

29-1 GENERAL

29-1-1 Observance; Familiarity With These Instructions—

A. Personnel assigned to duty at stations and on board lightships shall thoroughly familiarize themselves with the contents of this chapter insofar as their duties are concerned with pertinent parts thereof.

29-1-5 Organization—

A. *Complement of unit.*—The complement of a unit consists of the officer-in-charge (or commanding officer) and the crew. The officer-in-charge (or commanding officer) shall be the person designated as such by proper authority. The crew consists of personnel in numbers and ratings authorized and allowed by the Commandant and assigned by the District Commander.

B. *Officer-in-charge.*—The majority of stations and lightships are manned by military personnel. The person in charge of a station is generally a petty officer designated as the "officer-in-charge." Other persons attached to a station may be rated or nonrated enlisted personnel. The officer-in-charge of a lightship may be a warrant officer or a rated enlisted man. Should the person in charge of a lightship be a commissioned warrant officer, he is designated as the Commanding Officer. The remainder of the crew of a lightship are rated and nonrated enlisted personnel. See the Commandant's Circular series of directives for details of the authority of an officer-in-charge and limitations thereof.

C. *"Keeper."*—Certain stations and a very few lightships are manned by civilian employees. At a light station these civilian employees are popularly known as "keepers". When a civilian keeper is designated in charge of a light station, the reference to officer-in-charge as made throughout this chapter in connection with the duties and responsibilities of that office, apply equally to said civilian keeper-in-charge. Units having civilian employees aboard may also have military personnel.

D. *Designation of officer-in-charge.*—In the absence of the regularly assigned officer-in-charge, the person designated by the District Commander shall assume the duties of the officer-in-charge. If such designation has not been made, the next senior rating in the crew shall assume the duties of officer-in-charge.

E. *Group Commander.*—A number of stations and lightships may be under the command of a group commander who may be a warrant or commissioned officer.

F. *Other aids to navigation duties.*—In some cases, the officer-in-charge of a light station may have additional aids to navigation duty, consisting of tending a group of minor lights in the proximate locality, i. e., light attendant duty.

G. *Other Coast Guard duties.*—The military officer-in-charge of a station may have other Coast Guard duties aside from aids to navigation duties.

29-1-10 Watch, Quarter and Station Bill—

A. The station complement must be organized for the accomplishment of the assigned operational mission. The necessary organization can be realized best by the preparation of a "Watch, Quarter and Station Bill" covering the various activities. This bill should contain such of the following information as is pertinent to the particular unit:

(1) Station and duties for each man for all drills prescribed by Coast Guard Regulations for light stations and lightships (i. e., fire, inspection, resuscitation, etc.).

(2) Daily and weekly routine operational duties, cleaning stations, watch and liberty schedules for each man.

(3) Station and duties for special occurrences such as boat rescue, etc. Station and duties for such other drills and exercises as may be prescribed by the District Commander.

(4) Name and rate of each person attached, address and phone number if quartered away from station, etc.

B. No sample "Watch, Quarter and Station Bill" is shown herein due to the present lack of standardization of stations and their facilities. The officer-in-charge should consult with his immediate superior if in need of assistance in preparing a suitable bill.

C. *The fire bill* should contain information concerning the fire alarm, fire stations, location of fire-fighting equipment and the duties of each member of the crew. In assigning stations and duties, allowance should always be made for the fact that some of the crew may be on liberty or leave. Important stations should be covered at all times. Each major piece of fire-fighting equipment should be given a number, which should appear on the equipment, i. e., fire plugs Nos. 1, 2, etc. When the station is within an area covered by municipal fire-fighting apparatus, indicate the means of sounding the municipal alarm.

D. *A maintenance bill* is useful to indicate regular maintenance routines, schedules of equipment tests, and the maintenance responsibility of individuals.

E. *Other data for station bill.*—Station Bills may also contain such of the below listed information as deemed necessary and pertinent to efficient operation. When these instructions are not included in the formal station bill, they should be made available to personnel in such other form as the officer-in-charge deems necessary. (No attempt has been made to list everything personnel should know; however, these are salient features.)

Describe clearly:

(1) Any duty required by the Aids to Navigation Operation Bill and not explained therein. (See sec. 29-8-1.)

(2) How to focus the light source.

(3) How to time the light apparatus and make corrective adjustment.

(4) How to clean the glass prisms, reflectors, and metallic part of the apparatus; how to clean the lantern glass; schedule of cleaning, duties of each man, materials used.

(5) How to change to standby apparatus (light source, and lens-drive motor or clock.)

(6) Schedule of station cleaning, painting and other maintenance duties of each man.

(7) Watch schedule and any other special or routine instructions for each man.

(8) The method of operation of radiobeacon; how to start and stop transmitter.

(9) How to monitor station signal; how to monitor group station signals.

(10) How to shift to standby transmitter.

(11) Schedule of master clock operation; change from No. 1 to No. 2 clock.

(12) Schedule of radiobeacon operations; change from No. 1 to No. 2 transmitter.

(13) Schedule of receiving time ticks.

(14) Regulation of master clocks; correction for "fast" or "slow," allowed rate.

(15) How to operate radiobeacon alarm device.

(16) Trouble shooting; what to do when signal goes off the air or is defective.

(17) What should be known about spare radiobeacon tubes or parts.

(18) How to start the fog signal; main power source; standby.

(19) How to time the fog signal characteristic and make adjustments.

(20) How to operate auxiliary machinery.

(21) How to operate boat hoists or other special machinery.

(22) Care of boats.

(23) Maintenance of grounds, fences, drains, roads, buildings, etc.

(24) Liberty schedule.

(25) Other special or routine duties peculiar to the station.

29-1-15 Arrangements of This Chapter—

A. Although many of the following sections of this chapter are primarily pertinent to light stations, certain sections and individual paragraphs pertain in whole or in part as well to lightships and to light attendant stations. An asterisk (*) placed before a paragraph or section designator means that the information contained therein is applicable to a greater or less degree to lightships as well as to light stations. A dagger (†) placed before a paragraph, section, or part designation means that the information contained therein is applicable to a greater or less degree to light attendant stations as well as to light stations.

B. The term "crew member" as used herein means a member of the complement of the unit, military or civilian, as pertinent.

29-2 DEFINITION AND DESCRIPTION OF STATIONS

29-2-1 Mission of a Light Station—

A. The mission of a light station is to service, tend, and maintain a light on a fixed structure (in conjunction with such radiobeacon, fog signal, or other related aids to navigation equipment as may be provided) on shore or on a marine site; in addition, at units designated "Light Station (Lookout)," to

maintain continuous lookout for search and rescue purposes, and, at units designated "Light Station (Rescue)," to maintain continuous lookout and rescue equipment.

A light station is popularly known as a "light-house."

29-2-5 Location and Description of a Light Station—

A. Light stations are found upon all coasts of the United States, upon the Great Lakes, and along some of the interior waterways of the country. Such structures are so well known as to require little description. Light stations are placed where they will be of most use, on prominent headlands, at entrances, on isolated dangers, or at other points where it is necessary that mariners be warned or guided. Their principle purpose is to support a light at a considerable height above the water. This is accomplished by a tower. The same structure may also house a fog signal and radiobeacon equipment, and also contain quarters for the attendants. However, in a majority of instances, the fog signal, the radiobeacon equipment, and the operating personnel are housed in separate buildings grouped around the tower. Other buildings may be for storage purposes and to house boats or vehicles. All of these structures comprise the light station.

B. All light station towers, whether they be of the totally enclosed masonry type or of the skeleton iron variety, and whether separate or combined with other buildings, have certain basic features in common. The tower generally supports a lantern, of a size adequate to house the illuminating apparatus selected for that site. It also embraces a closed passageway from the ground to the lantern so that the attending personnel may reach the light regardless of the state of the weather.

29-2-10 Typical Component Equipment of a Light Station—

A. The following equipment and apparatus may be found installed in a large light station:

(1) A fixed lens, or a revolving lens on a mercury float, ball bearing, or roller wheel-type chariot, with electric light or incandescent oil vapor lamp (very few of the latter remain in use).

(2) A radiobeacon room containing either a Class A, B, or C radiobeacon transmitter, with signal timer, radio receiver, primary clocks, all in duplicate, and radiotelephone transmitter-receiver.

(3) Two gasoline, diesel, or electric motor-driven air compressors.

(4) Two sound fog signal horns, mainly diaphones or diaphragm type, operated by the radiobeacon signal timer or a Crosby Characteristic Regulator. (The latter type is rapidly growing obsolete.)

(5) Two electric generators with prime movers, and a bank of batteries.

(6) Air storage tanks (receivers).

(7) Fresh and salt water motor-driven pumps.

B. In addition, boats, vehicles and other equipment incidental to the operation of a station are furnished.

29-2-15 Mission of a Light Attendant Station—

A. The mission of a light attendant station is to service, tend and maintain a group of minor aids to navigation (i. e. buoys, automatic lights on fixed structures, etc.) within an assigned area.

29-2-20 Location and Description of a Light Attendant Station—

A. Light attendant stations are located at strategic points in harbors or along inland waterways throughout the country. There are no particularly distinguishing features such as exist in the case of a light station (i. e., the tower).

B. The station consists of such structures (storage buildings, garage, boathouse, dwelling, pier or wharf, messing facilities, shops, etc.) necessary to the accomplishment of the mission.

29-2-25 Typical Component Equipment of a Light Attendant Station—

A. The following equipment and apparatus may be found at a light attendant station:

- (1) Buoy boat or other type of craft.
- (2) Vehicle.
- (3) Miscellaneous equipment for moving and handling batteries, cylinders or other aids to navigation apparatus.
- (4) Battery charging equipment.
- (5) Spare aids to navigation apparatus.

29-3 LIGHT SOURCES, LENSES, AND REVOLVING APPARATUS

29-3-1 General—

A. In order that personnel connected with the operation of a light station may have a better understanding of the lighting apparatus under their care, a summary of the physical and theoretical aspects of illumination and illuminating apparatus is included in this chapter. For a more thorough exposition of the principles of illumination, see Chapter 23 of this manual, "Lighted Aids to Navigation, Theory, Design, and Application.

29-3-5 Light Sources—

A. In all modern lighthouses, the rays of light from the light sources are collected either by prisms or mirrors or both, and caused to travel in a desired direction. The electric light filament is the source of light in most of the major lights in the Service today; the incandescent oil vapor mantle lamp which was extensively used some years ago is being rapidly replaced, although a number of installations are being retained for standby lights.

29-3-10 Lenses—

A. *Fresnel lens.*—The first really brilliant light for lighthouses came as the result of the work done by the French engineer, Fresnel, whose discoveries in about 1820 resulted in the design and construction

of a glass optic, or lens, which reflected or refracted a major portion of the light emitted from the light source. The aggregation of cut glass prisms (see fig. 29-1) collects and concentrates a very high percentage of the light and directs it out along useful horizontal beams. The largest lenses are constructed of separate prisms, angular in shape (except the bull's-eye) and individually designed for a specific purpose.

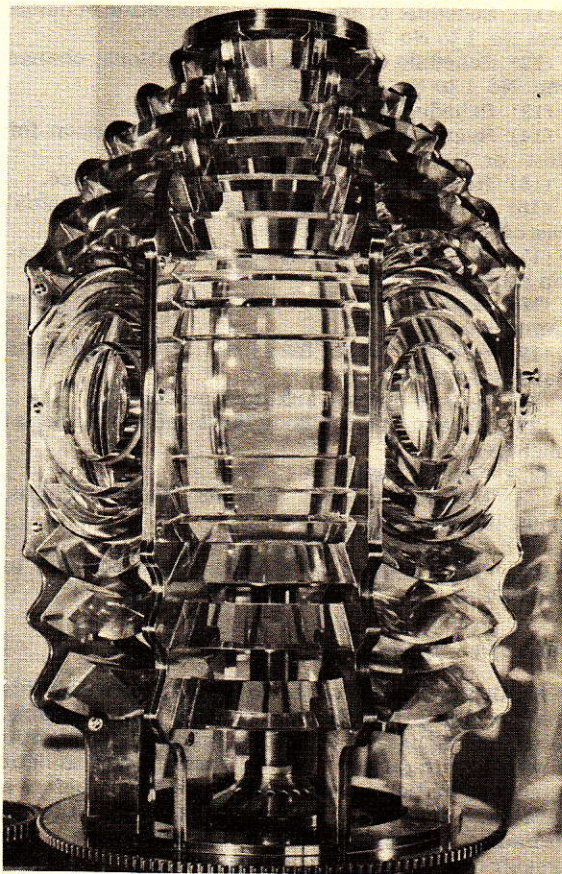


FIGURE 29-1.—Cutglass prisms.

B. *Prisms* are of three basic types:

(a) Prisms designed so as to reflect light are called *catoptric prisms*. They act as mirrors, see fig. 29-2.

(b) Prisms designed so as to refract or bend light in the desired direction are known as *dioptric prisms*, see fig. 29-3. The dioptric system is used in all lighthouse apparatus.

(c) Prisms designed to both refract and reflect the light in a desired direction are known as *catadioptric prisms*, see fig. 29-3.

(1) All prisms in larger lenses are of ground and polished glass, more frequently called cut glass. Large lenses are fabricated of individual elements of the different type prisms which are set in brass frames. The frames are assembled to make up a lens. The middle section (also the commonplace

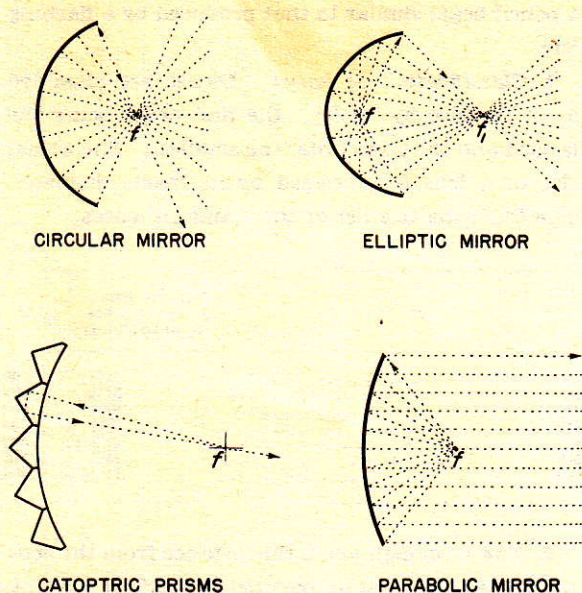


FIGURE 29-2.—Types of mirrors.

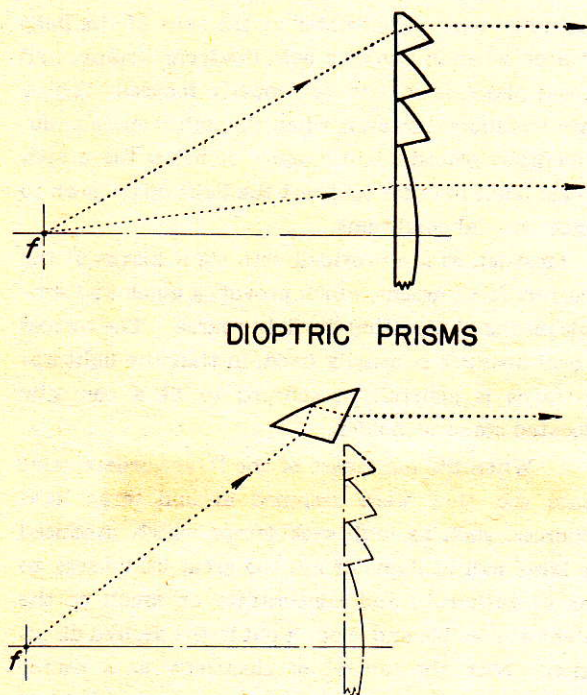


FIGURE 29-3.—Types of prisms.

pressed glass buoy lantern lenses) are made up of dioptric prisms. The sections both above and below the middle section are made up of catadioptric prisms. Catoptric prisms are arranged behind the light source and act as mirrors.

(2) Dioptric prisms are numbered upward and downward starting with the belt or bull's-eye as No. 1, and working outward. Catadioptric prisms are numbered upward and downward from the dioptric.

C. *Mirrors or reflectors* are spherical in shape, and by their proper location with respect to the light source, increase the over-all efficiency of a lens system, see figure 29-2.

D. *Types of lenses.*—There are three basic types of lenses; the *fixed* or stationary lens, the *flashing* or revolving lens, and the *range* or bull's-eye lens.

E. *Fixed lenses* produce a so-called fan beam which spreads out on a concentrated plane over an angle of 360° or less, the angle depending upon the desired spread, and consists of a dioptric drum section with upper and lower catadioptrics. The dioptric drum section is made up of lens elements consisting of a center belt (central dioptric element of a fixed lens) with several annular ring prisms above and below, assembled in brass astragal frames. By common usage, the term "drum lenses" has come to refer only to dioptric cylindrical lenses. Lenses containing only drum elements are always fixed; that is, they do not revolve.

F. *Flashing lenses* produce a so-called pencil beam which is concentrated in a single direction. This beam, when revolved, presents a flash to the observer. The sections of a flashing lens are known as panels (see paragraph G below). Each panel generates pencil beams. Figure 29-4 illustrates a complete flash panel showing the relative position of various lens sections mentioned above.

G. *Flash panel lenses* have been made with a number of panels varying from 2 panels to 12. The revolving lens with 2 flash panels is called a bivalve lens and others are known as 3-, 4-, 6-, 8-, 10- and 12-panel lenses. The flash panels concentrate the light into a horizontal beam of small vertical and horizontal divergence with candlepower proportionate to the area of the optic and brightness of the light source. The dioptric and catadioptric elements of the flash panels are framed and mounted on a rotating table which may be supported on a ball or roller-bearing carriage, or supported in a mercury float, so as to rotate around the focus and be visible from any point on the horizon as the lens revolves. The revolving lens was formerly driven by clockwork using weights, and is now generally driven by electric motors.

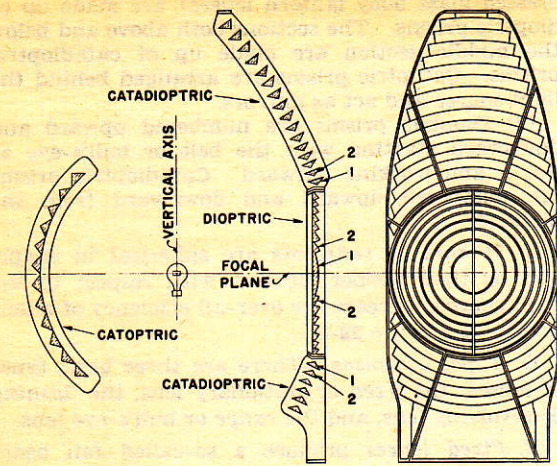
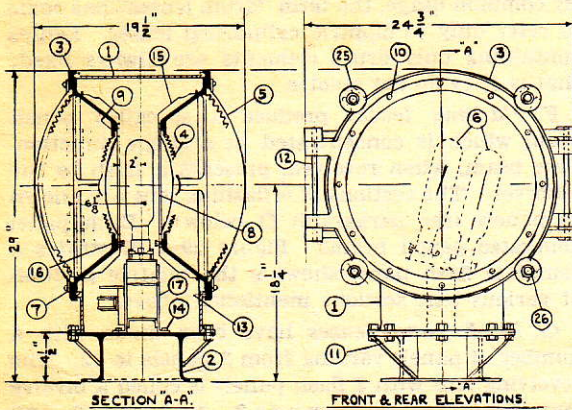


FIGURE 29-4.—Flash panel and prismatic mirror.

H. Range lenses (fig. 29-5) consist of a bull's-eye (central dioptric element of flashing lenses) surrounded by concentric prisms (rings), and produce



List of Parts

Dwg. No.	Pt. No.	Name
7914	1	Drum.
7914	2	Base.
7609	3	Door.
7609	4	Doublet lens, 10 x 2 inches F.
7609	5	Outer lens, 18 x 9 inches F.
7609	6	1,000 watts, 115 volts, T20, C13 Electric lamp.
7609	7	Lens ring.
7609	8	Doublet ring.
7609	9	No. 8-32 C'sk. hd. mach. screw.
7609	10	3/4 inch rd. hd. screw.
7609	11	1/2 inch bolts and nuts.
7609	12	Hinge pin.
7609	13	3/16 inch sq. rubber gasket.
7609	14	No. 10-30 fl. hd. mach. screw.
7609	15	Light guard.
7609	16	No. 8-32 screw for pt. 15.
7609	17	Lamp changer (2 lamps).
6342	25	Latch nut.
6342	26	Latch bolt.
6342	28	Latch pin.

FIGURE 29-5.—Double-ended diverged beam range lantern with lamp-changer for revolving beacon.

a pencil beam similar to that produced by a flashing lens.

I. Classification of lenses. Lenses are classified as to the size by "order," the first order being the largest and the sixth order the smallest. The actual size of a lens is expressed by its inside diameter. The following is a list of the standard lenses:

Size (order)	Inside dimensions (inches approximately)	MM
1st	72 ⁷ / ₁₆	1840
2d	55 ⁵ / ₈	1400
3d	39 ³ / ₈	1000
3 ¹ / ₂	29 ¹ / ₂	750
4th	19 ¹ / ₁₆	500
5th	14 ³ / ₄	375
6th	11 ³ / ₁₆	300

J. The focal distance is the distance from the center of the lens (light source) to the inside of the lens, in other words, half of the inside diameter.

K. The focal plane is a line through the center of the belt, as in a fixed lens, or bull's-eye in a flashing or range lens. The center of the area of the light source, when in line with both the focal distance and focal plane, is said to be properly focused. There are instances, however, when the light source is deliberately placed slightly above or below the proper focal point in order to divert the light up or down to meet special conditions.

Most lenses are provided with sight marks at the correct focal height, which provide a quick and simple means of adjusting the light source. The correct focal distance is usually fixed, in that the light apparatus is generally machined to fit a centrally located stand or holder.

L. When the cut lenses of the larger orders came into use, they were designed around large light sources, such as multiwick lamps which produced a large ball of flame of not too great brightness, so as to gather in and concentrate as much of the light as possible and shoot it out in the desired direction. With the advent of electricity as a source of light and the possibility of concentrating light of great brightness into a relatively small source, large lenses are no longer required. The modern trend is toward the searchlight type of light which is revolved by motor drive and which can be mounted one on top of the other at calculated angles so as to produce a desired characteristic. The 36-inch double-drum beacon is of this type (see fig. 29-6.)

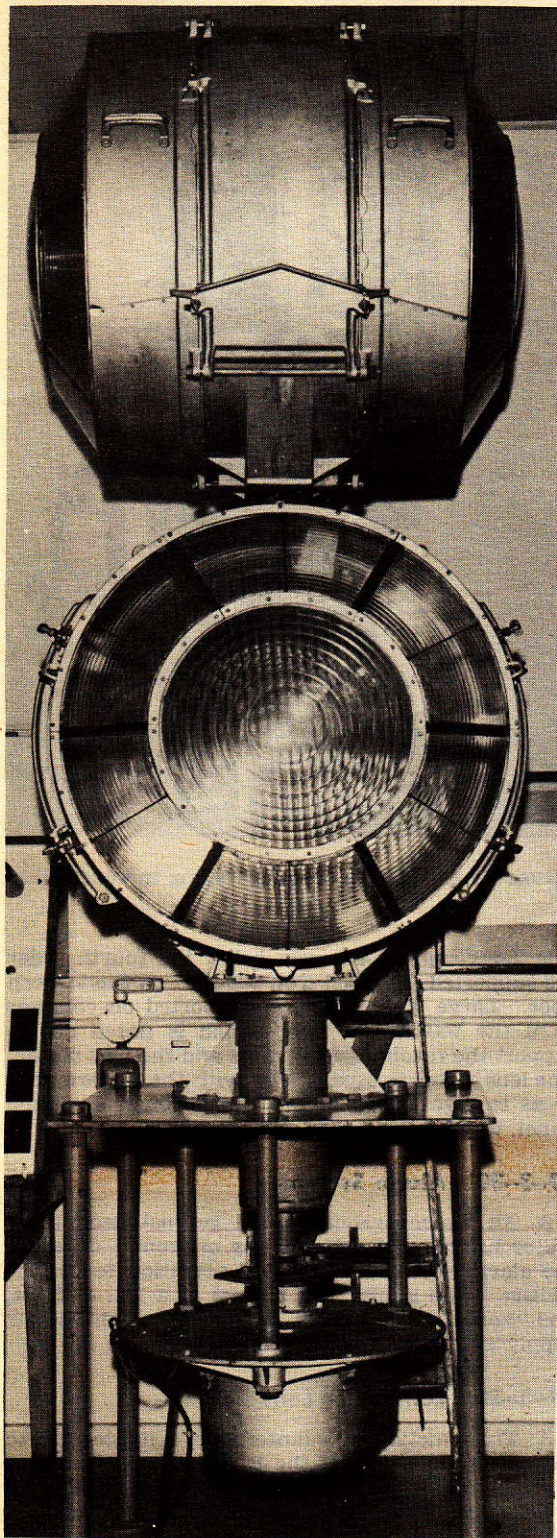


FIGURE 29-6.—36-inch double-drum beacon.

29-3-15 Standby Lights—

A. Standby equipment (fig. 29-7) should be readily available at all times: The Aladdin kerosene mantle lamp provides a satisfactory standby lamp (see fig. 29-8) and has been used as a regular light at some secondary lights. In the larger primary electric lights, an Incandescent Oil Vapor unit is usually at hand in case of a major breakdown.

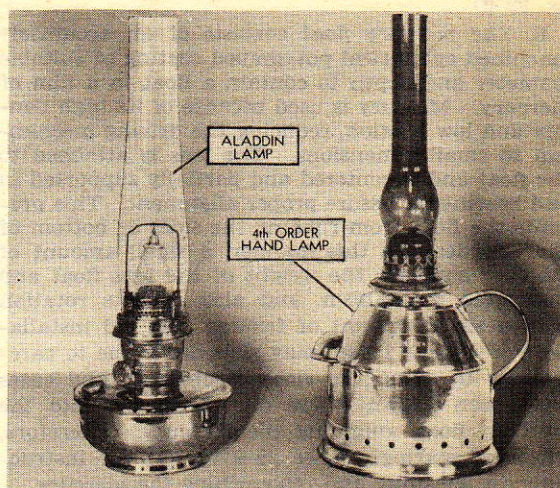


FIGURE 29-7.—Standby lights.

29-3-20 Flashing Equipment—

A. *Methods.*—There are several methods of producing the flashing characteristic of major lights: In fixed lenses, an open-sided shade or shield may be caused to revolve around the light source inside of the lens; a prismatic flash panel (catoptric lens or mirror) may be caused to rotate around the outside of the lens; or the light may be interrupted at the source. The latter is accomplished by the use of flashing mechanisms, of which there are several types. The mercury-type breakers are preferable.

B. *Characteristic.*—By arranging the flash panels (see fig. 29-4) in suitable combinations on a revolving platform, and rotating the lens at required speed, the desired characteristic may be obtained. The flash period is the time it takes for the beam to pass the eye of the observer at the speed of rotation, and the eclipse period is the time between flashes. The duration of the flash depends on the angular width of the light beam (divergence of the beam), and the width of this angle depends on the width of the light source, the focal diameter, the accuracy with which the lens was ground, and the speed of rotation.

29-3-25 Revolving Apparatus—

A. *Lens carriage or chariot.*—A lens which is intended to revolve is mounted on a lens carriage or chariot. The simplest form is a chariot held in position by a centrally located pinion, supported on steel wheels, traveling on a circular track. The carriages of many of these lenses have been rebuilt and fitted with conventional thrust and guide ball or roller bearings. In many of the fourth order lenses originally installed years ago, the weight of the lens and its carriage is supported upon a mercury float (see fig. 29-8).

B. *The mercury float* consists of an accurately machined cylindrical pot-shaped casting of suitable diameter and depth to contain a float in a film of mercury. Mercury is used because of its high density and low friction, reducing the driving mechanism to small dimensions. The lens is attached to the float and is centered and partially supported in ball bearings to assure proper alignment. This prevents the float from rubbing the sides or bottom of the cylinder. In this manner, a small amount of mercury supports the weight of the lens float and associated mechanism, and also permits rotation with a small amount of friction. At old installations, revolving lenses may slow down due to carelessness in oiling the clock mechanism and cases have been known where oil has seeped into the mercury float, gumming the mercury. Therefore, lubricate sparingly. See 29-9-70 (O) for instructions for cleaning and replenishing the mercury.

C. *Electric drive.*—In most present day installations drive is accomplished by an electric motor through reduction gears connected to the chariot by a pinion meshing with a gear on the periphery of the chariot, or on the central shaft in the case of smaller lens supports. Constant speed alternating-current or direct-current motors (in many instances in duplicate) are normally used, although speed controls of various types have been applied.

D. *Clockwork drive.*—In former years, many lenses were revolved by a large clockwork, propelled by a weight suspended within the tower. These devices varied in size and driving power with the size of the lens to be revolved, i. e., first, second, third, fourth, fifth, or sixth order. Such a clockwork consisted of a drum on which the weight cord was wound. This drum was connected through a chain of gears with a pinion which meshed with a ring gear on the lens chariot. A vane-type governor controlled the speed of revolution, and a hand crank was used for winding up the weights. The clock mechanism, enclosed in a glazed case, was attached to the pedestal of the lens. The drum had a ratchet, gears, and clutch, so that it could be wound without turning the lens mechanism.

(1) Since the speed at which the lens turns governs the characteristic, it should be checked frequently.

(2) Although electric drives are standard, nevertheless, the clock mechanisms should be retained as a standby and all personnel trained in their use. See 29-9-70 for maintenance instructions.

