RADIO SERVICE BULLETIN

ISSUED MONTHLY BY BUREAU OF NAVIGATION, DEPARTMENT OF COMMERCE

Washington, February, 1915—No. 2

CONTENTS.

DEPARTMENT OF COMMERCE,
BUREAU OF NAVIGATION,
Washington, January 14, 1915.

To collectors of customs, radio inspectors, and others concerned:

This publication is issued monthly by the Bureau of Navigation, Department of Commerce, and distributed to the United States officers engaged in or concerned with the enforcement of the radio laws for their guidance and instructions, and to those concerned with the operation of Government and commercial radio stations for their information.

The Radio Service Bulletin supersedes the quarterly supplements to the list of Radio Stations of the United States, and will contain information concerning Government, commercial, and special stations only. Information regarding amateur stations will appear only in the annual edition of the list of Radio Stations of the United States.

The bulletin contains tables of new stations, alterations, and corrections under headings, so that the list of Radio Stations of the United States and the list of Radiotelegraph Stations, published by the international bureau at Berne, may be brought up to date. Additions, alterations, and corrections should be entered in these two publications promptly on receipt of the bulletin.

Amendments to or changes in the Radio Laws and Regulations of the United States (edition of July 27, 1914) will be printed in this bulletin in such a manner that they may be clipped and pasted in their proper places in that publication.

Items of general interest concerning the enforcement of the radio laws will be printed in the bulletin from time to time, as occasion warrants.

E. T. CHAMBERLAIN,
Commissioner of Navigation.

Approved:
E. F. SWEET,
Acting Secretary.

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ABBREVIATIONS.

INTERNATIONAL ABBREVIATIONS USED IN THIS LIST.

Nature of service:
PG=General public.
PR=Limited public or limited commercial.
P=Private.
O=Government business exclusively.

Hours of operation:
N=Continuous service.
X=No regular hours.
m=a. m.
s=p. m.
12 m=Midday.
12 s=Midnight.
fr.=Franc (francs).
c.=Cents.

OTHER ABBREVIATIONS.

Name =Name of station.
G. loc. =Geographical location (O=west longitude, N=north latitude).
Call =Radio call letters.
System=Radio system used and sparks per second.
Range =Normal range in nautical miles.
W. L. =Wave lengths.
Service=Nature of service.
Hours =Hours of operation.
Rates =Ship or coast charges in francs and dollars.
Notes =Refers to notes in the Berne list.
Co. =Company.
Corp. =Corporation.

NEW STATIONS.

SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS.

[Additions to the list of radio stations of the United States, and to the International List of Radiotelegraph Stations published by the Berne bureau.]

Name.	Call signal.	System.	Wave lengths.	Ship rate.	
				Per word.	Minimum per radiogram.
Bradford[1]	KNG		300, 600		
California (WOR)[2]	WOR		300, 600		
Camaguey[3]	KWI		300, 600		
Coalinga[4]	WOT		300, 600		
Colon (WHO)*[5]	WHO	Marconi	300, 600	4 c. (0.20 fr.)	40 c. (2 fr.).
Dayton[1]	KNP		300, 600		
Moreni[1]	KNX		300, 600		
Northern Pacific*[6]	WIM	Marconi	300, 600	4 c. (0.20 fr.)	40 c. (2 fr.).
Pioneer[1]	KIG		300, 600		
Polarine	KOI		300, 600		
Santiago[3]	KWE		300, 600		
Satsuma[7]	KJI		300, 600		
Wico*[1]	KNN	Marconi	300, 600	4 c. (0.20 fr.)	40 c. (2 fr.).
William O'Brien*[8]	KPN	Marconi	300, 600	4 c. (0.20 fr.)	40 c. (2 fr.).
Wm. E. Chapman[9]	KRM		300, 600		

* Radio station operated and controlled by the Marconi Wireless Telegraph Co. of America.
[1] Standard Oil Co. of New Jersey, owner of vessel.
[2] John A. Hooper, owner of vessel.
[3] New York & Cuba Mail Steamship Co. (Ward Line), owner of vessel.
[4] Union Steamship Co., owner of vessel.
[5] American-Mexican Steamship & Trading Co., owner of vessel.
[6] Great Northern Pacific Steamship Co., owner of vessel.
[7] Barber & Co., owner of vessel.
[8] East Coast Transportation Co., owner of vessel.
[9] Merritt & Chapman Derrick & Wrecking Co., owner of vessel.

SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS.

Call signal.	Station.	Call signal.	Station.
KIG	Pioneer.	KRM	Wm. E. Chapman.
KJI	Satsuma.	KWE	Santiago.
KNG	Bradford.	KWI	Camaguey.
KNN	Wico.	WHO	Colon.
KNP	Dayton.	WIM	Northern Pacific.
KNX	Moreni.	WOR	California.
KOI	Polarine.	WOT	Coalinga.
KPN	William O'Brien.		

SPECIAL LAND STATIONS, ALPHABETICALLY BY NAMES OF STATIONS.

[Additions to the list of radio stations of the United States only.]

Station.	Call signal.	Wave lengths.	Service.	Hours.	Station controlled by—
Hartford, Conn.	1ZC	200, 300, 425, *600*...	P	X	Harry E. Chapman.
Kansas City, Mo.	9XK	Variable.	P	X	Robert R. Moore.
Lexington, Mass.	1ZD	200, 425, *600*.	P	X	Samuel W. Dean.
Penikese, Mass.	1ZP	200, 300, 425, *600*...	P	X	James A. B. Thomas.
Springfield, Ill.	9ZS	600, *2000*.	P	X	Illinois Watch Co.
St. Louis, Mo.	9XV	*850*, 1200, 1500, 2000.	P	X	Washington University.

SPECIAL LAND STATIONS, GROUPED BY DISTRICTS.

Call signal.	District and station.	Call signal.	District and station.
	First district:		Ninth district:
1ZC	Hartford, Conn.	9XK	Kansas City, Mo.
1ZD	Lexington, Mass.	9XV	St. Louis, Mo.
1ZP	Penikese, Mass.	9ZS	Springfield, Ill.

ALTERATIONS AND CORRECTIONS.

LAND STATIONS, ALPHABETICALLY BY NAMES OF STATIONS.

[Alterations and corrections to be made in the list of radio stations of the United States, and in the International List of Radiotelegraph Stations published by the Berne bureau.]

HILLCREST (DALY CITY), CAL.—Range, 200; system, Marconi, 340.

HOBOKEN, N. J.—Range, 400; system, Marconi, 1000; W. L., 2250; service, PR; hours, X. Notes: Radio station operated and controlled by the Marconi Wireless Telegraph Co. of America. Station limited to correspondence with land stations at Scranton, Pa., Binghamton, N. Y., and Buffalo, N. Y., and with trains of the Delaware, Lackawanna & Western Railroad, and is for the purpose of transacting that company's railroad business.

SHIP STATIONS, ALPHABETICALLY BY NAMES OF VESSELS.

[Alterations and corrections to be made in the list of radio stations of the United States, and in the International List of Radiotelegraph Stations published by the Berne bureau.]

ADMIRAL DEWEY.—System, Marconi, 400.

ADMIRAL SCHLEY.—System, Marconi, 400.

ALAMEDA.—Strike out range; system, Kilbourne & Clark; strike out rates. Note, Alaska Steamship Co., owner of vessel.

ANTILLES.—System, Marconi, 400.

CALAMARES.—Range, 500; system, composite, 1,000; service, PG; hours, N; rates, 8 c. (0.40 fr.) per word, 80 c. (4 fr.) minimum per radiogram. Notes, Radio station operated and controlled by the Tropical Radio Telegraph Co. Calamares Steamship Corp., owner of vessel.

CHARLTON HALL.—System, Marconi; rates 4 c. (0.20 fr.) per word, 40 c. (2 fr.) minimum per radiogram. Notes, Radio station operated and controlled by the Marconi Wireless Telegraph Co. of America. United States Steel Products Co., owner of vessel.

COMUS (KKD).—System, Marconi, 400.

CONCHO.—System, Marconi, 400.

CORDOVA.—Strike out all particulars.

CORWIN.—Strike out all particulars.

DOLPHIN (WAU).—Strike out all particulars.

EDITH.—Strike out all particulars.

EL DIA.—System, Marconi, 240.

EL SIGLO.—System, Marconi, 240; hours, X.

E. R. STERLING.—Range, 100; system, composite, 200; W. L., 300, 450, *600;* service, P; hours, X. Notes, Radio station operated and controlled by Sterling Ship Co., owner of vessel.

