If the co-ordinates on a great circle course are transferred from a gnomonic chart to a Mercator chart and the lines connecting them drawn, what is the appearance of the great circle course on the Mercator Chart?

How should charts be kept corrected?

What precautions are necessary when charts have laid unused for a lengthy period after the date of issue?

If a vessel has laid off a great circle track and has departed from the track through bad weather or lack of observations, should she attempt, when her position is determined, to get back on the original track laid down or work out a new course from her determined position?

A vessel on course 000° sights a light vessel dead ahead at a distance of 10 miles. What course should she set to pass the light vessel one mile off her port side?

What information is provided by the Daily Memoranda?

Is the water ever shallower than indicated on a chart? Explain.

In approaching land, what scale chart should be used?

Name the reference planes of soundings used on charts and state how you would determine the reference plane when consulting a chart.

What precautions would you take when transferring positions from one chart to another?

What information is contained in the Coast Pilots?

How is the latitude and longitude of a particular point on a Great Circle chart determined?

How would you know of the issuance of new editions of Hydrographic Office charts in order to replace the old corrected charts aboard ships?

Are parallels of latitude straight lines on a polyconic chart? Explain your answer.

Explain the limitations on the use of middle latitude sailing when crossing the equator.

In taking a vertical sextant angle, what care is required if the object observed is situated far inland from the shore?

State three methods by which, without obtaining the precise position, the navigator may assure himself visually that he is clear of any particular danger.

A vessel desires to make good a course of 100° and a speed of 9 knots through a current setting NE. True with a drift of three knots.

Required: The course and speed required to accomplish this.

What precautions should be taken when obtaining the position of a ship by means of a "bow and beam" or "four point" bearing?

Why should bearings of near objects be used in preference to objects farther away, even though the latter may be more prominent?

What caution should be observed in "homing" on the bearing of a lightship's radio beacon signal?

Why is a correction necessary in plotting on a Mercator chart bearings obtained through the use of a radio direction finder?

What preparation would you make when planning to enter a strange port?

A vessel hears a radio distance finding signal from a light vessel and 10 seconds later hears the sound signal. What is her distance from the light vessel?

What measures should be taken to check the accuracy of direction finder bearings?

When taking radio direction finder bearings off a coast with islands between your ship and the shore transmitter, what care would you exercise? Why?

Describe briefly how ocean station vessel's radio beacons may be located on the chart.

When a vessel equipped with a radio direction finder hears a distress signal, what measures should be taken?

What factors must be considered in obtaining radio direction finder bearings on a station broadcasting entertainment programs?

How is a radio direction finder on board ship calibrated for errors caused by electrical conductors nearby?

How are bearing errors caused by nearby electrical conductors corrected on board ship?

What is the meaning of the following information taken from the radio beacon chart for the stations indicated?

I San Francisco L.S. 314 (3–6).

II Farallon 314 (3–6).

III Bonita Pt. 314 (3–6).

How is "night effect" usually manifested in radio-direction finder bearings?

Why is night effect unusual when a vessel obtains a bearing from a position less than 50 miles from the radio beacon?

6. COMPASS DEVIATION.

Enroute from New York to Cape of Good Hope in D. R. Latitude 31°–26′ North and Longitude 55°–17′ West, an azimuth of the star δ (Delta) Cyngi was observed. The following data was obtained at the time of observation:

Compass Bearing of Star	*Greenwich Hour Angle*	*Declination of Star*
329°–00′ psc	150°–36′.3	45°–01′.9

Variation for the locality was 18°–30′ West.

Required:

The true azimuth.

The deviation of the standard compass.

Candidates may use any method of solution.

---

9. MERCATOR SAILING.

By mercator sailing, find the true course and the distance from Ambrose Channel Lightship (Lat. 40°–27′.1 North and Long. 73°–49′.4 West) to a point in Lat. 32°–22′ North and Long. 64°–39′.0 West, off St. David Island Lighthouse, Bermuda. Show all work.

---

11. PILOTING.

Running along the coast off a lighthouse listed as 145 feet high. You measure its vertical sextant angle and find it to be 1°–3′. How far off the lighthouse are you?

Steaming south by gyro at a speed of 12 knots, a lighthouse was observed bearing 126°–00 by gyro. After a run of 30 minutes the same lighthouse bore 100° by gyro.

Required:

Distance off at second bearing.

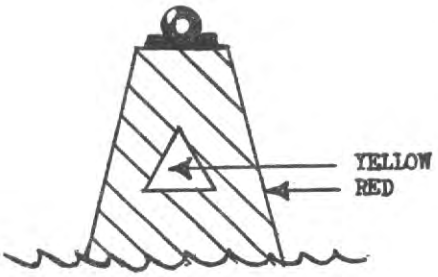
Distance off when abeam.

A ship is steering 101° p.g.c., Variation 23° East, deviation 3° West, which is 82° p.s.c. A light is sighted bearing 129° true. On what gyro bearing must the light be observed so that the run between bearings would equal the distance off the light when the light bears 191° gyro?

NOTE: Problems may be given pertaining to piloting which are under other titles in this book.

12. AIDS TO NAVIGATION.

What is the meaning of a red nun marked with a yellow triangle as illustrated?



What is the meaning of the "class" of a buoy as specified in the U.S. Coast Guard Light List?

When a buoy is in position during a certain period of the year only, how may the dates when the buoy is available be determined?

Describe the use of a range (or leading lights) in entering or leaving a harbor. What precautions must be observed in the use of such ranges?

What is the significance of the shape of unlighted buoys as used in the lateral system in United States waters?

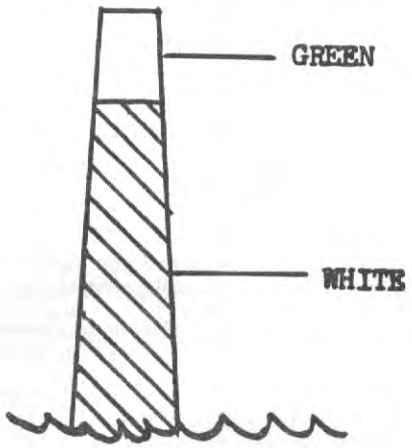
On a clear, dark night, a light is sighted just breaking clear of the horizon. If your height of eye is 50 feet and the charted visibility of the light is 12.5 miles, what is your distance from the light?

Define exactly what is meant by a group occulting light. (Candidates may submit a sketch such as that contained in the light list to help demonstrate complete comprehension of the term).

Name the different types of buoys sketched.

Where it is desired to show the need for particular caution, at important turns, etc., what light period is given buoys?

What is indicated by the white buoy with green top as sketched?



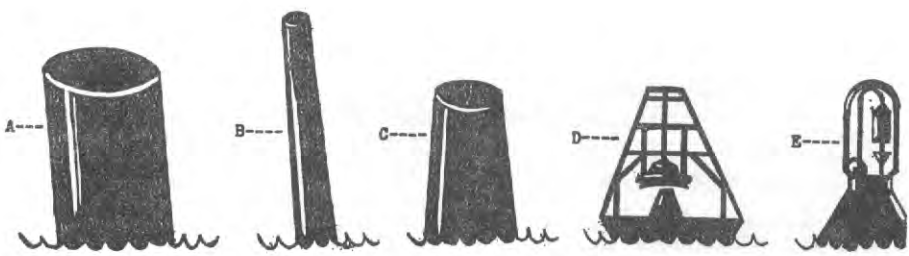
How would you identify a lighthouse in the daytime?