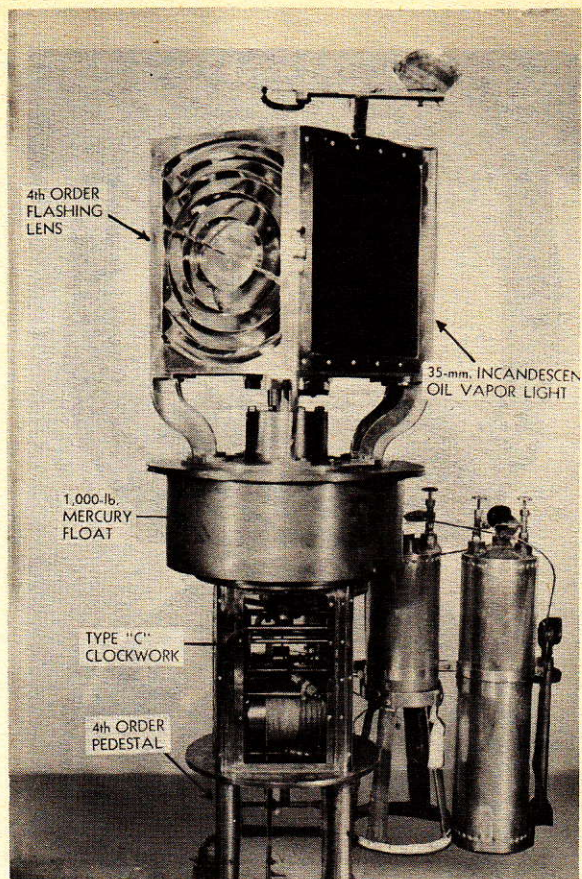


FIGURE 29-8.—Fourth order revolving mercury-float light.

E. *Lens support.*—Lenses below the fourth order are supported on a cast iron pedestal on the lantern floor. Large size lenses are supported on columns from the watchroom floor which is flared out to support the revolving apparatus and the lens platen. The lens platen is usually level with the lantern deck so as to give access to the lens through a hinged panel, to tend the light. (See figure 29-9.)

29-3-30 Alarm System—

~~A. An alarm system should be installed on all major lights. Attended locally or from a distance, the alarm should serve to call attention to irregularities. The alarm may consist of a bell or light, and should indicate both the failure of the power supply and the revolving apparatus.~~

29-3-35 Lantern or Lens Room—

A. The function of a lantern for a lighted aid to navigation is to protect the lens and other parts of the lighting apparatus from the weather, and to provide ventilation if an open-flame type of lamp is employed. A lantern should offer the minimum of obstruction to the rays of light, consistent with adequate strength. A typical lighthouse lantern is of cast iron construction and consists of a cylindrical

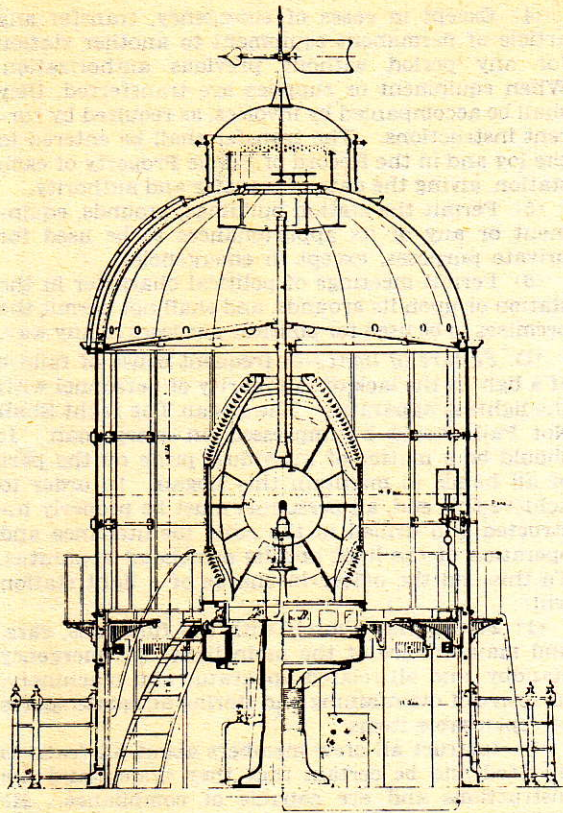


FIGURE 29-9.—Major lens and lantern.

base, a series of helical bars supporting the glass panes, and a cap or hood forming a roof over the whole. The roof of the lantern is made up of cast iron frames with metal sheeting, or of flanged castings bolted together and terminating in a ventilator to carry off an accumulation of gases in the lantern. Ventilators are installed at the lantern floor. The base may have a door giving access to the gallery outside, from which the glass panes are cleaned.

B. The helical bars and curved panes of glass used in modern lanterns avoid the production of sectors of reduced candlepower which would result from vertical astragals, and secondary flashes due to reflections from the lantern glass of polygonal lanterns. The lantern panes are installed in sections with vertical height at least equal to the height of the lens, so as not to obscure the light. Lanterns of standard design have been made for the various lenses and are called first, second, third, and fourth order lanterns.

29-4 ELECTRIC APPARATUS

29-4-1 Lamps—

A. As stated before, electric lamps comprise the major source of illumination used in major attended lights throughout the Service. Complete data on lamps is included in Chapter 21 of this manual, section 21-15-5.

A. Electric lamps comprise the major source of illumination used in major attended lights throughout the Service. Complete technical data on lamps will be included in Chapter 14 of this manual when published.

B. A preliminary burning test of each lamp at normal voltage is desirable to detect those lamps which have developed flaws subject to manufacture. Since the flaws are usually caused by the shipment and handling, the test should be at the location of use, i. e. in the optic itself. The following shall be carried out as a routine program:

(a) When a lamp is replaced during the daytime because of blackening from age or because of expiration of life on a predetermined time schedule, the lamp should be allowed to burn all that day.

29-4-5 Lampchangers—

A. A few attended lights have lampchangers installed to provide a spare lamp in the event of failure. However, most stations have only the single lamp burning from a socket mounted either on a pedestal or suspended from overhead. See sections 21-8-15 and 21-15-15 of this manual for data relative to lampchangers.

29-4-10 Storage Batteries—

A. Many light stations are equipped with a bank of storage batteries. For data on this subject see Chapter 21, part 21-4.

29-5 OIL APPARATUS

29-5-1 Incandescent Oil Vapor Lamp—

A. Although I. O. V. lamps are not generally used for the main source of illumination at light stations, nevertheless this apparatus has been retained at a number of stations for a standby or emergency lamp and at a few stations it still comprises the main light source. The operation of the I. O. V. apparatus is complicated and requires careful and ample training in its use. See Chapter 22 of this manual, part 22-2, for complete data on the operation and maintenance of the I. O. V. lamps.

29-5-5 Other Types of Oil Apparatus—

A. A number of light stations use Aladdin or fourth order wick-mantle-type oil lamps for standby emergency lights. See Chapter 22 of this manual, parts 22-3 and 22-4, for data on this subject.

29-6 FOG SIGNALS

29-6-1 General—

A. The sound fog signal is an important part of a light station and involves the use of considerable machinery to provide the compressed air necessary to actuate the signal. See Chapter 25 of this manual for complete data on the subject of fog signals.

B. See section 29-7-5 of this chapter for some additional data on the operation of fog signals.

29-7 ADMINISTRATIVE INSTRUCTIONS FOR STATIONS

29-7-1 General—

A. *Attention to duties.*—All personnel are required to give constant and faithful attention to their duties, and no person shall be absent from his station or duty without proper authority. In the event of serious illness, the officer-in-charge will report the fact at once to his immediate superior in the chain of command.

When the officer-in-charge of a unit is not available for duty, the person designated as his relief by the District Commander shall assume charge. (Such designation should be made in advance of necessity and revised as change occurs.) In the event such designation has not been made, the senior person available for duty shall assume charge.

A. A lampchanger shall be installed in the main optic at all attended lights unless the physical limitations of the optic prevent such installation. If the design of the lampchanger so permits and if a light-out alarm is installed (See para. 29-3-30) the alarm shall be so arranged that it gives an indication when the first lamp (of a 2-lamp device) has burned out and continues to give the indication as long as the lampchanger has the standby in operating condition.

B. Responsibilities of officer-in-charge.—The officer-in-charge shall:

(1) Have command and control of the enlisted and other persons attached to his station, whether on duty, leave, or liberty, and shall be responsible for the drilling, discipline, and efficiency of his crew.

(2) Be regarded as on duty at all times.

(3) Keep on hand sufficient quantities of fuel and lubricating oils for the station machinery, power boat, and motor vehicle in order that they may be ready at all times for instant service.

(4) Anticipate the need of repair and replacement parts for all station equipment. Should such parts be needed, they shall be obtained as provided for by governing directives.

(5) Report in accordance with current safety directives all accidents involving Coast Guard property, equipment or personnel.

(6) Prepare for his station the bills listed in Section 29-1-10 and submit them to the Group or District Commander for approval.

(7) Be responsible for the proper maintenance and repair of station property and equipment, and for the procurement and distribution of replacement items.

(8) Be responsible for the keeping of records and logs, and the preparation of reports and returns required by competent authority.

(9) Be polite and courteous to visitors, but shall neither permit them to handle any gear or apparatus nor deface or damage station property by writing, carving, scratching, or other means. He may detail a member of the crew to show visitors about the station, when station activities are not impaired by such visits.

(10) Publish to his crew all orders and directives received from higher authority which are of interest or pertinent to the crew, and post them where they will be available to all hands.

(11) See that the medicine chest is neatly stowed and appropriately stocked in readiness for instant use.

(12) Institute and maintain a safety program in accordance with current directives.

(13) Report without delay, any subordinate whom he considers inefficient, lacking in zeal, or in any manner unfitted to be continued in the Coast Guard.

(14) Be responsible for the care, management, efficiency, and cleanliness of his unit, and for the proper conduct of all persons thereat.

(15) Be responsible for the proper execution of all assigned duties of the unit, whether performed by him or by his assistants. To a greater or lesser extent, depending upon his independence of action and authority as prescribed by Coast Guard Regulations, this duty applies to every person in charge of every aid to navigation unit, whether he is a military person or a civilian employee.

C. The officer-in-charge shall not:

(1) Permit intoxicated persons to loiter on the station premises.

(2) Engage, or permit any member of his crew to engage, in personal employment except as may be authorized by competent authority.

(3) Require, or permit any member of the crew to require, a junior rating to perform personal services.

(4) Except in cases of emergency, transfer any article of permanent equipment to another station for any period without previous authorization. When equipment or supplies are transferred, they shall be accompanied by invoices, as required by current instructions. The transfer shall be entered in the log and in the Record of Public Property of each station, giving the date of transfer and authority.

(5) Permit the station buildings, grounds, equipment or any of its appurtenances to be used for private purposes, except in emergencies.

(6) Permit meetings of political character in the station or upon its grounds, and shall not permit the premises to be used for political purposes in any way.

**D. Failure of light.—*A frequent cause of failure of a light is the lack of familiarity of personnel with the lighting apparatus. The slogan *The Light Shall Not Fail* should be impressed on every man. It should be a matter of individual pride on the part of all hands to maintain this slogan. In order to achieve this end, all personnel must be properly instructed and drilled in the care, maintenance and operation of the light and its associated apparatus. To this end the officer-in-charge of a light station will:

(1) Familiarize himself with the functions, care, and maintenance of the main light, its emergency standby, and all related apparatus and machinery, inclusive of maintaining and storing adequate spares of replaceable items.

(2) Instruct all crew members about all features involved and be certain that they understand the instructions and are capable of compliance. He shall not permit any person to stand a watch alone until qualified.

(3) The officer-in-charge of a *light attendant station* shall familiarize himself, and shall instruct his crew in the proper servicing and maintenance of all types of aids to navigation under his care. All hands shall endeavor to maintain the same slogan quoted above for the aids under their charge.

**E. Fog signal and radiobeacon.—*No less important than the main light are the fog signal and radiobeacon which shall be treated similarly as described in paragraph (D) above. The importance of a major aid to navigation cannot be stressed too strongly, as a disaster can easily occur as the direct result of the failure of a major aid to navigation (light station or lightship).

**F. It is the duty of subordinate personnel* to learn promptly the manner of working, care, and maintenance of all apparatus, equipment, and machinery of the light station, and to diligently apply themselves to receiving the instructions of the officer-in-charge as directed in paragraphs (D) and (E) above.

**G. Availability of technical information.—*Other chapters of this manual cover in detail many of the points that are mentioned in a general manner in this chapter. For further information on technical matters and procedures consult the following chapters:

Chapter 20, Lighted Aids to Navigation, Acetylene Apparatus.

Chapter 21, Lighted Aids to Navigation, Electric Apparatus.

Chapter 22, Lighted Aids to Navigation, Oil Apparatus.

Chapter 23, Lighted Aids to Navigation, Theory, Design, and Application.

Chapter 24, Lighted Aids to Navigation, Buoys, Mooring Appendages, and Minor Structures.

Chapter 25, Lighted Aids to Navigation, Fog Signals.

Chapter 26, Lighted Aids to Navigation, Marine Radiobeacons.

Chapter 27, Lighted Aids to Navigation, Aids to Navigation Seamanship.

Chapter 28, Lighted Aids to Navigation, Glossary of Aids to Navigation Terms.

**H. Reporting and correcting defects.*—Any aid to navigation which fails to function as described in the Light List as corrected to date, immediately becomes a menace to navigation unless it is promptly restored to proper operation. The prompt correction of any defect in operation, the prompt reporting of defects not readily corrected, and the equally prompt reporting of the correction of defects previously reported, are imperative to guarantee the safety of navigation at all times. See the Aids to Navigation Operation Bill for further instructions in this matter.)

**I. Unauthorized changes in aids are prohibited.*—The order or class and distinctive characteristics of all aids to navigation are fixed by the Commandant, and no change in them shall be made without his authority. Public notice will be given of all authorized changes.

**J. Warning signals.*—If personnel at an aids to navigation unit observe a vessel proceeding dangerously off her course, they shall immediately warn the vessel by sounding the regular fog signal or by other means. Prompt action may prevent a disaster. If full pressure is not available, the fog signal should be sounded at reduced pressure. Units which are approached fairly close should make a signal with any means at hand if the regular fog signal cannot be used immediately.

**K. Sleeping or dozing on watch.*—No person shall sleep or doze during his watch, or at his post, or leave his station or post before being regularly relieved. Violation of this instruction may be considered cause for trial by court martial of military personnel, or dismissal of a civilian attendant.

**L. Encourage civilian reports.*—All persons interested in navigation should be encouraged by responsible Coast Guard officers and by officers-in-charge to give information of any observed defect in the manner of operation of any aid, as well as information tending to the improvement of the aids to navigation service.

M. Other interests.—Personnel shall not allow any private or other interests to interfere with the proper discharge of their duties, and they must not engage in any business or trade that will in any way so interfere.

N. No traffic or trade shall be carried on within any unit of the Coast Guard, and no article of private property shall be exposed for sale on the premises. Refreshments shall not be sold on any

reservation, without written authority of the Commandant.

**O. Personal conduct.*—All personnel are required to conduct themselves in such manner as not to bring disrepute on the Coast Guard, and those responsible for stations shall not cause or permit any disorderly conduct thereon. Personal habits which are likely to detract from a man's ability to perform his duty in time of stress or of danger will not be excused or tolerated.

P. No intoxicated or other objectionable person shall be allowed on reservations belonging to the Coast Guard.

Q. The introduction of alcoholic liquors or other intoxicants on board any lightship or within any light or light attendant station is strictly prohibited.

(1) The possession or use of intoxicating liquors for beverage purposes, obtained in violation of law, or of prohibited drugs, or any illegal connection therewith by any Coast Guard personnel, will be considered cause for disciplinary action against the offenders.

(2) District Commanders are authorized and required to initiate the suspension, in accordance with civil service rules, of any civilian employee of the Coast Guard found in a state of intoxication, and such action must be reported at once in detail to the Commandant.

R. Relations with the public.—Courtesy to the public is expected of every man while he is engaged on official duties. When persons make inquiry concerning the work of the Coast Guard, courteous reply should be made and the information given, if practicable, in accordance with Coast Guard policy. Discourtesy to the public will not be tolerated, and officers-in-charge shall see that their subordinates conduct themselves with politeness and propriety. It is realized that conducting people around the station time after time, answering the same questions over and over, is tedious and boring. However, remember that a man's conduct reflects on the Service and the public forms its opinion accordingly.

(1) Visitors may be admitted in limited numbers to Coast Guard aids to navigation shore units, such as light stations, at such hours as may be determined by the District Commander, and at times which will not interfere with the work of the service or of the unit.

(2) Visitors, while on the reservation, shall be accompanied by the officer-in-charge or other member of the crew and must not be allowed to touch any part of a lens or other apparatus, or to deface or injure any part of the equipment, buildings or grounds. Children must not be admitted unless accompanied by adults.

(3) Disorderly or boisterous persons must not be admitted, nor unseemly conduct of any description allowed.

(4) Personnel, both military and civilian, are forbidden to accept gratuities.

(5) The officer-in-charge of the light station shall see that a copy of the placard "Rules for Visitors" is posted at or near each entrance to the reservation, or at some other convenient place where it can be seen by visitors, as well as in the tower and in the fog signal house, if any.

(6) Personnel shall strictly enforce the regulations in regard to visitors and will be held accountable for damage caused by them to Coast Guard property.

(7) The power machinery and other apparatus must not be started merely for the purpose of showing visitors the operation of the light or the fog signal, etc.

*S. *Cleanliness.*—The utmost neatness of all Coast Guard units and reservations, and of their equipment, appurtenances, and all other property is demanded. Spare articles and utensils must be kept at hand and ready for use.

Untidiness in dress or uncleanness of person will not be tolerated in any member of the crew.

*T. *Personnel are forbidden to accept fees* or other compensation for courtesies extended or aid rendered in their official capacity. With the specific authority of the District Commander, just compensation may be accepted, but not demanded, for personal supplies or property voluntarily furnished in an emergency.

*U. *Effective cooperation with other Government services and marine interests* is maintained by the Commandant and the District Commanders. In order that Coast Guard aids to navigation may be as effective and efficient as practicable, personnel shall cooperate in every proper way with the above services and interests in accordance with the policies and the instructions of their District Commander.

*V. *Training in aids to navigation work.*—An Aids to Navigation School is located at the Coast Guard Training Station, Groton, Conn., which is able to give a short basic course on the mechanical side of aids to navigation to a limited number of men from the various districts. Personnel who wish to take the course should find out the requirements for admission and, if qualified, should make application through the proper channels, to their District Commander.

(1) Since much training, original, special, refresher, and advanced, must constantly be given in each district for the benefit of the many personnel engaged in aids to navigation work, graduates from the school at Groton, Conn., will constitute a valuable nucleus in each district for teaching in the district training program.

(2) The officer-in-charge should give special attention to setting up a program of training and study at the unit. He shall require that all personnel attached to the station learn all phases of duty pertinent to that station. He should encourage and guide personnel in the study of this manual and other publications, to enhance the value of said personnel to the service-at-large.

*W. *Conduct of business.*—Subordinates must conduct official business through their immediate superiors; any official act or correspondence relating to the aids to navigation service or the use of any papers connected therewith, otherwise than with the knowledge of such superiors, is strictly prohibited.

*X. *Correspondence* will be conducted in accordance with Coast Guard Regulations and the publication, "Navy Correspondence Manual" as amended

for Coast Guard use. Personnel not provided with either of these publications will conduct correspondence in accordance with instructions given them by the District Commander or by their immediate commanding officer.

*Y. *Names of aids.*—Aids to navigation are carefully named in accordance with definite rules. In all correspondence, personnel shall refer to aids by their official names as printed in the latest Coast Guard Light List corrected to date, or by the recommended name in the case of an aid not yet established. To insure quick and positive identification, in addition to the name, the Light List number or page of the aid should be used whenever an aid is referred to in correspondence.

*Z. *Charts and other publications.*—The light, fog signal, and radiobeacon characteristics used at light stations and lightships are shown in the Coast Guard Light Lists. Minor lights and buoys serviced by light attendant stations are also listed in the Light List. All aids to navigation units are supplied by or through the District Commander with the latest Charts, Light Lists, Coast Pilots, Tide Tables, and other important publications, corrected up to date. The larger units especially, should not depend entirely upon the District Commander to look out for their publication needs, but shall make request as necessary in the proper manner and at the proper time for new editions of old publications and for new publications.

*AA. *Voluntary service.*—No person shall accept voluntary service for the Government or employ personal service in excess of that authorized by law, except in cases of sudden emergency involving the loss of human life or the destruction of property. Any person violating the above shall be summarily removed from office and may also be punished by a fine of not less than \$100 or by imprisonment for not less than 1 month. (Sec. 3679 R. S. as amended by act of Feb. 27, 1906, 34 Stat. 49.) An appointment to serve without compensation which is accepted and properly recorded is not a violation of the statutory inhibition against acceptance of voluntary service and is valid if otherwise lawful. (Comp. Dec. Aug. 6, 1920.)

*BB. *Inspection of units and aids.*—In addition to the inspections of Coast Guard units conducted by representatives of the Inspector in Chief, the District Commander or his representative will frequently make operational or special inspections of units and aids. Inspections of unattended lights, buoys, daybeacons, private aids, and bridge lights may be delegated by the District Commander to station personnel, who will be instructed how to conduct the inspections and what reports to submit.

*CC. *Inspecting officers to instruct.*—Inspecting officers shall explain, when necessary, to officers-in-charge, the manner of attending to the illuminating and fog-signal apparatus, as well as all other equipment at the unit, and the manner of keeping the necessary official records and making proper reports and returns. When necessary they shall also instruct such persons in the use of tools and implements and in the routine daily duties of the service.

***DD. Assistance to mechanics.**—Personnel of all aids to navigation units and on vessels are required to give such assistance as they can to working parties, mechanics, and technicians at their units.

If the officer-in-charge is dissatisfied in any respect with any work performed on his station, he shall promptly notify his immediate superior, and sign the work order, listing his objections.

***EE. Changes in aids.**—District Commanders will promptly submit recommendations to Headquarters regarding aids to navigation which should be established, discontinued, or changed in position or characteristic, in order better to meet the needs of navigation, or as may be required because of changes or improvements in channels, or other causes. Officers-in-charge should advise the District Commander whenever they consider any such changes desirable.

***FF. Uniforms.**—The District Commander will require that all personnel stationed on lightships or at stations shall wear uniforms while at their station, as prescribed in the current uniform regulations for military personnel or civilian employees, whichever apply.

Personnel at aids to navigation units will wear regulation working clothes when engaged in cleaning apparatus, etc.

***GG. Reserve provisions.**—At light stations and lightships, which, because of their isolation or inaccessibility, are likely to be cut off from communication for considerable intervals, District Commanders will require that there be kept on hand a stock of reserve provisions. Personnel will see that the quantity prescribed is always kept on hand in good condition and separate from the regular mess supplies. They are to be specially marked with month and year of delivery, used in rotation, and replaced so that none will remain in stock longer than 2 years.

***HH. Violation of fishing and game laws.**—Fishing privileges of personnel shall conform to prescribed State laws or regulations or such other rules as apply to the area. Disciplinary action shall be taken in the case of any person found guilty of violation of the laws protecting game, fur-bearing animals, and fish.

Proper report shall be made by officers-in-charge, of any violations of the "Regulations for the Protection of Migratory Birds" coming to their attention.

***II. Medicine chests.**—Medicine chests and medical or first-aid books will be furnished to aids to navigation units in accordance with their needs, by the District Commander. Officers-in-charge will see that medicine chests are kept in good condition and that they do not contain deteriorated medicines. Particular care will be taken to see that poisons are not taken by mistake for medicine or used by unauthorized persons for any purpose.

***JJ. Libraries.**—Circulating libraries will be furnished to all lightships, to inaccessible offshore stations, and to certain other aids to navigation units, by the District Commander. They shall be cared and accounted for by officers-in-charge, and suitable arrangements shall be made at proper intervals for exchange between stations and vessels. Each aids

to navigation unit will be furnished by the District Commander with such books and other publications as are required for permanent use.

KK. Division of watches.—At light stations having one or more assistant crew members, watches must be kept and so divided that an equal share of work and desirable hours of watch shall fall to the officer-in-charge and to each assistant. Watches shall be stood in such place and manner as to give continuous, and the best possible, attention to the light and the fog signal when in operation.

LL. Attendance at a light station.—Normally, either the officer-in-charge or an assistant should always be present at a light station for duty. At light stations having no assistant, the officer-in-charge shall not be absent beyond sunset except in an emergency or unless authorized by the immediate superior.

MM. Precautions to insure proper operation.—At light stations having no assistant, military or civilian, the officer-in-charge must not leave the light for at least half an hour after lighting it, in order to see that it is operating properly, and must visit the light at least twice between 8 p. m. and sunrise. On stormy nights the light must be constantly looked after. At stations where automatic alarms are installed, the officer-in-charge shall see that these mechanisms are kept in good working order, and that they are tested to insure that they function in a proper manner (see Aids to Navigation Operation Bill).

NN. Exhibiting lights in the daytime.—The lights on a number of high powered ranges are operated on a 24-hour basis. At a few important coastal light stations where haze is prevalent, the light is exhibited from 1 hour before sunset to 1 hour after sunrise. It is not considered desirable to adopt any uniform practice in these respects, but District Commanders will give due consideration to any special needs and make recommendation to the Commandant wherever there is ample evidence to justify the belief that the advantages of exhibiting lights in the daytime will not be disproportionate to the additional maintenance costs involved. This matter is covered for personnel by special instructions to suit cases.

***OO. Time to exhibit lights.**—Unless orders have been issued for a longer period of operation, lights must be exhibited punctually at sunset and kept lighted at full intensity until sunrise, when the lights will be extinguished and the apparatus put in order, ready for relighting.

PP. Cleanliness of stations.—All personnel at stations must keep their premises clean and well painted, grounds in order, and all the inside painted work of the lanterns clean. Spare articles on hand must be examined frequently, checked to see that they fit, and kept clean and in order, ready for use.

QQ. Signs to be posted.—Metal signs of an approved type, warning against injury to public property, shall be posted at light stations, and elsewhere as necessary. To avoid rust, these signs should be fastened with brass or nickel-plated steel (round-headed) screws.

(1) Signs showing visiting hours, etc., for the public shall be displayed at resident light stations.

(2) Only approved signs shall be displayed.

RR. Preventing injury to public.—In addition to the proper cautionary posting of all aids to navigation structures and reservations, all personnel concerned will report promptly any existing condition which constitutes a hazard to the public, even though proper signs have been placed, in order that the situation may be corrected at the earliest date.

SS. Trespass and injury to public lands, etc.—Unlawful cutting or destruction of timber growing on the public lands of the United States or removal of timber from said lands, is punishable by a fine of not more than \$1,000 or imprisonment of not more than 1 year, or both. (From Act of Mar. 4, 1909, sec. 49; 35 Stat. 1098.)

Unlawful breaking or opening of any gate, fence, hedge, or wall inclosing any lands of the United States, or driving any livestock upon any such lands when they may destroy the grass or trees, is punishable by a fine of not more than \$500 or imprisonment of not more than 1 year, or both. (From Act of Mar. 4, 1909, sec. 56; 35 Stat. 1099.)

TT. Erosion of shore lines.—In case of actual or threatened erosion of shore lines at aids to navigation units, especially in the vicinity of important light stations, personnel will make proper periodic measurements to determine the existence of erosion or the danger thereof, and will keep the District Commander advised. The measurements must always be made in the same direction, and permanent range stakes must be set. Should the high-water line subsequently come in nearer at some other point, a measurement must be made in the new direction, and both distances reported.

UU. Surveying permitted.—Officers of the United States Coast and Geodetic Survey, when engaged on official business, may be permitted to make observations at aids to navigation shore units with the understanding that no interference with, or expense to, the Coast Guard will be created thereby.

***VV. Familiarity with conditions.**—Officers-in-charge of isolated aids to navigation units sometimes must render emergency assistance in cases of shipwreck, etc. They should study and plan what to do under various conditions so as to be able to render effective emergency aid without endangering Coast Guard lives unnecessarily. Personnel in remote localities must familiarize themselves with, and be prepared to cope with, the physical characteristics of the country in the vicinity of their units, particularly in heavily wooded sections. The possession of such knowledge may greatly minimize the possibility of loss of life resulting from exposure and exhaustion of both rescuers and persons being assisted.

***WW. Weather forecasting.**—Weather forecasting is not a function of an aid to navigation station, and personnel shall not give such information to the general public. This does not preclude the dissemination of official United States Weather Bureau forecasts properly identified as such. Certain sta-

tions will be designated as reporting stations, in cooperation with the Weather Bureau. Specific instructions will be issued by the District Commander in this event.

XX. Dwellings used by others.—No crew member's dwelling shall be used as a pilot station or a boarding or lodging place for pilots or other persons not in the Coast Guard, except by special authority of the Commandant. It is not intended, however, to prohibit a crew member from having relatives or friends visit his family and remain for short periods at units having dwellings occupied by families, but prior approval of the District Commander must be obtained in each case.

***YY. Release of information to public.**—Officers-in-charge shall not release any information concerning service activities to the general public, the press, etc., except in accordance with the latest Commandant's and District Commander's instructions relative to public information.

ZZ. Cooperation with fire and police departments.—Officers-in-charge will endeavor to maintain close liaison and cooperation with local municipal fire and police departments.

***AAA. Drills must be held and logged.** Drills will be held as prescribed by Coast Guard Regulations, and by the District Commander.

BBB. Inspection of shore units.—All officers-in-charge of shore units of aids to navigation will make a personal weekly inspection of the unit, including quarters, if any, and of all personnel. When inspecting the unit the officer-in-charge shall give particular attention to detecting fire hazards, including grass, trash, gasoline, bad chimneys, and to posting and safeguarding dangerous locations about the unit such as eroded banks, trash piles, sunken walls, broken stairs, loose chimney bricks, etc. The inspection of quarters will be made in the presence of the subordinate concerned at a reasonable hour, and record of condition made in the log. This latter inspection requirement may be waived or modified by the District Commander.

CCC. Lookout.—Although many stations have not been officially assigned "Lookout" duties, personnel of all stations, when up and about, should habitually scan the waters and beaches in the vicinity of their station from time to time and report anything out of the ordinary to proper authority.

