### Arizona

\*Ajo, \*Douglas, \*Flagstaff, \*Globe, Phoenix, Prescott, Tucson, \*Yuma.

#### Arkansas

\*Camden, Fayetteville, Fort Smith, Helena, Jonesboro, Little Rock, Texarkana.

#### California

\*Bishop, Chico, Eureka, Fresno, Los Angeles, Red Bluff, Riverside, Sacramento, San Diego, San Francisco, San Jose, San Luis Obispo, Santa Barbara, \*Santa Cruz, Santa Rosa, Stockton, Vallejo.

#### Canal Zone

\*Balboa Heights.

#### Colorado

Colorado Springs, Denver, Durango, Fort Collins, Fort Morgan, \*Glenwood Springs, Grand Junction, La Junta, Leadville, Monte Vista, Montrose, Pueblo, \*Sterling, Trinidad.

#### Connecticut

Bridgeport, \*Danbury, Hartford, Middletown, New Haven, New London, Waterbury, Willimantic.

#### Delaware

Dover, Wilmington.

#### District of Columbia

Washington.

#### Florida

Gainesville, Jacksonville, \*Key West, Miami, Orlando, Pensacola, Tallahassee, Tampa.

#### Georgia

Albany, \*Athens, Atlanta, Augusta, \*Columbus, Gainesville, Macon, Rome, Savannah, Thomasville, \*Valdosta, \*Waycross.

\*Honolulu.

#### Hawaii

#### Idaho

Boise, Coeur d'Alene, Grangeville, Idaho Falls, Lewiston, Moscow, Pocatello, \*Sandpoint, \*St. Anthony, Twin Falls, \*Weiser.

#### Illinois

Aurora, Cairo, \*Centralia, Chicago, Decatur, East St. Louis, Effingham, Freeport, Galena, Galesburg, Kankakee, Peoria, Quincy, Rockford, Rock Island, Springfield, Streator, Urbana.

*Indiana*

Angola, Bloomington, Evansville, Fort Wayne, \*Hammond, Indianapolis, \*Jeffersonville, La Fayette, Marion, Muncie, Richmond, South Bend, Terre Haute, Valparaiso, Vincennes.

*Iowa*

\*Ames, Atlantic, Burlington, Cedar Rapids, Council Bluffs, Creston, Davenport, \*Decorah, Denison, Des Moines, Dubuque, Fort Dodge, Iowa City, Marshalltown, Mason City, Ottumwa, \*Shenandoah, Sioux City, Spencer, Waterloo.

*Kansas*

Concordia, Dodge City, Emporia, Fort Scott, Kansas City, Lawrence, Leavenworth, Manhattan, Norton, \*Parsons, \*Pittsburg, Salina, Topeka, Wichita.

*Kentucky*

Ashland, Bowling Green, \*Covington, Henderson, Hopkinsville, Lebanon, Lexington, London, Louisville, Middlesboro, Owensboro, Paducah, Paintsville, Somerset.

*Louisiana*

\*Alexandria, Baton Rouge, \*Lake Charles, \*Monroe, \*New Iberia, New Orleans, (C. H.), Shreveport.

*Maine*

Augusta, Bangor, Bath, Calais, Caribou, \*Fort Kent, Houlton, \*Lewiston, Portland, Rockland.

*Maryland*

Baltimore, (C. H.), Cumberland, \*Easton, Hagerstown, Salisbury.

*Massachusetts*

\*Amherst, Boston, (C. H.), Brockton, Fall River, Fitchburg, Greenfield, Hyannis, Lawrence, Lowell, New Bedford, Pittsfield, Salem, Springfield, Worcester.

*Michigan*

Alpena, Ann Arbor, \*Battle Creek, \*Big Rapids, \*Cadillac, Cheboygan, Detroit, Escanaba, Flint, Grand Rapids, Houghton, Ironwood, Jackson, Kalamazoo, Lansing, Manistee, \*Marquette, Muskegon, Port Huron, Saginaw, \*St. Joseph, Sault Ste. Marie, Traverse City.

*Minnesota*

\*Anstlin, \*Bemidji, \*Brainerd, Crookston, Duluth, \*Ely, Fairmont, Fergus Falls, \*Glenwood, \*Grand Rapids, \*International Falls, Mankato, Minneapolis, Montevideo, Pipestone, Rochester, St. Cloud, St. Paul, Thief River Falls, \*Virginia, Willmar, Winona.