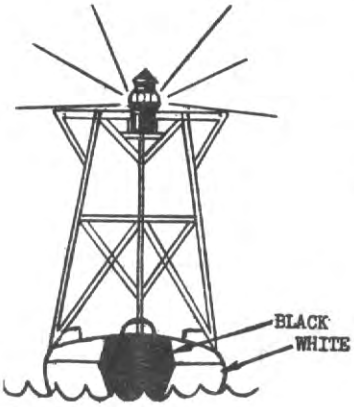
Where are station buoys found and what is their function?

How far could you see a powerful navigational light whose height is 100 feet from the bridge of a vessel where your height of eye would be 80 feet above the water?

What word indicates color variations in the characteristics of a light?

Define exactly what is meant by an interrupted quick flashing light. (Candidates may submit a sketch such as that contained in the light list to demonstrate their complete comprehension of the term).





a. On which side would you leave this buoy in passing?

b. What number would such a buoy have?

c. What color light would the buoy display?

d. What phase characteristics would the light of this buoy have?

e. How would this buoy be indicated on a chart?

Entering from seaward you sight the black and white vertically striped lighted buoy illustrated above.

How are bearings relating to sectors of visibility of lights stated in light lists?

What are the standard light colors used for lighted aids to navigation?

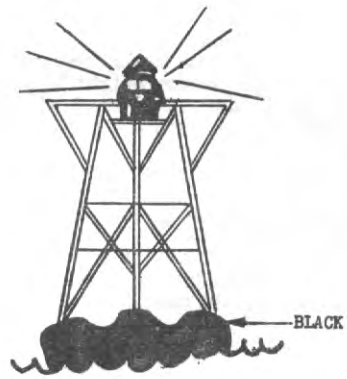
What do colored sectors in lights mark?

How is the power of a light expressed in the light list?

How would you determine if the visibility given for a light is the geographic or luminous range?

Describe the effect of atmospheric refraction on the visibility of navigational aids.

In entering a United States port the black lighted buoy is sighted as shown below:



a. On what side should it be left in passing?

b. What type number would it have?

c. What color light would it show?

d. How would this buoy be indicated on a chart?

e. What phase characteristics would this light have?

---

15. INSTRUMENTS AND ACCESSORIES.

How would you clean the arc of a sextant?

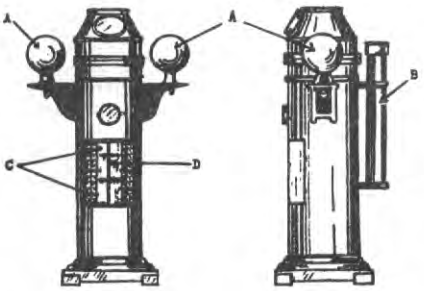
What is the purpose of the mercury ballistic wicks on the master gyro-compass?

Why are corrections for latitude, height and temperature applied to a mercurial barometer?

Describe in detail the procedure of stopping the gyro-compass.

What routine inspection of the gyro-compass should be made each watch at sea? State briefly what you would check?

Name the corrector indicated by each letter on the sketch and state the type of magnetism each is designed to correct.



How can the brightness of the reflection from the horizon glass be varied in a sextant?

How is the master gyro-compass compensated for permanent errors? Suppose the master gyro heading is 278° and it has been definitely established (by azimuth, bearings, etc.,) that the compass has a 2° easterly permanent error, state how you would compensate the master to read true.

How do you determine the accuracy of a ship's barometer, whether mercurial or aneroid?

Why is mercury used in the barometer in preference to other liquids?

Make a rough copy of the sketch below and on it label the following: "E-Layer," "F-layer," "One Hop F," "Two Hop F," "One Hop E," "Two Hop E," and "ground wave."

In taking a loran reading:

(a) What will be the result of matching a first sky wave with a ground wave, or matching a first sky wave with a second sky wave?

(b) What precautions should be taken to insure that the first pulse in a train of pulses is not being overlooked?

In the loran method of navigation:

(a) What is the base line?

(b) What is the base line extension?

In using a loran chart, the lines on the chart are for ground waves. Where are the corrections to be found when using sky waves?

When sky waves are used for computing loran lines of position, are they more accurate close to the station or far away from the station?

What does blinking of a loran signal indicate?

How is a chronometer's accuracy checked?

What is the error of collimation of a sextant?

What is a ground wave?

What is a sky wave?

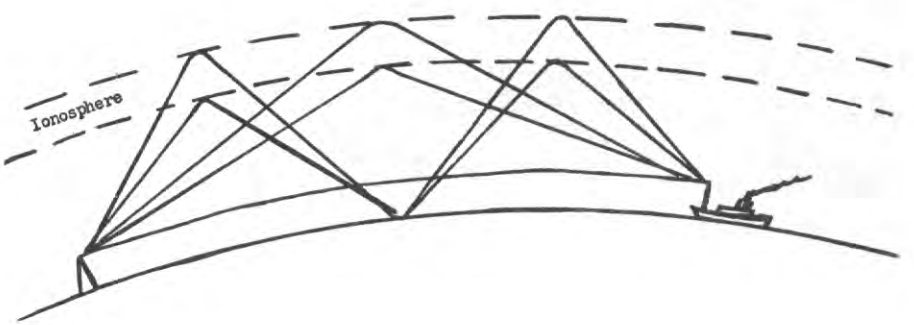
What is the critical range in loran reception; why is it critical; and what precautions must be taken with regard to the use of signals?

Explain the construction, principle, and care of the barograph.

Upon what 2 natural forces does the directive force of the gyro-compass depend?

State briefly the routine inspection and maintenance care which should be given the master gyro-compass each month.

What are the markings of the hand lead line?



What is a hygrometer and what is it used for?

What is a Pitometer Log? Describe its principle.

When a patent log line is hauled in, how do you take the turns out before drying it and stowing it away?

What is a stadimeter?

What is a hydrometer and what is it used for?

What is a psychrometer?

Where is information concerning loran coverage, charts, and tables available?

Which end of a Kelvin sounding tube must be uppermost when taking a sounding?

Describe the glass sounding tube or other depth recording device used with a patent sounding machine, and state how Boyle's law applies to the principle upon which it operates.

Give a brief description of the principle and operation of the Fathometer.

Explain the use of chemical tubes to record soundings.

What effect will an unusually soft bottom have on soundings obtained by fathometers?

Explain in detail and in proper order the procedure to be followed in taking soundings with a sounding machine.

What method is generally employed aboard merchant ships for checking accuracy of a chronometer and determining its rate?