***DDD. Abuse of authority.**—Superiors of every grade are forbidden to oppress those under them by tyrannical conduct or by abusive language. Authority over subordinates shall be exercised with firmness and justice, and each person shall set a good example to others. The use of profane language in giving and enforcing orders or the nagging of any subordinate at any time is forbidden.

EEE. Welfare of crew.—Particular attention shall be paid to the welfare and health of the crew. At stations not having family quarters, the officer-in-charge shall see that the food is properly cooked, served at regular hours and includes a liberal quantity of fresh provisions. Clean and sanitary methods in the preparation and storing of food shall be insisted upon.

29-7-5 Records and Property—

*A. *Documents not to be removed, etc.*—Official letters, documents or books of an aids to navigation shore unit or vessel shall not be removed or destroyed except in accordance with current directives.

*B. *Official records; safeguarding contents of.*—No correspondence, account, record, or other document or paper of, or in the custody of, the Coast Guard shall be made public or offered in evidence outside the Coast Guard by any person connected in any way with the Coast Guard, without the written consent of the Commandant.

*C. *Procuring materials and services.*—All aids to navigation units will procure supplies and services in accordance with the methods outlined for them by the District Commander.

*D. *Returns of property.*—All persons charged with the keeping or application of supplies or other property of the Coast Guard at aids to navigation units shall make regular returns of the receipt and expenditure of the same, in accordance with Coast Guard regulations or the instructions of the District Commander.

*E. *Inspection and record of supplies.*—All supplies shall be inspected when received, by the officer-in-charge or by his representative. Any deficiency in quantity or defects in quality shall be noted on the receipts given, and a prompt report of the facts made to his immediate superior. A record of accountable supplies shall be promptly entered in the record of public property.

*F. *Economy in expenditure of supplies.*—In the expenditure of stores and supplies, personnel must practice the strictest economy compatible with maintaining at all times an efficient unit. Unauthorized or excessive expenditures and damage or loss through neglect shall be considered misconduct.

*G. *Use of public property and services.*—No property or supplies of any description belonging to the Coast Guard, or official work of any Coast Guard person, militarized or civilian, or the use of any Coast Guard vessel, boat, or other equipment, shall be applied to any purpose outside of the public business, or otherwise than as provided in proper instructions or regulations.

*H. *Work for private parties.*—No work for private individuals, firms or corporations shall be done by the Government force at any Coast Guard aids to navigation unit, or by any person attached to such a unit, except by authority of the District Commander. Aids to Navigation Regulations (CG208) show the charges that shall be made by the Coast Guard when, under special circumstances, aids to navigation work is done for private parties or for other Government agencies.

I. *Protection of property.*—Personnel are required to take proper measures to protect public property in their charge from encroachment, trespass, or any other acts inimical to the interests of the Coast Guard. In case of controversy, the facts will be reported to the immediate superior.

*J. *Loan or gift of public property.*—No article of Coast Guard property shall be disposed of by

gift, loan, or in any other way for the personal use or benefit of anyone. Property may, however, be loaned temporarily to other branches of the Government, under specific authority of the Commandant, when a sufficient public exigency warrants. Property may be loaned to private parties by specific authority of the Commandant when in his judgment a substantial interest of the Government may be subserved thereby.

*K. *Recovery of property.*—Whenever any buoy, boat, or other Coast Guard property is reported to have been found adrift or otherwise, and is delivered or offered to any crew member, he shall receive it, care for it, advise his immediate superior and await instructions. In the event of any person or persons recovering and holding Coast Guard anchors, cables, or other property without proper authority, any crew member having knowledge of the same shall notify his immediate superior in order that he may demand such property. Personnel shall report the date, time, and position of buoys picked up in the open sea, with the station from which they went adrift and the date, if known.

L. *Recovered moorings, etc., not to be removed.*—No lost moorings or appurtenances thereof belonging to the Coast Guard shall, upon recovery, be removed from the vicinity where found, except by proper authority.

*M. *Safeguarding transportation requests.*—Personnel having custody of Government transportation requests will be held strictly accountable for their proper use. Because of the possibility of their use by unauthorized persons, Government transportation requests should be safeguarded the same as cash.

*N. *Procedure when unit damaged or destroyed.*—In the event of damage to or destruction of an aids to navigation unit, the personnel shall remain under the authority of the officer-in-charge until released by proper authority. The officer-in-charge must promptly account for all Government property under his charge and await orders.

*O. *Reporting damage to aids, etc.*—If buoys or other aids to navigation have been damaged by any vessel or person, officers-in-charge who observe or have knowledge of such damage shall immediately report same to their immediate superior, together with all information that will aid in fixing the responsibility, including the whereabouts of the vessel or person causing the damage.

(1) Damage by storm, sea, fire, or other cause, to vessels, buildings, grounds, or protective works shall be promptly reported to the immediate superior.

(2) The action of the sea on the shore at stations shall be watched, and any encroachment, causing or threatening damage, shall be promptly reported to the immediate superior.

*P. *Vandalism.*—Unfortunately there has been a considerable amount of vandalism in connection with aids to navigation. Officers-in-charge shall report all such cases immediately to their immediate superior. The report shall contain the following information:

- (1) The date of the discovery of the vandalism.
- (2) The character of the vandalism; that is, whether it be simply breakage, or theft, and, if parts are missing, a description of the parts.
- (3) A history of any previous acts of vandalism on the aid.
 - (a) If any parts remain, they should, if practicable, be tagged for identification and preserved until instructions are received from the District Commander, relative to their disposition.
 - (b) Repairs shall not be made to damage of station property in cases of vandalism unless necessary to maintain the station in operation. Damaged conditions should be left unaltered for official inspection.

Q. Saving I. O. V. lamp fittings.—Incandescent Oil Vapor lamp fittings should not be discarded if they can be cleaned and continued in use. When discarded, such articles must be preserved until inspected by a representative of the District Commander authorized to state what disposition shall be made of them.

***R. Logs and record books.**—Logs and record books will be kept at lightships and light stations in accordance with the "General instructions" in the Aids to Navigation Operation Bill and current directives. In addition, such property and other records will be kept as may be ordered by the District Commander. Logs may be kept at light attendant stations if so directed by and in accordance with instructions of the District Commander.

***S. Altering records.**—Necessary changes in the log at aids to navigation units will be made in accordance with current directives. No alteration or addition will be made in any other official record except by the officer-in-charge, who must initial same whenever made, adding an explanatory note if necessary. Erasures must not be made. When corrections are necessary, they may be shown by insertions and by ruling out words with pen and ink.

T. Entries by Coast Guard personnel only.—No entries or signatures shall be permitted in any of the official record books of aids to navigation units, except by crew members or by officials of the Coast Guard.

***U. Special reports.**—Reports on the condition of aids to navigation units, when recommending repairs or alterations, shall be explicit as to all necessary details, i. e., special reports of damage to lens, fog-signal machinery, or appurtenances, etc., shall give cause, parts damaged, and detailed information to expedite renewal of same.

***V. Record of machinery operation.**—A complete history of hours of operation must be kept of every essential machine on the station. This does not apply to oil burning motors and ice-box motors, for example, but does in particular apply to prime movers for generators and air compressors. When a machine has reached the given number of hours required for overhaul, it shall receive the required degree of overhaul. The officer-in-charge shall make a report to his immediate superior when for any reason this is not done.

When records are not officially required to be kept on certain forms, logs of machinery hours such as the above, etc., may be neatly kept in any desired notebook form.

***W. Office files** must be kept neat and in orderly fashion. Special circulars and instructions should be filed separately. Classified matter (restricted, etc.) shall be given appropriate security as required by Coast Guard Regulations.

X. Occupancy of premises.—Permission will not be given, except by authority of the Commandant, to any person to occupy any premises belonging to the Coast Guard, and in case of trespass it is the duty of any person to whom it may become known, to make report to his immediate superior without delay.

Y. Erection of buildings.—No crew member shall erect any building of a permanent character on Coast Guard premises, except as may be authorized. Approval must first be obtained from the District Commander as to the location, size, exterior appearance, disposition upon removal of the person concerned, etc., of minor buildings, such as henhouses, etc., which personnel may wish to erect at their own expense.

29-7-10 Miscellaneous Instructions Concerning Military and Civilian Personnel—

A. Families on reservations.—The immediate families of crew members may occupy such quarters on reservations as may be designated by the District Commander. Personnel will be held responsible for the personal conduct of their families residing on premises belonging to the Coast Guard.

B. Women and children at isolated or offshore stations.—No women or children will be allowed to reside at isolated or offshore aids to navigation shore units, unless by special permission of the District Commander, previously obtained. In case of approval of the District Commander of a man's request for authority to have relatives or friends as visitors at his unit, the man will be informed that such approval is subject to the conditions that there will be no interference with the work of the station and with no obligation on the part of the Coast Guard, and that all risk and hazard will be the responsibility of the man and his guests.

C. Accommodations to be furnished.—Whenever it may be necessary for a District Commander, Inspector, or other official to remain at a light station, he is authorized to occupy one of the rooms of the dwelling of the officer-in-charge as an office and chamber and may require the officer-in-charge to furnish him board and furniture for which a reasonable compensation shall be paid. An officer representing the District Commander, the district aids to navigation officer, for example, shall be similarly accommodated, provided the order upon which he is traveling so states.

The officers-in-charge of light stations are required to give such assistance as they can to working parties connected with the Coast Guard. If the outbuildings at the stations will not properly lodge the party, the officer-in-charge may be called on by the District Commander to furnish lodgings for not more than two persons for each vacant room at the light station.

D. Boarding workmen.—Contractors for work under the Coast Guard will not be allowed to board their men at an aids to navigation shore unit unless it be impracticable for them to obtain board in the neighborhood, in which case the contractor shall deposit in advance with the officer in charge or with the District Commander, if that officer so directs, such sum of money as he may require as security for such board. If the deposit be made with the District Commander, he will inform the officer-in-charge by letter of the amount of money in his possession, and will pay to the officer-in-charge such amount as is required to settle board bills.

***E. Aid rendered shipwrecked persons.**—The act of July 27, 1912, (37 Stat. 239), provides for the reimbursement to crew members for provisions and clothing furnished shipwrecked persons under certain conditions.

(1) Whenever destitute shipwrecked persons are sheltered at an aids to navigation unit which has no general mess or clothing locker, the officer-in-charge may furnish such persons subsistence from any stores he has on hand, and necessary clothing, if practicable. When subsistence or clothing has been furnished, the officer-in-charge or other proper officer will take a receipt from the recipients for the actual value thereof and, if practicable, present for payment on account covering the same to the master, owner, or agent of the vessel concerned.

(2) If the master, owner, or agent of the vessel is inaccessible, or refuses to pay the account, the officer-in-charge shall transmit to the District Commander an account specifying the number of meals furnished and giving a list of the articles of clothing furnished, accompanied, if practicable, by a certificate signed by the master or officer in command of said vessel, or by the owner or agent thereof, that the account is correct and no payment thereof has been made. Full details should be given.

(3) Upon receipt of an account as stated herein, the District Commander will immediately forward the same to the commandant, with recommendations for payment thereof.

F. Transportation of personnel and families.—When a crew member is transported under orders by service craft from one shore unit to another, he shall be considered as an official passenger. When members of the man's family are being transported with the crew member by service craft, they shall be considered as unofficial passengers and furnished subsistence if desired; however payment for such must be made.

***G. Damage to property in assistance cases.**—Any unusual expense, such as damage to boats or to other equipment of an aids to navigation unit, directly caused in rendering aid to shipwrecked persons or to vessels or to those in danger of shipwreck, shall be reported to the Commandant, with the District Commander's recommendation as to reimbursement to the Government therefor.

***H. Civil service rules, etc.**—With respect to all matters affecting civilian crew members, district commanders and others concerned are guided by the Civil Service Act, rules, and regulations, and such department circulars, Coast Guard circulars, etc., as are applicable and in effect.

I. Classification of pay at light stations, etc.—For civilian personnel (keepers), light stations are classified for pay purposes with reference to the character of the apparatus and with due allowance for isolation and additional minor lights cared for, if any. Recommendations will be submitted to headquarters by the District Commander for changing the classification for pay at a light station when circumstances and conditions connected with the station make it justifiable, as for instance, the addition of other facilities, or the discontinuance of a fog signal or a light, etc. Any change in the character of the apparatus or equipment at a light station which affects the classification thereof for pay purposes should be reported to headquarters without delay with recommendation for appropriate adjustment.

***J. Transfer and promotion.**—District Commanders will give consideration to the requests of civilian personnel for transfers to other localities in the event of vacancies. Each District Commander will keep a record of the civilian personnel in his district, showing their seniority and relative efficiency. Transfers will not be based solely upon seniority, but on relative efficiency as well, and consideration will be given to local educational facilities for the crew member's children. A systematic method will be kept in effect by each District Commander for handling requests of employees for transfers, etc., in order to insure uniform and equitable treatment.

***K. Discontinuance of positions, etc.**—When the District Commander submits recommendations for the discontinuance of an aid to navigation, he will make recommendation at the same time for the discontinuance of the authorized civilian positions, if any, and for the disposition of the services of the employees in those positions. Recommendation will be made to transfer such employees to other suitable positions for which they are qualified.

***L. Transfer of civilian attendants.**—Recommendation for a transfer of a civilian employee within the Coast Guard which involves reduction in pay or rank, shall be accompanied by written agreement of the employee that the reduction involved is acceptable. If, however, the transfer is recommended as a disciplinary measure, the reason shall be given, with the statement that approval will not be in violation of Civil Service rules regarding political or religious opinions, if this be true. Transfer for disciplinary purpose involving reduction in pay or rank, as in every case of transfer involving a permanent change in post of duty, will not be effected without the prior approval of Headquarters.

M. School facilities.—In event of vacancies permitting transfer to aids to navigation shore units convenient to school facilities, consideration will be given to crew members having children of school age who do not have access to schools. Other conditions being equal, District Commanders will probably not recommend for transfer to stations not accessible to schools, personnel having children of school age, unless such men give assurance that they will make proper provision for the education of their children. See Pay and Supply Instructions for detailed information regarding Coast Guard assistance in connection with the education of children of personnel at isolated shore units.

N. *Teachers.*—Section 2 of the act approved June 20, 1918 (40 Stat. 608), provides that under certain conditions the Coast Guard may pay for the traveling expenses and subsistence of teachers while they are actually employed by states or by private persons to instruct the children of certain classes of personnel.

Whenever personnel at aids to navigation shore units, located where there are no school facilities, have children of school age, District Commanders will ascertain whether such personnel desire to avail themselves of the provisions of the above act. When crew members desire such instruction for their children, District Commanders will advise the proper public school authorities of the provisions of the above act and cooperate so far as practicable with them in obtaining the services of the teachers needed. For details on this subject see Pay and Supply Instructions.

O. *Commissary privileges.*—Civilian keepers at light stations, and a few other civilian employees, are permitted to purchase commissary and quartermaster supplies from the Army, Navy, and Marine Corps at the prices charged officers and enlisted men of those Services. (Act of May 22, 1926, sec. 4, 44 Stat. 626.)

District Commanders will furnish information to those entitled to the above privilege as to posts where commissary supplies may be obtained, and the conditions applicable. Those who avail themselves of commissary privileges must pay in cash for supplies at the time of purchase, and may request only supplies for themselves and their families. Supplies shall not be purchased for transfer to other persons.

*P. *Medical treatment; civilian employees.*—Keepers and vessel employees are entitled by law to medical relief without charge at hospitals and other stations of the United States Public Health Service under the rules and regulations governing the care of seamen of the merchant marine. Civilian employees in need of medical treatment should, when in doubt about the extent of benefits due them, or the proper method of obtaining same, request the advice of the District Commander.

(1) Treatment by the United States Public Health Service should not be requested by or for civilian employees who are not entitled to free treatment under the law, except that in case of injury to an employee, action should be taken in accordance with the employees' compensation law, which covers all employees.

(2) On September 30, 1930, the Secretary of the Treasury approved the following regulations which, although since amended and the names of services changed in some cases, are still substantially in effect as follows:

Retired civilian personnel.—“Pursuant to the act of Congress approved by the President June 24, 1930 (Pub. No. 430, 71st Cong.), the following regulations governing the medical care and treatment of retired personnel of the Lighthouse Service are hereby promulgated:

“(a) Lightkeepers and assistant lightkeepers (who during their active service were entitled to medical relief at hospitals and other stations of the Public Health Service), and officers and crews of vessels of the Lighthouse Service, who have been or who

may hereafter be retired under the provisions of section 6 of the act entitled ‘An act to authorize aids to navigation and for other works in the Lighthouse Service, and for other purposes,’ approved June 20, 1918 (U. S. C. Title 33, sec. 763), and of acts amendatory thereof or supplementary thereto, shall, upon application and proper identification, be furnished hospital treatment at any Marine Hospital and out-patient treatment at any regularly established relief station of the Public Health Service in charge of a medical officer, but not at a station of the fourth class, or at a place where the only representative of the Public Health Service is a physician appointed specially to furnish medical relief to active personnel of the Lighthouse Service and the Coast Guard.

“(b) An applicant must present himself, at his own expense, at a Marine Hospital, if he needs hospital treatment, or at an out-patient office if he needs only office treatment. Transportation of applicants to or from Public Health Service Stations of the second and third classes is not chargeable to the public funds.

“(c) Applicants admitted to Marine Hospitals will be entitled to all facilities available therein, but dental treatment elsewhere, except by a salaried dental officer, is not authorized, nor is treatment in contract hospitals. At second- or third-class relief stations, expense is not authorized for orthopedic apparatus, medicines except those in stock, or for attending specialists.”

Q. *Vaccination.*—Civilian employees whose duties require them to perform interstate travel, or who are regularly engaged in the handling of mail or other material to be carried in interstate traffic, may receive, without cost, vaccination against smallpox or typhoid fever, or both, upon applying in person at those places designated by the Surgeon General of the United States Public Health Service, and presenting a certificate from their immediate commanding officer showing the nature of their employment.

*R. *Compensation for injury or death.*—The act of September 7, 1916 (39 Stat. 742, as amended), provides for the payment of compensation, subject to certain conditions, for disability or death of a civilian attendant resulting from a personal injury sustained while in the performance of his duty.

(1) Immediately after an injury sustained by an employee while in the performance of his duty, whether or not disability has arisen, and for a reasonable time thereafter, the United States shall furnish to such employee reasonable medical, surgical, and hospital services and supplies, unless he refuses to accept them. Such services and supplies shall be furnished by the United States medical officers and hospitals, but where this is not practicable, shall be furnished by private physicians and hospitals designated or approved by the commission and paid for from the employees' compensation fund. If necessary for the securing of proper medical, surgical, and hospital treatment, the employee, in the discretion of the commission, may be furnished transportation at the expense of the employees' compensation fund.

(2) After the injury the employee shall, as frequently and at such time as may reasonably be required, submit himself to an examination by a medical officer of the United States or by a duly qualified physician designated or approved by the commission. The employee may have a duly qualified physician designated and paid by him present to participate in such examination. For all examinations after the first the employee shall, in the discretion of the commission, be paid his reasonable traveling and other expenses and loss of wages incurred in order to submit to such examination. If the employee refuses to submit himself for, or in any way obstructs any examination, his right to claim compensation under this act shall be suspended until such refusal or obstruction ceases and the period of such refusal or obstruction shall be deducted from the period for which compensation is payable to him.

(3) In the case of any disagreement between the physician making an examination on the part of the United States and the employee's physician, the commission shall appoint a third physician, duly qualified, who shall make an examination. (Act of Sept. 7, 1916; 39 Stat. 743, 747.) The act also provides for burial expenses within certain limitations in the event of death.

(4) District Commanders will familiarize themselves with the entire provisions of the act, and with such rules and regulations as may be issued by the United States Bureau of Employees' Compensation, and will issue such instructions as may be necessary to civilian employees so that all required reports may be made and proper action taken in the case of injury, disability, or death while in the performance of duty of an employee under their direction.

(5) Employees injured in the line of duty and entitled to compensation may be allowed leave with pay, if the same be due them, to cover the period of incapacitation, but no claim for compensation submitted by them should include the period for which they were on leave with pay due to injury. If employees elect to take their leave with pay while away from duty on account of injury, payment may be made to them as usual, but if they decide to submit a claim for compensation and not have the period of absence from duty or any part thereof charged to leave, such payment should not be made by the District Commander pending action of the compensation commission.

(6) Periods when employees are in a nonpay status while receiving compensation from the Employees' Compensation Commission shall not be included as service periods for the purpose of computing retirement annuities of employees who are retired under the act of June 20, 1918, as amended.

***S. Retirement of civilian personnel.**—Civilian personnel are entitled to retirement under various laws. Employees desiring information concerning retirement matters in their particular case should address an inquiry to the District Commander.

***T. Burial expenses, civilian personnel.**—The Employees' Compensation Act of September 7, 1916 (39 Stat. 742, as amended), relative to compensation for injuries, etc., provides for the necessary expenses of burial, under certain circumstances and conditions, when death of a civilian employee results from in-

juries sustained in line of duty. The necessary expenses of burial for deceased patients of the United States Public Health Service may also be paid by that service. There is no provision of law by which burial expenses of civilian personnel may be paid out of funds appropriated for the Coast Guard.

***U. Leave and liberty** of military personnel are covered in detail in the current Commandant's Circular series. They are granted at each individual unit in accordance therewith, and with particular instructions and policies issued by the District Commander or his representative. In cases where the general provisions of Headquarters, or the specific instructions of the District Commander, do not appear to fit the peculiar circumstances existing at any unit, the officers-in-charge should take the matter up with the District Commander through official channels.

(1) Leave and liberty of civilian personnel are governed by the annual and sick leave laws, by regulations promulgated by executive orders, by the Civil Service regulations, and by specific instructions of the District Commander.

(2) Compensatory absence at isolated stations is governed by a Commandant's Circular.

V. Since leave and liberty of military personnel are governed by Coast Guard Regulations as supplemented by the Commandant's Circular series of directives, and such special instructions as are issued by the District Commander as stated above, this paragraph concerns primarily the civilian employees, though parts also apply, in principle at least, to military personnel.

(1) Stations with quarters: Personnel are not considered absent from duty when engaged in routine duties of the station, such as attending minor lights, getting supplies and mail, attending church, etc., except where such absence exceeds 6 hours in any one day, in which case the absence in excess of 6 hours, unless on official business and so shown in the log shall be charged to leave. All absences at night shall be logged.

(2) Stations without quarters: A person at his usual residence or en route between the light structure and his home, between regular watches, shall not be considered absent from the station. Absences of any other character will be logged. Record should also be made showing what man is on duty at any time. At isolated stations with or without quarters, all absences of whatever nature will be logged, such stations to be determined by the District Commander. An officer-in-charge leaving a station temporarily must notify the senior assistant crew member present of his departure, return, probable duration of absence, and any other matter necessary to an intelligent execution of duty. An officer-in-charge will require his assistants to obtain permission before leaving the station, to report their departure, return, and, if practicable, directions for reaching them in an emergency.

(3) All cases of sickness or other disability preventing a proper performance of duty will be reported as "absence on account of sickness, etc."

(4) Special or doubtful cases not covered by this paragraph will be referred to the District Commander for decision.

W. Leave of employees outside continental limits.—Civilian personnel stationed in Puerto Rico, Alaska, and Hawaii may be granted the annual leave allowed by the regulations; and those who are accustomed to living in continental United States are entitled to additional leave (travel time) with pay as may be necessary for the trip, if taken, by the most direct route to and from a mainland port of the United States not more frequently than once in any 24-month period.

X. Lamplighters not entitled to leave.—Personnel in charge of lights who are civilians employed upon Coast Guard duties for only a part of their time, are called lamplighters. These part-time employees are not entitled to leave of absence with pay.

Y. Basic workweek for civilian employees.—The basic workweek for civilian personnel will consist of five eight-hour days, Monday, through Friday inclusive; however, as provided in the act of June 29, 1949, Public Law 143, Eighty-first Congress. Keeper and vessel personnel may be called upon for duty in an emergency at any or all times. The scheduling of an equivalent workweek other than Monday through Friday to provide appropriate watches is authorized.

Additional compensation, as provided by the above law, is authorized in payment for services or confinement within post of duty beyond the 40-hour basic workweek, in operating essential facilities, maintaining watch or continuity of availability, and in consideration of necessary duty on night shifts and on holidays. This is in lieu of overtime, night differential, and holiday pay.

***Z. Abuse of leave.**—Any abuse of leave of absence by civilian employees will be reported to the District Commander with recommendation.

***AA. Sick leave.**—In all cases of sickness or other disability of civilian employees, prompt report of the fact must be made to the District Commander. Under sick leave regulations revised by the Civil Service Commission, it is provided that a medical certificate may be required to support an application of an employee for period of absence on account of illness. This is generally not required for absences of 3 days or less, unless the privilege is abused. For periods of absence of more than 3 days, the application must be supported by a medical certificate or other evidence administratively acceptable, provided, that in lieu of a medical certificate, a signed statement of the employee indicating the nature of the illness and the reason why a medical certificate is not furnished may be accepted whenever it is unreasonable to obtain such certificate because of a shortage of physicians, remoteness of locality, etc.

Commandant's Circulars and other official directives give detailed information about handling these matters in regard to military personnel.

BB. Seasonal closing of light stations.—At light stations where navigation is closed in the winter because of ice, in the absence of definite instructions from the District Commander, lights may be extinguished when navigation ceases, but lights must be shown when it is at all possible for vessels to benefit from them. The time of discontinuance and re-lighting must be promptly reported.

CC. Absence during closed season.—Civilian keepers in districts where navigation is closed during the winter season may be granted permission to be absent in excess of the accrued leave rate from January to March in each year, when their services can be spared, with the understanding that should such employees leave the service before the end of the calendar year, deduction to cover the period of absence taken in excess of leave which accrued up to the date of their separation shall be made from salary due them and proper amount refunded if salary due is not sufficient.

DD. Furniture for quarters.—Allowance lists and instructions have been promulgated to govern the outfitting, repairing and replacing of all furniture and furnishings for use in Government-owned quarters, under the jurisdiction of the Coast Guard, occupied by military and civilian attendants.

EE. Change in status of isolation.—The isolation of a light station and other conditions concerning it are subject to change which may be brought about by a change in transportation facilities, by lessening of the need for certain aids at the unit, etc. District Commanders should analyze all conditions at their units from time to time with the above in mind and make recommendations whenever it appears desirable to change the authorized complement, pay for civilian keepers, grades, etc., at any unit because of changed conditions.

29-8 OPERATING INSTRUCTIONS

*29-8-1 Aids to Navigation Operation Bill—

A. Each attended aids to navigation unit shall be operated in accordance with the instructions contained in the latest approved Aids to Navigation Operation Bill, and such further instructions as may be promulgated by the District Commander from time to time.

B. The Aids to Navigation Operation Bill, Form CG 2814, is placed under glass and posted in a conspicuous place at each attended aids to navigation unit in the district operating one or all of the facilities named in the bill. It covers the operating requirements of the light, fog signal, radiobeacon, and the general duties of the unit. Nothing in the instructions contained in this chapter is intended to conflict with the Aids to Navigation Operation Bill. This bill, when referred to herein, is abbreviated "A. to N. Op. bill."

C. **Correct characteristics.**—The maintenance of the correct characteristics of the light and fog signal in accordance with the latest Light List and A. to N. Op. Bill is essential. Rheostats installed for adjusting characteristics should be marked for the proper setting to give the required characteristics after all associated equipment has reached normal operating temperatures and conditions for both battery and generator operation. With a revolving lens, the time of revolution should be checked as prescribed by the A. to N. Op. Bill, using small painted or inscribed watch marks on the stationary pedestal and revolving lens base.

D. **Equipment instructions.**—Instructions for the operation and maintenance of all machinery such

as generators, compressors, their prime movers, radiobeacons, etc., will be furnished to each unit to cover the individual specific equipment at that unit. The chapters of this manual listed in paragraph 29-7-1 (G) will be found useful for reference purposes.

*29-8-5 Fog Signals—

A. The following paragraphs contain instructions for the operation of fog signals in addition to those set forth in the Aids to Navigation Operation Bill.

B. *Attendance.*—Whenever fog signal machinery is in operation, a competent crew member must be in attendance at all times.

C. *Promptness in sounding.*—At every station having a fog signal, a close watch must be kept for the approach of a fog or reduced visibility conditions, and every effort must be made to sound the fog signals at once when the visibility becomes less than that specified in the A. to N. Op. Bill. The fog signal machinery and apparatus must at all times be kept in a thorough condition of repair and preparation for use on the shortest notice, and when weather conditions warrant, all preliminary preparations must be promptly made for sounding the signal. Where air-operated signals are installed, approximately full air pressure shall be maintained in the air receivers at all times, if practicable.

D. *Failure to sound.*—Whenever a fog signal is not sounded for the entire period during which weather conditions require sounding of the signal, a full explanation must be entered in the log and a special report sent promptly to the District Commander.

E. *Cleanliness and care.*—The space occupied by fog signal machinery must be kept clean, and all parts of the apparatus must be kept well oiled and free from dust, dirt and rust. No oily waste, cotton, woolen rags or oily cloths shall be left in boxes, corners or elsewhere to cause danger of fire by spontaneous combustion or otherwise. When wiping off is finished, such articles shall be thrown into buckets of water for washing or, if unfit for further use, shall be promptly burned in a safe manner.

F. *Inspection and tests of machinery.*—All machinery must be carefully inspected prior to each time the signal is placed in operation. Machinery shall be tested as prescribed by the A. to N. Op. Bill and other pertinent directives. Fog signals operated by internal combustion engines or otherwise than by steam (if not operated during the previous week) will be worked at full pressure at least 60 minutes ^{Every 7 days} each week; see A. to N. Op. Bill. ~~Judgment shall be exercised in the sounding of fog signals during test operation, so as not to unnecessarily annoy residents in the area.~~ ^{During this test period the fog signal should be sounded for at least 107 minutes.}

(1) All parts of the apparatus must be thoroughly oiled and cleaned and examined for loose bolts, nuts, or other defects after a run, and all oil tanks, oil and grease cups and other lubricating means, filled and the machinery made ready for instant starting.