FALCON (WRK).—Strike out all particulars.

FIFIELD.—Strike out all particulars.

FINLAND.—Range, 200; system, Marconi, 240; W. L., 300, *600;* service, PG; hours, N; rates, 8 c. (0.40 fr.) per word, 80 c. (4 fr.) minimum per radiogram.

GENERAL HUBBARD.—Strike out all particulars.

GEORGE W. FENWICK.—Strike out all particulars.

JEFFERSON (KOD).—System, Marconi, 400.

JEFFERSON (WAJ).—Strike out range; system, Kilbourne & Clark; strike out service; strike out hours; strike out rates. Note, Alaska Steamship Co., owner of vessel.

LAMPASAS.—System, Marconi, 400.

LATOUCHE.—Strike out all particulars.

MADISON.—System, Marconi, 400.

MARIPOSA.—Strike out range; strike out system; strike out rates. Note, Alaska Steamship Co., owner of vessel.

MORRO CASTLE.—System, Marconi, 400.

NEW YORK (KSN).—Range, 200; system, Marconi, 240; W. L., 300, *600;* service, PG; hours, N; rates, 8 c. (0.40 fr.) per word, 80 c. (4 fr.) minimum per radiogram. Notes, Radio station operated and controlled by the Marconi Wireless Telegraph Co. of America. International Mercantile Marine Co. (American Line), owner of vessel.

NOME CITY.—Strike out all particulars.

NORTHWESTERN (WAN).—Strike out all particulars.

NUECES.—System, Marconi, 400.

PHILADELPHIA (KSM).—System, Marconi, 480.

PIONEER (WPN).—Strike out all particulars.

PRINCESS ANNE.—System, Marconi, 400.

ROBERT DOLLAR.—Rates, 4 c. (0.20 fr.) per word, 40 c. (2 fr.) minimum per radiogram.

SACRAMENTO (WIA).—Strike out all particulars.

SANTA ANA.—Strike out all particulars.

SEWARD.—Strike out all particulars.

SIERRA.—System, Poulsen arc. Notes, Radio station operated and controlled by the Federal Telegraph Co. Oceanic Steamship Co., owner of vessel.

ST. PAUL (KSO).—Range, 200; system, Marconi, 240; W. L., 300, *600;* service, PG; hours, N; rates, 8 c. (0.40 fr.) per word, 80 c. (4 fr.) minimum per radiogram. Notes, Radio station operated and controlled by the Marconi Wireless Telegraph Co. of America. International Mercantile Marine Co. (American Line), owner of vessel.

TATOOSH.—Strike out all particulars.

TYEE.—Strike out all particulars.

VICTORIA.—Strike out all particulars.

WAKIVA (WLA).—Strike out all particulars.

WASHINGTONIAN.—Strike out all particulars.

YAGUEZ.—Strike out all particulars.

SHIP STATIONS, ALPHABETICALLY BY CALL SIGNALS.

Strike out particulars after the following call signals: KDY, WAD, WAE, WAI, WAL, WAN, WAR, WAU, WAV, WIA, WKW, WLA, WMT, WNG, WNN, WPC, WPE, WPN, WRF, WRK, WRN.

SPECIAL LAND STATIONS, ALPHABETICALLY BY NAMES OF STATIONS.

[Alterations and corrections to be made in the list of radio stations of the United States only.]

BELOIT, WIS.—W. L., 300, 600, 900 variable.
LOS ANGELES, CAL.—W. L., 300, 485, 600 variable.
SLINGERLANDS, N. Y.—W. L., 200, 300, 600, 1000, 1200, 2000, 5500. Radio station controlled by C. F. & B. V. Deitz.

MISCELLANEOUS.

RADIO STATIONS OF THE UNITED STATES.

[Oct. 1, 1914.]

Commercial and special land stations.

Controlled by—	General public.	Limited pul lic.	Limited commercial.	Government official.	Special.[1]	Total.
United States Navy	23			25		48
United States Coast Guard Service				1		1
United States Army	7			32		39
Superintendent United States Capitol Building and Grounds				1		1
Insular government, Philippine Islands	6					6
Marconi Co.	58	3	1			62
National Electric Signaling Co.	1	1	1			3
Tropical Radio Telegraph Co.	2					2
Federal Telegraph Co.		6	2			8
Mutual Telephone Co., Hawaii	3	2				5
Atlantic Communication Co.	2					2
Delaware, Lackawanna & Western R. R. Co.			4			4
Unclassified	3		5		54	62
Total	105	12	13	59	54	243

Ship stations.