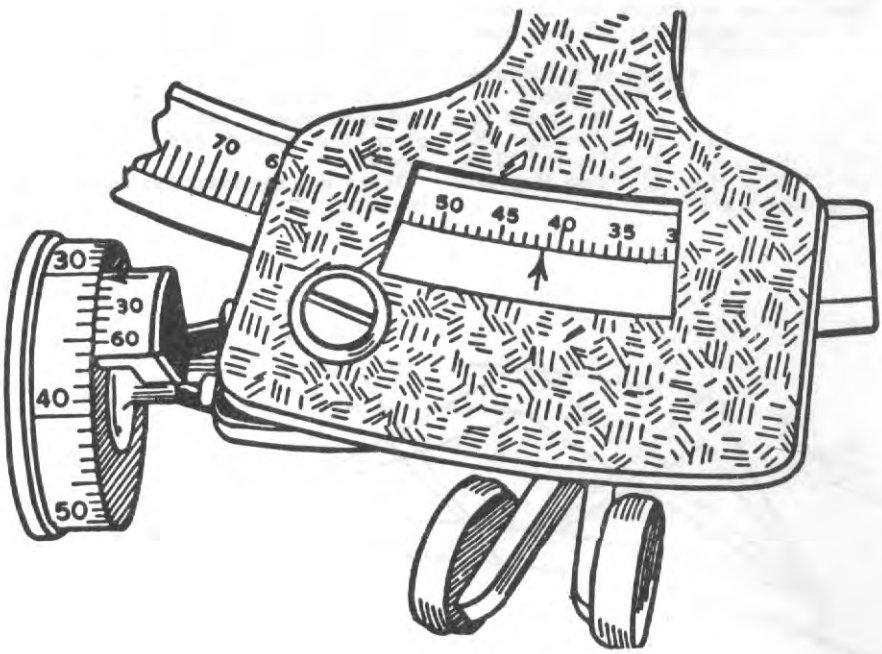
Why is the morning normally the best time of day for winding time pieces?

Where will complete information be found on the times, frequencies of emissions, and characteristics of radio time signals?

On 1 June, a time signal at 1200 GMT shows chronometer "A" 3m–52s fast. On 5 June, a time signal at 1800 GMT shows chronometer "A" 3m–35s fast. An observation is taken on 7 June at 1800 GMT. Assuming a constant chronometer rate, what correction should be applied to chronometer "A"?

In New York (Zone +5) a time signal was heard, and at 1400 Eastern Standard Time, the chronometer read 18h–35m–38s. What was the chronometer error?

What is the reading of the micrometer sextant illustrated?



18. TIDES AND CURRENTS.

Define:

(a) Flood tide.
(b) Ebb tide.
(c) Set of tide.
(d) Drift of tide.

Where would you find the time of slack water after high or low water in any given port of the United States?

What are subordinate stations, as used in the Tide Tables?

What is the purpose of the ratios given in the Tide Tables for computing height of tide and how would you use such ratios?

Name three planes of references to which soundings and tidal data are referred.

Describe the effect of wind and abnormal barometric conditions on the tides.

What celestial body is principally responsible for the tides, and what additional celestial body influences the tide?

At St. Johns, New Brunswick on 7 February 1958:

(a) What is the tabulated time and height of a.m. high water?

(b) If the largest scale chart of the locality showed a depth of 10 feet for a given area, what would be the depth at high water at that area?

At Anchorage, Alaska on 3 May 1958:

(a) What is the tabulated time and height of p.m. low water?

(b) If your chart of Anchorage showed a depth of 20 feet for a given area, what would be the depth at low water at this area?

At Deer Island Light, Boston, Mass. Harbor on 28 March 1958:

(a) What is the tabulated time and velocity of maximum p.m. ebb current?

(b) In what direction does the ebb current flow at this position?

(c) What time meridian is used in tabulating the times given for the currents at this port?

At San Diego Bay Entrance, California on 13 January 1958:

(a) What is the tabulated time and velocity of maximum a.m. flood current off Ballast Point?

(b) In what direction does the flood current flow at this position?

(c) What time meridian is used in tabulating the times given for the currents at this port?

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19. OCEAN WINDS, WEATHER AND CURRENTS.

How is the sea water temperature obtained for a weather observation?

How would you read a thermometer? State the sources of possible error.

How should a wet and dry bulb hygrometer be placed and what care should be given to this instrument?

Convert (—) 10° Celsius (Centigrade) into temperature Fahrenheit.

What is "sleet"?

Define the term "temperature".

On a weather map:

(a) An elongated area of high pressure extending from an eminence (or high) is called a .....?

(b) An elongated area of low pressure extending from a depression (or low) is called a .....?

What is "wave height"?

What "wave height" should be recorded?

How is the visibility determined?

What is a "synoptic chart"?

What is an "occluded front"?

What is the meaning of the term "sky cover" and how is the "sky cover" determined for purposes of weather reports?

What is meant by the cloud "ceiling"?

How would you determine the "cloud ceiling"?

What are the four principal families or types of clouds, and what feature forms the basis of the classification?

Low clouds are defined as those whose mean upper level is 6,500 feet.

Middle clouds are defined as those whose mean lower level is 6,500 feet and whose mean upper level is 20,000 feet.

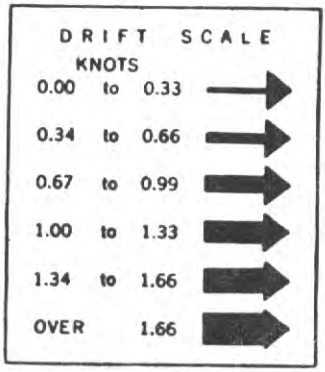
High clouds are defined as those whose mean lower level is 20,000 feet.

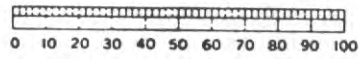
Classify as low, middle, or high the following cloud forms:

(a) Altocumulus.
(b) Cirrostratus.
(c) Stratus.

Why are islands or shore lines in the tropics often marked by cumulus type clouds in the daytime, particularly in the afternoon?

Interpret the data provided by the current rose shown from the Atlas of Surface Currents, North Atlantic Ocean. (H. O. Publication 571).





SCALE OF FREQUENCY PERCENTAGE

What is the meaning of the term "drift-ice" (or "pack-ice"), used in a wide sense?

Discuss the ice movements in the North Atlantic.

What is "fast-ice"?

What is the best position for conning a ship in ice?

Explain the temperature volume relationship of gases if pressure is held constant. State in words or mathematical notation. (*Charles Law*).

How is the correction for an aneroid barometer noted and where should this correction be posted?

How often should the correction for an aneroid be checked?

How is the correction for an aneroid determined?

What action is taken by the weather bureau when comparison indicates that a barometer is defective?

What care must be given an aneroid barometer to assure that it will retain its calibration?

State the precautions necessary to obtain the correct sea level pressure when using an aneroid barometer.

Describe briefly the relationship between barometric pressures and the corrections that must be applied to altitudes of celestial bodies observed by sextant.

What is "vapor pressure"?

A vessel's true course is 025° and speed 22 knots. The apparent wind direction is from NE. with 16 knots apparent wind velocity.

REQUIRED:

(a) The direction from which the true wind is blowing.

(b) The velocity of the true wind.

To what wind force on the Beaufort Scale do the following conditions correspond?

WIND SPEED.....17 to 21 knots.
SEA CONDITIONS.....Moderate waves, taking a more pronounced long form; many white foam crests; there may be some spray.

What is a cyclone?

Distinguish between a tropical cyclone and an extra-tropical cyclone.

Describe squall lines and the conditions associated with them.

How can the barometer show the approach of a cyclone in the tropics?

At what latitude (North or South) does a tropical cyclone normally recurve?

When do tropical cyclones usually move at the slowest speed?

State two reasons why tropical cyclones are divided into semi-circles, one considered dangerous and the other considered navigable.

What is the effect of current upon the waves caused by a storm?

What provides the energy for atmospheric disturbances along frontal zones?

What name is applied to tropical cyclones in:

(a) The North Atlantic.
(b) The western North Pacific.
(c) The Phillippines.
(d) Western Australia.