(2) Record of tests will be made in the log. All applicable instructions contained in the A. to N. Op. Bill will be strictly followed.

G. *Duplicate plants.*—When any part of the plant or equipment is in duplicate, each set should be given an equal amount of usage (see the A. to N. Op. Bill).

H. *Report accidents/defects.*—In case of accident to, or trouble with, any part of the fog signal equipment which cannot be repaired by the personnel of the station or lightship, an immediate report must be made to the District Commander, giving such information as will enable that officer to provide the necessary assistance and materials for putting the fog signal in good working order in the shortest time.

†*29-8-10 Internal Combustion Machinery Notes—

A. *General instructions.*—Due to the number of different makes of machinery in use at stations and floating units, it is impracticable to formulate a uniform set of instructions that will be applicable to each particular piece of equipment. The following instructions cover general points and do not, therefore, supplant maintenance instructions issued by the manufacturer, headquarters, and the district.

B. *Cleanliness.*—The engine, piping, all accessories and the surrounding area should be kept clean at all times, thus not only improving the appearance of the engine, but facilitating trouble-shooting and aiding preventive maintenance.

C. *Qualified personnel.*—To be efficient, a boat or stationary engine must be ready to start at a moment's notice and operate for a reasonable length of time without interruption. All personnel operating and maintaining machinery must be trained for the work. They should be familiar with the manufacturer's operating instructions and any special instructions which may be issued by the district, or by headquarters, regarding the operation of power machinery. Copies of current instructions shall be kept on hand. If they are lost, replacement copies shall be requested.

D. *Detection of engine trouble.*—Although experience is a great asset to the trouble-shooter, any operator who conscientiously studies his power unit and exercises his common sense and latent detecting ability, will soon be able to diagnose and correct engine trouble quickly and accurately.

E. *Safety.*—See paragraph 29-9-45 (B) for specific safety instructions pertinent to the handling of gasoline and ventilation of engine compartments. Although safety in general is discussed under a separate section (29-9-65) it is sufficiently important to be repeated here. A set of rules, such as follows, should be made up by each officer-in-charge and posted as a guidance and reminder to all personnel operating machinery:

(1) Keep all rags away from moving parts of the engine or compressor inlet manifolds.

(2) Never wear loose or torn clothing while operating engines.

(3) When wiping engine parts, crankcase, etc., use only lint-free type rags.

(4) Keep rags in metal container marked "clean," or "soiled," or "used," as the case may be. Keep containers covered at all times.

(5) Never allow oily or gasoline-soaked rags to accumulate or to be packed tightly in soiled containers. Empty the containers frequently.

(6) Do not leave loose rags lying in engine spaces.

(7) Never leave inflammable liquids setting in open pails or cans. This not only applies to the engine room but also to any other place at the unit.

(8) Get thoroughly acquainted with the location and operation of all fire-fighting equipment at your station.

(9) During repairs to electrically started engines, always disconnect the battery. Don't fail to do this, as serious accidents, or fire, may result.

Remove fuses when working on electric circuits, to prevent injury in case of accidental closing of a switch.

F. Cold engine.—When starting a cold engine, the load should be built up gradually.

G. Lubricating oil.—Lubrication reduces friction and wear of moving parts. It is most important to the proper operation of any machinery. Make periodic inspections and record the amount of oil consumed by each engine over a given period of time.

(1) *Check gages frequently.*—The man on watch should frequently check the oil in the crankcase, the oil pressure gage, thermometer and viscometer, as the oil pressure will vary, depending on the temperature and also on the viscosity of the oil.

(2) *Type of oil to use.*—Special types of oil should be used when and where required. Manufacturers' recommendations for proper lubrication should be referred to and followed. Filters and strainers should be cleaned regularly.

(3) *Normal pressure and temperature.*—If, at any time, the pressure on the lubricating oil system falls below normal, the engine shall be stopped immediately and reported "out of order;" the cause shall be found and the condition remedied. Normal pressures and temperature to be maintained for each particular installation are specified in the operating instructions.

H. Cold water.—Under no circumstances shall a large amount of cold water be allowed to enter the engine suddenly.

I. Inspection before starting.—Before operating any engine, make an inspection including checking of the fuel quantity in the gasoline tank, all fuel lines, and the oil level in the engine. Oil by hand all moving parts not included in the lubricating system. Examine all parts of the engine, particularly working parts, to see that they are clear for running.

J. Speed.—After starting, operate engine at moderate speed until it is thoroughly warm and running smoothly. Check oil and water circulation, and see that all cylinders are firing.

K. Discharge temperature.—Check discharge temperature of circulating water, which should not exceed the maximum indicated in the manufacturer's instruction book. Watch gages, thermometers, and pyrometers carefully at all times for proper indication.

L. Sudden increase in speed.—Do not attempt sudden increases in speed and do not race the engine by quickly opening the throttle. Less wear results when the throttle is opened gradually.

M. Sudden application of load.—Do not apply a load suddenly to any internal combustion engine and, in the case of propulsion engines, do not use reverse at full speed. Nothing is so sure to ruin engine bearings or reverse-gears as sudden backing at full speed.

N. Diesel engines.—Some diesel boat engines have normal service maximum power rating at a revolution per minute which is less than the maximum revolutions per minute which the engine will develop. Such boats should be equipped with a warning plate showing the maximum revolutions per minute at which the engine should normally be operated. On such boats the engine shall not be operated at full throttle except under emergent conditions.

O. Purpose of maintenance inspections.—The purpose of regular inspections of machinery is to avoid casualties. The best plan is to establish a preventive maintenance schedule of inspections and tests, as such a routine is insurance for continuous, reliable operation.

P. Inspection schedule.—Minor repairs should be given immediate attention. No engine should be dismantled for major overhaul unless warranted by its condition and performance record. Since all power plants are not identical, the same routine will not apply to all machinery. However, an appropriate schedule for a particular boat or plant can be worked out in accordance with manufacturer's recommendations and good engineering practice. The following routine might apply generally to all plants, additional inspections being added in accordance with individual requirements:

(1) *Daily:*

- (a) Turn over the engine.
- (b) Inspect for gasoline leaks or fumes.
- (c) Check gas, oil, and water.
- (d) Check grease fittings, if a boat under way.

(2) *Weekly:*

- (a) Operate engine for a stated period under load, if not operated before during the week.
- (b) Check storage battery for gravity and water.
- (c) Check and clean all fuel, lubricating oil, and water strainers.
- (d) Give bilges or engine area a good cleaning.

(3) *Monthly:*

- (a) Examine electrical ignition system on gasoline engines and fuel injection on diesel engines.
- (b) Check valve stem clearances and springs, adjust where necessary.
- (c) Check all throttle and governor linkage.
- (d) Check and grease all fittings, as necessary.

(4) *Quarterly:*

- (a) Inspect entire electrical system, including brushes, holders, commutators, connections, and wiring.

(b) Check ignition or injection timing. Clean and adjust spark plug gaps or nozzle tip atomizer holes.

(c) Check compression of each cylinder by ear, gage, or resistance to turning.

(5) *Semiannually:*

- (a) Clean fuel tanks thoroughly.
- (b) Check alignment of engine to shafting or equipment.
- (c) Remove inspection plates and clean out rust and incrustations in water jacket spaces of all cylinders.
- (d) Clean water side of all lubricating oil coolers or heat exchangers.
- (e) Check clutch or power take-off adjustments.
- (f) Remove carbon, grind intake valves, if necessary. Tune up engine.

(6) *Annually:*

(a) Disassemble engine for general overhaul if conditions permit and hours of operation coincide with current instructions. *Do not needlessly tear down an engine which is operating properly. Only qualified personnel should perform this work.*

(b) Take careful measurements of all clearances in engine and accessories and record them. Replace all worn or defective parts as far as practicable.

(c) Clean, repair, and overhaul complete engine, lubricating system and accessories.

(d) Check accuracy of all instruments.

Q. Freezing weather procedure.—In freezing weather, all parts containing water shall be carefully drained or, in the case of fresh-water cooled engines, antifreeze solution added in proper amount.

R. Immediate repairs.—Immediately remedy any trouble discovered, regardless of how minor it may appear. Do not permit defects to increase.

†*29-8-15 Electrical Equipment Notes—

A. Switches.—The modern station is equipped with a multitude of electric switches. These switches must be given special care and frequent attention. The failure of one switch, or the failure of the man on watch to give the proper attention to one switch, can cause the whole unit to become inoperative. This generally happens at a time when it would be most needed—at night.

(1) All individual switches should be properly marked with a number; i. e., the number corresponding to the main switch of the circuit in the main terminal box. The main terminal box should have a complete list of the names and numbers of the switches pasted on the inside of the cover or door. Never allow faulty switches to remain in service. Repair or replace them immediately.

(2) Switches should be kept clean, and "knife" type switches frequently polished. When operating this type of switch, never open or close it in such a manner as to draw an arc. Arc shields, when installed, should be kept in proper position.

(3) Get acquainted with your switches and know when and how to use them. You may save someone from getting a severe electrical burn or even save his life by your quick action and knowledge.

B. Batteries should be kept clean at all times and properly charged. In cleaning batteries, neutralize any acid that may be spilt on the case by washing with ammonia and water; dry off and cover tops and poles with a light coat of petrolatum.

(1) Inspect batteries periodically, making sure that the electrolyte is at the proper level and that the batteries are being charged at the correct rate.

(2) Do not smoke or allow an open flame near active batteries. The more active the battery the more fumes are given off, consequently the greater the danger, if the room is not ventilated.

C. Generator or motor.—The interior and exterior of a generator or motor must be kept free from water, salt, lint, dust, dirt, and oil. Particular care should be taken to avoid accumulation of carbon and copper dust. When cleaning a machine, care must be exercised not to crowd dirt into narrow spaces between conducting parts or into the air ducts.

D. Oil containers.—Care must be taken when filling oil containers, that the level is not so high as to result in leakage along the motor shaft. Filling oil containers too full causes overflow into brush rigging and low field coils and spreading of oil into interior of spider and thence to commutator and windings.

E. All bolts should be gone over occasionally to keep them tight.

F. Sparking brushes.—The cause of sparking brushes should be determined and rectified immediately. Ordinarily, sparking brushes can be relieved by lifting and lowering them in the holder or by holding a clean dry piece of coarse cloth against the commutator while it is turning. A slight application of paraffin to the cloth may assist. If sparking persists, the commutator slots should be cleaned with a knife blade. Do not change the position of the brush holders on the rocker arms. If the commutator is developing noticeable grooves, that fact should be reported to the district engineering office. Grooves in the commutator are not, however, a cause of alarm unless sparking is also present. Sanding of commutators or collector rings should only be undertaken as a last resort and then only very fine sandpaper should be used. Under no circumstances should emery cloth be used.

G. Adjustment of new brushes.—When new brushes are installed, they must be carefully adjusted to the surface of the commutator by slipping a piece of fine sandpaper under the brush with the abrasive facing the brush, and carefully rotating the armature and sandpaper back and forth until the entire face of the brush bears on the commutator.

H. Adjustment of control equipment.—Make no adjustments to relays, contactors, or rheostats on control equipment for engine generators, compressors, and refrigeration machinery until the source of trouble has been determined. The operation of contacts may be improved by carefully cleaning them with fine sandpaper, exercising care not to bend flexible contact arms.

I. Voltage adjustment.—Never readjust voltage of generators without authority and advice from the civil engineering officer or his authorized representative.

J. Maintenance of shore power storage batteries.—Shore power storage batteries shall be maintained as indicated in Chapter 21 of this manual.

†*29-8-20 General Engine Room Notes—

A. *Fuel*.—When fuel is delivered to a unit by a tender, it is often pumped to the unit through a hose. Thus there is always a possibility of a small amount of water being present in the fuel. Check the strainers frequently and see that there is a sufficient number of proper size strainers in the pump suction line to protect the pumps from excessive wear or damage. It is important to keep vent openings clean and free of foreign matter to prevent the possibility of excessive pressure buildup within the tank. The vent should be checked before each filling since it is then that excessive pressures are most likely to occur.

(1) Fuel tanks should be kept free from rust and water. By systematic use and keeping proper records, all tanks can be thoroughly cleaned over a period of time. To clean the tanks, remove the covers several hours prior to cleaning. This is to give the fumes a chance to escape. If a blower is available, ventilate the tanks thoroughly. Wire brush the inside of the tank, taking care that the men stay inside only a few minutes at any one time, coming out for fresh air and rest. Remove as much rust as possible from the bottom by pail, then finally remove the drain plug from the bottom of the tank and flush it out.

(2) It is also important at this time to check the tank cover gasket, renewing it if necessary, using the same treatment as used on old-type buoy pocket gaskets, i. e., using a mixture of dry graphite and water to completely cover the gasket on both sides. This will keep the gasket from adhering to the tank or cover and will protect it from rotting. Be sure that the surfaces of the tank casting and the cover are smooth and clean.

B. *All valves* should be maintained in good condition and should be repacked or reground whenever necessary to maintain a tight fit. If a valve is properly ground, closing it hand tight is all that is necessary. Never use a wrench on a valve stem. In opening a valve, do not screw it back hard all the way. After opening to the limit, turn back toward the closed position at least one-half turn. Then it can be easily determined whether the valve is open or closed. A valve jammed hard in the open position may be mistakenly considered closed. When installing valves, make sure that they are of the correct pressure range and that the standing pressure comes under the seat. Regulating and safety valves should be tested at least once each week. A few of the different type valves used at a station are:

Gate valve—Used in engine exhaust lines.

Plug valve—Used in engine exhaust lines.

Globe valve—Used in water, air, and fuel lines.

Needle valve—Used mostly in connection with the I. O. V. lamp.

C. *Leaks* in fittings, valves, etc., can keep an engine room in an untidy condition regardless of the amount of time spent in cleaning. Repair all leaks on or about engines immediately, or as soon as practicable. Repairing the smallest leak, not only reduces the amount of time spent on cleaning, but also permits the engine to operate at its best efficiency.

(1) When repairing leaks on lines with high pressure, with the valves at some distance from the job, always tag the stop valve when you close it, or station a man near the valve to prevent accidental opening while repairs are in progress.

(2) Make frequent inspections of connections on or about the engines and of the packing nuts while the engine is in operation. Leaks on packing nuts especially, are caused by the frequent use of the valve or by vibration, and can easily and quickly be repaired by merely screwing down the packing nut just enough to stop the leak.

D. *Ventilation*.—It should be made a daily practice to open the windows or start the blower, if so equipped, to air out the engine room even though engines are not in operation. When an engine is operating, keep the engine room ventilated as much as possible; also make an inspection of all connections and valves on the exhaust lines to insure against possible leaks. Leaks of this type are very dangerous and can cause carbon-monoxide poisoning.

E. *Painting*.—All engine rooms and engines should be painted out in accordance with current painting instructions or as directed by the district commander. When painting, be sure that all dirt and loose paint is removed, otherwise, the paint will crack and peel off. Avoid excess painting by washing often, and before the dirt gets ground in. Extreme care should be exercised when painting on or around engines to prevent the machinery from getting spotted, or the oil holes from becoming plugged. After completion of a painting job, or at the end of the day, return all paint and brushes to the paint locker, taking care to store the paint properly and thoroughly wash out the brushes.

F. *Air tanks*.—Air tanks or receivers should be inspected at regular intervals for leaks or rust. Repair leaks if possible, or if rust is found, scale it off, wire brush the area, and apply an approved paint.

(1) A small amount of oil is forced into the tanks together with air from the compressor, and settles to the bottom along with the moisture from the air. This moisture and oil should be drained off regularly. Oil may seep out from the piping and the bottom of a diaphone. Keep it wiped up.

(2) Inspect all safety valves and test them regularly, making sure that the safety valves are set at the proper operating pressure.

(3) Where facilities are available, it is desirable to subject pressure vessels including air compressor receivers to a hydrostatic test of $1\frac{1}{2}$ times the normal working pressure.

G. *Tools*.—Have tool boxes and tool boards or racks placed in a handy location and keep them clean. Replace tools when not in use. Check the condition of your tools frequently. Keep axes and chisels sharp and all handled tools fitted with firm unbroken handles. Keep tools free from rust and polish. Tools broken beyond repair should be removed and disposed of. Always use the proper size and type of tool for the job. Never use a wrench for a hammer, for example.

H. *Spare parts*.—See that the station is provided with a spare parts list covering all station equipment. Each unit should have one or more spare parts boxes where spare parts for engines and generators can be safely stored and preserved. The officer-in-charge should give his personal attention to the outfitting of this box, the preservation of the parts and the expenditures. All parts for each engine or generator should be listed, giving date received, amount, name, and part number; also giving name, type and serial number of engine to which it belongs. This list should be pasted on the inside of the cover and whenever any part is removed, it should be checked off and recorded. Always try to maintain sufficient spare parts on hand. When ordering spares, give all the above information and any other that is available. Do not order more than is necessary, as indicated in the official allowance list.

I. *Summary of general operation and maintenance*.—It is impossible to give a definite procedure of operation due to the variety of types of engines at present in use in the service. However, a general outline which may be applied to any engine is given below. Each officer-in-charge should study and follow the operating instructions given in the manufacturers' book for the machinery at this unit. If instructions are not provided covering equipment, request them.

(1) *Engines:*

(a) Determine that the fuel tanks have an adequate amount of fuel.

(b) Check the crankcase, making sure that the oil is at the full mark of the bayonet gage.

(c) Check the fuel injection pump; lubricating oil should be at the proper level.

(d) Check all wires, fuel and exhaust lines. When two engines exhaust into a common line, be sure that the exhaust shut-off valve from the spare engine is closed and the other is open before starting the engine.

(e) Make sure that no tools or rags are left lying on or near the engines.

(f) While the engine is in operation, make frequent checks on all gages, noting rise or fall, if any.

(g) Check the water in the radiator. Keep water about 2 inches below the top of the cap.

(h) Always keep your ear tuned to the exhaust of the engine. If an engine continues to skip, stop it and start up the spare engine immediately. Make repairs as soon as practicable.

(i) Maintain a regular cleaning routine, logging all expenditures, date of changing oil, cleaning filters, etc., and number of hours run between cleaning periods.

(2) *Generators:*

(a) Keep check of the temperature by thermometer or by feel while machine is in operation.

(b) Maintain regular cleaning of the lubrication system.

(c) Inspect the brushes for wear and arcing. Change generators if this occurs and make repairs.

(d) Regularly observe the height of the mica on the commutator and undercut it when necessary.

(e) Check the output of the generator against its rated performance.

(f) Keep the fields and the armature clean and dry. This will avoid arcing.

(3) *Compressors:*

(a) Keep the intake clear and allow plenty of ventilation to supply the needed air for operation.

(b) Keep the intake filters in good condition by cleaning as often as conditions require.

(c) In cleaning filters do not use kerosene or gasoline, as the fumes may be sucked into the compressor and cause an explosion; clean with a light lubricant. Always choose a well-ventilated place; when at all possible, clean them out of doors.

(d) Maintain proper operating temperatures.

(e) Keep the discharge stop valve on the idle compressor closed.

(a) Change the chart daily. Be sure to fill in all information required such as signature, date, time, and station.

(b) Forward the charts to the district office monthly.

(c) Refill the pen as often as necessary; use only the ink supplied for the pen.

(d) Clean out the pen regularly for best results. Soak it in warm water overnight, rinse and allow to dry thoroughly before placing in service. These are very fragile and should be handled with great care.

(e) Always have spare pens on hand.

(f) Treat the clock as you would any other high grade timepiece; keep it cleaned and polished. Regulate it for correct time keeping. It is a good practice to wind it at the same time every day.

(5) *Operating fundamentals*.—In putting a station into operation, the following fundamentals must be kept in mind:

(a) Make sure there is oil and water in engines and compressors.

(b) Fuel must be turned on. Check measuring or gravity tanks if used.

(c) Exhaust valve of operating engine must be opened; those of other units if interconnected, closed.

(d) The proper switches must be closed.

(e) Compressor and air line valves must be opened for selected operating units.

J. While the foregoing instructions contain a long list of specified things to do, a qualified operator learns to do a large part of them automatically. When a competent operator has learned the "tune" and "smell" of his engine room, he will instantly become conscious of any irregularity. This faculty results from the complete and thorough knowledge of your station. To know your station and your job is to become automatically alert.

***29-8-25 Radiobeacons—**

A. Due to the complexity of this subject, radiobeacons are treated separately in Chapter 26 of this Manual.

29-8-30 Watches at Light Stations—

A. Policies with respect to duration of watches, liberty and leave are set by the District Commander, and the following example should not necessarily be construed as required procedure; also, stations differ considerably in type and arrangement of equipment. Watchstanding is only mentioned here as a sample of what may be expected. It is the duty of the officer-in-charge to regulate and assign men to watches. These may vary at different stations as conditions warrant. It is his duty to see that all men know the duties of the watch and are thoroughly instructed in regards to operating all station equipment and understand the Aids to Navigation Operation Bill, which shall be posted in a conspicuous place. The officer-in-charge shall make up the watch list and post it adjacent to the Aids to Navigation Operation Bill, care being taken in making up this watch list that every man has an equal amount of duty and that the watches are rotated as much as possible.

B. *Typical day's duty.*—The following paragraphs illustrate an example of a day's duty at a typical light station. Assume that the station has the following equipment:

A revolving lens on a mercury float with electric or I. O. V. light source.

A class C radiobeacon.

Gasoline engine-driven compressors.

Diaphragm-type fog signal, operated either by the radiobeacon timers or a Crosby Regulator.

Diesel generators, nonautomatic, and one battery bank.

C. The first watch to be described is from 0400 to 1200. (*The schedule of watches varies considerably at different stations.*) The watch coming on duty first checks the characteristics and condition of all operating equipment. He makes a general checkup on outside conditions, such as weather, lashings on boats, etc., and observes other lighted aids which may come under the supervision of his unit. He sees that all defects, if any, have been logged and remedial action begun if possible, and that the log book is written up to the hour and signed. He may then take over the duties of the station.

D. Having taken over the duties of the watch, he carries out all standing orders, such as calling the cook, etc. He starts the generators for the daily charge of batteries at the scheduled time, taking specific gravity and temperature readings of the pilot cell. When specified by the A. to N. Op. Bill, he secures the main light. If it is a revolving incandescent oil vapor lamp, he stops the clockwork, checks and cleans all parts of the light and puts it in order so that it can be relighted whenever necessary. He measures and refills the oil tank and logs the amount of oil used. He pumps the oil up to operating pressure, cleans all equipment of any oil or dirt, and stores soiled rags in the proper place. He dusts off the lens with a clean lens towel and covers it with the regular cover. He hangs up the lantern shades to protect the lens from the sun; winds up the weights to the top and takes the strain off the cable by using a small rod passed through

the eye bolt on top of the weight and across the opening of the weight's well. He cleans all decks and ladders in the light tower.

(1) If the light is electrified instead of an I. O. V., he throws the switch to secure the light and proceeds to clean and cover the lens as described above. He examines the lamp and electric lens drive; lubricates as necessary.

(2) See section 29-9-70 for more complete instructions on the maintenance of illuminating apparatus.

E. After breakfast, the watch makes colors at 0800, logging same. Since it has been 4 hours since weather conditions were logged, he take the barometer readings, temperature, sky, and weather, and visibility for entry in the log.

F. Having kept an alert watch, the man on duty finds the visibility has closed in to less than 10 miles. He immediately starts the radiobeacon on continuous schedule, checking his equipment for correct minute of transmission, signal strength and voltage, and logs same.

G. Later, he notices that the visibility is lowering further. When it gets down to less than 5 miles he starts the engine-driven air compressor, builds up the required amount of air, if necessary, and then turns on the horns and also the switch for distance-finding or synchronization of sound signals to the radiobeacon. He immediately logs the time the engine was started and the operating air pressure. During the run the man on watch makes a periodic check on all operating equipment, watches the temperature and oil pressure of the engine, the pressure on the dial clock, and checks the signal for correct characteristic and tone.

H. After a period of time, the visibility has cleared to a distance of 5 to 6 miles, therefore the duty crewman stops the engine, shuts off the distance-finding switch on the radiobeacon signal timer and logs the time stopped, duration of run on engines and fuel consumption. He immediately cleans the engines and checks the oil, etc. In other words, he leaves the engine just as he found it, everything in order and ready to start at a moment's notice.

I. The radiobeacon is still operating on continuous schedule as the visibility is under 10 miles. A ship is about 5 miles off, signaling a request for calibration, which the man on watch has to answer in the negative since calibration cannot be given when the radiobeacon is in continuous operation or when any other station in the same group is operating.

J. At 1145 the visibility lifts to above 10 miles; therefore, the radiobeacon is changed to operate on clear weather schedule. The time stopped and duration of run is logged. The daily battery charge is secured by stopping the generator, which has been running since 0630. The man on watch logs the time stopped, number of hours run, amount of fuel used, voltage and current on generator, voltage and gravity reading of pilot cell of batteries. He cleans the generator, then prepares to check his primary clocks and changes the fog signal dial, dating and signing the dial that he removes, for the files. (Some stations change recording dials at 0000.) Weather conditions are taken and logged again and the watch

is finally secured after having checked all equipment. He signs the log and gives his relief any written or verbal orders about the next watch or equipment.

K. There are things not included in the above sample watch that have to be done every day and at a certain time of the day. These duties, such as daily cleaning of the furnace, making colors, putting the light in operation, or any other such duties required at stations of various types, should be assigned to the watch that is on duty at the time.

L. The general duty of all personnel standing watches is that watches shall be stood in an alert manner and frequent check of the characteristics of all equipment and operating conditions shall be made. Watchstanders must familiarize themselves with the A. to N. Op. Bill, routine of the station, and the care and operation of all equipment under their charge.

29-8-35 Light Attendant Stations—

A. Although no specific operating instructions are given herein for light attendant stations, officers-in-charge and all crew members should carefully study Chapter 27 "Aids to Navigation Seamanship" of this manual, and the following parts and sections thereof in particular.

Sections 27-1-10 and 27-1-20.

• Parts 27-2, 27-3, and 27-6.

Sections 27-7-1 and 27-7-5.

Parts 27-10, 27-11 and 27-13.

In addition, study Chapters 20 "Acetylene Apparatus," 21 "Electric Apparatus," 24 "Buoys, Mooring Appendages and Minor Structures," and 28 "Glossary of Aids to Navigation Terms," of this manual.

†29-2 STATION MAINTENANCE AND ROUTINE

29-9-1 General—

A. A light or light attendant station consists of the grounds, structures, and equipment necessary to the accomplishments of its mission.

B. *Condition of the unit.*—Personnel should take pride in keeping their unit immaculate inside and out. Some stations are located in remote isolated spots, others may be found in or near populated areas. Some are surrounded by spacious lawns and beautiful trees as a part of the property; others may be located on waterfront areas or in places consisting of nothing but rocks. Regardless of what the conditions may be, the entire unit shall be kept in spic and span order.

C. *Assistance to civil engineer.*—When requested by a district civil engineering representative, the officer-in-charge shall assign members of the crew to render such assistance as may be practicable in the prosecution of district maintenance work at the station, provided such additional work does not interfere with maintenance of necessary watches, or reasonable hours of rest for the crew.

D. *Inactive or discontinued station.*—When a station is placed in an inactive status, or discontinued, detailed instructions will be issued by the District

Commander relative to procedure to be followed to guard against vandalism and undue deterioration of equipment and buildings.

E. Except when specific reference is made, the following paragraphs are generally pertinent to light attendant stations as well as light stations.

29-9-5 Grounds—

A. The station grounds consist of the strategically located land area owned or leased by the Coast Guard on which the structures and equipment necessary to the accomplishment of the mission are located or based.

B. *Condition.*—The grounds shall present a neat appearance; rough places shall be leveled; lawns and shrubbery, if any, shall be trimmed; all debris shall be cleared away and station equipment stowed neatly.

C. *Stowage of equipment.*—Station equipment shall not be stowed on property other than that owned or leased by the Coast Guard without prior authority of the owner, and district approval.

29-9-10 Structures—

A. Station structures may consist of a light tower, dwellings, machinery and radio buildings, outbuildings, garage, boat house, piers, launchways, bulkheads, etc., located on Coast Guard property, which are necessary to the accomplishment of the mission.

B. *No unauthorized changes* in construction shall be made in any station structure.

C. *Condition of buildings.*—All buildings shall be kept clean, in good repair, properly ventilated and aired, and shall be painted in accordance with current directives.

D. *Monthly inspection.*—Foundations, skirtings, floors, and other vital parts of a structure should be inspected each month in order to detect any settling, deterioration or need for repair. If repairs are needed, the fact shall be reported to the immediate superior with a request for appropriate action. Repairs of a minor nature, such as repairs to sashes, sills, joints, broken window glass, locks, doors knobs, and hardware should be accomplished by station personnel with station equipment and supplies, if possible.

E. *Sand* shall be kept below the sills or joints to prevent rotting.

F. *Gutter and down spouts* shall be kept clear of trash, leaves, and sand. Down spouts leading to a drinking water cistern shall be fitted with a suitable bypass.

G. *Sanitary conditions* shall be maintained as follows:

(1) *The septic tank or cesspool* shall be inspected each spring and fall by removing the vent cap or manhole cover and testing the depth of the sludge by means of a rod or plumbbob. The sludge which forms at the bottom must be periodically removed to avoid filling the tank with solid matter, thus destroying its proper action. Whenever the sludge level appears to reach the low end of the intake

or discharge pipes or there are other signs of the fluids running freely through the tank, it shall be cleaned. If the solids are not removed by a contractor and transported away from the station, they shall be disposed of by burial. The solids shall not be dumped into adjacent bodies of water. If a siphon is used, it is advisable to clean the siphon tank and automatic siphon when the septic tank is cleaned.

(2) *Leaking plumbing.*—All leaking valves and faucets should be repaired without delay by replacing valve seats and/or packing or installing new washers of the proper size. A supply of valve seats, packing, and washers should be maintained at the station.

(3) *Water treating plants* should be kept clean and properly backwashed in accordance with the manufacturer's instructions.