*Mississippi*

Corinth, \*Greenville, \*Grenada, \*Hattiesburg, \*Holly Springs, Jackson, Meridian, Natchez, \*Oxford, \*Starkville, Vicksburg, West Point.

*Missouri*

Cape Girardeau, Chillicothe, \*Columbia, Hannibal, Jefferson City, Joplin, Kansas City, Kirksville, Maryville, Moberly, Nevada, Poplar Bluff, Rolla, St. Joseph, St. Louis, (old C. H.), Springfield, Warrensburg.

*Montana*

Billings, Bozeman, Butte, \*Glasgow, Great Falls, Havre, \*Helena, Kalispell, Lewistown, Miles City, Missoula.

*Nebraska*

Alliance, Beatrice, Broken Bow, Chadron, Columbus, Fremont, Grand Island, Hastings, Holdrege, Lincoln, McCook, Nebraska City, Norfolk, North Platte, Omaha, \*O'Neill, Scottsbluff, Sidney, Superior, Valentine.

See footnotes on p. 13.

*Nevada*

Carson City, Elko, \*Ely, Fallon, \*Goldfield, Reno.

*New Hampshire*

Berlin, \*Claremont, Concord, \*Durham, \*Hanover, Keene, Manchester, Plymouth, Portsmouth.

*New Jersey*

Atlantic City, Camden, Newark, \*New Brunswick, Trenton.

*New Mexico*

Albuquerque, East Las Vegas, \*Las Cruces, \*Raton, Roswell, \*Santa Fe, Tucumcari.

*New York*

Binghamton, Buffalo, \*Chautauqua, Elmira, Ithaca, Jamestown, New York, (C. H.), Ogdensburg, (C. H.), Plattsburg, Poughkeepsie, Rochester, Syracuse, Troy, Utica.

*North Carolina*

\*Asheville, \*Chapel Hill, Charlotte, \*Durham, \*Gastonia, Goldsboro, Greensboro, \*Hickory, Newbern, Raleigh, \*Rocky Mount, \*Salisbury, Washington, Wilmington, \*Winston-Salem.

*North Dakota*

\*Beach, Bismarck, \*Devils Lake, Dickinson, Fargo, \*Grand Forks, \*Harvey, Jamestown, \*Kenmare, \*Mandan, \*Minot, \*New Rockford, \*Oakes, \*Valley City, Wahpeton, Williston.

*Ohio*

Ashtabula, Athens, Canton, Chillicothe, Cincinnati, Cleveland, Columbus, Dayton, Ironton, Lima, Mansfield, Marietta, \*Portsmouth, Sandusky, Steubenville, Toledo, Youngstown, Zanesville.

*Oklahoma*

\*Altus, Ardmore, Bartlesville, Chickasha, Enid, Guthrie, Lawton, McAlester, Muskogee, Oklahoma, Stillwater, Tulsa, Vinita, Woodward.

*Oregon*

Astoria, \*Baker, Bend, \*Corvallis, Eugene, \*Grants Pass, \*Klamath Falls, La Grande, \*Marshfield, Pendleton, Portland, Salem, The Dalles.

*Pennsylvania*

\*Altoona, \*Bethlehem, Chambersburg, Dubois, Erie, \*Galeton, Harrisburg, Kittanning, Lancaster, Oil City, Philadelphia, Pittsburgh, Reading, Scranton, \*State College, Sunbury, Uniontown, Warren, Wilkes-Barre, Williamsport.

*Porto Rico*

San Juan.

*Rhode Island*

Narragansett, Newport, Providence.

*South Carolina*

Charleston, \*Chester, \*Clamson College, Columbia, Florence, Greenville, \*Greenwood, \*Orangeburg, \*Spartanburg, \*Sumter.

*South Dakota*

Aberdeen, Brookings, \*Chamberlain, Deadwood, Hot Springs, Huron, \*Lemmon, Madison, Milbank, Mitchell, \*Mobridge, Pierre, Rapid City, Redfield, Sioux Falls, Watertown, Winner, Yankton.

*Tennessee*

Bristol, Chattanooga, Jackson, Knoxville, Memphis, Nashville.

*Texas*

Ablene, Amarillo, Austin, \*Brownsville (C. H.), \*Bryan, \*Corpus Christi, Dallas, \*Del Rio, El Paso, Galveston (C. H.), Houston, Laredo, \*Lubbock, \*Marfa, Nacogdoches, Palestine, \*San Angelo, San Antonio, \*Texarkana, Waco, Wichita Falls.