What causes the fog frequently associated with the frontal areas between two air masses? Why are night conditions more conducive to such fogs than day conditions?

Is fog more common and dangerous along cold fronts or warm fronts? Why?

When water vapor condenses in a storm area and is precipitated in the form of rain, snow, etc., what is the effect upon the temperature of the air?

Which is lighter:

(a) dry air;

(b) moisture laden air?

What are isallobars? What is their value in constructing weather maps and forecasting?

In what direction do warm fronts usually move and what is their average speed of movement?

In the Southern Hemisphere, in which semi-circle of a tropical cyclone would a vessel be if the wind shifted counter-clockwise, while she was hove to?

In the Northern Hemisphere, how should a steam vessel maneuver in the dangerous semi-circle of a tropical cyclone?

Hove to in the Southern Hemisphere under tropical cyclone conditions with the barometer falling and the wind shifting clockwise, what is the vessel's probable position relative to the center of the storm, and what action should be taken if possible to avoid the center of the storm?

Describe the use of a "storm card" or diagram of wind direction in maneuvering in a tropical cyclone area.

What weather conditions may result from the movement of a cold air mass over a warmer sea surface?

If the smoke from the funnel does not rise, but lays horizontally, what atmospheric conditions are indicated?

What is the "Bermuda high"?

What causes the fog frequently encountered off the grand banks of Newfoundland?

How can a ridge of high mountains give rise to a depression?

What is a central area of high pressure called and in what direction do winds circulate around it in both the Northern and Southern Hemispheres?

What is a line called which connects all points on a weather chart that have the same reading of the barometer?

What is the relation between wind direction and the direction of the isobars on a weather chart?

Draw a sketch of the earth showing the location of high and low pressure belts and the general wind systems.

What is the normal barometric pressure at sea level?

Where can detailed information about ocean winds and currents be obtained?

How do you determine the reliability of the ship's barometer, whether mercurial or aneroid?

State how Buys-Ballot's law is used at sea in order to determine the approximate bearing of a storm center.

What is the dew point of the atmosphere and how is it determined?

What is the distinction between tide and current?

Hove to in advance of a tropical cyclonic storm, in what position would a vessel be with respect to the track followed by the storm center if:

(a) The wind veered;

(b) The wind backed;

(c) The wind remained steady in direction and increased in force?

What are the dangerous and navigable semicircles of a tropical revolving storm in the Northern Hemisphere?

What are the indications of the approach of revolving storms?

What is a Warm Front?

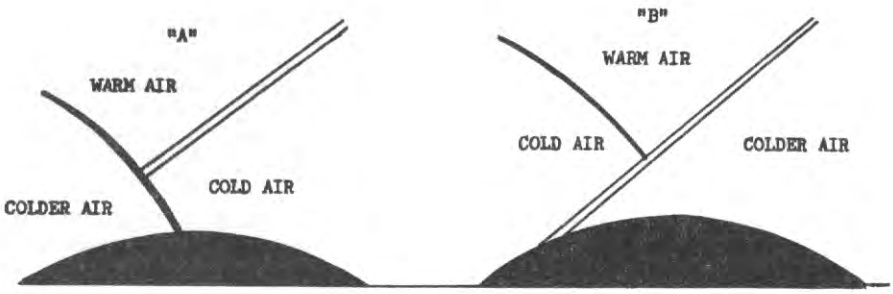
What does the size of waves depend upon?

What are the two reliable signs of field ice?

Sketched below are vertical cross sections through two types of frontal systems.

(a) What are fronts called when the warm air is aloft?

(b) What type of such a front is "A" and what type is "B"?



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20. NAUTICAL ASTRONOMY AND NAVIGATION DEFINITIONS.

What is:

1. Vernal equinox?
2. Conversion angle?
3. Hour circle?
4. Logarithm?
5. Nautical twilight?
6. Time signal?
7. Occultation?
8. Solstice?
9. Meridional parts?
10. Prime meridian?
11. Greenwich apparent time?
12. Greenwich mean time?
13. Sidereal hour angle?
14. Apparent time?
15. Polar distance?
16. Amplitude?
17. Diurnal circle?
18. Sidereal day?
19. Circle of equal altitude?
20. Parallel of altitude?
21. Most probable position?
22. Greenwich sidereal time?

Define the term "magnitude" as it is employed in nautical astronomy.

What is meant when two celestial bodies are said to be in:

(a) Conjunction;
(b) Opposition?

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22. SIGNALLING BY INTERNATIONAL CODE FLAGS, FLASHING LIGHT; LIFESAVING, STORM AND SPECIAL SIGNALS.

What would be indicated by a black or green signal seen floating in the air from a parachute about 300 feet above the water?

State the meaning of the following hoist in International Code Flag Signalling:

(a)	(b)	(c)
Answering pennant	X	T
E	2	1
	1st repeater	1st repeater
	0	0
		3rd repeater

When signalling by International Code Flags and using the code flags or answering pennants to indicate a decimal point, is the code flag included in determining which repeater or substitute is to be used?

In sending a message to a vessel by Morse Code using flashing light, how would you indicate that the message would be coded from the International Code of Signals?

Describe how the International Code flags are used to signal the position of the ship expressed in terms of latitude and longitude.

Name the component parts of a Morse Code message.

Show exactly how you would signal the following times, using the International Code flags:

(a) Five minutes past midnight.
(b) Six-forty-five p.m.
(c) Ten o'clock a.m.
(d) Ten o'clock p.m.

What signal, that may be transmitted by flashing light, is provided by the International Rules of the Road to indicate that a vessel is in distress and requires assistance from other vessels or from the shore?

When a vessel in distress in International Waters requires assistance from the shore, what signals are provided by the International Rules of the Road for her to use?

What is indicated by an aircraft circling a vessel at least once, then crossing the bow close at a low altitude opening and closing the throttle or changing the pitch of the propellers, and then flying away on a particular bearing?

Describe the procedure for calling another vessel, or vessels, using the International Code flags.

Describe the procedure for answering flag signals.

Describe the correct use of the erase sign and show how the erase sign is made in signalling by flashing light.

For what purpose is the model verb "to glean" printed in all of its forms in the text of the International Code of Signals?

What is the lifesaving signal indicating, "landing here highly dangerous"?

How would you transmit the following procedure signals and signs in signalling by blinker light:

(a) Space sign;
(b) "Everything which follows in this message is to be repeated back word by word, as soon as received;"
(c) Ending sign;
(d) From;
(e) "You are correct"?

How do you complete a signal using flags?

What are the meanings of the flag letters, "D," "E," "F," "G" when flown as single letter signals?

How would you signal the following message by International Code Flags? "Bearing 45 miles 90° true from Diamond Head, Hawaii." (The hoist for Diamond Head AEWN).

In signalling by blinker light, what is the sign for end of message and how is it answered?

How many flags are in an International Code Flag hoist used between a vessel towing and the vessel she is towing? How are towing signals made at night?

What is the meaning of the letter "W" when sent by the receiving ship during a communication by blinker light?

In signalling by International Code Flags, what is the significance of signals consisting of:

(a) Single-letter signals;
(b) Two-letter signals;
(c) Three-letter signals;
(d) Four-letter signals?

Four-letter signals beginning with the letter "A" are used for what type signals?

How are the code flags used to signal the chronometer time?

Explain the use of amplifying phrases in International Code Signalling.

How would you acknowledge the receipt of a code group in a coded message sent you by blinker light?