(4) *Toilet and washing facilities* are most important to the health and well-being of all hands. While it is realized that all stations do not yet have modern facilities and conveniences, it is important to keep existing facilities in the best possible condition of cleanliness. All bowls, showers and shower gratings should be cleaned frequently. Use deodorants freely, but not to cover up neglect of cleanliness.

Caustic soda (lye) may be used to clean out drains. However, the lye should not merely be poured directly into a drain right out of the can. Lye which is poured directly into a drain congeals into a mass and consequently plugs up the traps, causing considerable work and possible damage. First, dissolve the lye in warm water. Then pour it down the drain while still warm. *Caution: Lye or any alkali or acid cleaner must not be used in any toilets or drains which empty into a septic tank. Such chemicals will destroy the bacterial growth upon which a septic tank depends for effectiveness.*

(5) *Privies.*—A number of light stations in isolated locations still use "privies." All privies require periodic attention. Seats and covers should be washed weekly or oftener with soap and water or with disinfectants, such as cresol, pine oil, and hypochlorite or chloride of lime. These have deodorant properties and are generally available.

(a) During the fly season, fly and mosquito eggs will be destroyed by pouring half a pint of crude oil, crankcase oil, fuel oil, kerosene, or borax solution (1 pound powdered borax dissolved in about 10 gallons of water (over the contents of the pit about once a week.

(b) Odors from privy pits can be reduced by covering the contents with dry earth, ashes, manure, or sawdust. These materials fill up the pit rather quickly, but can be used where other deodorants are not available. Sometimes two cakes of yeast dissolved in 2 gallons of water are effective in reducing odors. Commercial deodorants are available from suppliers of disinfectants.

(6) Insanitary conditions, the correction of which is impracticable with station personnel and equipment, shall be reported to the immediate superior.

H. *All boat houses, inclines, and launchways* shall be kept clear of sand, ice, snow, and other obstructions, at all times.

I. *Screens and exterminating supplies.*—Kitchens, pantries, eating, living, and sleeping spaces shall be kept free from flies, mosquitoes, roaches, and vermin, by the use of proper screens and exterminating supplies.

J. *Repairs.*—Personnel attached to stations are required to make repairs as soon as possible to the station and equipment, to the extent of their capabilities. In instances beyond this, a complete report of needed repairs, damage or failure of equipment should be made to the proper authority. Don't cry for help until you have exhausted your own efforts. On the other hand, however, don't attempt repairs on apparatus which requires specialized training beyond your scope.

K. *Drying out damp towers by ventilation.*—Personnel who have difficulty with dampness in masonry towers or buildings should attempt to overcome the condition by systematic ventilation in cool, dry weather. In warm, damp weather such buildings should be closed. It takes time to get the moisture out of the thick walls of a big tower, but in some instances bad conditions have been completely overcome by intelligent and persistent ventilation.

L. *Lightning conductors.*—Officers-in-charge shall see that the lightning rods on all towers, oil houses, dwellings, and other structures at aids to navigation units are kept in efficient condition. See that all connections are brazed or fused but not riveted. Do not permit any kinks or short turns to exist in lightning rods, where the rod passes down over the edge of lantern gallery for example. These will largely spoil the usefulness of the rods. Particular care should be taken to insure that poor electrical connections do not result from corrosion or other cause below ground level or at other points hard to observe. If defects or improper conditions exist which cannot be remedied by the officer-in-charge, they should be reported at once to the immediate superior.

M. *Fuses.*—Stations wired for electricity must have household circuits fused for not over 15 amperes, except where specially authorized. Overfusing may cause wiring to become overheated, with resultant fires.

N. *Work schedule.*—The officer-in-charge shall plan and lay out the general work of maintenance, having regard for weather conditions and seasons. All general work should be planned in advance, whether it be semiannual, monthly, weekly, or daily.

29-9-15 Cleanliness—

A. *Daily and weekly routine.*—Daily cleaning and general field day is routine throughout the Service. Because a station is isolated is no reason for neglecting this routine. Daily cleaning applies to quarters, lens room, machinery spaces, radio room and any other space requiring frequent attention. For general field day (once a week) cellars, furnaces, rope and paint lockers, store rooms, all outside buildings, and grounds, boats and vehicles, etc. should be given a thorough cleaning and squared away.

B. *Galley.*—While the whole station should be kept in immaculate condition, special attention should be

given to the galley. Decks should be scrubbed down daily; dishes washed and dried properly and drainboards and sinks scrubbed down after each meal; refrigerators cleaned inside and out. Never leave dirty dishes inside a refrigerator or allow them to accumulate longer than necessary in the sink. Keep the galley range free from dirt and grease and clean it after each meal. The dining room (mess hall) should be given similar attention.

C. *Shower gratings* should be "sand and canvassed" and rinsed down with fresh water frequently. This method is preferable to that of continuous use of strong "soggie" solution which will eventually rot the wood.

D. *Bedding*.—Sheets and pillow cases should be changed at least once a week, and blankets and mattresses aired frequently.

E. *Disposal of garbage and trash*.—Domestic garbage and trash can be divided into two classes—combustible trash and noncombustible material. The disposal of these wastes is simplified if the two classes are kept separately.

(1) Trash to be burned should be kept dry. Coffee grounds, tea leaves, citrus rinds, fish heads, entrails, eggshells, and similar material are most readily handled if drained and put in paper sacks.

(2) Cans should be placed where they will not collect water and become breeding places for mosquitoes. When the trash accumulates it should be hauled to some out-of-the-way place, such as a gully, or buried.

(3) Neat-appearing garbage containers are desirable for kitchen use and should be small enough to require daily emptying. Large containers may be placed within easy reach outside the house and screened with a lattice fence or shrubbery. Substantial containers of rust-resistant metal will not quickly become an eyesore and a nuisance. Tight covers should be used to keep out prowling animals and to eliminate the habit of tossing wastes from the back door. Open or wooden containers are not recommended.

(4) A good way to protect the garbage pail is to place it in a small pit that has a manhole frame and a lid that can be raised by foot pedal. A gravel bottom in the pit will assist in draining water away.

(5) Outdoor receptacles, if emptied and cleaned once a week, generally do not become foul. Grease, coffee grounds, and other similar materials that adhere to the sides of containers can be removed by scraping with a little sand prior to scalding.

(6) Incineration is the most sanitary method of disposing of certain wastes. Garbage, however, is not easily burned. A limited quantity of refuse may be burned in a kitchen range or a furnace, but it may cause accumulations of grease in the flue and require frequent cleaning to prevent fire.

(7) Next to burning, burial is the most desirable method of waste disposal. Waste material may be deposited in a trench 3 or 4 feet wide, 7 or 8 feet long, and 4 or 5 feet deep and covered with earth when filled to within 18 inches of the top. If there is no fire hazard, the contents of the trench may be burned.

(8) Garbage may be included in a compost heap with leaves, peat, manure, and similar materials. The compost pile should be in an inconspicuous place, built up to the desired height with materials that will rot, and then covered with 2 or 3 inches of earth. The top should be level and the sides steep sloping. It is necessary that the material being composted be kept moist; otherwise it will not rot. Frequently commercial fertilizer is added to increase the fertilizing value of the compost.

(9) Ashes and clinkers removed from furnaces should be placed in metal containers to eliminate fire hazard. Wood ashes may be spread on the lawn or garden, as they have some fertilizing value.

(10) Trash burners of various designs suitable for burning small quantities of paper and rags are available or may be improvised. The main requirements are provision for adequate draft and for preventing the escape of burning paper or live embers.

(11) Never dispose of garbage in a toilet bowl. Waste materials of this type will readily clog the pipes.

29-9-20 Care of Floors and Floor Coverings—

A. Proper care of floors and floor coverings is an important item in maintaining a station. Its appearance serves as a gleaming example of a unit's attitude. Many instructions have been published relative to the proper care of floors. Methods of procedures and surface applications vary with the type of floor. Many manufactured cleaners, polishes, and preservatives are available. Some of these are good; many are practically useless for their intended purposes. The use of most preservatives on surfaces other than those for which they are expressly intended, will frequently cause permanent damage by discoloration and increased rate of deterioration of the flooring. Therefore, in caring for your floors, first "know" the floor concerned; second, carefully determine the proper type of material to be applied; and third, apply it strictly in accordance with the proper instructions with no variations thereto.

In the absence of conflicting instructions of manufacturers for specific materials, the following paragraphs suggest procedures as applicable.

B. *Sanding wood floors*.—Due to the amount and nature of the work involved, hand-sanding of wood floors is rarely overdone. It is frequently required in periodic reconditioning and maintenance of floors. Therefore, no restrictions are placed on hand-sanding of wood floors by unit personnel. However, machine-sanding can, and frequently does, ruin a floor due to the lack of "know how" by the operator. Each sanding will appreciably reduce the life of the floor. Therefore, no unit shall sand by machine the wood floors of any Coast Guard structure without prior approval of the immediate superior. Requests for same shall include full justification of need, extent of areas involved, cause, and qualifications of the intended operator. Normal good housekeeping will generally preclude the need for extensive sanding.

C. *Cleaning and refinishing wood floors.*—The use of various highly inflammable liquids such as gasoline, benzine, acetone, etc., in connection with cleaning and refinishing floors introduces severe and unnecessary fire hazards and has been a contributing factor in several disastrous fires.

(1) *Cleaning:* "Except in unusual cases, satisfactory cleanliness can be secured by regular sweeping or mopping, and, when absolutely necessary, by scrubbing with soap and water. Care should be taken to use only mild soap. Floors should never be flooded or water allowed to stand on them, as strong soap or flooding have a deleterious effect. Do not use sweeping compounds on linoleum surfaces unless such compounds are especially prepared for this type of surface. Where the above methods will not give satisfactory results, liquids having flash point of not less than 100° F., may be used. Where such liquids are used the following safeguards should be observed:

- (a) Clean only a small area at one time.
- (b) Provide all possible natural ventilation.
- (c) Keep all open flames and spark-producing devices away from cleaning operations.
- (d) Prohibit smoking in the area where work is being done.
- (e) Restrict the amount of liquid to that necessary for the immediate operation, and return the unused liquid to its customary place of storage as soon as cleaning is completed. Do not use open containers.
- (f) Provide metal cans for cleaning rags and remove them from the building before securing.

(2) *Refinishing:* "Refinishing operations involve more serious hazards than cleaning, because it is necessary to remove the old finish and then apply new finishing materials. Removal of floor surfacing may usually be accomplished by sanding, scraping, or rubbing with an abrasive, but in exceptional cases it may be necessary to use liquids more volatile than those specified for cleaning. These liquids, and those used for new floor finish, include paint and varnish remover, varnish, liquid paint, shellac, etc., which have flash points as low as 40° F. Removal of old finish and application of new finish should be done only under expert supervision, and all precautions listed in paragraph (1) above should be observed with the following additional safeguards:

- (a) All personnel not engaged in this work should be excluded from the area.
- (b) Where practicable, the main electrical switch for the entire building should be disengaged and work done by natural light. When this is not practicable, all electrical appliances of any kind in the vicinity should be disconnected before any finishing material is applied, and should not be reconnected until drying is complete.
- (c) Prohibition of open flames and smoking should be continued for one hour after drying is complete.
- (d) Residue from sanding machines should be placed in cans, wetted down, and removed promptly from building.
- (e) Take such additional precautions as the circumstances may indicate.

(3) *Waxing:* "After cleaning or refinishing, the surface may be protected by application of a thin

coat of wax. Polishing is not necessary unless a high luster is desired. Waxing rags should be placed in metal cans until properly disposed of, and mops preferably stored outside of buildings. Where necessary to keep mops in buildings, well ventilated closets with incombustible floors are advised. Keep wax containers closed when not in use."

D. *Maintenance of linoleum.*—Following are some notes on linoleum care obtained from a manufacturer:

(1) "Avoid the excessive use of water in cleaning; a damp mop often suffices. If a cleaner is needed, use only a good neutral soap and rinse off with clear water. Use alkaline or abrasive cleaners only to remove discolorations or accumulations. Excess water seeps under the linoleum and causes the bur-lap backing to come loose and decay. This causes the linoleum to buckle, crack, and flake off. Good linoleum seldom wears out, but it is often washed out.

(2) "Do not use varnish, lacquer or floor seal on good linoleum. If the linoleum is old and badly worn, a good floor seal will extend its usefulness for a while, but varnish or paint causes the linoleum to harden and crack. Also, they wear off in spots and paths and show laps when you make repairs. Linoleum cannot be safely sanded, nor can you use paint and varnish remover on it. The best method for maintaining linoleum is to use a good water wax (self-polishing) or a solvent-type liquid wax (requires buffing). A good linoleum, properly laid and properly maintained, will look its best for years, in fact, it will last almost indefinitely. A linoleum, even a good one, soon becomes a liability if it is mistreated. No other type of floor is so easily damaged and yet no other type of floor can give more satisfaction when properly taken care of."

E. *Asphalt tile.*—The Asphalt Tile Institute recommends these factors for extended life and beauty of asphalt tile:

(1) *Cleaning:* New floors should not be washed or waxed until all the tiles have tightly adhered to the sub-floor. This may require several days. If cleaning is necessary in this time, wipe up with a damp cloth or mop—not wet. When ready, clean the floors thoroughly, and apply a good grade of water emulsion wax. Several successive light coats are recommended. An occasional washing with a diluted warm suds solution of a good neutral soap or cleaner will keep floors clean and attractive. After washing, rinse thoroughly with clear water and when all traces of soap and dirt have been removed, dry with a clean mop. Do not use cleaning compounds which are not readily soluble in water, or strong detergents. In no case use cleaners or sweeping compounds that contain gasoline, kerosene, turpentine, oils, free fat, alkali, or acids. If ordinary washing fails to remove any stains, the surface of the tile should be rubbed lightly with No. 00 steel wool, using a concentrated solution of neutral soap or cleaner and warm water. Never attempt to use gasoline or other solvents such as benzine, turpentine, etc.

(2) *Waxing*: The use of a good grade *water emulsion wax* applied in accordance with the manufacturer's directions is recommended. If a high lustrous sheen is desired, apply several successive light coats, buffing each coat after it has been allowed to dry thoroughly. Do not use waxes containing such solvents as turpentine and benzine, as they soften the tile and cause the colors to bleed. Grease and oils allowed to remain in contact with asphalt tile will permanently stain the floor. In case of spillage, wipe off immediately. Do not use varnishes, lacquers, shellac, or other plastic finishes. These materials usually contain solvents that will permanently injure asphalt tile.

(3) *Loading*: All bearing or contact areas of furniture, equipment, etc., resting on asphalt tile floors should be such that:

(a) The contact surface is smooth, flat, and free from small projections, recesses, holes roughness, etc.

(b) The contact surface shall be of sufficient size to carry the load without marring the floor.

(c) All edges are rounded to prevent any cutting action, if momentarily turned on edge.

(d) Where movement is contemplated, the design will be such that the flat smooth bearing surface will continue to remain uniformly in contact with the floor. For side chairs, light cabinets, etc., that are moved more or less frequently, glides having a smooth, flat base, with rounded edges and a flexible pin to maintain flat contact with the floor, are recommended. The size should depend upon the weight to be carried. Such glides can be obtained in sizes from about 1 inch to 2½ inches diameter. Small metal domes should be removed from the bottoms of all chair and furniture legs, and replaced with flat glides. Easy swiveling ball bearing wide wheel casters, or flat glides, should be used on furniture that is moved frequently, such as desk chairs, etc. Casters should have large diameter wheels (2-inch or more) with wide flat soft rubber composition tread. Small diameter, narrow, hard wheel casters, particularly with a crowned tread and without ball swivels, will unnecessarily and unduly mark all types of resilient flooring. Furniture cups are made of a composition material in a pleasing neutral color, designed to prevent the legs of furniture from cutting the floor. They are manufactured with openings 1½ inches, 2 inches, and 2½ inches square, and also with round openings 1⅜ inches and 1⅝ inches in diameter. They are designed for use on heavier furniture that is moved infrequently.

F. Rugs and carpets.—Keep rugs and carpets free from imbedded grit by occasional beating and frequent vacuuming. Keep them clean by vacuuming and occasionally shampooing with a mild soapy lather and scrub brush, using a minimum of water. Shift positions occasionally, to avoid spotty wear—this pertains particularly to stair carpets.

G. For further data, refer to the booklet "Care and Repair of the House" by United States Department of Commerce, National Bureau of Standards.

29-9-25 Fresh Water—

A. Purity of drinking water.—Officers-in-charge of all aids to navigation units must constantly be on guard to see that their drinking water is pure and uncontaminated. The fresh water problem is likely to be particularly acute at small isolated units. Great Lakes water must not be used for human consumption unless properly treated. Personnel in doubt about the purity of their water supply should report the fact to their immediate superior. Water which is questionable due to taste or odor should be tested as soon as possible. This can be done by requesting a sample bottle from local or state health authorities. Follow the directions accompanying the sample bottle meticulously. Wash your hands thoroughly with soap and warm water before handling the bottle. When tenders furnish water to units, the commanding officer of the tender shall insure that the water is potable. The officer-in-charge of the unit is responsible for keeping the tanks, wells or cisterns clean and safe for use.

B. Rain water.—To obtain rain water, inspect all rain roofs and gutters daily for cleanliness; check strainers in the gutters and lead pipes to make sure that the valves on the lead pipes are open so that the water will run overboard. During a good rain, the roof and gutters are first flushed down (turn the valves so that water cannot flow into the cistern). After a thorough flushing, turn the valves to allow the rain water to flow into the cistern. Only approved paint should be used on roofs and gutters used in this connection.

C. Care of water cistern.—About every 3 months spread (not just drop in one place) about 1 pound of slaked lime into the cistern. This tends to purify the water. If too much is used, the water will have a brackish taste; however, this will disappear in a few days and is noninjurious.

(1) Cisterns should be aired out occasionally by removing the manhole covers. (Be sure to rope off the openings to prevent injury.) When replacing the covers, inspect and renew the gaskets if necessary. Keep the manhole covers tightened down at all other times.

(2) Clean the cistern annually during a rainy season. Carefully figure the amount of water required during the cleaning period (several days) and store sufficient water in breakers or other suitable containers to meet all the personnel and cleaning needs of the station. Notify the District Commander of the amount of water on hand, and the date and amount of water that will be required, giving at least 10 days advance notice.

(3) At light stations the cistern is usually made of cement. To clean the cistern, proceed as follows:

(a) Pump out all water, clean out the sump in the bottom, remove all loose whitewash on the walls by wire-brushing, rinse down thoroughly, bail out the rinse water and allow to dry. While it is drying, inspect the walls for cracks, and piping and strainers for defects; repair or renew as necessary.

(b) After the cistern has dried, apply two or three coats of whitewash. The first coat should be thin; the others of a creamy texture. Allow time to dry between coats, and ventilate as well as possible.

(c) The following formula for whitewash, when properly made and applied, gives a white that does not easily wash or rub off: To 10 parts of slaked lime add 1 part of cement, mix well with salt water and apply quite thin.

29-9-30 Heating System—

A. *Care of smoke pipes and furnaces.*—The Service is put to considerable expense each year renewing burnedout grates for ranges and heaters and renewing smoke pipes to heaters. A large part of this expense is unnecessary, the cause of the damage not being well understood by personnel.

B. *Grates* are quickly destroyed by excessive heat caused by insufficient space under them to allow a free circulation of air through the grate. Ashes should be removed from beneath the grates *at least once a day*, and sometimes oftener during severe winter weather, in order to keep proper air space under the grates. Warped grates will in turn cause the linings to crack, necessitating expensive renewal.

C. *Pipes and connections.*—Inspect pipes and connections daily for leaks or damage. Keep them clean and free from rust. All leaking valves or traps should be repaired immediately.

D. *Dampness.*—Smoke pipes in some localities soon rust out if they are allowed to remain in place during the summer months. Damp air passing through the heater and pipe, by draught from the chimney, deposits its moisture not only in the pipe but in the heater as well. This moisture, acting in conjunction with alkaline matter in soot, soon destroys the pipe and may seriously injure the heater. Personnel should, where applicable, thoroughly clean out their heaters and smoke pipes every spring as soon as fires have been extinguished for the season and, when necessary, take additional precautions to preserve them.

E. *Use of coal.*—Coal should never be used for fuel in a firebox unless it is suitably fitted for such fuel. Never permit a stove to get overheated and then suddenly cool it off by removing covers and opening doors and windows. Keep grates well cleaned from clinkers.

F. *Spare parts.*—When spare parts are necessary, order them promptly, specifying by number or sketch the exact parts required. If your stove is kept in good working order, it will serve its purpose with much less fuel and without overheating. Naturally, if the damper is burnt out you will have to heat the stove unnecessarily in order to get the oven to baking heat.

G. *Annual care.*—When a steam or hot water heating system is secured, usually at the end of the spring season, the water should be drained and completely refilled to prevent inside sections of the boiler from rusting. Wire brush the flues in the boiler; remove and clean out the soot from the piping from the furnace or range to the chimney; clean the chimney and remove the soot from the opening at the bottom. A burlap bag filled with brush or small shrubs, and pulled up and down, is one method of cleaning a chimney. The covering on the furnace or pipes should be whitewashed or painted and iron

parts which are not covered, such as bolts, dampers, checks, etc., should have a coat of light grease or oil applied. Oil burners should be cleaned and adjusted. Automatic controls should be tested for proper operation and adjusted or replaced.

29-9-35 Painting—

A. *Performed by station crew.*—All painting and application of washes, including the necessary cleaning, scraping, or chipping, at aids to navigation shore units shall be done by the crew, except when otherwise ordered by the District Commander. Both the interior and exterior of all structures at light stations must be kept clean by frequent scrubbing and be properly preserved by the application of paints and/or washes.

B. *When to paint.*—Parts that may be dirty or dingy will not be painted solely to give them a clean appearance when there is ample paint to protect such parts. They shall be scrubbed as often as necessary, and no paint shall be applied until the existing paint is worn thin. This applies to the exterior of buildings and towers as well as to the interior. In cases where the paint is excessively thick, cracked, peeling, or blistered, the same shall be scraped off and surfaces sandpapered before any more paint is applied. *When a blow torch is used, extreme precautions should be taken to prevent fires.* There have been instances in which fires have broken out an hour or longer after work was finished. This was due to ignition of smouldering material hidden behind the boards which were cleared of paint. A blow torch must be handled with care and not inverted when lighted. Only persons with experience at such work will be permitted to use blow torches on paint work. *The use of blow torches should be discouraged.*

C. *Water supply.*—When drinking water is obtained from roofs, special instructions will be given by the District Commander with regard to painting, to insure that danger from lead or other poisoning will not exist.

D. The use of newly developed paints and techniques of application have made many former painting instructions out of date. Manufacturers' instructions, if printed on the can, should be followed. A revision of instructions for Painting Coast Guard Vessels, Boats, and Stations is being prepared. Unless other instructions have been issued by the District Commander to cover special conditions at a particular unit, the instructions contained in the latest applicable Painting Instructions Memorandum should be observed. If there be any doubt as to the proper procedure with regard to painting, personnel will request instructions of their immediate superior.

E. *Caution with regard to painting.*—Officers-in-charge will see that proper precautions are taken to prevent injurious effects on the health of men painting with lead and other paints in confined spaces.

F. *No smoking signs.*—See that NO SMOKING signs are posted in the vicinity of paint stowage. Have a suitable type fire extinguisher handy.

29-9-40 Handling and Storage of Supplies—

A. *Check stores.*—When stores are brought aboard, they should be checked immediately for condition, completeness, and freedom from defects. Make entries in Record of Public Property promptly.

B. *Lock storehouses.*—Storehouses, oil houses and other storage buildings at light stations shall be kept locked, except when being entered on official business.

C. *Commissary stores.*—When commissary stores are received, do not take them directly to the galley or food locker. First, unpack them outside to avoid the danger of spreading vermin. Often, packages of stores are contaminated by roaches and other vermin. Keep insecticide on hand at all times and use it freely at the first sign of vermin.

D. *Canned foods* should be stored neatly on shelves in the food locker (which should be a cool, dry place) using the same method as described above for storing paints.

E. *Caution.*—Do not stow cartons containing dry ice (such as ice cream) in walk-in refrigerators without first removing the dry ice. Otherwise, carbon dioxide gas may be given off and a person working inside the ice box may suffocate.

F. *Paints.*—All paint stores should be stowed in a cool, dry and well-ventilated place. When stowing paint on shelves, place the new stock behind the old so as to use up the oldest stock of paint first. Arrange the paint by color and size of can so as to make it easier to take inventory. Never leave leaky or open cans of paint on the shelves for storage. Use these up first.

G. *All engine parts*, properly oiled, wrapped in heavy paper and tagged with name and serial number of the part, are stowed neatly in the spare parts box for engine supplies. Make a list showing the contents, with the name of the engine, serial number and model or type, bore and stroke, name and serial number of the spare parts and amount of each on hand, etc. Post a copy of this list inside the spare parts box and correct it each time a part is drawn out.

H. *Tools.*—Keep all tools stowed in chests or on tool boards. They should be free from dirt or rust, slightly oiled, in good working order, and stored in their proper places when not in use.

I. *Rope* should be kept in a dry place and neatly coiled or faked down on gratings to allow air to circulate under it, or on reels. Sizes should be separated and in order. Wet rope should always be dried out before stowing. See part 27-2 of Chapter 27 of this manual, "Aids to Navigation Seamanship," for further rules on the care of rope.

29-9-45 Handling and Storage of Inflammable Liquids—

A. *Kerosene* kept by personnel at shore units in an oil house, or a separate room, shall be inspected frequently to detect leaks and every precaution taken for its safekeeping. No fire or lighted lamps shall

be carried into such storage spaces. Oil in cases must at all times be stored with tops up.

B. *Gasoline* evaporates easily from the open surface; its heavy fumes stay low, filling all of the dead pockets in the bilges, where they form explosive mixtures that need only an open flame or spark to set them off. Therefore, it is of utmost importance that the following safety precautions be observed:

(1) *Gasoline accumulation.*—Gasoline shall not be permitted to accumulate in drip pans or bilges.

(2) *Gasoline and oil soaked rags.*—Gasoline and oil soaked rags shall be immediately removed from the area of engine installations and proper disposition shall be made of them.

(3) *Waste.*—Never use waste for cleaning and wiping around, or on, internal combustion machinery.

(4) *Smoking, open flames, etc.*—Smoking, lighting matches, and carrying open flame lights in the area of the gasoline equipment shall be strictly prohibited.

(5) *Periodic inspection.*—Electrical systems shall be inspected periodically for elimination of grounds and sparking of commutator brushes.

(6) *Spilling of gasoline.*—Extreme care shall be exercised to avoid spilling gasoline when fueling the boat or tanks. Extreme care should also be taken during, and immediately after fueling to prevent ignition of gasoline fumes by sparks from static, electrical equipment, smoking, friction, etc.

(7) *Circulation of air before starting engine.*—On gasoline-powered boats, if an exhaust blower is installed in the engine compartment, it shall be operated for 5 minutes before starting the engine or entering the compartment. Vents shall be opened to permit fresh air to be drawn into the compartment while the blower is operated. If the blower becomes inoperative, the engine shall not be started except under emergent conditions, and then only after all practicable steps have been taken to circulate sufficient air through the engine compartment to remove gasoline fumes. On gasoline-powered boats, not equipped with a blower for the engine compartment, the engine room hatches shall be opened to permit circulation of air through the compartment before starting the engine. If there is not sufficient wind blowing across the boat to insure the removal of gasoline fumes, circulation of air through the compartment shall be created by fanning with a life jacket or a piece of canvas, or by other available means.

(8) *Storage.*—Gasoline at aids to navigation shore units must be kept in drums or other containers provided for the purpose, stored separately with good ventilation, protected from the weather and, if practicable, at a safe distance from other structures. Gasoline containers should be painted red in order that the contents may not be mistaken for kerosene, etc., empty gasoline barrels are highly explosive if they contain fumes. Gasoline storage containers and tanks of vehicles and boats should be kept free from water.

(9) *Leaking gasoline.*—Leaking gasoline is the cause of many fires and great care should be taken

to avoid such leakage. *Even a small amount of gasoline in bilges is extremely dangerous.*

C. Alcohol.—The following instructions shall be carefully observed in the handling and use of alcohol for incandescent oil vapor lamps, and other purposes, at light stations:

(1) *Where stored.*—Alcohol is to be stored in the oil houses at light stations on shore or in the oil rooms of stations on submarine sites, both the oil houses and the oil rooms to be well ventilated.

(2) *How stored.*—Alcohol is to be kept stored in the original 1- and 5-gallon cans in which it is received at the station and not transferred in quantity to larger containers with faucets. Containers should be so painted or plainly marked as to avoid possible mistakes as to contents. The cans are to be stored separately from other stores, marked or tagged for easy identification, and placed so that leaks will show up readily.

(3) *Open lights.*—No open lights, lighted cigars, cigarettes, or pipes are to be taken into places where alcohol is stored. The cans are to be examined frequently for leaks.

(4) *Faucets.*—No cans with faucets will probably be furnished, but should they be, either in commercial cans or otherwise, the faucets are to be examined to see that they shut tight. Cans provided with the usual low screw cap near one corner must have the caps fastened down tight.

(5) *Amount needed.*—An ordinary half-pint squirt can full of alcohol is generally sufficient for an incandescent oil vapor lamp for one night, and no greater amount should be drawn unless for good reasons, as for use in connection with fog signal engine torches. For the latter purpose it is desirable to fill a 2-quart lamp feeder. The feeder should be kept at some convenient place, but not carried into the lantern; only the squirt can should be used in the lantern or at the fog signal torch.

(6) The squirt can must be filled only in daylight from the original cans in the oil house or room or from the lamp feeder. Both these containers must be kept tightly closed and spouts capped and observed often for leaks. The lockers in which both are kept must be well ventilated and the doors labeled to show what is inside, and a warning displayed to guard against carelessness. If alcohol is spilled, allow it to evaporate or mop it up, especially in the lantern, before any matches are used.