*Utah*

\*Logan, Ogden, \*Provo, Salt Lake City.

*Vermont*

Brattleboro, Burlington, Middlebury, Montpelier, Newport (C. H.), Rutland, St. Albans (C. H.), St. Johnsbury, White River Junction.

*Virginia*

\*Abingdon, \*Alexandria, \*Blacksburg, \*Charlottesville, \*Clifton Forge, \*Lynchburg, Norfolk, Richmond, Roanoke, Staunton, \*Winchester.

<sup>1</sup> Address local secretary, care Alaska Railroad.

<sup>2</sup> Address local secretary, care U. S. Land Office.

<sup>3</sup> Address local secretary, care Immigration Service.

<sup>4</sup> Address local secretary, care Reclamation Service.

<sup>5</sup> Address local secretary, care Forest Service.

<sup>6</sup> Address local secretary, care Immigration Service, 508 Grant Street.

<sup>7</sup> U. S. Civil Service Commission represented in Porto Rico by chairman, Porto Rican Civil Service Commission, San Juan.

*Washington*

Aberdeen, Bellingham, \*Centralia, \*Everett, Olympia, \*Pasco, Port Townsend, \*Pullman, \*Raymond, Seattle, Spokane, Tacoma, Vancouver, Walla Walla, Wenatchee, Yakima.

*West Virginia*

Bluefield, Charleston, Clarksburg, Elkins, Grafton, Hinton, Huntington, Martinsburg, Morgantown, Parkersburg, Wheeling.

*Wisconsin*

Appleton, Ashland, Eau Claire, Fond du Lac, Green Bay, Janesville, La Crosse, Madison, Marinette, Milwaukee, \*Rhinelander, Stevens Point, Superior, Wausau.

*Wyoming*

\*Casper, Cheyenne, \*Cody, \*Evanston, Lander, Laramie, Rawlins, \*Rock Springs, Sheridan.

## A COURSE-SHIFT INDICATOR FOR DOUBLE-MODULATION TYPE RADIOBEACON

To further increase the reliability of the visual radio range (directive radiobeacon) system developed by the Bureau of Standards, a course-shift indicating instrument primarily for station use has been developed and is described in the paper, *A Course-Shift Indicator for the Double-Modulation Type Radiobeacon*, by H. Diamond and F. W. Dunmore, Research Paper No. 77, Bureau of Standards Journal of Research for July, 1929. This instrument serves a twofold purpose, (1) to indicate to a station operator whether a given course as laid out in space remains unvarying during a given time of operation, and (2) to facilitate a check of the radio range calibration. A station attendant is certain that the course marked out in space remains unvarying as long as the instrument pointer is at the center scale or zero. A change in course of  $0.1^\circ$  is readily detected. This instrument may also be used as a visual course indicator on large aircraft. Its advantages and disadvantages as compared with the vibrating-reed course indicator are discussed.

Reprint copies of this paper will be available within a few weeks and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price will be quoted by that office upon application.

## A COMPARISON OF FORMULAS FOR CALCULATION OF INDUCTANCE OF COILS AND SPIRALS WOUND WITH WIRE OF LARGE CROSS SECTION

In a paper, *A Comparison of the Formulas for the Calculation of the Inductance of Coils and Spirals Wound with Wire of Large Cross Section*, by F. W. Grover, Research Paper No. 90, Bureau of Standards Journal of Research, July, 1929, two methods have been used for the calculation of the inductance of coils of wire having a relatively large cross section. Of these the summation method gives the inductance of the coil as the sum of the self-inductances of the turns and the mutual inductances of all the pairs of turns. The Rosa method calculates the inductance of the equivalent current sheet as a first approximation to the inductance of the coil and obtains the correction which must be applied by calculating (a) the differences between the self-inductance of the turns of wire and of the current sheet, and (b) the differences of the mutual inductances of pairs of turns of wire and of the corresponding turns of the current sheet. It is here shown that, contrary to previous opinions, the two methods give identical results when terms of the same degree are retained in the series expression.

Reprint copies of this paper will be available within a few weeks and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price will be quoted by that office upon application.

## RADIO DEVELOPMENTS APPLIED TO AIRCRAFT

In a paper, *Radio Developments Applied to Aircraft*, by J. H. Dellinger and H. Diamond, published in *Mechanical Engineering*, July, 1929, the authors point out the need for equipment and methods that will reduce the weather hazards of air transportation. During the past three years research work carried on by the Bureau of Standards has led to developments through which weather and landing conditions can be communicated to pilots while in flight and through course navigation flying can be done satisfactorily regardless of fog. The paper describes particularly the work done by the Bureau of Standards on the development of the visual radio range (directive radiobeacon) with a description of the radio range which is capable of producing 12 courses in space. Copies of this paper are not available from the Government.