If at sea you sighted an international orange buoy about three feet in diameter, what action should you take?

What is the space sign used in signalling by Morse Code and for what purposes is it used?

What is the meaning of the answering pennant over "G" in International Code Flag Signalling?

What is the break sign in blinker signalling?

How would you call a pilot by blinker light at night?

In sending a message by flashing light, how would you request the receiving ship to repeat back, word for word, the message?

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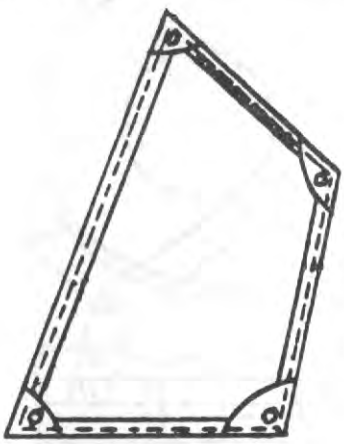
24. SEAMANSHIP.

Make a rough sketch of the standing lug lifeboat sail as shown; name the edges, and corners, and describe briefly its construction.



In anchoring a vessel in fog, how might you determine the vessel's way through the water in order to have the vessel dead in the water or with minimum way on her when the anchor is dropped?

What precaution, with respect to way of the vessel, is necessary in anchoring in a strong current or tidal stream?

In picking up the anchor, what information must the Mate on the foc'sle head relay to the bridge in order that the engines may be used to minimize the stress on the windlass and chain?

What is the purpose of the stream and kedge anchors, that are carried by sea going vessels?

Describe in detail how merchant ships prevent water from entering the chain locker.

In addition to flooding the chain locker, what damage may be caused a vessel by taking water through the chain pipes?

You are standing by the anchor windlass on the foc'sle head of a vessel proceeding in a channel. You receive an order to drop the anchor because the vessel has taken a sudden sheer toward another vessel or the shore. Describe how you would handle the anchor.

How would you embark passengers into a lifeboat when abandoning a vessel in rough weather?

What test is required by the Regulations each year where practicable in order to test the strength and efficiency of lifeboats and the gear for lowering them?

Where a lifeboat may be damaged in lowering by projecting obstructions or contact with the hull due to list, what provisions must be made to facilitate launching if the boat is 15 feet or more above the water when the vessel is light?

Name the anchors carried by a seagoing vessel.

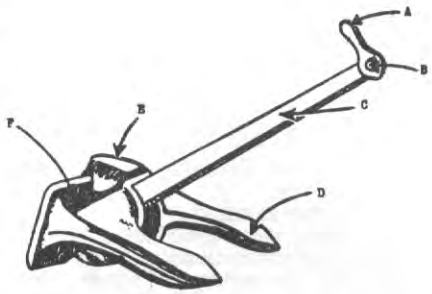
How is the required number and weight of anchors for a vessel determined?

Shown below is a sketch of a brake band assembly and compressor for a typical windlass.

(a) Describe the care and inspection you would make in seeing that this equipment is in good condition for its service.

(b) The steel bar "B," angled up into the central groove of the wildcat, has what function?

Name the parts indicated on the anchor sketched.



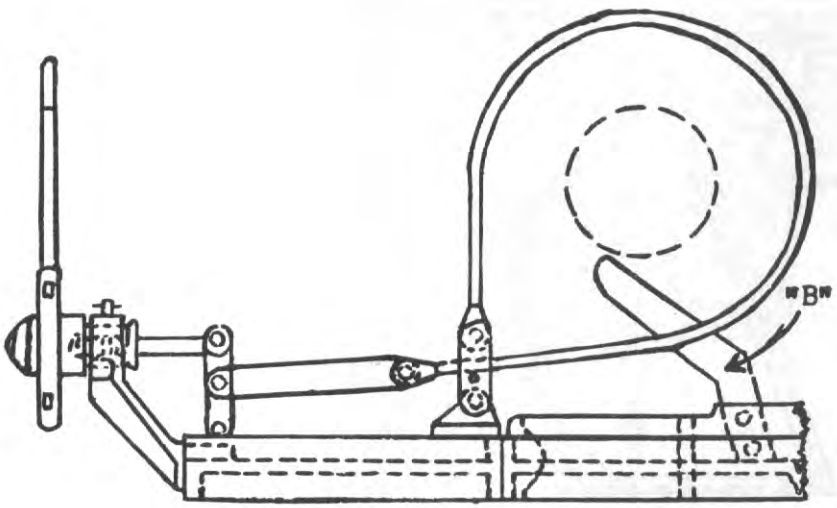
Describe the methods that may be employed to move an anchored vessel to avoid striking, or being struck by other vessels while swinging in a tide or wind shift.

With the wind and tide in opposite directions, what factors will determine the manner in which a vessel will ride to her anchor?

Describe briefly how a sailing vessel is able to sail in the direction from which the wind is blowing.

What equipment for sewing canvas is required in a lifeboat?

What is the purpose of canvas covers on lifeboat winches?



What color is required for lifeboat sails?

What care should be given canvas aboard ships?

How many tarpaulins are required for hatches of a merchant vessel in ocean service?

What is the minimum grade of material required for tarpaulins?

Where the shell of a lifeboat is liable to damage, wear, or corrosion from contact with chocks, how is the boat fitted to keep the possibility of such damage to a minimum?

Where the shell of a lifeboat is liable to damage, wear, or corrosion from contact with chocks, what maintenance care should be taken by the officers and crew of the vessel?

What protection is afforded aboard ships against flooding of compartments by water backing through scuppers, tank overflows, sanitary discharges, etc., below the freeboard deck?

What are the dangers that may be created by vent or sounding lines from a double bottom tank being damaged below the deck of a vessel in cargo holds or other spaces?

What precautions must be taken to avoid harbor pollution when taking fuel oil or petroleum cargoes?

Where vessels are fitted with cowl type ventilators, what means must be provided for closing them in the event of storm or fire?

What is the importance of freeing ports on a vessel with solid bulwarks operating in a heavy sea?

What speed must a fully loaded motor lifeboat be capable of attaining?

What quantity of fuel is required to be carried in a motor lifeboat?

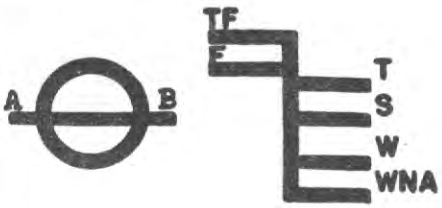
In shifting a vessel forward on a pier as illustrated, would off-shore headline "A," inshore headline "B," or inshore headline "C" provide the greatest pulling effect? Why?

Referring to the sketch:

(a) What is the name and purpose of the figure illustrated?

(b) Explain the meaning of the various lines and letters.

(c) How is the marking placed on vessels?



What is the required length of life boat falls?

If for any reason the boat falls were too short to enable a lifeboat to be lowered into the water, what might be done?

Are provision and special equipment lockers of a lifeboat required to be watertight?