(7) *Matches.*—No matches other than safety matches may be used near alcohol and then only with caution in lighting incandescent oil vapor lamps, night lamps in the tower, and fog signal engine torches. A receptacle for used matches should be kept in each place.

(8) Matches, candles, or open flames of any kind must not be used for searching in dark places about the oil houses, oil rooms, towers, or where inflammable materials are stored or gas may collect.

(9) All officers-in-charge and others concerned must be warned of the danger due to careless handling of alcohol in connection with open lights of any kind.

*29-9-50 Fire Prevention

A. Smoking.—District Commanders and other responsible commanding officers will issue orders regarding smoking on Coast Guard aids to navigation reservations, vessels, etc., to prevent the danger of damage to Government property by fire. No smoking is allowed in any compartment of a motor boat, or before or immediately after starting the engine. Smoking is allowed only in the open and if there is no chance for sparks to fall where gasoline vapors could have collected.

B. Precautions against fire.—At aids to navigation shore units every precaution must be taken against fire. Fire buckets, when provided, must be kept filled with water. Other fire apparatus must be kept accessible and in a fixed place. Combustible debris must not be allowed to accumulate; paint burners must be used with caution; electric wiring must be kept in safe condition; all joints and fittings in stove pipes and furnace uptakes must be fastened together with screws; oil stoves of all kinds must be operated with care. Carelessness with regard to the above matters has frequently resulted in fire. Any fire starting at an isolated shore unit with a small complement is likely to develop to disastrous proportions. Good housekeeping is the very best fire prevention and safety measure that there is. In a clean orderly shop, with a place for everything and everything in its place, most fire hazards have been eliminated.

(1) Should oil or gasoline become ignited, the best means of extinguishing it is by the use of the liquid chemical fire extinguishers, being sure to direct the stream at the base of the fire. In the absence of such an extinguisher, sand, earth or ashes should be used. A heavy blanket thrown over the fire will also tend to smother it.

(2) Open fires on open lights in buildings must never be left unattended.

(3) Open lights must never be taken into rooms used for storing oils, paints, gasoline, or other inflammable materials.

(a) The presence of vapors from combustible liquids, in sufficient concentration to cause a odor, is a recognized hazardous condition. Under such conditions no open flame should be permitted in the vicinity; and steps should be taken to provide the best possible ventilation, thereby preventing the accumulation of dangerous vapors.

(b) Kerosene refrigerators should be considered semiautomatic and must be kept clean and free of carbon by frequent inspection and attention, to prevent improper combustion and absorption of kerosene by carbon accumulation.

(4) Only safety matches are permitted on Coast Guard premises.

(5) Oily waste, rags and other articles subject to spontaneous combustion must be placed in a metal fire-proof container immediately after use. The contents of the refuse can must be disposed of daily.

(6) Officers-in-charge shall frequently examine the premises for possible fire hazards and observe type, number, location, and condition of fire extinguishers. Check the types of extinguishers against the probable cause of fire in the location. Note the tag showing the date extinguishers have

been refilled or weighed. Examine personnel regarding their knowledge of extinguishing fires and the types of extinguishers to use for electric fires, gasoline, oil, wood, or cloth fires, and fires where human beings are on fire, or where the fires are in confined areas. Check the Fire Stations of the personnel, their knowledge of the use of equipment available and of first aid in case of accident. Keep the station organization bills, including the fire bill, current and posted, without other notices, under glass.

(7) Living quarters above the main floor should be protected by fire escape lines suitably knotted to permit the escape of personnel. Two separate fire exits should be maintained, where possible, from barracks and sleeping quarters. Hot gases and smoke, rather than the flames themselves, are most often the cause of fire fatalities.

(8) Lightning rods and lightning rod grounds must be carefully inspected to insure that they are insulated from the structure and that the path of the conductor is continuous to the ground. Conductor mends should be fused or brazed and not riveted.

(9) Trash and other fire hazards must be eliminated in accordance with the principles of good housekeeping.

(10) All excess oil should be wiped up and oily rags disposed of by burning or washing. (See subparagraph (5) above.)

(11) High grass and weeds in close vicinity of structures must be cut down. At least 10 feet of clear space should surround buildings. Piling lumber and gear against building walls permits the accumulation of debris, paper, and leaves, and creates a definite fire hazard. Stations should requisition suitable brush hooks and scythes as necessary. Driftwood, odd unusable pieces of excess lumber, shavings, and odds and ends of shingling should be raked up and burned in a safe place under weather conditions which will preclude the spread of fire.

(12) Never keep gasoline stored inside, but in a prescribed drum, painted red and marked "GASOLINE", stored out-of-doors and away from wooden buildings or narrow passageways between buildings. These drums have a safety vent cap and should be inspected frequently to see that they are in proper working condition. Never paint the valves or allow any grit to get under the valve seat.

(13) In transporting gasoline, safety cans with flexible tubing must be used, and amounts in portable storage reduced to a minimum. NO SMOKING signs should be posted in vicinity of all fuel storage tanks and internal combustion engines, and inside as well as outside of oil houses, paint lockers, etc.

(14) Keep all rags used in cleaning in tightly covered cans and marked as such, clean or soiled.

(15) Be sure that the ignition is off when working on gasoline engines, especially if the spark plug ignition wires are not connected to the spark plugs.

(16) The officer-in-charge shall instruct all men in the use of blowtorches and burning of paint before allowing any of this type of work to be done. He shall also inspect the woodwork closely before the paint is burned off to see the condition of the place to be burnt. If there are signs of the wood being rotted, never attempt to burn off the paint; use wood scrapers. The officer-in-charge shall in-

spect the work and the surrounding area after burning. If necessary, he shall have the area to be burnt wet down as an added precaution against fire starting later on. A fire watch shall always be posted, not only on this particular work, but on any type of work where it is deemed necessary.

C. Fire extinguishers.—Liquid chemical fire extinguishers may be of one of the following: "Pyrene"-type—containing carbon tetrachloride; CO₂-type—containing carbon dioxide gas; Foam-type—containing two chemicals, in an inner and outer chamber, which form bubbles of foam (under pressure) when mixed. A dry chemical extinguisher may also be furnished. Water extinguishers may be of the following types: CO₂ cartridge-type; soda-acid-type.

The chemical extinguishers may be used on oil and electrical fires. The water extinguishers must never be used on oil fires, and both foam and water extinguishers must never be used on electrical fires, due to the danger of electrocution. See September-October 1951 reprint of "Safety News" from Engineers' Digest for important discussion of what type of extinguisher to use on what class of fires. Units not having the above publication should request same from the District Commander.

D. Inspection.—A daily inspection of all fire-fighting equipment should be made. All equipment shall be ready for instant use and stationed in its proper place, such as CO₂ extinguishers in engine rooms and in boats; "Pyrene" extinguishers in boats and radio rooms, etc.

Caution.—If any soda-acid type extinguishers are in use, they shall only be stationed in places where they will be used to combat wood or paper fires. This type of extinguisher must never be stationed in the engine or radio room.

E. Knapsack water fire extinguisher sprayers may be used in localities where brush fires are apt to occur, but of course can be used on any type of fire except oil or electric. These extinguishers should be stowed in a warm place in freezing weather.

F. Fire hose shall be carefully drained and dried after each use. It shall be kept free from oils and acids and shall be stored so as to prevent chafing and exposure to the weather. All necessary wrenches and nozzles should be located adjacent to the hose rack. All equipment shall be free from rust or dirt; name plates easily readable; all connections tight and tested for leaky valves. Fire hose shall be tested at fire main or pump discharge pressure every 6 months. All defective sections shall be replaced.

G. Nozzles and applicators shall be kept free of corrosion and the water outlets in the spray heads shall be kept open. Care shall be exercised in cleaning the water outlets in order that the designed angularity of each outlet is not changed.

H. Some units may be furnished the following equipment:

(1) **Mechanical foam equipment**—usually consists of a duplex pressure proportioner or a pickup tube, mechanical-foam nozzle and liquid-foam solution. Mechanical-foam equipment shall be kept clean, free of corrosion, and all fixtures in operating condition.

(2) *Internal-combustion engine-driven pump*—usually a portable unit with a two-cylinder, two-cycle gasoline engine driving a positive displacement pump. Ten-foot sections of 2-inch suction hose are used for drawing water from an open source. Regular fire hose is used on the discharge side of the pump. Internal-combustion engine-driven pumps shall be maintained in accordance with manufacturer's instructions, machinery maintenance instructions, and the Fire Fighting Manual.

(3) *Protective equipment*.—The following protective equipment may be supplied:

(a) *Self-contained breathing apparatus*—contains a means of supplying oxygen (chemicals or bottled oxygen), a means of purifying exhaled air (chemicals), a means of cooling exhaled air, and a means of storing reserve air ready for breathing. Four types of apparatus may be encountered: Type A, type A-1, patrol type, and oxygen rescue breathing apparatus.

Caution.—Remember that a gas mask can only purify air. In a compartment full of CO₂ or oil fumes, such as a gasoline storage tank, the gas mask cannot furnish oxygen; it can only clear contaminated air. For oxygen deficiency a self-contained breathing apparatus must be used, and not a gas mask.

(b) *Lifeline*—50-foot length of 3/8-inch woven steel wire, equipped with a stout hook at each end. Never send a man in a tank or smoke-filled compartment without stationing someone outside to tend his lifeline and keep him under observation.

(c) Protective equipment shall be maintained in accordance with the manufacturer's instructions and the Fire Fighting Manual.

(4) *Hose cart*—generally a two-wheeled cart with a hose reel for stowage and transportation of fire hose.

(5) *Miscellaneous equipment*—other fire-fighting equipment that may be encountered consists of fire axes, ladders, couplings, spanners, strainers, reducers, etc.

(a) *Ax handles* shall be checked frequently to detect shrinkage.

(b) *Fire ladders* shall be checked frequently to detect rung shrinkage or rotting. Ladders should not be painted, due to danger of hiding dry rot. Preservative should consist only of colorless material such as linseed oil or varnish.

I. *Operating instructions*.—Instructions covering the operation of fire fighting equipment will be found in the manufacturer's publications on the equipment and in the Fire Fighting Manual.

J. *Recharging fire extinguishers*.—Fire extinguishers must be kept charged, have tags attached showing date of last charging, and be recharged as specified below. They must be kept in a fixed and easily accessible place, and the personnel should be thoroughly instructed in their use.

(1) *"Pyrene" type*.—Hand portable fire extinguishers of the carbon tetrachloride type shall be tested quarterly and inspected weekly. They shall be tagged to show date when last tested and recharged. **WARNING**.—Carbon tetrachloride vapor is highly toxic. Care must be exercised when handling it. A leaky extinguisher, an open container of the

liquid, or any operation which allows the vapor to escape in the room, will result in exposing all personnel using the room to carbon tetrachloride poisoning. Carbon tetrachloride extinguishers empty themselves after a test unless jolted until valves are seated. A drip leak evaporates so fast that the carbon tetrachloride extinguisher is found empty when needed. Frequent tests are necessary, as the valves and pump rods freeze. Never use anything but pure carbon tetrachloride for extinguisher refills, as obtained from the manufacturer for extinguisher use. Poor liquid sticks the working parts. Carbon tetrachloride when heated generates *phosgene gas*. **DO NOT USE** on a fire in closed compartment without ventilation.

(2) *Portable CO₂ type*.—Portable CO₂ extinguishers shall be weighed upon receipt and ~~semiannually~~ ^{monthly} thereafter and tagged to show date, weight, and name of person who supervised weighing. They shall be inspected weekly. The tare weight of the extinguisher consists of the weight of the cylinder, plus the weight of the hose and coupling. The balance of the over-all weight is the weight of the carbon dioxide charge, which must not fall below a certain minimum for safety. This minimum is indicated on the brass plate. Weighing must be extremely accurate, since the difference in weight between a fully charged and a discharged cylinder is very small, measured in fractions of a pound. An extinguisher with a weight of gas charge below this critical minimum will not form "snow"; it will merely discharge high pressure gaseous carbon dioxide which will chiefly serve to fan the flames. Every 5 years, cylinders should have a strength test, ashore.

Depots will stock spare extinguishers for issue to isolated units where facilities for weighing and proper recharging are not easily available, to replace units removed ~~every 6 months~~ ^{monthly} for weighing and recharging, as necessary, ashore.

(3) *Built-in CO₂ type*.—The cylinders of built-in fire extinguishing equipment (Lux and CO₂) shall be weighed on receipt and semiannually thereafter, and shall be tagged to show date, weight, and name of supervising officer. Inspecting officers may supervise the weighing of cylinders. The operating mechanism connections and outlets of these systems shall be inspected weekly. Cylinders should not be allowed to lie in the sun or become heated, as the pressure increases rapidly.

(4) *Soda-acid type*.—The soda-acid extinguisher should be completely discharged at least once a year, washed out, and fitted with a fresh charge. All personnel handling soda and acid type fire extinguishers should make sure the nozzle and hose are entirely clear before recharging, and also before using, so far as can be ascertained. Such extinguishers have been known to explode because material jammed into the hose nozzle prevented discharge of the liquid when the extinguisher was turned bottom side up. (All soda-acid extinguishers must now have a relief valve fitted in the cap to prevent explosion if hose is plugged when discharged.)

(5) *Foam extinguishers*.—Where foam extinguishers are in use, annual recharging is required; the same as for soda-acid extinguishers.

It is important to completely mix charges of foam or soda acid; otherwise the powder settles and forms a solid which does not generate the necessary pressure.

K. Station fire safety is an individual responsibility. Every member of the station has a vital interest and should take part in a checkup to find fire hazards. The questions on the following safety checklist are so worded that all may be answered "yes" or "no". Each question answered "no" points to a serious fire safety hazard. Since this checklist is intended to be as complete as possible, some of the hazards listed may not exist at all stations. When the form is completed, those questions answered "no" will stand out and give an accurate picture of existing fire hazards. Steps can then be taken to eliminate these hazards at once.

FIRE SAFETY CHECKLIST

- (1) Have you removed all flammable rubbish and leaves from your station grounds?
- (2) Have you removed all combustible material from near building walls? Are areas of dead grass cleared away from building walls or stored materials?
- (3) Have weeds, dried leaves, and rubbish that could cause a possible fire on your station been cleared from vacant property adjacent to your station grounds? In other words, have you established an adequate firebreak around your station?
- (4) Is one man always present during the entire time trash, leaves, etc., are being burned out of doors?
- (5) Have you removed all waste, debris, and litter from your station buildings?
- (6) Does your station garage building have a concrete, brick, or earthen floor?
- (7) Do you have an adequate, vented, and posted (No Smoking) paint storage locker?
- (8) If you store paint, varnish, etc., are the containers always kept tightly closed?
- (9) If gasoline is stored above ground, is it kept in an isolated location where it cannot possibly create a fire hazard for your station buildings?
- (10) Have you prescribed and marked areas where smoking and the use of matches or flame are prohibited, and permitted?
- (11) Is there adequate illumination in oil storerooms and paint lockers so that there will be no temptation to strike a match for better visibility?
- (12) Are "No Smoking" areas established around magazines, gasoline tanks, and paint lockers? Are these areas adequately posted with signs? Are these signs enforced?
- (13) Do you keep your storerooms free from rubbish, old rags, old papers, broken furniture, etc.?
- (14) Are combustibles such as excelsior, straw, or other packing material disposed of when no longer needed?
- (15) If you use an oil mop, do you keep it in a metal container or other safe, well-ventilated place where it will not catch fire?
- (16) Do you destroy or safely dispose of oily polishing rags or waste after using? The most common source of oxidizing oils subject to spontaneous combustion are animal and vegetable oils such as linseed oil and turpentine.
- (17) Have your station personnel been forbidden to use gasoline, benzine, or other similar flammable cleaning fluids for clothing or on floors in your building?
- (18) Are floors under stoves and heaters protected by metal, brickwork, concrete, or ventilated air space?
- (19) Does inspection insure that overheated surfaces—engine exhausts, chimneys, stove pipes, ovens, bearings—cannot cause fire?
- (20) Are all oil burners on your station periodically cleaned, adjusted, and inspected by qualified personnel?
- (21) Are all stovepipes and chimneys periodically cleaned, repaired and inspected by qualified personnel?
- (22) Do any stovepipes pass through attic, closets, storerooms or frame partitions? If so, see No. 23 below.
- (23) Are walls, ceilings, and partitions in the vicinity of stovepipes, stoves, and oil heaters protected by insulation or adequate separation from overheating?
- (24) Are your station personnel forbidden to start fires with kerosene or other flammable liquids?
- (25) Does good housekeeping, safety consciousness, and ventilation prevent the accumulation of combustible dusts and explosive vapors?
- (26) Do you allow only qualified personnel to install or extend your wiring?
- (27) Have you done away with all multiple attachment plugs?
- (28) Are your electric irons and all electrical appliances used for cooking, equipped with metal stands and heat controls?
- (29) Are special circuits provided for heavy-duty appliances, such as washing machines, refrigerators, ironers, etc.?
- (30) Do you periodically inspect the electrical cords of all appliances?
- (31) Have you checked to eliminate overfused electrical circuits?
- (32) Are all flexible electrical extension cords on your station in the open—none placed under rugs or over metal hooks or nails?
- (33) Do you keep matches in metal containers away from heat, children and pets?
- (34) Do all personnel on your station extinguish all matches and cigarette butts carefully before disposing of them?
- (35) Do you see to it that there are plenty of ash trays or sand traps available in the station buildings and about the station grounds?
- (36) Are all members of your station personnel warned not to smoke in bed?
- (37) Does your station have adequate fire extinguishers and are they properly maintained and suitably located?
- (38) Is each type of fire extinguisher provided where it can be used on the fire expected to be in the area? (Soda-acid type not located in garage or paint locker, foam or soda-acid types not located in generator room, for example.)
- (39) Does each member of your station personnel know the location and operation of each extinguisher?

(40) Does your station have adequate sand buckets?

(41) Are your extinguishers checked and weighed or refilled periodically as required?

(42) If you have a fire pump, will it deliver full pressure within 60 seconds?

(43) Are your fire hoses properly dried and racked each time they are used?

29-9-55 Vehicles—

A. General instructions.—Due to the number of different makes of mobile equipment in the Coast Guard, it is impracticable to formulate a uniform set of instructions that will be applicable in all minor details to each particular piece of equipment. These instructions cover general points of maintenance and do not, therefore, supplant maintenance instructions issued by the manufacturer, headquarters, and the district.

B. Preventive maintenance.—A preventive maintenance program shall be maintained in accordance with headquarters and district instructions. In general, this program will consist of:

(1) Weekly tire, wheel, and battery inspection.

(2) Monthly or 1,000 mile (whichever comes first) preventive maintenance servicing.

(3) Semiannual or 6,000 mile (whichever comes first) preventive maintenance servicing.

C. Cleanliness.—Mobile equipment shall be kept clean and polished at all times.

D. Paint work shall be touched up whenever necessary.

E. Brakes shall be maintained in efficient condition at all times. Vehicles with faulty brakes shall not be operated.

F. Oil pressure.—Special attention shall be given to maintaining proper oil level and pressure. No motor vehicle shall be operated with excessively low or high pressure. The cause therefor shall be determined and corrected before further use.

G. Grade of oil or grease.—The grades of lubricating oils and greases recommended by the manufacturer or specified by headquarters shall be used.

H. Fenders and chassis.—The under side of the fenders and chassis of all new trucks and passenger vehicles shall be treated with one of the better commercial grades of undercoating. In case of failure of any portion of this surface, the area affected should be wire-brushed free of rust and recoated with the same type of undercoating as was used in the original application.

I. New vehicle.—Each new motor vehicle shall be driven a distance of at least 500 miles at a speed not in excess of 25 miles per hour on improved roads before being used on the beach or in loose sand.

J. Tire inflation.—Tires should be kept inflated to the proper pressure under normal conditions, but pressure may be reduced in tires of vehicles used on beaches, if necessary. In any case, care shall be taken not to *underinflate* the tire more than necessary, as this will result in breaking the fabric and will shorten the life of the tire.

K. Wheel rims shall be kept free from rust. Special care shall be given the inner surface with which the tire and tube come in contact.

L. Radiators shall be drained and flushed in the spring and fall and at such other times as the condition of the cooling system may indicate.

M. Antifreeze.—Sufficient quantity of an approved type of antifreeze shall be used whenever danger of freezing exists.

(1) The following table lists five antifreeze solutions and indicates the percentage of antifreeze by volume required for various freezing points in degrees Fahrenheit.

Antifreeze—Percent by volume

Freezing point (° F)	Methanol	Ethylene glycol	Propylene glycol	Ethanol	Isopro- panol
32	0	0	0	0	0
30	3	4	5	5	5
20	12	16	19	20	22
10	20	24	29	30	32
0	28	32	37	38	42
-10	34	38	43	44	61
-20	39	43	48	49	72
-30	44	47	52	58	78

(2) It should be noted that minimum safe exposure temperatures below the freezing point vary with antifreeze materials and solution concentration, as well as with the design of the cooling system and it is recommended that the published freezing protection tables furnished with standard antifreeze products be followed in determining the amount of antifreeze necessary in any given size of cooling system for the protection required.

N. Warming up engine.—After the motor is started in cold weather, it shall be run slowly until the oil is warmed and pressure becomes nearly normal. If this is not done and the engine is raced, there may be danger of scoring the cylinders and burning out the bearings due to lack of proper lubrication.

O. Gasoline tanks.—Keep gasoline tanks clean and full.

P. Prompt repair.—Whenever a part breaks or becomes worn, immediate action to repair the damage shall be taken.

Q. Fire extinguisher.—Trucks of greater than 1½ tons nominal rating shall be equipped with a fully charged fire extinguisher.

R. First-aid kit.—Each motor vehicle shall be equipped with a first-aid kit.

S. Traffic regulations.—Motor vehicles shall be operated in accordance with State and local traffic regulations.

T. Driver's permit.—Only persons possessing Coast Guard driver's permits shall operate station motor vehicles.

U. Passengers.—All passengers shall be seated while the vehicle is in motion. No person shall be permitted to ride on a running board, fender, or similar position of potential danger. Passengers shall not be carried in the rear of an open-bodied vehicle unless a protective guard rail, chain, or rope is used at the rear of the body.

V. Accidents involving Coast Guard vehicles shall be reported in accordance with current directives.

***29-9-60 Small Boats—**

A. Light attendant stations and off-shore light stations are generally furnished with small boats of a size and power commensurate with the size, type and location of the station and duties assigned. Boats which may be assigned to stations may include the following, illustrations of which can be found in the publication "United States Coast Guard Standard Boats":

(1) *Forty-foot buoy boat.*—Found at light attendant stations and at a few light stations having additional light attendant duty assigned.—A carvel-built power boat with pointed bow, transom stern and the following characteristics:

Length, over-all.....	40 feet 4 inches.
Beam, over fenders.....	12 feet 6 inches.
Draft.....	4 feet 2 inches.
Weight, with outfit (approx.)..	26,000 pounds.
Speed.....	12 miles per hour.
Cruising radius.....	170 miles.
Power (gasoline).....	180 horsepower.
Capacity, normal load.....	30 men.
Cargo capacity.....	5,000 pounds.
Holst capacity (gasoline driven)	1,500 pounds.

(2) *Twenty-six foot motor self-bailing surfboat.*—Used at a few stations.—A clinker-, carvel-, diagonal-built, double-ended power boat with the following characteristics:

Length, over-all.....	25 feet, 10 inches.
Beam (over fenders).....	7 feet, 11 inches.
Draft.....	2 feet, 0 inches.
Weight, with outfit (approx.)..	4,400 pounds.
Speed.....	8.5 miles per hour.
Cruising radius.....	45 miles.
Power (gasoline).....	30 horsepower.
Capacity, normal.....	16 men.

(3) *Twenty-six foot cabin launch.*—Widely used at light stations.—A carvel-built power boat with pointed bow, transom stern, and the following characteristics:

Length, over-all.....	25 feet, 10 inches.
Beam (over fenders).....	8 feet, 0 inches.
Draft.....	2 feet, 6 inches.
Weight, with outfit (approx.)..	4,600 pounds.
Speed.....	10 miles per hour.
Cruising radius.....	80 miles.
Power (gasoline).....	36 horsepower.
Capacity, normal.....	10 men.

(4) *Sixteen foot dinghy.*—A clinker-built pulling boat with a pointed bow, transom stern, and the following characteristics:

Length, over-all.....	16 feet, 1 inch.
Beam (over fenders).....	5 feet, 1 inch.
Weight with outfit (approx.)..	340 pounds.
Capacity, normal.....	4 men.

(5) *Ten foot dinghy.*—A clinker-built pulling boat with a pointed bow, transom stern, and the following characteristics:

Length, over-all.....	10 feet, 9 inches.
Beam (over fenders).....	4 feet, 7 inches.
Weight, with outfit (approx.)..	175 pounds.
Capacity, normal.....	2 men.

(6) Some stations may be furnished an older type (38 foot) buoy boat similar to the boat described in subparagraph (1) above. Others may have larger buoy boats ranging in size up to 65 feet in length.

B. *Responsibility.*—The importance of an off-shore station's boats cannot be overemphasized.

Not only are they the only regular means of transportation to shore, but their ready availability may be the means of saving life in an emergency. Supervision over the proper operation, departure, arrival, stowage, and care of station boats is a primary and essential function and responsibility of the officer-in-charge. Other members of the crew, when placed in charge of a boat, share the above responsibility.

C. *Use of boats.*—Boats shall be marked and known by their official numbers assigned by Headquarters. Except in cases of emergency involving the saving of life and property, or unless authorized by the Commandant, Coast Guard boats at aids to navigation units shall be used for official purposes only, which shall be construed to include all work connected directly or indirectly with the care and maintenance and assigned duties of the unit and the personnel thereof.

Light station boats must never be used for heavy freight or by working parties, except under the supervision of the officer-in-charge or by authority of the District or Group Commander. Care must be taken not to overload the boats either with passengers or material. Keep them in proper trim when loading.

D. *Provisions and outfits for boats.*—The officer-in-charge shall see that every boat of his unit is suitably provided with and carries such of the following articles as necessary; fire extinguishers, anchor and line, drogue, lifejackets, spare oars and oarlocks, sails, spars, provisions, water, compass, bucket, flashlight, lantern, boat box with usual gear, bilge pump, flares, and all such other articles as the duty or special occasion demands. Following is a typical list of equipment for a small boat:

- 3—Spare oars, and rowlocks.
- 6—Preservers, life.
- 1—Anchor, boat, 30-pound Danforth or equal.
- 1—Line, anchor, 2¼-inch line, 20 or more fathoms long.
- 1—Pump, bilge, hand, galvanized, with 4-foot length of canvas hose, or bailer.
- 1—Portable CO₂ or carbon tetrachloride extinguisher.
- 1—Set flares.
- 2—Flags, semaphore, with staffs.
- 1—Painter, bow, 2¼-inch line 7 fathoms long.
- 1—Sternfast, 2¼-inch line, 5 fathoms long.
- 1—Breaker, water, 3 gallons (full).
- 1—Box, boat, equipped.
- 2—Hooks, boat, 8 feet.
- 1—Horn, fog, mouth.
- 1—Staff, bow, for combination running light.

E. *Instructions on small boat handling* are available in many standard textbooks on seamanship. Boat-equipped units not having such a textbook should request same from the District Commander, Part 27-10 of Chapter 27 of this manual, "Aids to Navigation Seamanship," contains considerable data of interest. All personnel handling small boats shall conscientiously study available material to improve their boat handling ability to operate safely and efficiently.

Caution.—Good judgment must be exercised at all times in connection with the use of small boats, or sudden disaster is likely to ensue.

F. Preventing gasoline explosions and fires.—On gasoline-operated boats there is a constant hazard of explosion and fire. To reduce this hazard to a minimum, responsible officers must exercise constant vigilance. They must conduct proper and serious inspections, see that good housekeeping practices are followed, use and inculcate common sense, make proper selection of personnel for all billets, see that personnel are properly instructed and trained, and see that boats which cannot be operated safely are not used until they have been made safe. CG-168, "Motorboat Regulations," contains excellent and extensive matter concerning recommended practices for the care and safe operation of motorcraft for civilian use. All persons who need to make a serious study of safe motorboat operation should obtain a copy of the above pamphlet from their District Commander.

(1) Gasoline vaporizes rapidly and the vapor collects in bilges or compartments. Any spark or flame will ignite this vapor, whether or not it is near the gasoline source. The gasoline fumes are very heavy and settle rapidly. Leaks from a gasoline line or tank, vapors from an open can, or a spill spread through the bilges can set up an explosive potential wherever they travel. Thus a leaky valve on the gas line at the tank in the stern spreads vapor through an open bilge, which may be ignited by the engine distributor which is located well forward.

(2) It takes 43 times as great a concentration of vapor to explode than for the average person to detect by smell. Therefore if you smell where the heavy vapors are likely to be the strongest, you can detect the fumes long before they can possibly explode.

(3) When starting the motor of a decked boat such as the motor self-bailing surfboat, which has not been run for several days, each compartment cover must be removed and the inclosed space aired and checked for fumes. In every case, **PREVENT THE ACCUMULATION OF VAPORS** in the boat.

G. Safe operation of motorcraft.—The constant daily use of small boats by personnel under all conditions and the rarity of accidents in their use undoubtedly has a tendency to obscure the dangers which are always present in connection with such operations. Boat work regularly involves hazards since cargo must be handled, difficult servicing operations performed, and landings made under dangerous conditions. It is especially important that there be no relaxation of the constant attention to safe practices which are normally effective in controlling the hazards which always exist, as they exist in every other line of work. The following matters must at all times receive careful attention:

- (1) Proper loading, limited for safety under existing conditions.
- (2) Proper stowage of cargo for utmost safety.
- (3) Skillful handling at all times; proper speed where power is used.
- (4) Adequacy of lifesaving equipment aboard.
- (5) Wearing of life jackets.
- (6) Condition of the boat and equipment in use and its suitability for the purpose.
- (7) Proper realization by supervisory officers of their responsibilities in these matters.

H. A life preserver (lifejacket) shall be carried in station boats for each member of the boat's crew. When passengers are carried or may be carried, an additional life preserver will be provided for each passenger.