## REFERENCES TO CURRENT RADIO LITERATURE

This is a monthly list of references prepared by 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 Government. The various periodicals can be secured from their publishers and can be consulted at large public libraries.

## R100.—Radio principles

- R100 Duncan, R. L., and Drew, C. E. *Radio telegraphy and telephony*, (book). Publisher: J. Wiley & Sons, New York, N. Y. 1929.  
A textbook for students of radio.
- R113 Nakai, T. On the difference of East to West and West to East transmission phenomena at sunrise and sunset. *Researches Electrotechnical Lab., Tokyo*, No. 241; November, 1928. Original in Japanese. Abstract in *Experimental Wireless and Wireless Engr.*, (London), 6, p. 323; June, 1929.  
From theoretical considerations based on ultra-violet radiation from sun it was concluded that the ionized layer goes down much more rapidly after sunrise than it rises after sunset. Therefore, little difference between sunrise and sunset effects should be found in East-West radio transmissions while sunrise effects should be much larger than sunset effects for West-East transmission. Data are cited in confirmation of this reasoning.
- R113.1 Parkinson, T. Some observations of short period radio fading. *Proc. Inst. of Radio Engrs.*, 17, pp. 1042-1061; June, 1929.  
Causes of fading are investigated by means of graphic fading records made simultaneously with different types of receiving antennas. Evidences are found of fading due to interference, to direction shifts, to rotation of plane of polarization, and to varying intensity of indirect rays, to multiple rays.
- R113.2 De Wardt, R. G. Variations in signal strength from Australia. *Post Office Elec. Engrs. Jour.*, (London), 22, pp. 52-58; April, 1929.  
Data from systematic records of 11,660 kilocycles transmissions from Australia as received in England are presented in graphic form. Average diurnal and seasonal variations of signal strength are shown for the 12 months of the year. Daylight-darkness effects on different portions of two transmission paths are noted.
- R113.4 Mirick, C. B., and Hentschel, E. R. A new method of determining height of the Kennelly-Heaviside layer. *Proc. Inst. of Radio Engrs.*, 17, pp. 1034-1041; June, 1929.  
Periodic variations of fairly constant frequency over a considerable time interval are shown in graphic records of radio signals transmitted from a high frequency aircraft transmitter. From geometric considerations of this frequency the ground speed of the plane, and the transmitting distance, the effective height of the layer is computed.
- R113.5 Maurain, Ch. Sur l'origine de certain parasites. (On the origin of certain atmospherics) *L'Onde Electrique*, 8, pp. 131-134; April, 1929.  
The value of making observations of the connection between radio disturbances, electro magnetic phenomena, and meteorological conditions as a study of the relations between the meteorological and electrical properties of the atmosphere is stressed.
- R113.5 Bureau, R. Sur l'origine de certain parasites. (On the origin of certain atmospherics) *L'Onde Electrique*, 8, pp. 135-142; April, 1929.  
Arguments in favor of a meteorological origin of night atmospherics are summarized. The theory is offered that atmospherics of the afternoon are the effect of a strong meteorological situation and not of the storm itself.
- R113.5 Maurain, Ch. Sur l'orage magnetique du 7 au 8 Juillet, 1928 et les phenomenes connexes. (On the magnetic storm of July 7-8, 1928, and connected phenomena). *L'Onde Electrique*, 8, pp. 170-172; April, 1929.  
Reports concerning sunspots, radio transmission, and aurora displays attending the magnetic storm of July 7 and 8, 1928, are summarized.