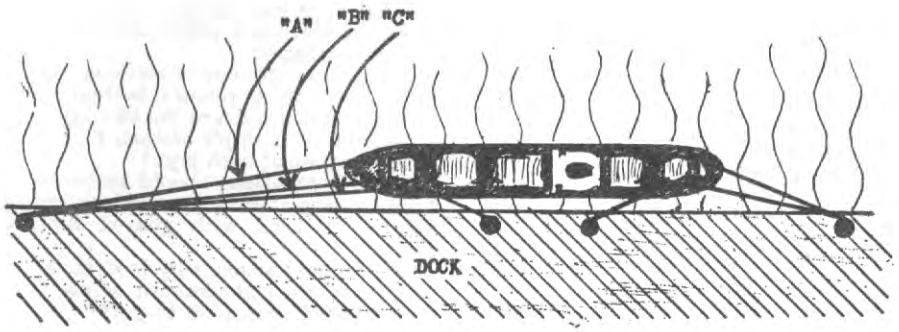
What color should running light screens be painted?

Describe the use of tricing lines on lifeboats suspended from gravity davits when the boat is swung into the embarkation deck for passengers to get into it. State why the frapping lines should be passed before releasing the tricing line pelican hooks.

When the vessel is moored to two anchors, does she require the same amount of cable on each of the two anchors as when laying to one anchor?

How are lifeboats required to be numbered and marked?

What is the purpose of the footings in a lifeboat?



Describe briefly the operation of an electro-hydraulic steering apparatus and the type of hand-operated emergency steering gear that may be provided with it.

If you were in charge of a lifeboat:

(a) How would you prevent it from swinging as the vessel rolled when the boat is at the embarkation deck?

(b) How would you prevent it from swaying if the ship is pitching?

Describe how a lifeboat should approach a wrecked vessel in rough weather to save passengers and crew and then return to her own vessel.

When moored to two anchors, how is a foul hawse prevented?

What scope of chain is used under normal conditions in anchoring?

What anchor is normally used in anchoring?

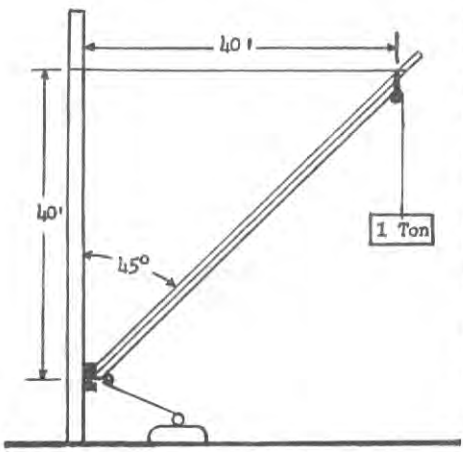
What precautions to avoid pollution of coastal waters should be taken by a vessel pumping bilges, ballast, or oil overboard at sea?

What precaution must be observed when taking on water ballast to avoid danger of oil pollution, cargo damage, and structural damage to the vessel?

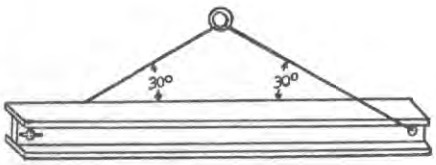
In the sketch shown:

(a) What is the tension on a topping lift when the height of the kingpost above the boom gooseneck is 40 feet, the length of the topping lift span is 40 feet, and the boom forms an angle of 45° with the kingpost?

(b) What is the thrust on the boom in the sketch when the weight of 1 ton is being lifted? Consider loss of efficiency due to friction as 10 percent at each block.



A beam weighing one ton is to be lifted by a bridle sling, each leg of which forms an angle with the beam of 30° as shown in the sketch below. What is the stress on each leg of the sling, when the weight of the beam is suspended from the sling?



What is the minimum number of tucks in an acceptable thimble or loop splice in wire rope for use on cargo gear?

What precaution must be taken in splicing nylon or other plastic type rope with a slippery surface and high elasticity?

A weight of 3 tons must be lifted using one-half inch diameter wire rope with a breaking strength of 9.4 tons. A factor of safety of 5 is required.

(a) Will doubling up the gear, that is, using a single sheave moving block, provide the necessary factor of safety, considering friction loss as 10 percent per sheave for each of two sheaves?

(b) What strength must the shackle for the upper block have, using a safety factor of 5?

A vessel is loading cargo in a forward hold when it is noticed that the pipe running along the bilge to the forepeak is leaking water badly. The forepeak tank is full of water. What would you do to prevent damage to the cargo?

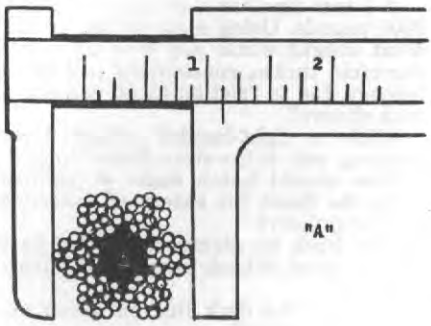
What care should be given mooring lines when ice and snow conditions are encountered?

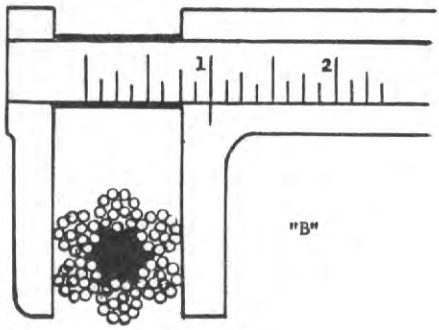
What caution should be observed when navigating a power-driven vessel in shallow water?

What are the two functions which paint used on a vessel's bottom must perform; i.e., what are the two types of paint used on a ship's bottom, and what is the purpose of each type?

What precautions should be borne in mind by ship officers when maneuvering vessels powered with geared turbine drive?

In a limited space, why is it easier to turn a single right-handed screw ship to starboard than it is to port?





Would you measure wire rope as "A" or "B" in the sketch?

What minimum factor of safety should be used with wire rope?

Is the steering effect of a right handed propeller greater going ahead or astern? Why?

Describe the instructions required to be posted in the steering engine room.

Describe briefly the purpose of a main steam condenser, and the consideration that a deck officer may be obliged to give it.

Why do ships yaw badly in a following sea?

What methods are available to reduce yawing?

Describe the effect of wind on the steering and heading of a vessel underway.

What is the most likely damage that may occur to an ordinary merchant vessel when operating in floe-ice, or in areas where large logs or floating objects of like nature may be encountered?

In the sketch below the seamen are testing a rope to assure its safe working load. Each seaman exerts a force of 100 pounds. Is the stress on the line greater in case "A" or case "B"? Explain your answer, stating the total stress on the line in each case.

What is the purpose of loadlines on vessels?

How do you measure freeboard?

When must the steering gear be tested by a licensed officer?

Describe the devices used for the measuring of ullages.

How should guys be positioned for maximum efficiency in securing a boom?

How often must motors in motor-propelled lifeboats be operated?

What equipment must be provided on gasoline powered lifeboat motors to prevent fire caused by carburetor backfire, or danger because of gasoline dripping into the bilge?

How are motor-lifeboat gasoline tanks vented, i.e. what means are provided to prevent the gasoline becoming "air-bound" in the tanks and not flowing to the fuel lines?

Describe briefly the use of steam turbines as main propulsion units and the methods of connecting the engine to the shaft.

What precautions should be taken in order to prevent kinking when using manila mooring lines on a windlass gypsy-head or a capstan?

What is the purpose of the brake fitted on the steering gear of some vessels?

(A)

(B)

In what length of time should the steering engine be capable of putting the rudder hard over from one side to hard over to the other side?

Describe the factors affecting the steering effect of a right handed screw propeller, when going ahead.