All personnel shall wear life preservers while in station boats during drills, exercises, and during actual operations, and particularly during hoisting and lowering, if men remain in the boat. Life preservers must be kept clean, otherwise no one wants to wear them. If they are too dirty to wear, have them cleaned or surveyed.

I. Motor-propelled boat.—Whenever a motor-propelled boat is under way there should be two persons aboard capable of operating it. Only an experienced person should be allowed to operate a boat. There should be no smoking in any compartment of a gasoline motor boat, or before or immediately after starting the engine. Allow smoking only in the open and if there is no chance for sparks to fall where gasoline vapors could have collected. [Smoking is permitted on diesel-powered boats except when fueling or sounding tanks.]

J. Departure and arrival reports.—Where practicable, boat trips to and from distant isolated stations shall not be made without first obtaining permission from the Group Commander, advising him as to departure, destination, estimated time of return, and purpose for which the trip is being made. When such plan does not prove feasible, pertinent information concerning the itinerary of the trip should be passed to the nearest Coast Guard unit and followed up by a subsequent arrival report.

K. When boats not in use.—When not in use at stations, boats are to be properly stored in davits or securely moored, depending upon the facilities available. Officers-in-charge should examine their respective boats *daily* for watertight integrity and material condition, reporting any defects immediately to proper authority. Boats which are not kept in the water should have some fresh water poured into the bilges, if necessary, to keep them from drying out. However, if no leaks are observed or the weather is so cold that ice is likely to form, this procedure should not be continued. The best method of preventing shrinkage is to shift boats from the boat-house to the outside and remove the covers during rainy, foggy or damp weather.

L. Trial data.—The officer-in-charge shall determine by actual trials the general characteristics of each station boat, including cruising radius under normal conditions, maneuverability, and speed. He shall see that the crew is familiar with individual boat characteristics and with applicable safety precautions.

M. General maintenance and readiness.—Boats shall be kept clean, in good operating condition, and fully equipped for service. Upon returning from service each boat shall be refueled and its equipment thoroughly cleaned, dried out, inspected, and replaced in proper condition, ready for immediate action.

N. Compliance with laws.—All Coast Guard boats shall be equipped and operated at all times as re-

quired by law for the particular class of motorboat concerned.

O. The authorized hull and machinery allowances shall be in accordance with "United States Coast Guard Standard Boats Allowance Lists." Form CG-1087 "Small Boat Allowance," specifies the allowance of boats for a particular station.

P. *Number plate.*—Each boat shall carry a number plate, with numbers always legible and free from paint; secured to the boat in accordance with the latest instructions from headquarters. If the number plate is lost, a replacement will be requested from headquarters.

Q. *Fuel tank.*—The fuel tank of a standard Coast Guard gasoline motorboat is usually provided with a sump or pocket in the bottom. Explanatory instructions for pumping out the fuel tank sump will be found on a plate installed on the tank. Periodic pumping is the most satisfactory method devised to date for assuring a clean, satisfactory fuel supply to power plants and auxiliaries. To insure clean fuel in boats, periodic pumping of fuel tank sumps and cleaning of all strainers shall be accomplished as often as necessary. An entry in the station log shall be made each time such a cleaning operation is performed on station boats.

(1) If any gasoline powered boats in service have tank vents installed so that fumes are likely to enter closed compartments or collect in the bilges, or filling connections installed so that gasoline is likely to be spilled inside the boat, a request for modification of such fittings should be initiated.

(2) Note carefully the diagrams contained on pages 61, 63, 65 and 67 of CG-168, "Motorboat Regulations" in reference to the above.

(3) When refueling observe the following precautions:

(a) Except in emergency or when impracticable, fueling of gasoline powered boats should be accomplished only when boats are in the water, and during daylight.

(b) Stop engines, shut off all potential spark-producing devices, and extinguish any fires or open flames aboard.

(c) Allow no smoking aboard or in the immediate vicinity.

(d) Try to avoid spilling of gasoline; if any should spill, wipe it up immediately, preventing vapors from settling within the boat during fueling.

(e) Close all ports, windows, and hatches to reduce the hazard of gasoline fumes collecting in compartments.

(f) Be sure filling nozzle is kept grounded to the fill pipe while fueling.

(g) After tanks have been filled and danger of outside gasoline fumes have been eliminated, open all compartments for airing for a period of about 5 minutes prior to starting engine or lighting fires aboard.

(h) A fire extinguisher of approved type shall be provided at the scene ready for immediate use.

R. *Deck hatches; bilges.*—Deck hatches of boats kept in boat houses or outside during fair weather, shall be kept partially or completely open during

daylight hours to permit airing and drying of the interior. Bilges of boats shall be kept clean at all times, particular care being taken to prevent leakage of fuel or oil into bilges of power boats. Fuel floats on top of water in the bilges and constantly emits vapors. This condition sometimes results from a flooded carburetor.

S. *Daily inspection.*—A boat which is ordinarily kept in the water shall be inspected each day, and the water line shall be kept free from marine growth. Such a boat shall be hauled out, bottom painted, inspected for corrosive effects on all metal fittings, and zincs renewed as often as found necessary under local conditions. All bolts, fastenings, steering gear, and related fittings shall be checked for possible weakness, and repairs shall be effected promptly. Zincs should never be painted. Dry rot often occurs around fittings such as bits and cleats. Don't wait until a strain is taken to discover that the cleat or bitt is loose or unsound and will be pulled out.

T. *Movable attachments.*—All caps, vents, drain plugs, pumps, and other movable attachments shall be kept free of paint or corrosion and in proper operating condition.

U. *Rubber gaskets* around deck scuttles and watertight doors shall be kept free of paint and varnish and shall be replaced when damage or deterioration occurs.

V. *Painting.*—Boats are to be painted in accordance with current Painting Instruction Memoranda, or as directed by the District Commander and shall be inspected at regular intervals for any signs of deterioration inside or out. If any are found, they shall be reported immediately to the district office so that steps may be taken to effect necessary repairs.

W. *Chafing.*—Boats shall be protected from chafing or more serious damage when tied alongside other vessels or piers, by proper use of fenders, and shall never be left alongside another vessel without a competent boatkeeper. Chafed mooring lines have resulted in the loss of many boats.

X. *Storage.*—Whenever boats are lifted from the water for storage, special care shall be taken to see that proper shoring is furnished and used to prevent hogging or sagging, unless they are placed on specially built carriages. A boat shall never be stored in such a position as to rest with its bilges on the ground.

Y. *Engine maintenance.*—General maintenance instructions for boat engines is covered in section 29-8-10.

Z. *Boat hoist.*—The officer-in-charge and all assistants should be thoroughly skilled in the handling of boat hoisting apparatus. New personnel reporting for duty should be drilled in its use as soon as possible. Ignorance in this function can easily result in serious, if not fatal, injury to personnel and damage or loss of equipment.

AA. *Outboard motors.*—At stations where outboard motors are used, care must be taken in installing and removing them from boats. A suitable lanyard should be made fast to the motor and to the boat to prevent loss should the motor suddenly become loose. Keep a supply of shear-off

pins available at all times when under way. After each use, the motor should be thoroughly flushed out with fresh water before storing away on a suitable rack.

BB. Following are miscellaneous notes that should be considered in the operation of small boats.

(1) Always have the engine throttled down before shifting the position of the clutch lever. To move the clutch while the engine is running at half or full throttle can cause considerable damage to the clutch, reduction gear or coupling.

(2) Always check the cooling water supply before starting. See that the suction intake valves are open. After starting the motor, check to see that the water pump is circulating properly before departing on a mission. Some water pumps need priming due to long lengths of intake piping.

(3) The practice of full-speed landings will invariably result in extensive repairs.

(4) Don't wait until you need emergency equipment to discover that it is inoperative or absent. If you are not sure the rowlocks in a motor boat function properly, so that the boat can be rowed in an emergency, check them before getting under way. A signal flag is no good without means of attachment to a staff, boat hook or oar. Oarlocks are useless if both they and the oars don't fit; maybe they are new and have never been checked for clearance and fit.

(5) If a boat is departing from sight of the station or may be absent during darkness, see that the flares are dry, and that the flashlight or lantern will burn.

(6) Bilge pumps and valves dry out if not in frequent use—see if they operate.

(7) When practicable, keep a close watch on a small boat departing or operating in the vicinity.

(8) Carbon monoxide is present in the exhaust of every gasoline or diesel engine. A leak in the exhaust line may mean only a headache for the personnel or it may render them unconscious if it can collect in the pilot house or cabin.

*29-9-65 Safety Measures—

A. Safety campaign.—Personnel with supervisory responsibilities must not only be ever on the alert themselves to avoid preventable accidents, but must conduct a continuous and unremitting safety campaign. They must constantly keep the matter of safety before their subordinates, because familiarity with dangerous work in many instances soon leads to carelessness. Adequate supervision is necessary to insure that each man always remembers the *Right Way* is the *Safe Way*.

B. Overloading motor vehicles, etc.—Officers-in-charge will take steps to guard against the overloading of all motor vehicles and other power equipment under their supervision.

C. Acetylene and oxygen cylinders.—When acetylene and oxygen cylinders are being used, particularly in connection with ship work, they should be placed in such a location that in case of fire they can readily be turned off. In vessel work they should be placed either on the dock or in the open gangways of the vessel. When working in or near bilges,

the bilges should be pumped out and cleared of all oil and water so far as possible before such work is commenced. Efficient fire extinguishers shall be kept nearby while the torch is in use, and adequate watch shall be maintained during and after operations to assure that any fire that may start is extinguished at once. Care shall be exercised in the handling of the lighted torch in order to prevent the flame or sparks from contacting inflammable material.

D. Leakage of acetylene cylinders.—The matter of gas leakage from acetylene cylinders presents a danger so great that vigilance should be exercised to detect this condition and to correct it immediately, if it occurs.

E. General precautions and instructions for acetylene installations.—Detailed instructions for servicing and recharging acetylene installations on both fixed and floating aids are set forth in Chapter 20 of this manual.

F. Safety posters.—Much will be accomplished by keeping the importance of safety precautions before the crew by means of posted notices, as well as by systematic instruction. The latter is not practicable at all localities because of the scattered nature of a large proportion of aids to navigation personnel. Vessel officers may accomplish much by instructing ship personnel; and when there is opportunity for group assembly of shore personnel, the matter can be stressed. One suitable notice, worded similarly to the one below, shall be kept posted conspicuously at each attended aids to navigation shore and floating unit. A sufficient number of these notices will be posted where men congregate at the larger units.

NOTICE

AVOID ACCIDENTS

DO THINGS THE SAFE WAY

Exercise care in:

- Lifting objects.
- Standing clear when hoisting.
- Starting and operating machinery.
- Handling inflammable liquids and explosives.
- Tending steam boilers or other pressure vessels.
- Servicing high-voltage electric equipment.
- Ventilating confined spaces, as on boats.
- Handling boats in a seaway, loading, etc.

G. Miscellaneous hazards.—Statistics indicate that the largest percentage of accidents occur in the home and are due to falls. Light stations differ from a home in that hazards of machinery, steep winding staircases, and the nature and remoteness of location are present to add to the normal accident possibilities of a dwelling place. Most of the stairways in lighthouses are of cast iron and are frequently worn smooth. Should these be wiped down with an oily rag, they would become even more hazardous. Open areaways, trapdoors and the like, are dangerous if protection is not afforded. Stairways must all be well lighted, and the light switch conveniently located. Keep the stairs clear—they are not for storage purposes. When obstacles are placed on stairways incidental to station work,

rope off the area to help avoid accidents. Always be on guard for the danger of a severe electric shock from the high-powered radiobeacon and other electrical equipment. *Safety* is nothing more than continuously applied common sense. Make every effort to encourage safety-consciousness.

H. Safe water approach to station.—It is most important at any offshore light station for all hands to know the safest approach to the station boat landing under various wind, tide, and current conditions. As a means of accomplishing this, and at the same time providing a constant reference, it is suggested that, after careful observations have been made over a period of time sufficient to cover a fair representation of conditions, a chart or sketch of the area be made up and posted to show this information.

Caution.—Equally as important as a full knowledge of conditions around the station, is good judgement and common sense as to weather conditions under which it is safe to leave or return to the station. Watch out for the natural anxious tendency, when the regular leave period comes around, to put the boat over at all cost and get ashore. Lives have been lost in the past because of this anxiety. The prudent man waits for safe conditions.

I. Asphyxiation from flue gases.—Personnel at certain shore units, unless they use due care, are liable to injury and possible death from gases coming from heating and other fires. It is necessary to see that all flues and stacks are free from soot and obstructions at all times, that sufficient draft is provided, and that there is adequate ventilation. The danger is greatest with short stacks during times of strong shifting winds. The top of every stack should be of proper design to prevent down drafts and should always be maintained in efficient condition.

J. Care with liberty parties.—Aids to navigation work requires personnel to visit many remote and inaccessible localities. Good judgment and care on the part of supervisory personnel is necessary to prevent accidents should any hiking parties or other liberty parties be permitted to leave units in such localities. Fatal accidents from heart failure, exposure, etc., have occurred when persons from units employed at aids to navigation duty have become lost in difficult terrain.

K. Guard against poisonous snakes.—In certain areas it is necessary to be on guard against bites from poisonous snakes. Persons in such areas should have snake-bite kits handy. However, a snake-bite kit is not a cure-all and personnel should exercise the greatest caution to avoid being bitten at all, for if the venom is introduced in quantity directly into a vein, death is liable to ensue almost instantaneously, no matter what measures may be taken.

Snakes frequently sun themselves upon minor lights in the South, particularly upon the St. Johns River, Fla., even though the light may be at a distance from shore.

L. Trap doors to have device to hold open.—Officers in charge of light stations will see that every trap door in lantern floors has an efficient device to hold the door open. The minimum requirement for such a device is a simple gravity catch holding the door until the catch is released by hand.

M. Cleaning with gasoline forbidden.—Cleaning machinery and other articles with even small quantities of gasoline is a dangerous practice and is forbidden. In the few instances where cleaning with an inflammable liquid is justifiable, kerosene or diesel oil alone should be used, and the ventilation of the area should receive special attention when such work is in progress.

N. Use of matches.—Safety matches only shall be used on Coast Guard premises. Particular care must be taken that the match is not afterwards thrown where it might start a fire. See section 29-9-50 for data on fire prevention.

O. Safe operations of hoisting gear.—It is important that all officers, both on shore and on board floating units, who work with, or are responsible for, hoisting gear or other equipment that might cause casualties or damage should it carry away, exercise the utmost care to keep the same in the best possible condition. Frequent inspection and the use of proper gear of ample size for the work are imperative. New and repaired apparatus shall be given prescribed tests.

P. Inflammable liquids.—See section 29-9-45 for data on inflammable liquids and rules for safe practices concerning them.

29-9-70 Illuminating Apparatus—

A. Clean lens and lantern.—The lens and lantern must be cleaned daily, except at those stations at which a lantern is not provided, such as at installations of exposed airways-type beacons. To clean the lens, wipe with a soft linen cloth and polish with a thoroughly dry buff skin. Remove oil or grease with a linen cloth moistened with ammonia or other authorized wash. Never use a skin which has been wet or damp. All material used for cleaning lens or lantern glass must be free from grit of any kind. Launder lens towels frequently to keep them soft and clean.

(1) The lens must be dry. If it is a rainy day or wet morning, wait until the lens is dry, otherwise it will smear.

(2) Due to their size, large first order lenses are usually cleaned several sections at a time, with the entire lens being completely cleaned twice a week or so. Depending on the dust conditions existing at the station, personnel must see that the lens is cleaned frequently enough to insure its giving maximum brilliance at all times.

B. To prevent frosting of the lantern glass, rub a small quantity of glycerin over the surface with a linen cloth, repeating as necessary.

C. To clean reflectors, dust with a soft cloth, rub with a buff skin lightly dusted with authorized powder, then rub lightly with a second buff skin, and finally with a third by passing over the reflector with a light, quick, circular stroke. Stove gas will tarnish reflectors.

D. Cleaning chimneys.—Soiled chimneys should be rubbed with a rag or softwood dipped in oil. If still discolored, rub with a wet cloth and soda or common salt; afterwards cleanse in warm water, as the adhering salt will cause breakage.

E. *Preventing dust.*—Damp cloths and hand brushes (foxtail) should be used in general cleaning about the lantern to prevent dust.

F. *Polished metal work.*—Keep all metal (brass or copper) polished brightly and free from paint, lacquer, corrosion, or other defacing materials. Metalwork is usually polished weekly.

G. *Storing cleaning gear.*—The lantern must never be used to store cleaning gear, etc. Such items must be kept in the service or watch room in covered metal containers. Never keep greasy rags in wooden boxes or drawers.

H. *Broken or cracked lantern glass.*—Any lantern panes which are cracked or broken so as to admit rain or air, or which have cracks so situated as to fall in the focal plane of the light or affect the appearance of the light as viewed from sea, shall be promptly replaced. Clean all particles of foreign matter from the pane frame. After the new glass is cut, the edges should be ground level and smooth by rubbing with a cast-iron plate covered with sharp, wet sand or rubbing with a block of coarse carborundum. To avoid breakage from vibration, leave about one-sixteenth of an inch on all sides between the glass and the frame. The glass should be rested on thin sheets of lead or softwood. Imbed the glass solidly on edges and two sides in whiting putty or best grade of prepared nonhardening glazing compound.

(1) In many cases, cracked panes of lantern glass do not require immediate replacement. Replacing lantern glass is an expensive procedure. Unless the cracking covers a large area, thus seriously interfering with the transmission of the light's beam, results in a loose piece which is apt to become dislodged, or by actual experience is known to leak water during a storm, the glass should be left in place. Many such panes will last for years without further damage.

(2) Every light station having a lantern should be provided with a lantern glass box equipped at all times with one or more panes of glass of proper thickness and dimensions to replace any pane in the lantern.

I. *Cover lens.*—Shield cut glass lenses ^{which rotate on some bells eyes} which are mounted in lanterns against direct sunlight during all periods when the light is not in operation. Most lanterns are equipped with devices to support shades. Shield the lens with either (or both) lantern-hung shades or a hood-type lens cover.

J. *Electric lens drive.*—Inspect electric lens drives frequently and keep all electrical contacts free from oil, grease or other foreign matter. (This applies as well to all electrical apparatus.) See that the drive mechanism is properly lubricated.

(1) Electrically driven motors may operate on direct or alternating current. If a d. c.-type, the speed is controlled by a rheostat. A change of speed of the generator plant can change the speed of the light rotation. Therefore the speed of the generator should be frequently checked. The a. c. motor is a synchronous motor and has no speed regulator.

(2) In the case of large lenses, it is a good practice to start the lens turning by hand before engaging the clutch, so as to relieve the strain.

(3) All personnel should be familiar with the electric lens drive mechanism, and should know how to disengage the lens drive motor and operate the clockwork mechanism as a stand-by (if one is installed). They should know how to install the spare lens drive motor. Check your spare motor to see if it will function and will fit the present bed plate.

(4) Some stations follow the practice of alternating their stand-by motor with the regular motor. It should be remembered in this case that with both motors approximating the same number of operating hours, the possibility of failure of both motors at about the same time is raised.

(5) It was found that one station, having a d. c. motor, makes a monthly test of the spare motor, inserting it in place and running it for 1 hour, inspecting and cleaning the brushes, commutator, etc., as necessary. The regular motor is then cleaned up, similarly replaced and run for a 1-hour test.

(6) Many electric drive gear boxes have a gage to indicate the oil level. However, at periodic intervals, the top should be removed and the oil checked for cleanliness and if no gage is provided, for proper quantity. There should be just enough oil to immerse the bottom of the uppermost gear in the oil. Too much oil will splatter. Some types of gear boxes may use grease instead of oil.

(7) A d. c. motor must be inspected and cleaned more often than an a. c. motor. The blackening of the commutator may indicate that the lens chariot is sticking, causing the motor to labor.

K. *Other electric apparatus.*—Check all electrical apparatus daily and see that the wiring, switches, motors, contacts, etc., are in proper repair and good operating condition. See that the full description (including the manufacturer's rated lamp life) of the electric lamp assigned to the main light is posted conspicuously in the light tower or service room. Make sure that only lamps of this type are used in the light. Keep a record of the number of hours that each lamp has served. Replace the lamp after it has burned 80 percent of its rated life, or at such earlier date as discoloration of the lamp globe may appear which may diminish the brilliancy of the light source in the lens.

(1) It is advisable to test new shipments of lamps for the presence of gas. If gas is present, the lamp will smoke up.

(2) Lamps usually burn out at time of lightup or shutdown.

L. *Care of revolving lens chariot.*—The chariot or carriage of a revolving lens must be kept clean and the moving parts well oiled. This is especially true if the lens is rotated by clockwork, since the drive is not powerful enough to overcome the friction of foreign matter. Inspect the revolving mechanism daily (while the light is still operating) by ordinary examination and observation. Look for overheating of drive mechanism; binding of wheels or ball bearings; wheels loose on pin or bushing; contaminated mercury, etc.

M. *Roller wheel type.*—The race is generally lubricated weekly with a light oil. Some stations prefer to use castor oil for this purpose, as it provides an excellent cushion between the wheels and the race. The roller wheels are lubricated once a month or so

The foregoing instructions apply to unattended as well as attended stations if the lenses concentrate the sun's rays in such a manner as to damage the wiring or light apparatus or otherwise creates a fire hazard.

with a light (S. A. E. 10) oil. Let the lens chariot sit still for the remainder of the day to allow the oil to penetrate. Certain local conditions may require more frequent oiling. The table (race) and wheels should be thoroughly cleaned of old gummy oil, grease, dust, lint or any other foreign matter. Kerosene or Diesel oil may be used).

(1) Replace the wheels whenever they show signs of wear (generally about every 4 years or so). A properly curved wheel should only show about one-fourth inch bearing surface. Replace all the wheels at a time, otherwise the lens may become unbalanced. Extra wheels are usually kept at a station but are seldom used. Only a skilled mechanic should exchange chariot wheels. This is generally a base or depot maintenance project.

(2) When necessary to remove the wheels for cleaning or other purposes, jack up the lens chariot on the three portable screwtype jacks provided, and remove one wheel at a time. In replacing the wheel, put it back on the same shaft or pin from which it was removed without changing the number of washers.

(3) Always do all inspection, cleaning, and oiling work in the morning so as to allow as much time as possible before it is necessary to put the light back in operation.

N. Ball-bearing type.—If the lens revolves on ball bearings, the groove or track in which the balls run, and the balls themselves, must be kept absolutely clean. Many ball-bearing-type chariots are fitted with a revolving jack (collar type), which when set up, supports the weight of the lens assembly. Revolving lenses so equipped should be jacked up when not in use to prevent the weight from remaining on the balls in one position, and to protect the lens carriage from structure vibration. The jack is operated by inserting a bar in a hole in the collar located just above the ball-bearing race, and turning it.

(1) The ball bearings of rotating lens chariots should be inspected, cleaned, and oiled as often as necessary. The exact period may vary from weekly to several months, depending on conditions. The ball bearings are lubricated sparingly with light oil (clock oil).

(2) If the lens gets sluggish, examine the ball bearings for gummy oil deposits, and check the vertical drive mechanism and gearing by disconnecting the coupling to the electric lens drive motor and gear box.

(3) To service or remove ball bearings on most revolving lights (if the installed jacking mechanism does not raise the lens concerned high enough to expose the balls and races), place three portable brass screw jacks under the lens carriage to relieve the weight. Then turn the big sleeve on the vertical part of the lens (some are left-handed thread). This screws off the base and allows access to the ball bearings. The weight of the lens remains on the three screw jacks. Remove the entire ball bearing assembly and wipe off each ball with kerosene or diesel oil. Wipe the race clean similarly. If a ball shows wear, insert a spare.

O. Mercury float type.—When kerosene was used for the light source in former years, difficulty was experienced in keeping the mercury from becoming contaminated with leaking oil. With clockwork drive, the contaminated mercury would slow down the revolutions of the light. With electric light source and powerful electric motor drive, contamination is no longer a problem. It is important to keep the lens assembly level. This condition can change due to working of a structure, and should be periodically checked. Wedges are used around the base of the pedestal to effect the leveling adjustment.

(1) The lens carriage of a mercury float light is not jacked up when not in use as is done for ordinary ball-bearing-supported lens carriages. Mercury does not wear out and nothing would be gained by relieving the weight when not in use. However, a certain inspection routine should be followed as described above for ball-bearing-equipped rotating lenses, since mercury lenses also have a set of enclosed ball bearings which require attention.

(2) The mercury should be inspected every 2 years; however, it is rare that more need be added.

(3) Certain mercury float installations have a plug in the top and bottom of the sump for drawing off and replenishing the mercury. If not so equipped, then the procedure described in the following subparagraphs must be followed.

(4) The mercury is inspected by removing the chariot or lens carriage carefully. Before starting to dismantle the lens and carriage, see if the lens table turns freely. If the table rides too low, additional mercury will need to be added. Two to four pounds of mercury should be a sufficient quantity to have on hand before beginning a routine inspection. The above check of the lens table for free movement is the only gage for measuring for proper quantity of mercury.

(5) Mercury is seldom stored at a station since very little is ever used. Usually a district mechanic will come out to the station for this inspection and will bring some spare mercury with him.

(6) Dismantle the lens by removing the light source and the bolts holding the lens to the carriage. Set the lens off to one side on planks and secure it well, since it is top heavy and may be severely damaged if allowed to fall over. Lift the carriage out of the bowl or sump. Examine the submerged part of the carriage, removing any dirt or foreign matter. Place the chariot to one side. Examine the mercury for foreign matter. Specks and discoloration are readily visible. See if the mercury adheres to the inside of the bowl or outside of the carriage. That fact discloses that the mercury is dirty. Mercury that is perfectly clean will not stick to anything and will roll off in a ball.

(7) There is generally no faucet or spigot on the bowl for drawing off the mercury. If examination shows the mercury to be contaminated, it must be removed, strained through a chamois and replaced. To do this, proceed as follows:

Bail the mercury out of the sump with a teacup or similar container, preferably one with a lip for pouring smoothly and slowly. Place it in a clean

container, preferably an earthen jar. Clean out the bowl thoroughly with lint-free rags. Secure a chamois skin (light or medium weight) about 12 inches square over the lens bowl and pour the mercury onto the chamois. It will not run through readily and must be pressed or squeezed through. Do only a small quantity at a time. Mercury is so **p**lusive that if too much is poured, some of it will be lost. Do not hurry this part of the job.

(8) Since the clearance for free movement of the lens table has been checked *before* disassembling, determination is easily made as to whether additional mercury need be added when it is poured back into the bowl. Replace the lens carriage and reassemble lens.

P. Clockwork.—Revolving clockwork must be kept clean and well oiled. Be sure to remove old and gummy oil. Clock oil only should be used on the works and a cloth greased with clock oil on the iron or steel parts. The use of a salted grease is forbidden. The foot of the vertical driving shaft must be watched to prevent cutting or wearing. The weight, when not in use, is to be kept on its relief bar.

(1) Where a weight-operated clockwork mechanism is retained as a spare, operate and check same at least once a week. Be sure that all parts are operating properly and that the assigned characteristic speed is produced.

(2) Wind the clockwork by inserting a crank in the drum. When winding clockwork drives, do not allow the wire to make overlapping turns: this can throw the governing mechanism off. Do not allow the wire to come to the extreme end of the drum. It is considered good practice to wind the clock at the same time each day when the clockwork drive is in constant use. When installing new wire, be sure that it is free from kinks and twists. Stretch it well out, even running it off in a boat where necessary.

(3) The speed of the clockwork drive is regulated by a governor consisting of revolving vanes. These vanes are adjustable and may be tilted, being secured by means of a set screw. To speed up the governor, close the vanes or tilt them flatter; to slow down, open them farther apart. Any binding will seriously affect the governor; therefore the numerous pins and bearings must be kept clean and well oiled.

(4) In addition to the governor, the speed of the clockwork is regulated by adding or removing weights. In cold weather, the oil is stiff and extra weights may be required on the clockwork. Then after ½ to 1 hour of operation, take off the extra weight. A relief bar is located at the top or base of the tower to take the strain of the weight off the mechanism when it is not in use.

When using electric drive, be sure that the clockwork mechanism is disengaged. There is a coupling at the motor gear box which must be disconnected and one at the clockwork which must be engaged, when placing the clockwork drive in operation.

Q. Dark goggles.—When attending and regulating high-powered lights, wear dark goggles in order to avoid the injurious effect on the eyes of such lights.

29-9-75 Emergency (Standby) Light—

A. All stations should be equipped with an emergency light maintained ready for use at all times. All personnel must be thoroughly familiar with its operation. The officer-in-charge should set up an emergency routine bill to be followed in every instance of failure of the main light. This routine should be that method which will produce:

(1) *The minimum period of outage.*—It should be clearly understood that the emergency light is to serve only during the minimum period required to restore the main light source to its normal operation in case it fails due to some unpredictable cause.

(2) *That minimum period of displaying a light characteristic other than that published in the Light List and specified in the A. to N. Op. Bill.*

(3) *Earliest restoration to normal operation.*

(4) *Immediate advice to the District Commander and Group Commander of an outage, its cause, characteristic to be displayed until corrected, method used in maintaining this temporary characteristic, and prompt advice to these officers when the failure is corrected.*

B. Drill.—Emergency light operation drill should be held biweekly, or oftener if necessary, and all hands thoroughly indoctrinated. The drill shall be logged. At each drill the emergency (standby) light shall be actually operated, after which it shall be made ready for immediate use and carefully stored. All related apparatus shall receive similar trial and "ready" checking.

C. Types of emergency lights.—The type of emergency light apparatus used at light stations generally is one of the following:

(1) *Incandescent oil vapor apparatus.*—This is a complicated apparatus and ample training in its use must be given to all hands. See Chapter 22 of this manual for complete data.

(2) *Aladdin wick-mantle lamp.*—Like any mantle lamp, this device requires special training in its operation. See Chapter 22 of this manual.