Controlled by—	Number.	Controlled by—	Number.
United States Navy	248	Tropical Radio Telegraph Co.	21
United States Coast Guard Service	25	Atlantic Communication Co.	15
United States Army	34	Unclassified	197
United States Department of Commerce.	6		
Marconi Co.	330	Total	895
National Electric Signaling Co.	19		

Amateur stations licensed.[2]

District and headquarters.	Number.	District and headquarters.	Number.
1. Boston, Mass.	374	7. Seattle, Wash.	114
2. New York, N.Y.	503	8. Cleveland, Ohio	456
3. Baltimore, Md.	543	9. Chicago, Ill.	172
4. Savannah, Ga.	36		
5. New Orleans, La.	36	Total	2,796
6. San Francisco, Cal.	562		

[1] Including experimental and special amateur. [2] To July 1, 1914.

Summary of radio stations of the United States.

Kind of station.	Number.	Kind of station.	Number.
Government land stations	95	Government land and ship stations	408
Private, commercial, and special land stations	148	Private, commercial, special, and private land and ship stations	730
Total	243	Total	1,138
Government ship stations	313	Amateur stations licensed	2,796
Private, commercial, and private ship stations	582	Grand total	3,934
Total	895		

COMMERCIAL OPERATOR'S LICENSE SUSPENDED.

Under authority of the Radio Cummunication Laws and Regulations of the United States, page 49, paragraph 5, one of the United States coast guard cutters was recently conducting a range test with a merchant vessel at sea and considerable difficulty was experienced in establishing communication. The operator on the merchant vessel became exasperated and asked the operator on the coast guard cutter why he did not learn to receive, thereby violating the Regulations.

In accordance with section 3 of the act of August 13, 1912, his commercial first-grade license has been suspended by the Secretary of Commerce for a period of one month.

GASOLINE ENGINES.

Gasoline engines may not be installed and operated as a source of auxiliary electric power on passenger vessels previous to the promulgation of the Steamboat-Inspection Service Regulations. The board is now in session.

Those contemplating such installations should bear in mind that the engine should be located with the same view to safety and effective operation as approved storage-battery equipments.

Attention is invited to the act of July 23, 1910, amended June 24, 1912, which requires "auxiliary power supply," and to the service regulations of the London Convention, Article XI, which provides that such emergency power supply shall be located with a view to greatest possible protection against accident, to be determined by the Government issuing the wireless license. Attention is also invited to the laws and regulations, page 49, paragraph 2, which states that the transmitting apparatus operated from the emergency power supply should be capable of functioning within two minutes after unexpected notice to the operator.

COMMERCIAL EXTRA FIRST-GRADE OPERATORS.

The names of the following operators have been added to the list of those to whom commercial extra first-grade licenses have been issued by the Secretary of Commerce, as a reward for long and efficient service: H. W. Sinclair and E. W. Lovejoy, San Francisco, Cal., and J. H. Benson, Philadelphia, Pa.

COMMERCIAL OPERATOR PENALIZED.

About a year ago an operator holding a second-grade commercial operator's license changed the face of his license to read "Commercial first grade," and secured employment thereunder as a commercial first-grade operator.

The case came to the attention of the Department when the operator applied for a renewal of his license, and the Secretary of Commerce suspended his license for a period of one year, and, furthermore, all the papers in the case have been referred to the United States district attorney for prosecution for forgery.

OPERATOR EXAMINATIONS.

The act of August 13, 1912, providing for the licensing of commercial radio operators went into effect December 13, 1912. These licenses are issued for a period of two years, and during the past few months a great deal of attention has been given to their renewal. The attention of all radio operators is invited to the Radio Communication Laws of the United States, edition of July 27, 1914, page 66, paragraphs 152 to 162, inclusive.

Under certain conditions prescribed in the regulations, renewal licenses may be issued without examination, but all operators are warned that they should keep well informed as to the manipulation and operation of modern radio apparatus, and that it is necessary for them to keep posted in regard to any new radio laws or regulations.