- R131 Average characteristics of amplifier tubes with a. c. filament supply. Radio (San Francisco), 11, p. 46; July, 1929.  
Data on tubes.
- R132 Brainard, J. C. Mathematical theory of the 4-electrode tube. Proc. Inst. of Radio Engrs., 17, pp. 1006-1020; June, 1929.  
The mathematics of the 4-electrode tube, including in the most general case expressions for the plate and two grid currents in terms of the applied voltages in the 2-grid circuits and the impedances of all three circuits, are given. To avoid complexity the general expression is reduced to illustrative specific cases.
- R132 Aughtie, F. Push-pull amplification—The use of resistance-capacity coupling. Experimental Wireless and Wireless Engr., (London), 6, pp. 307-309; June, 1929.  
A circuit is described in which use is made of the phase reversal of a simple resistance-capacity coupled stage to feed the grid of the second tube of the output pair of a push-pull amplifier. A transformer is therefore not needed, and adjustment for maximum power output is simple.
- R134 Reed, M. The problem of turnover. Experimental Wireless and Wireless Engr., (London), 6, pp. 310-315; June, 1929.  
A mathematical explanation of the difference in output currents from a rectifier with the same a. c. input but with connections reversed is given. Conditions for a minimum difference are summarized and the application of the results to the design of vacuum-tube voltmeters is pointed out.
- R150 Beauvais, G. A. Sur les ondes de 10 a 20 centimetres. (On waves of 10 to 20 centimeters.) Bull. de la Soc. Francaise des Electriciens, 9, pp. 503-510; May, 1929.  
Production of very high frequencies by means of a circuit arrangement by Pierret is given, with difficulties encountered in the generation of such frequencies. Application of these frequencies to radiotelephony and radiotelegraphy is discussed.
- R190 Carson, J. R. Reciprocal theorem in radio communication. Proc. Inst. of Radio Engrs., 17, pp. 952-956; June, 1929.  
An analysis of Rayleigh's reciprocity theorem and the Sommerfeld-Phrang reciprocity theorem shows them to be distinct in their practical field of application. The latter theorem is shown to have restrictions seriously limiting its field of applicability.
- R190 Pelabon, H. Application de la theorie electronique aux mauvais contacts. (Application of electron theory to bad contacts.) L'Onde Electrique, 8, pp. 160-170; April, 1929.  
With the help of the electron theory the expression for the intensity of a direct current and of an alternating current in a circuit containing an imperfect contact are deduced. Rectification by a contact between identical metals in which one electrode is movable is explained. A study of effects of electromagnetic impulses shows the phenomena of coherence with an imperfect contact to be due to the displacement of the electrodes. An idea on Branley's negative coherence in  $PbO_2$  is given.
- R200.—Radio measurements and standardization
- R220 Bligh, N. R. Measurements of the grid-anode capacity of screen-grid valves. Experimental Wireless and Wireless Engr., (London), 6, pp. 299-300; June, 1929.  
Measurements of the grid-anode capacities of the screen-grid tubes of the 8G25 and 8215 type give an average for the former of 0.022  $\mu\mu\text{f}$  and for the latter of 0.014  $\mu\mu\text{f}$ .
- R220 Loughren, A. V., and Parker, H. W. The measurement of direct interelectrode capacitance of vacuum tubes. Proc. Inst. of Radio Engrs., 17, pp. 957-65; June, 1929.  
A method of measuring direct capacitance in the range of  $10^{-10}$  to  $10^{-13}$  farads by a charging current at radio frequencies is described. The circuit is arranged to provide apparatus giving results measured visually by the substitution of a standard.
- R270 Hollingworth, J., and Naismith, R. A portable radio intensity measuring apparatus for high frequencies. Experimental Wireless and Wireless Engr., (London), 6, pp. 316-318; June, 1929.  
Circuit for apparatus to measure radio field intensities in the range 12,000 to 4,547 kilocycles, (25 to 66 meters), is described. It includes a local oscillator, an attenuator in the form of a resistance voltage divider, and a heterodyne receiving set and a rectifying unit for measuring the output.
- R300.—Radio apparatus and equipment
- R325.1 A new direction finder for naval vessels. Jour., Sci. Instr., (London), 6, pp. 201-202; June, 1929.  
Type D. F. M. 4 direction finder developed by research department of Marconi Co. for use on naval vessels. Set is used for taking bearings on CW, ICW, spark or phone stations, and has a frequency range of 75 to 1,000 kilocycles (300 to 4,000 meters).
- R330.4 Hodgson, B.; Harley, L. S.; and Pratt, O. S. The development of the oxide-coated filament. Jour. Inst. of Elec. Engrs., (London), 67, p. 762; June, 1929.  
Reviews development of oxide-coated filament. Describes in rough outline present-day methods of manufacture for commercial purposes and indicates most recent views on mechanism of electron emission from alkaline earth oxides.
- R341 Gas-filled rectifying valves. Experimental Wireless and Wireless Engr., (London), 6, pp. 291-292; June, 1929.  
The tubes developed by A. W. Hull, of the General Electric Co., for the rectification of large alternating currents are described and an explanation of the thermionics involved is given.
- R342 Engel, F. H. Engineering features of the UX-245. Radio Broadcast, 15, pp. 167-168; July, 1929.  
Characteristics of tube as power amplifier.