(3) *Fourth order kerosene wick-mantle lamp.*—This lamp is similar to the Aladdin Lamp above. See Chapter 22 of this manual.

(4) Any other type of portable or hand lantern or lanterns capable of giving a light of reasonable candlepower.

D. Adaptor.—Obtain careful, exact measurements and provide a permanent-type adaptor or base so that the emergency light will center its mantle on the focal plane and the focal center of the lens.

E. Retain clockwork for spare.—All revolving lenses having electric lens drive motors should retain the clockwork drive as a spare even though spare motors are available. Thus the advertised characteristic of the light can be obtained by disconnecting the lens drive motor and engaging the clockwork drive. If the clockwork fails, the lens can be rotated by hand in many cases. In the case of a fixed lens showing a flashing or occulting characteristic, it is obvious that the emergency oil lamp could display only a fixed light.

F. Note.—In the event that the main light apparatus is of such a nature that it is impracticable to insert an emergency light inside the lens (such

as a 36-inch rotating beacon), then a suitable emergency light apparatus should be devised so as to furnish illumination to seaward to the best possible extent. Where such emergency apparatus does not now exist, recommendation should be made to the District Commander as to what type apparatus is considered feasible.

29-10 ENGINE GENERATOR CHARGE CONTROLLER

29-10-1 General—

A. *Purpose.*—The charge controller is a device for automatically controlling the amount of engine generator operation necessary to maintain a permanently connected lead-acid storage battery in a charged condition when properly adjusted. It automatically prevents both overcharging and undercharging, thereby reducing the amount of manual supervision and prolonging the life of the battery.

B. *Use with 54 cells.*—The controller, as used by the Coast Guard, is designed for use with 54 cells. It will not operate properly with any other number of cells.

C. *Appearance.*—The charge controller is similar in appearance to a domestic-type watt-hour meter. All parts are assembled on a base plate and are protected from dust, dampness and mechanical injury by a tightly fitting glass cover. Electrical connections are brought to four terminal blades which plug into jawtype contacts in a mounting base or receptacle.

D. *Two types in use.*—Two types of charge controller have been furnished. They are the EDSC Controller manufactured by the Electric Storage Battery Co., and the GIC DC Controller manufactured by the Geophysical Instrument Co. They are practically identical in appearance.

E. For further information on battery charge controllers, see Headquarters instructions for the installation and operation of DC Engine, Generators, Battery Charge Controllers, March 1946.

†29-11 REGULATIONS AND LAWS CONCERNING AIDS TO NAVIGATION

29-11-1 Private Aids to Navigation—

A. Private aids to navigation can be established, disestablished, and changed only in accordance with law and after permission has been obtained from the Commandant. Private aids and bridge lights shall be inspected as prescribed by the District Commander. Personnel shall report any failures in operation of private aids to the District Commander. The maintainers shall also be notified, in order that the proper remedy may be applied promptly.

29-11-5 Laws for the Protection of Aids—

A. Certain laws for the protection of aids to navigation are noted in the paragraphs below for the information and guidance of personnel.

B. Whoever holds out or shows any false light, or extinguishes any true light, with intent to bring any

vessel sailing upon the sea into danger, distress, or shipwreck, shall be imprisoned not less than 10 years and may be imprisoned for life. (Act of Mar. 4, 1909, sec. 297; 35 Stat. 1146).

C. It shall be unlawful for any person to obstruct or interfere with any aid to navigation established or maintained by the Coast Guard, or to anchor any vessel in any of the navigable waters of the United States so as to obstruct or interfere with range lights maintained therein, and any person violating the provisions of this section shall be deemed guilty of a misdemeanor and be subject to a fine not exceeding the sum of \$500 for each offense, and each day during which such violation shall continue shall be considered as a new offense. (Act of May 14, sec. 6; 35 Stat. 162).

D. It is not lawful for any person or persons to take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, obstruct by fastening vessels thereto, or otherwise or in any manner whatever impair the usefulness of buoys or other established marks, nor remove for ballast or other purposes any stone or other material composing such work. (Act of Mar. 3, 1899, sec. 14; 30 Stat. 1152.) Section 16 of the act mentioned prescribes the penalties for violation of section 14, providing a fine not exceeding \$2,500 or less than \$500, or imprisonment for not less than 30 days nor more than 1 year, or both such fine and imprisonment, one-half of said fine to be paid to the person giving information which shall lead to conviction.

E. The penalties provided in section 6 of the act of May 14, 1908 (35 Stat. 162), for obstruction or interference with any aid to navigation maintained by the Coast Guard, apply with equal force and effect to any private aid to navigation lawfully maintained under proper authority. (See act of Mar. 3, 1915, sec. 8; 38 Stat. 928). If any obstruction or interference occurs with respect to authorized private aids, a prompt report containing all the evidence available should be made to the Commandant through the District Commander of the district controlling the area in which the private aids are situated.

F. Bridge lights maintained in accordance with Aids to Navigation regulations are held to be protected against interference or obstruction by the provisions of section 6 of the act of May 14, 1908, and any obstruction of or interference therewith should be reported in the manner provided for private aids.

G. In addition to the above Federal laws, there are many state and territorial laws providing penalties to be paid by persons interfering in any manner with aids to navigation established and maintained by the United States.

29-11-10 Marking of Wrecks—

A. Whenever a vessel, raft, or other craft is wrecked or sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or daybeacon during the day and a proper light at night and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or

failure of the said owner so to do shall be unlawful. (Act of Mar. 3 1899, sec. 15; Stat. 1152).

B. See Chapter 5 of this manual for a thorough discussion of this subject.

29-11-15 Collisions With Aids—

A. Section 136.05-20 of title 46 of the Code of Federal Regulations, which section was promulgated under authority of U. S. C., title 33, section 361, as affected by the Reorganization Plan No. 3, requires the prompt submission of notice of a marine casualty or accident involving damage or destruction of aids to navigation. Such notices shall be given promptly to the officer-in-charge of the nearest marine inspection office of the United States Coast Guard. A penalty, in the nature of a fine of \$100, is provided for failure to report such casualty or accident as required.

29-12 LIGHTSHIPS

29-12-1 Functions and Description—

A. The functions of a lightship are identical with those of an important seacoast light station, namely: To furnish suitable housing and means of providing visual, sound and other aids to navigation signals. The fact that in one case the signals are installed aboard a ship is due solely to the fact that the signals are required at a point where it would be impracticable to build or maintain a lighthouse. Lightships may be moored in the channel or close to it, and they have the advantage over most lighthouses in that they provide a light, fog signal, or radiobeacon for which a vessel may steer directly without danger, so long as collision with the lightship is avoided, and also they may readily be moved, and moored in another position when change of conditions or necessity requires.

B. *Purpose served.*—A number of general purposes are served by lightships. Some are used as landfalls in the approaches to certain important ports, some mark important points in the courses of vessels, others serve as parts of a chain of offshore marks for coastwise navigation, and still another group marks intricate, fog-bound, current-swept waters of the New England sounds and the eastern and western seaboard.

C. *Special design.*—All details of the design of lightships have for their end the maintenance of these signals at the desired location and their efficient operation under all conditions. The hull, the propelling machinery, the auxiliary mechanical equipment, and all fittings are for this sole purpose. The special rig of a lightship and its special shape and paint color distinguish it from other ships. Other than these special marks and features, which fit lightships for their unusual duties, recently built vessels of this type are not basically different from other modern vessels used by the Coast Guard.

29-12-5 Lenses and Light Source—

A. *Lenses.*—Lightships are fitted with fixed pressed glass lenses of the drum type, showing a

light over 360° of the horizon. These lenses may be of three sizes: 500, 375, and 300 mm.

B. *Lamps.*—All lightships use electric incandescent lamps ranging from 250 to 1,000 watts in size. See Chapter 21 of this manual, part 15 for data on lamps and filaments.

29-12-10 Flashing Equipment—

A. Flashing characteristics of lights on lightships are usually obtained using what are known as occulting clocks. These clocks are about 11½ inches in diameter, constructed of brass and bronze. They are spring operated and have a cam cut for the desired characteristic, which operates a set of electrical contacts. The clocks are mounted on a switch and relay panel. All equipment is mounted in duplicate and so arranged that any combination of lights, clocks or relays may be used.

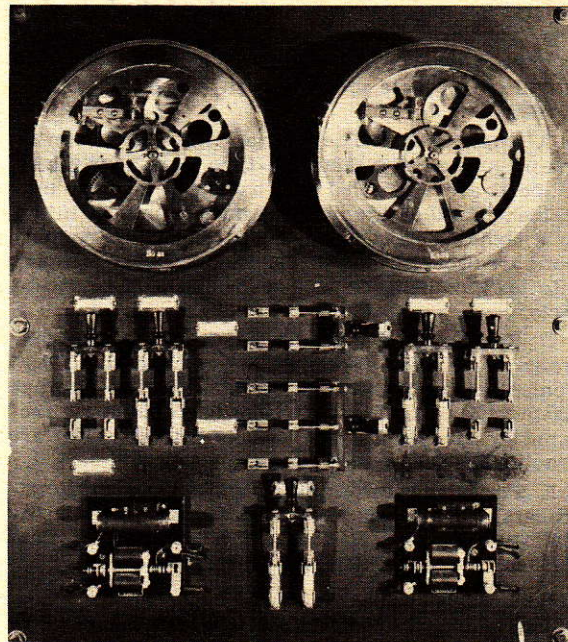


FIGURE 29-10.—Panel board with occulting clocks for controlling main light on lightship.

29-12-15 Fog Signals—

A. Lightships are equipped with sound-in-air signals operated by compressed air or steam. See Chapter 25 of this manual for a description of fog signals. See also the A. to N. Op. Bill and section 29-8-5 of this chapter for additional data pertinent to the operation of fog signals.

29-12-20 Radiobeacons—

A. All lightships are equipped with radiobeacons. This equipment is similar to that installed at light stations which is described in Chapter 26 of this manual.

29-12-25 Distance-Finding Signals—

A. All lightships have their radiobeacons and fog signals synchronized for distance-finding. The principle involved is that of measuring the time interval between receipt of a certain radiobeacon characteristic and the corresponding sound signal. From the time interval, the distance from the lightship may be computed (see Ch. 26).

29-12-30 Administrative Instructions—

A. *Commanding officer/officer-in-charge.*—Whenever the term "commanding officer" is used in this section, it shall be construed to mean the "officer-in-charge" when applied in the case of a lightship not having a commanding officer assigned, but having said "officer-in-charge."

B. *Responsibility.*—The commanding officer of a lightship shall be responsible for the efficient maintenance of the ship on its station as an aid to navigation, and for its cleanliness and upkeep and the welfare of the crew. The commanding officer and all other officers or petty officers of every lightship shall familiarize themselves with all articles of Coast Guard regulations that are applicable to their particular unit.

C. *Succession to command.*—When the commanding officer of a unit is not available for duty, the commissioned or chief warrant officer who is next in line for succession to command shall assume command. If there be no commissioned or chief warrant officer to succeed to command, the person designated by the District Commander as relief for the commanding officer shall assume charge. (Such designation should be made in advance of necessity and revised as change occurs.) In the event such designation has not been made, the senior warrant officer or enlisted person available for duty shall assume charge.

D. *The officer of the deck* is the officer on watch in charge of the ship. He shall be responsible for the safety of the ship, subject to orders received from the commanding officer. For detailed information relative to the authority and responsibilities of the officer of the deck, see Coast Guard Regulations.

E. *Division of work.*—A proper watch and division of work among officers and crew shall be required. A regular watch must be kept at all times. In bad weather, if at anchor, a spare anchor must be ready for letting go, and a sufficient watch on hand to meet any emergency.

F. *Rules of the road.*—All persons in the Coast Guard, including all light station and lightship personnel, militarized and civilian, while responsible for the navigation of Coast Guard vessels or boats, are required by Coast Guard Regulations to observe the laws, regulations, and rules for preventing collisions.

G. *Boats.*—Rules for readiness of lifeboats are contained in Coast Guard Regulations. When practicable, boats must be kept hoisted and covered when not in use, and swung in during bad weather. Boats should not be hoisted when heavily loaded or when filled with water.

H. *Departing from orders.*—Any person, militarized or civilian, who departs from his orders or instructions under any circumstances, or takes official action at the request of any person, must do so upon his own responsibility and immediately report the circumstances to his superior officer.

I. *Quarters and messes.*—The officers and crews are required to live on board the vessel to which they are attached. See Coast Guard Regulations for general provisions regarding quarters and messes, and Pay and Supply Instructions for detailed instructions covering all matters concerning crews' messes, including reports and returns to be made in connection therewith.

J. *Residence on vessels.*—No persons, except the regular officers and crews of such vessels, shall be permitted to reside continuously on any vessel of the Coast Guard on aids to navigation duty, except by the written authority of the Commandant.

K. *Passengers on vessels.*—Except in cases of emergency, as when persons are rescued from vessels in distress, no persons other than the regular officers and crews of such vessels shall be permitted to take passage on any Coast Guard vessel employed at aids to navigation work other than as authorized by the District Commander or by Coast Guard Regulations.

L. *Inspection of food.*—Frequent inspections of the food and the method of serving to the crew shall be made by the commanding officer or an officer representing him, and prompt steps taken to remedy any deficiency in quantity or quality.

M. *Cleanliness.*—All cooking and mess utensils must be kept clean. Those handling food must be clean in person and in dress.

N. *Welfare of crew.*—Particular attention shall be paid to the welfare and health of the crew. Food shall be properly cooked, served at regular hours and it should include a liberal quantity of fresh provisions. Water shall be of good quality and in liberal quantity.

Clean and sanitary methods in the preparation and storing of food, as well as in its transportation from one part of the vessel to another, shall be insisted upon.

O. *Temperature and ventilation.*—Every precaution must be taken to keep Coast Guard vessels dry, well ventilated, and at suitable temperatures. In seasonable weather, wind sails will be set and awnings spread, if necessary.

P. *Clothing and bedding.*—Clothing and bedding shall be inspected as necessary, in order to ascertain if they are clean, properly mended, marked, and of regulation pattern. All mattresses and pillows must have removable covers, which must be removed and washed frequently as determined by the commanding officer. Bedding shall be aired frequently. Wet clothing or bedding must be dried immediately.

Q. *Public property* on lightships will be cared and accounted for in accordance with the provisions of Coast Guard Regulations and Pay and Supply Instructions. See the latter publication for detailed instructions relative to records and returns of public property, boards of survey and sale of condemned material.

R. *Receipt of property.*—Supplies and articles of every description shall be carefully inspected at the time of delivery to the Coast Guard units. See Pay and Supply Instructions for additional data on the above inspection and for further detailed information with regard to supplies.

S. *Accountability.*—Loss, waste, or excessive consumption or expenditure of public property and supplies shall be prevented by the commanding officer or officer-in-charge responsible for the items; in accordance with Coast Guard Regulations.

T. *Lightship not to be moved.*—Under no circumstances, except those of extreme emergency, shall a lightship be removed from her station without authority from the District Commander, who will immediately advise the Commandant and issue suitable notices to mariners to cover the action taken.

U. *Lightships off station* must be promptly reported to the District Commander with reasons and details. Every precaution must be taken to prevent and to detect immediately a lightship dragging off station. See Chapter 27 for various methods of ascertaining position. See also paragraph (X) below. Should a lightship have dragged such a distance as to mislead passing vessels, both day and night characteristics must be concealed and the fog signal and radiobeacon must not be sounded.

(1) As soon as the fact is known, messages shall be broadcast by the commanding officer, advising all vessels that the lightship is off station.

(2) If for any reason a lightship has dragged, breaks adrift, or is not on proper station at night, if anchored, anchor lights are to be shown, and if under way, running lights as required by law for other vessels; and by day the international code signal letters PC (signifying lightship is not at anchor on her station) are to be constantly shown, whether vessel is anchored or under way.

V. *Lightship mooring chains.*—The inboard ends of mooring chains must be securely fastened to an eye or ring bolt provided for the purpose. See section 29-12-40 below for additional data.

(1) The scope of the riding chain shall be moderate in fair weather and increased as necessary in heavy weather.

(2) The riding chain should be hove in and examined for defects each month, its condition being noted in the log and reported to the District Commander.

(3) When necessary to protect the bow from heavy drift ice, a shot of chain should be led from the upper hawse pipe to the riding chain and set taut by veering on the riding chain.

(4) When directed by the District Commander, a spherical mooring buoy shall be shackled into the chain for vessels stationed in deep water.

W. *Use of propelling power.*—The utmost caution and judgment should be exercised by the commanding officer of a lightship in the use of the propelling machinery while riding at anchor in stormy weather.

X. *Positions of lightships.*—Commanding officers of lightships shall bear in mind the importance of having lightships as nearly as practicable in their correct positions at all times. When satisfactory charted objects are available, an acceptable check may be obtained by the careful reading of sextant

angles, the sextants being in proper adjustment. When it is difficult to see shore objects and when the angles subtended or the location of the objects are not suitable for sextant angle positioning, the position of the lightship may be fixed by transit observation from fixed points on shore or by other accurate means. Copies of the data for fixing the correct position shall be maintained on the lightship for reference purposes. See paragraph 27-11-30 (C) of this manual for additional data on determining a lightship's position.

Y. *Storm sails.*—If storm sails are kept bent during stormy season, they should be frequently loosed to dry in fair weather.

Z. *Characteristics of lightships.*—Lightships will be painted such color and be otherwise distinguished as prescribed by the Commandant and indicated in the Light List, and no change of color or other characteristics shall be made without his authority.

Lightships are distinguished at night by the number, characteristics and position of the main light or lights, and during the day by color, rig, etc., and by the marking name of the station painted on each side. No number is shown on the outside of the hull. Lightships should be referred to in correspondence by their full names and numbers and should be so carried in office records.

AA. *Riding lights on lightships.*—As prescribed in the Light List, a fixed white riding light forward, displayed in conformity with the International Rules, will be shown by all lightships whenever the station light is operating.

BB. *Lights, when to exhibit.*—Unless other instructions have been prescribed by the A. to N. Op. Bill or have been received from the District Commander, lights on all lightships will be displayed from one hour before sunset to one hour after sunrise, and at all times when the sound signal is in operation.

CC. *Signal flags on lightships.*—All coastal lightships, especially relief lightships, shall display the international code signal of the station whenever a vessel is approaching or is in the vicinity and there are indications that such vessel is in strange waters or fails to recognize the station, or whenever a vessel asks for the information.

DD. *Collisions with lightships.*—There have been a number of disastrous collisions between lightships and vessels that failed to give the lightship sufficient berth. A surprising proportion of collisions and near collisions have occurred during periods of excellent visibility. In order to warn and to train deck officers of all passing vessels to use safe navigating practices, each commanding officer of a lightship shall promptly report to the District Commander the name of every vessel that passes his lightship so close as to constitute a hazard to the lightship, giving details. The District Commander will, in turn, follow up the matter with the vessels or companies concerned, making suitable reports to the Commandant.

EE. *Daily inspection.*—The commanding officer shall inspect daily at 2000 or other appropriate time, see the watch set, lights burning properly, and the lightship secure for the night.

FF. Sounding the wells.—The wells should be sounded daily, and the depth of the water in the compartments of the lightship reported to the commanding officer. More frequent soundings, as necessary, must be made during bad weather. Unusual conditions of any kind must be reported at once to the commanding officer.

GG. Interference with lightships.—No vessel will be allowed to make fast to a lightship, or in any manner to obstruct the visibility of her lights.

HH. Use of boats.—Boats of lightships shall be used for official purposes only; they shall not under any pretense be detained on shore, or when alongside of a lightship remain in the water for a longer time than may be absolutely necessary. When not in use they shall be kept hoisted to the davits, and during stormy weather swung inboard. They shall be kept free of water and when practicable have all ballast and stores removed before being hoisted up and secured.

II. Stopping passenger steamers.—Except in cases of emergency, commanding officers of lightships shall not stop passenger steamers to put mail or other articles on board. When an emergency arises, the commanding officer shall see that the lightship's boat is in charge of a competent person, and such cases shall be reported to the District Commander.

JJ. Leave and liberty of Coast Guard personnel serving on lightship stations is, because of the peculiar nature of their duty, a matter of special importance. Commanding officers will see that leave is taken at proper intervals in regular rotation, so far as desirable and practicable. Personnel on isolated lightship stations without convenient communication with the shore have in the past been allowed a greater amount of leave than those on lightships not distant from the shore and with convenient communication. The commanding officer of each lightship will grant leave and liberty in accordance with instructions from the District Commander. See the applicable Commandant's Circular for general rules concerning leave and liberty of militarized personnel. Care must be exercised at all times to maintain aboard a force sufficient and capable to carry out the mission of the unit, and qualified to cope with any emergency that might arise.

In the case of civilian employees on lightships, leave and liberty will be granted in accordance with official directives and specific instructions of the District Commander.

29-12-35 Additional Instructions—

A. Certain sections and paragraphs specifically written for personnel at stations pertain, however, to a greater or lesser degree as well to personnel on board lightships. Identification of these sections and paragraphs appearing earlier in this chapter is made by an asterisk (*) appearing to the left of the section or paragraph designating number or letter.

B. Instructions concerning the care and maintenance of electric illuminating apparatus used on lightships will be found in Chapter 21 of this manual.

29-12-40 Care of Anchor Chain—

A. When a lightship parts her anchor chain at sea, the ship and crew are placed in a position of jeopardy, an important aid to navigation goes out of operation and several thousand dollars' worth of ground tackle is lost to the Coast Guard. It is, therefore, vitally important that the commanding officer of a lightship make the care and inspection of his ground tackle one of his chief concerns.

B. **Annual overhaul.**—At each annual overhaul the anchor chain should be ranged on the dock, wire brushed or sand-blasted as necessary, the connecting links broken down, and a careful inspection made of the chain, connecting links, swivels, bending shackles, etc. Attention of commanding officers is invited to Buships' Manual, Chapter 26, in connection with this inspection. The entire chain should be inspected for wear and incipient fractures. Any links worn to less than 90 percent of their original wire diameter should be replaced. Any sections of chain that are elongated, so that the length of six links is increased by more than three-eighths times the wire diameter, should be replaced. In reassembling the chain, the position of the shots should be rearranged to equalize wear. A record should be kept of the serial number of each shot, showing its position in the cable. The connecting links should be reassembled, using a 40-percent white lead—60 percent tallow mixture to slush the matching surfaces. The results of the inspection and any work performed on the chain should be entered in the ship's log, and in the hull history.

C. **Change of scope.**—On station, the scope of chain should be changed each week to equalize wear. In fair weather, moderate scope shall be used, and in foul weather up to full scope. This change of scope shall be logged.

D. **Inspection on station.**—When on station, once each month, and after every major storm, the anchor chain should be hove in to short stay and given a careful inspection. Particular attention shall be paid to the connecting links and swivels. As the chain is brought aboard it should be "rung out" by striking the links with a hammer and noting if they ring true. This inspection should be made by the commanding officer, or officer-in-charge, and should not be delegated. The results of the inspection should be entered in the log. If excessive wear or damaged links are discovered, a report should be made by dispatch.

E. **Spare equipment.**—Each lightship shall maintain a complete set of connecting links, swivels, bending shackles, etc., and have a shackling kit aboard ship and readily available. When any of this equipment is used, replacements shall be requisitioned immediately.

F. **Inspection of new chain.**—When new chain or appendages are received, the commanding officer should make a careful inspection of it before it is struck down into the chain locker.

29-13 LOGISTICS BY AIRCRAFT**29-13-1 General—**

A. The employment of aircraft for logistic duties in support of aids to navigation activities has increased steadily during the past several years. The development of the helicopter, and improved types of fixed wing aircraft, has enabled the Coast Guard to overcome a considerable number of the seemingly chronic logistic problems that have always plagued the aids to navigation program. Before the advent of the helicopter, it was not uncommon for an important radiobeacon on an island station to be inoperative for several days simply because a boat could not deliver technical personnel or replacement equipment due to impossible sea conditions. Many of these stations, under most weather conditions, can be serviced by helicopter with personnel and equipment within 2 or 3 hours after receiving a call. Medical patients can be evacuated expeditiously when removal by boat is either impracticable or impossible. There is an adequate landing field or water area within a short distance of many Coast Guard shore units. With such landing facilities available, it is possible to deliver a large number of personnel and a considerable amount of equipment and supplies in fixed wing aircraft, with a minimum of delay. Searches for expensive buoys lost in storms, etc., can be conducted much more economically by aircraft than by tenders and cutters. A wide variety of equipment can be dropped from the air to lightships, so that critical repairs can be effected without prolonged delays. The visual checking of certain fixed aids from the air is a practical operation, and all fixed wing aircraft have radio equipment installed, which can be used to monitor radiobeacon transmissions. In addition, all large Coast Guard patrol planes have both radar and loran equipment which can be utilized in checking radar beacons and loran lines.

29-13-5 Procedure for Station Personnel—

A. Whenever it becomes apparent that an aircraft intends to land at or near a Coast Guard unit, station personnel should take action as discussed in the following paragraphs.

B. *Communications.*—Be alert to establish communications with the aircraft. All Coast Guard fixed wing aircraft are able to transmit and receive on 2670 and 2698 kilocycles on radiotelephone, and the patrol and transport types can transmit and receive, either by voice or CW, on any standard Coast Guard frequency. Helicopters are ordinarily equipped to transmit and receive on VHF only. Frequencies available to the aids to navigation unit should be included in the request for aerial support. Portable radio equipment at scene of drop often proves a valuable means of communication. Standard procedures should be used.

C. *Radiobeacon.*—Stand by to provide continuous radiobeacon transmissions if so requested. This is extremely important to the pilot and, in unfavorable weather, may provide the only means by which he can locate the station.

D. *Radarbeacon.*—If a radarbeacon is installed, check to see that it is operating satisfactorily. Most fixed wing military aircraft have electronic equipment installed with which they can obtain bearings and distances from radarbeacons.

E. *Weather.*—Make frequent checks of the state of the weather. The pilot will undoubtedly ask for an estimate as to the ceiling (distance in feet between the ground surface at the station and the base of the clouds), and the approximate visibility in miles. The aids to navigation unit should know the distance and elevation of nearby landmarks to assist in estimating visibilities and ceilings. Also, he will most likely request the wind direction and velocity. If there is a control tower at an adjacent airport, the pilot will probably obtain weather information from the tower operator, but the data should be immediately available at the Coast Guard station in the event the pilot requests it.

F. *Airport runways.*—Whenever an airport is not in regular operation and under the control of full-time personnel, the runways should be checked to insure that they are not obstructed by cars, livestock, etc. If it is at all possible that the landing will have to be made during the hours of darkness, make certain that runway lights can be turned on as soon as the pilot requests them.

G. *Water landings.*—In the case of water landings, the pilot will ask for the sea conditions, and the wind direction and velocity in the landing area. The landing area should be carefully swept by a boat and cleared of logs and other floating obstructions. If necessary, anchored boats should be requested to shift their positions to provide a clear landing area. The pilot may drop drift signals which emit smoke to determine the local wind. A boat should always be manned, running up and standing by adjacent to the landing area during all water take-offs and landings.

H. *Approaching the aircraft.*—Great care must be exercised in coming alongside aircraft on the water. Approach should not be made until directed by those aboard the plane, and then from the direction and in the manner indicated. Keep well clear until propellers have stopped, unless otherwise directed. Propellers, wings, and tail surfaces are particularly dangerous and vulnerable. All personnel should be ready to fend off. Final part of approach by use of a light line may be preferred to coming in under oars or power. A water-borne plane will make more leeway than a boat or ship. If the wind is strong or water is rough, the plane may prefer to drop astern a liferaft or a line to pick up or deliver the personnel or supplies involved.

I. *Helicopters* do not require large areas in which to land. Clear area approximately 100 feet square which is reasonably smooth and level will suffice, if it is not surrounded by tall obstructions such as trees, power poles, buildings, etc. If obstructions are present, a larger area will be required for landings and take-offs. The pilot will survey the terrain and request information as to the levelness of the ground area prior to landing. Ground personnel should be alert to provide this data. Wind conditions are an even more important factor in helicopter take-offs and landings than in fixed wing aircraft operations, and the wind direction and velocity information should be immediately available to the pilot. Personnel on the ground must remain well clear of the landing area. The tail rotor is a very serious hazard, and this fact should be borne in mind when approaching a helicopter from any angle. Any loose items in the vicinity of the landing spot must be removed so that they are not picked up by the rotor wash and thus damage the blades.

J. *Air drops*.—There are several types of air drops utilized by aircraft in delivering equipment and supplies to ground units and vessels at sea. Fragile equipment such as electronic tubes, etc., are carefully padded and dropped by a cargo parachute to ground stations. If the equipment is to be dropped at sea, buoyant material and waterproof containers are added. In addition, a long buoyant retrieving line is attached to the parcel to facilitate recovery. A considerable number of drops are made free fall when there is little likelihood of damaging the ma-

terial. Personnel on the ground or on board ship should remain clear of the area or under cover during all air drops. This is true even when parachutes are used, as injuries could result should a chute fail to open. Any parachute used should be washed in *fresh* water if they have been wet with salt water or spray, then hung to dry in a well ventilated spot. Do not let them come in contact with grease, oil, etc.

K. *Flares*.—Most large aircraft carry paraflares which are each capable of illuminating a large area with a light equal to 750,000 candlepower for a period of 1 to 3 minutes. They are particularly useful for lighting water areas for boat searches, etc. These flares contain magnesium material which burns so intensely that it will penetrate concrete. The flares are dropped normally from an altitude that is sufficient for them to burn out prior to reaching the ground or water surface; however, pieces frequently break from the flares and reach the surface before they have dissipated. Water or fire extinguishers will not control the burning, and sand or dirt thrown on the burning material is the only effective means of combating a flare fire.

L. *Message blocks*.—Message blocks are often used to deliver messages to ground personnel or vessels at sea. These are nothing more than hollowed, small wooden blocks with a long bright colored cloth streamer attached. The blocks are buoyant and are painted a bright yellow or orange color so that they may be easily located. These are used for communication purposes in the absence of radio or Aldis (blinker) lamps.

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