Recently an operator holding a commercial first-grade operator license applied to one of the radio inspectors for a renewal of his license without examination, but the service record on the back of his license did not show the required service, so that the applicant was informed that he must take another examination. He took the examination and attained an average of only 36.5 per cent, which did not entitle him to hold even a commercial second-grade license.

Shortly after he had taken the examination he submitted a letter, sworn to by his employer, stating that he had been employed and served as a radio operator on ships during the 90 days specified in the regulations. This affidavit might have been accepted as evidence of satisfactory service in lieu of the service record except that the examination which the operator took demonstrated that the affidavit was not satisfactory evidence and indicated clearly that the applicant was not entitled to hold a first or second grade license under the requirements.

The present regulations and examinations concerning the renewal of operator licenses and reexamination were drawn up with a particular view to eliminate from the ranks those operators who fail to keep abreast of the times.

Any regulation similar to that concerning the reexamination of operators, where a division line is sharply drawn, is bound to appear to be a hardship in some cases.

Referring further to the whole question of the examination of operators, attention is invited to an article in volume 2, number 3, of the "Proceedings of the Institute of Radio Engineers," by V. Ford

Greaves, radio engineer of the Bureau of Navigation. Particular reference is made to the chapter under the heading "Technical knowledge," pages 201 to 204, inclusive.

The operator examination question sheets under the heading "Instructions" provide: "The questions are short, but applicants are expected to state clearly their full knowledge of each subject." No doubt those operators who have performed satisfactory service under a commercial first-grade license, but who fail in the examination for renewal of same, will study and procure their licenses at their next examination. When the operators now holding commercial first-grade licenses become familiar with the requirements concerning reexamination they will undoubtedly take the necessary steps to properly prepare themselves for the reexamination, which is the Bureau's intention.

STORAGE BATTERIES.

The following data concerning the care, operation, and testing of storage batteries are published for the information and guidance of radio inspectors, and it is believed that the information will be valuable to operators and others concerned with the maintenance of storage-battery equipments. Similar data concerning the inspection of the Edison storage battery may be published in a future edition.

With a view to obtaining uniform and consistent inspections and tests of the storage batteries furnished as the auxiliary source of power supply for the radio equipments on board ships, required by the act of July 23, 1912, amending the act of June 24, 1910, the following instructions covering suitable tests are issued:

It is probable that storage batteries of sufficient size and number to be used as the reserve power for the main motor generator set will soon come into more general use.

Tests involving discharging the battery are both uncertain in cases of partial charge and require too much time and aggravate the condition it is desired to correct. Therefore the tests indicated hereafter are made by putting the battery on charge. In addition, the general condition of storage batteries should be noted as to—first, cleanliness (battery trays should be kept clean and dry and free from electrolyte, which tends to short circuits and grounds); second, connections (all connections should be tight and free from verdigris); third, installation (cells or trays should be securely fastened in position to prevent accident in heavy weather or when vessel has listed considerably, conditions probable in emergency); fourth, maintenance (all caps, stoppers, or valves should be in proper position).

Data regarding the storage batteries should be posted in the radio room. This information should indicate the make, type, size, and the charging rates of the cells; also, if possible, information regarding the electrolyte, including information regarding the specific gravity before and after the charges, and records of charge and if any changes have been made in electrolyte.

The tests indicated hereafter may take a maximum of one-half hour time, so that tests should be started immediately on boarding vessel. Arrangements must be made to see that ship voltage is maintained at the proper or normal value. The charging amperage should be known, but the resistance of most panels are fixed so that standard

types will soon be familiar to inspectors. It must be remembered that the batteries provided on vessels may exceed the necessary capacity required to make the set comply with the law, and this fact must be considered before a battery can be rejected. The tests prescribed hereafter are approved by the manufacturers of the different types of batteries involved and a persistent use of the information gained by these tests, if brought to the attention of the proper authorities, will undoubtedly result in an improved maintenance of this equipment. Instructions covering the tests of the batteries made by the Electric Storage Battery Co. are furnished herewith.

The following instructions apply to the inspection of chloride, exide, and ironclad exide types of lead batteries made by the Electric Storage Battery Co., Phiadelphia, Pa.:

Types of batteries.—Batteries in wireless service on shipboard, as supplied by the Electric Storage Battery Co., are of several types, viz, exide, chloride, or ironclad exide, and are assembled in rubber jars in wood trays.