What measures could you take to prevent a vessel pounding heavily in a head sea?

Approaching a dock starboard side to, in a right-hand single screw steamer with moderate headway, what precautions should be taken, before backing, in order to prevent the bow from swinging in toward the dock when the engine is reversed?

Can the guys of a boom be so positioned that they need not be slacked off or hove in when raising or lowering the boom?

Describe the method of rigging booms where two topping lifts are employed to eliminate guys.

What is the proper method of placing cable clamps on wire rope? Would you place the nuts used to fasten the "U" bolts all on the same part of the rope, or would you stagger the clamps alternately?

How would you turn the stern quickly to port in a twin-screw vessel with sternway and both engines going full astern?

In making a "hydro" report on the sighting of a derelict, what information would you endeavor to include?

If a guy is rigged as shown in the sketch, what is the effect?

A 3 inch line has a breaking stress of 9000 pounds. Using a safety factor of 5, what weight would you pick up with a threefold tackle, considering loss of efficiency due to friction as 10 percent at each sheave?

With a right-handed single screw backing, why is the stern forced to port?

How should hatch beam or pontoon slings be fitted for safety of personnel handling them?

If a hook be straightened out, is it safe to bend it back and then return it to use?

What is the deck line on ocean and coastwise vessels?

NOTE: This question refers to the loadline markings of a vessel.

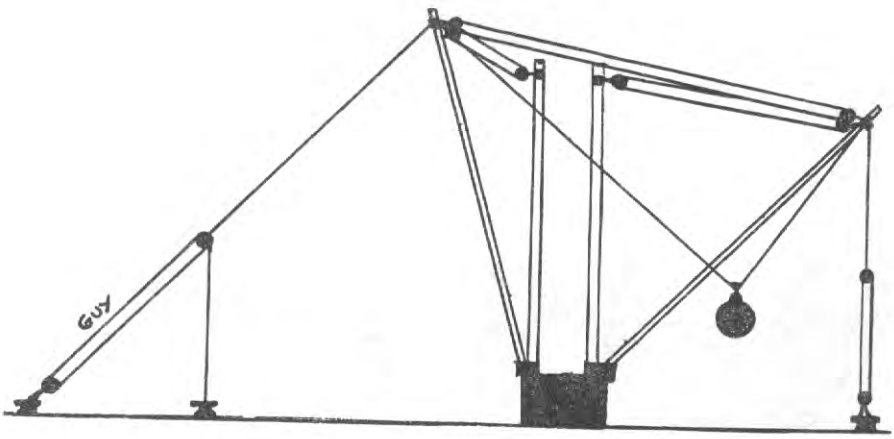
What is the maximum weight per draft permitted when loading explosives in accordance with the Regulations?

Does a knot in a manila line increase or reduce the breaking strength of the line?

Using the rule of thumb $B = \frac{C^2}{2.5}$, where "B" is the breaking stress in tons and "C" is the circumference, determine the breaking stress of a 3-inch manila line.

Using the rule of thumb formula $B = \frac{C^2}{2.5}$, where "B" is the breaking stress in tons and "C" is the circumference, find the size of manila rope to use to lift a 1-ton weight, when a factor of safety of 7 is required.

What is the required factor of safety for lifeboat falls?

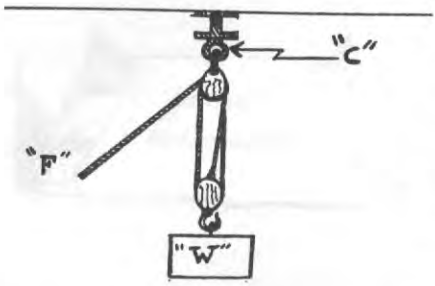


If a force of 50 pounds is applied at point "F" of the luff tackle shown:

(a) What is the weight that may be lifted at "W," allowing 10 percent friction loss at each sheave?

(b) If "W" is lifted one foot, how far must the line at "F" be pulled?

(c) What stress is put on the padeye at point "C" when lifting "W"?



A manufacturer states that the breaking strength of his 3-inch circumference manila rope is 9,000 pounds. If you use this rope as a single whip cargo fall, what is the safe working load, using a factor of safety of 7?

On merchant vessels when using booms to handle heavy weights or delicate objects, how do you reduce dynamic stresses; that is, stresses due to change of velocity of the load, such as taking up fast on a load at rest, increasing speed of hoisting, or suddenly stopping?

Why is the hauling part of a heavy lift purchase usually led to the mast rather than directly to the winch?

When is the tension of a topping lift at a maximum; i.e. at what angles with the mast is the heaviest stress put on the topping lift due to the weight of the boom and any weight being lifted?

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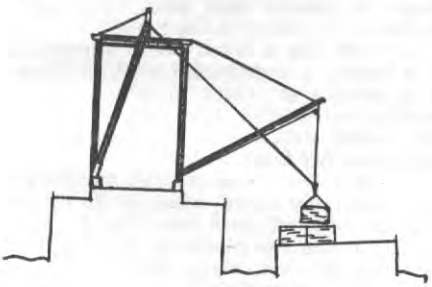
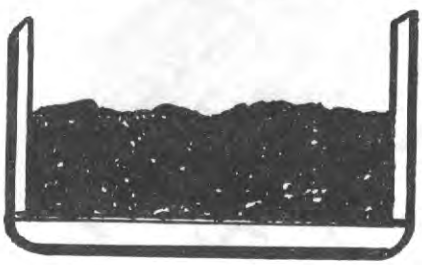
25. CARGO STOWAGE AND HANDLING.

In discharging cargo into a lighter as shown, with only a small amount of drift on the boom, what care is necessary?



If 2,000 tons of iron ore with a stowage factor of 15 is stowed in a cargo hold of rectangular shape whose bottom is 50 feet long and 45 feet wide, what is the height of the center of gravity of the ore above the bottom of the hold?



What type of tools should be used for opening and closing oil tank hatch covers?

At what pressure should the oil discharge piping of tank vessels be tested?

You are required to load wet logs in No. 4 lower hold and cases of canned goods in No. 4 'tween decks. What precaution would you exercise to avoid sweat damage to the canned goods?

Describe the stowage of cement and the precautions necessary for protection of other cargo in the same hold with cement.

Define:

(a) Explosive range.
(b) Fire point.
(c) Flash point.

Describe briefly how the amount of water below the oil in an oil tank may be determined.

Define:

(a) Inflammable liquid.
(b) Combustible liquid.

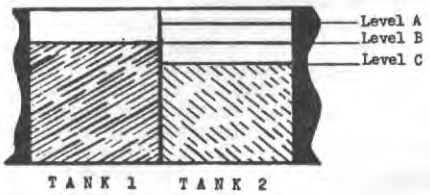
What precautions must be observed in the choice of wood for use as dunnage?

Describe the methods employed in the shipment of wet hides and the precautions necessary for good cargo turnout.

Describe the precautions necessary in the stowage of essential oils.

NOTE: "Essential Oils" is a term used to describe such oils as almond, attar of roses, clove, wintergreen, lavender, etc., which are used in perfumery and cooking.

In loading adjacent tanks with dissimilar products; would you top off your second tank at level "A," "B" or "C"? Why?



How many gallons are there in a United States barrel?

Prior to loading Grades "A," "B," or "C" cargoes, what precautions are necessary with respect to boiler and galley fires?

With respect to the danger of fire and explosion of liquid petroleum cargoes, why are greater precautions usually necessary when loading than when discharging?