- R342.15 Radio-frequency transformers as applied to screen-grid valves. *Experimental Wireless and Wireless Engr.*, (London), 6, pp. 293-298; June, 1929.

Under simplified assumptions expressions giving (1) the over-all voltage amplification and (2) the conditions for stability are derived for a screen-grid tube between a tuned circuit and a radiofrequency transformer with its secondary tuned. If the primary turns of the transformers are reduced to give the requisite stability, results comparable with those from a neutralized triode may be obtained from a good commercial screen-grid tube without the complications of a neutralized circuit.

- R342.5 Spitzer, E. E. Grid losses in power amplifiers. *Proc. Inst. of Radio Engrs.*, 17, pp. 985-1005; June, 1929.

The experimental results of a study of the driving power of a power amplifier at 60 cycles are presented. The power input to the grid is shown to be proportional to the direct current grid current raised to the 1.34th power and to be practically independent of grid bias voltage if grid current is kept constant. The study extends to six types of commercial air-cooled transmitting tubes. Effects of primary and secondary electron emission by the grid on the driving power are considered.

- R343 Colebrook, F. M. A selective 8-valve receiver for medium and long wave telegraphy. *Journal Scientific Instruments*, (London), 6, pp. 177-183; June, 1929.

A receiving set which was designed for the meteorology department of the National Physical Laboratory, London, for recording of time signals on frequencies of 200 to 15 kilocycles is described. The principal requirements were met in this set and were (a) comparative ease of manipulation and (b) sufficient sensitivity and selectivity for the signal operation of a relay for recording purposes.

#### R500.—Applications of radio

- R520 Dellinger, J. H., and Diamond, H. Radio developments applied to aircraft. *Mechanical Engineering*, 51, pp. 509-514; July, 1929.

Description of work done by Bureau of Standards in development of a radiobeacon system which serves eight courses.

- R522 Freeman, R. H. Radiotelephony aloft. *Radio*, (San Francisco), 11, pp. 39-41; July, 1929.

Description of work done by the Boeing Air Transport, (Inc.), on successful plane-to-plane and plane-to-ground communication system.

- R526.1 Etudes des radiophares par le "Bureau des Standards." (Study on radiobeacons by Bureau of Standards.) *L'Onde Electrique*, 8, pp. 143-159; April, 1929.

A summary of the work on radiobeacons for aircraft carried on at the Bureau of Standards up to November 6, 1928.

- R550 Eckersley, P. P., and Howe, A. B. The operation of several broadcast stations on the same wave length. *Jour. Inst. Elec. Engrs. (London)*, 67, pp. 772-789; June, 1929.

Consideration is given to the advantages to be derived from operation of several broadcasting stations on one wave length and to means whereby such operation may be attained. A brief outline is given of theory of production of distortion of various types inherent to single wave-length operation. A theory is elaborated to account, quantitatively, for amount of interference from a distant station likely to be experienced when listening to a local station operating on the same wave length. Conditions under which distortion introduced by such interference becomes negligible are determined, together with approximate service range of individual single-wave stations.

- R582 Mesny, R. Phototelegraphie d'amateur. (Amateur phototelegraphy.) *Bull. de la Soc. Francaise des Electriciens*, 9, pp. 511-524; May, 1929.

Description of Belin system of phototelegraphy.

- R582 Ranger, R. H. Potoradio developments. *Proc. Inst. of Radio Engrs.*, 17, pp. 966-984; June, 1929.

A description of recent developments in photoradio apparatus is offered. Among them are (1) a push-pull relay making possible increased speeds in transmission, (2) a reverse lead-screw for giving continuous operation of the analyzing head, (3) an air-speed control eliminating certain local electrical disturbances, and (4) a hot-air recorder for use with heat-sensitive paper.

#### R800.—Nonradio subjects

- 510 Ballentine, S. Reciprocity in electromagnetic, mechanical, acoustical, and interconnected systems. *Proc. Inst. of Radio Engrs.*, 17, pp. 929-951; June, 1929.

New proof under more general assumptions than those of previous treatments of the extension of Rayleigh's reciprocity theorem to an electromagnetic system is offered. The consideration of reciprocity is carried further into mechanical, acoustical, and interconnected systems. The concept of a transduction coefficient for use in treating interconnected systems is introduced.