Each tray bears a name plate. In the case of exide and ironclad exide the name plate gives the type, number of cells, charging rates, discharge rating, and the normal full-charge specific gravity of the electrolyte. In batteries of the chloride type, the name plate gives the catalogue number of the tray and the normal charging rate.

Voltage.—Put battery on charge at current rate, which is used for giving the battery its overcharge or equalizing charge as defined hereafter.

The charging panels for these types of battery are supposed to be designed so that the proper charging rates are obtained for the following tests when the ship voltage is kept up to normal. Radio inspectors must therefore see that the ship voltage is kept at proper value during the test.

All exide types of batteries on test should be charged at within 10 per cent of the finishing rate. This rate for the different types is rated on the name-plate data and is shown in the accompanying tables. All chloride batteries on test should be charged at within 10 per cent of the normal charging rate as shown on the name plate and in the accompanying tables. For chloride cells, the "finishing" and "normal" charge rates are the same. For exide cells the "finishing" rates are specially indicated.

If the closed current voltage of the battery, under proper charge rate, stops rising within 30 minutes—i. e., reaches a maximum, which is above 2.45 volts per cell (it may go as high as 2.65 volts per cell or over) and cells are gassing freely—battery can be considered as charged. If at the end of 30 minutes proper charge the battery voltage is still rising, but is an average of 2.45 volts per cell, and cells are gassing quite freely, battery can be assumed to be within 15 per cent of being charged—i. e., they can be considered as capable of furnishing within 15 per cent of rated normal full-charge capacity.

If at the end of 30 minutes battery voltage is below an average of 2.45 volts per cell, or cells are gassing but slightly or not at all, battery can not be considered as charged within 15 per cent of full capacity and should be put on charge and charge completed without delay.

Just before the end of charge, read the voltage of one or two cells of each tray of battery with the low-reading voltmeter provided and if these cell-voltage readings agree closely with the average cell

voltage of the battery (found by dividing the battery voltage by the number of cells in battery), it can safely be assumed that all cells are uniform in voltage and no more cell-voltage readings need be taken. If the cell voltages are above the average cell voltage of battery, as defined above, an inspection should be made to discover the defective cells, the presence of which is indicated.

Cell voltages at the end of each of the test charges outlined above will be found to vary somewhat between different batteries, due to type variation, temperature, or age and conditions of plates, and for this reason a fixed voltage value can not be used in these tests.

However, the minimum voltage required in the above tests—namely, 2.45 volts per cell—is considered to allow for all possible conditions which may be encountered and to be equitable to the ship station to a degree which the inspector may safely require. These voltage requirements also apply to the lead batteries made by the European companies affiliated with the Electric Storage Battery Co.

Electrolyte.—The specific gravity of the electrolyte in lead cells is an excellent indication of the condition of the battery if the values and treatments previous to the test are known. If the readings at the end of the last full charge are known and no changes have been made in electrolyte, the readings at the time of tests are reliable indications as to the state of discharge.

So far it has been impracticable to obtain reliable specific gravity data for ship storage batteries, and only those readings taken by radio inspectors can be relied upon and the voltage tests outlined must be the main basis for determining the condition.

Specific gravity.—If time permits, take a few specific-gravity readings of the electrolyte of several cells in different trays as a check on the general condition of the battery.

Marked variation in the specific gravity in the different cells of the battery may be an indication of trouble in the cells in which the gravity is low, and such cells should be carefully checked up, taking voltage readings when charging and noting whether these cells gas equally with other cells.

The specific gravity falls during discharge and rises during charge, and can be used as an indication of the state of charge of the battery provided the gravity at the end of the last full charge is known.

In batteries of the exide and ironclad exide type the normal gravity at full charge is 1.280 at 70° F., but a variation down to 1.250 is allowed. For batteries of the chloride type the normal full-charge gravity is 1.210 at 70° F. with an allowable variation down to 1.190.

As the temperature affects the gravity this must be considered and corrections made as follows: To correct the gravity to normal temperature (70° F.), subtract one point for each 3° F. below 70°, and add one point for each 3° above 70° F. For example, electrolyte which is 1.283 at 61°, or 1.277 at 79°, will be 1.280 at 70°; if 1.213 at 61° or 1.207 at 79°, it will be 1.210 at 70°.

Gassing.—All cells should gas uniformly.

Height of electrolyte.—Remove vent plugs from several cells throughout the battery to make sure the electrolyte covers the plates.

Connections.—See that terminals and connections are tight and free from corrosion.

Additional.—Additional information regarding the batteries manufactured by the Electric Storage Battery Co. can be obtained from the pamphlets and publications issued by this company.

The installation of a recording ampere-hour meter is strongly recommended for all storage battery equipments on shipboard.

TABLE OF CHLORIDE PORTABLE BATTERIES.

[Normal ampere hour capacity can be determined by multiplying the normal discharge rate by 8.]

Cat. No.	Cells in case.	Type and number of plates.	Rate of normal charge and discharge.	Outside dimensions of case.			Height over lugs.	Weight complete.
				Length.	Width.	Height.		
			Amps.	Inches.	Inches.	Inches.	Inches.	Pounds.
301	1	"C" 3	1½	3½	5⅞	8⅞	10⅜	8
302	2	"C" 3	1½	5⅜	5⅞	8⅞	10⅜	14
303	3	"C" 3	1½	7	5⅞	8⅞	10⅜	20
304	4	"C" 3	1½	8⅞	5⅞	8⅞	10⅜	26
305	5	"C" 3	1½	10⅝	5⅞	8⅞	10⅜	32
401	1	"D" 3	2½	3½	7⅛	10½	11½	15
402	2	"D" 3	2½	5½	7⅛	10½	11½	26
403	3	"D" 3	2½	7	7⅛	10½	11½	37
404	4	"D" 3	2½	8⅝	7⅛	10½	11½	48
405	5	"D" 3	2½	10½	7⅛	10½	11½	59
406	1	"D" 5	5	4½	7⅛	10½	11½	24
407	2	"D" 5	5	7	7⅛	10½	11½	43
408	3	"D" 5	5	9⅞	7⅛	10½	11½	62
409	4	"D" 5	5	13	7⅛	10½	11½	81
410	5	"D" 5	5	15½	7⅛	10½	11½	100
411	1	"D" 7	7½	5½	7⅛	10½	11½	33
412	2	"D" 7	7½	9½	7⅛	10½	11½	58
413	3	"D" 7	7½	13	7⅛	10½	11½	83
414	4	"D" 7	7½	16⅞	7⅛	10½	11½	108
415	5	"D" 7	7½	20½	7⅛	10½	11½	133
501	1	"E" 5	10	4½	9⅝	12½	13½	33½
502	2	"E" 5	10	7⅛	9⅝	12½	13½	60
503	3	"E" 5	10	10	9⅝	12½	13½	86½
504	4	"E" 5	10	13½	9⅝	12½	13½	113¼
505	5	"E" 5	10	15⅞	9⅝	12½	13½	140
506	1	"E" 7	15	5⅜	9⅝	12½	13½	42½
507	2	"E" 7	15	9½	9⅝	12½	13½	82½
508	3	"E" 7	15	13½	9⅝	12½	13½	122¾
509	4	"E" 7	15	17⅞	9⅝	12½	13½	163

EXIDE BATTERY DATA, SHOWING FINISHING CHARGE RATE.

Plates in jar.	M. V. ironclad exide.					M. V. exide.				
	Charge rate.		4½ hours discharge.	A. H. capacity.	Width of 1½-rib jars.[1]	Charge rate.		4 hours discharge.	A. H. capacity.	Width of 1½-rib jars.[1]
	Start.	Finish.				Start.	Finish.			
	Amps.	Amps.	Amps.		Inches.	Amps.	Amps.	Amps.		Inches.
7	19	8	21	94½	2⅜	19	8	21	84	2⅜
9	24	10	28	126	3⅛	24	10	28	112	3⅛
11	30	12	35	157½	4¼	30	12	35	140	4¼
13	35	14	42	189	5	40	16	49	168	5
15	40	16	49	220½	5⅞	45	18	56	196	5⅞
17	45	18	56	252	6¾	51	20	63	224	6¾
19	51	20	63	283½	7½	56	22	70	252	7½
21	56	22	70	315	8					8

[1] These jars have a uniform length of 6⅛ inches and height of 12 7/16 inches.

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