A locomotive weighing 32 tons is stowed on its 4 wheels, each of which has an area of one foot resting on the deck.

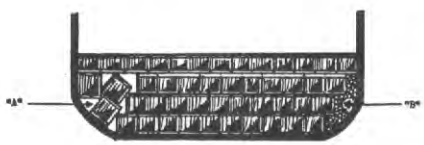
(a) What is the load per square foot on the deck if the locomotive's weight is equally distributed on the 4 wheels?

(b) If the deck capacity is 400 pounds per square foot, how could the weight be distributed?

What protection against fire is necessary where cowl deck ventilators feed directly into a magazine or a hold in which explosives are stowed?

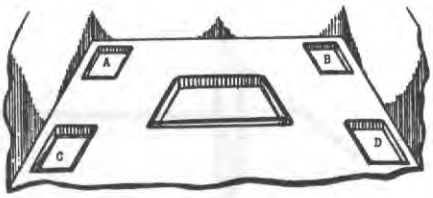
On vessels carrying mail, is it permissible to break bulk prior to discharging of the mail in ports of the United States?

Would you consider the stowage of boxed cargo better at "A," making use of all possible space, or at "B" where the successive tiers are kept level? State your reason.



A vessel preparing to load grain has four small hatches installed as sketched at "A," "B," "C" and "D" in her 'tween deck. What is their purpose?

When a hold is completely filled with loose grain in bulk, what quantity must be contained in feeders for that hold?



How many long tons are there in 100 metric tons if a metric ton is .98421 long tons?

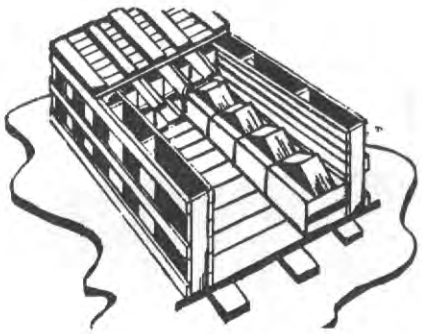
Explain what is meant by optional cargo and state the care necessary in the stowage of such cargo.

When trimmers are employed on bulk cargoes, what precautions should be taken to insure that none have been walled off by cargo in the hold?

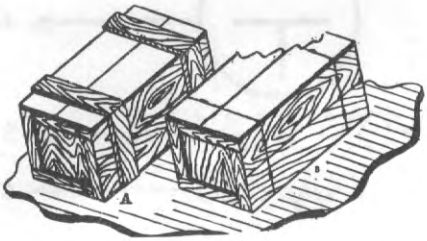
A vessel has a fresh water allowance of 8 inches. A hydrometer reading taken in a sample of water in which she is loading reads 1015. How far below her salt water draft may she load due to allowance for fresh water?

In stowing carboys of acid, which are not completely boxed, what is the maximum number of tiers permitted?

Why is the top planking of bins constructed for deck cargo required to be of sturdy construction?



You are required to supervise the stowage of two consignments of butter contained in cases as sketched. Describe the difference in the manner of stowage required for each lot.



Your reading of a combustible gas indicator showed that less than 0.1 percent petroleum vapor was present in a tank that had been used for sour crude (containing hydrogen sulfide, H_2S). Would you consider the tank safe as far as toxicity and explosibility are concerned?

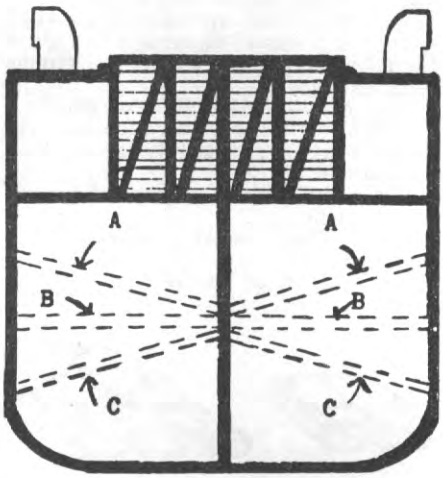
Describe the hazards that may be involved when working in tanks that have carried gasoline having a tetraethyl lead content.

Where shifting boards are rigged for a grain cargo:

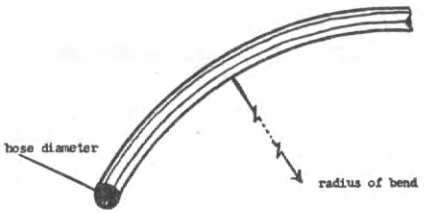
(a) Would you regard wooden shores "A," "B," or "C" as most efficient?

(b) Why?

(c) What compensation is made for inefficient positioning of shores?



An oil hose has an inside diameter of 8 inches. What is the minimum radius to which the hose should be bent?



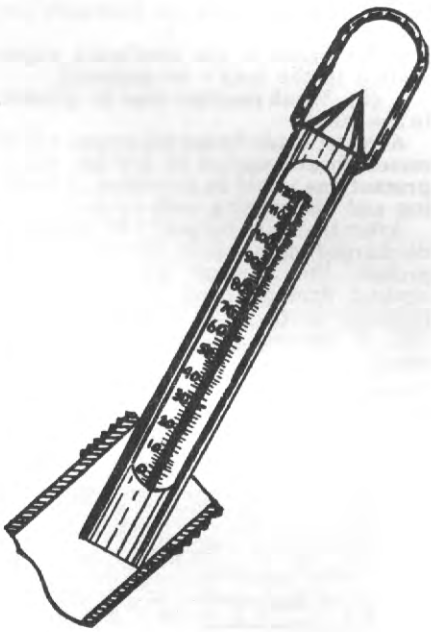
When gas-freeing a tank vessel, what precaution must be taken with respect to vent lines, heating coils, steam smothering lines, and loading and discharge piping?

When a centrifugal pump is operating with a suction lift:

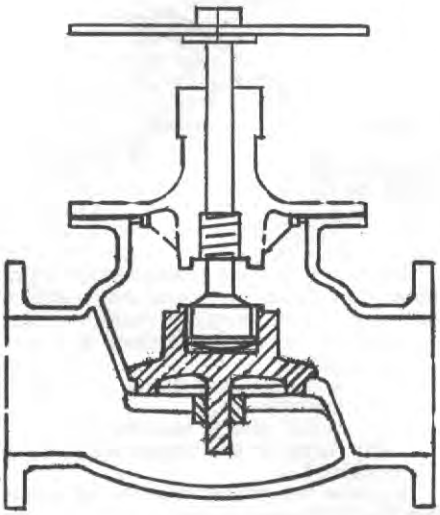
(a) what care is necessary?

(b) What is the maximum suction lift possible?

Describe the proper manner of reading the thermometer shown, when determining the temperature of a liquid cargo.



Why is a stop-check valve such as that sketched required to be fitted on a pump room bilge suction when the bilges are pumped by the cargo pumps or cargo stripping pump?



What means are required to evacuate the oil from a flooded pump room?

When a vessel has a gas-free certificate reading "safe for men-safe for hot work":

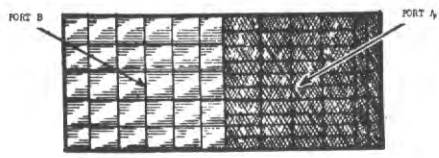
(a) What is the maximum vapor content in the tank's atmosphere?

(b) What residues may be present in the tank?

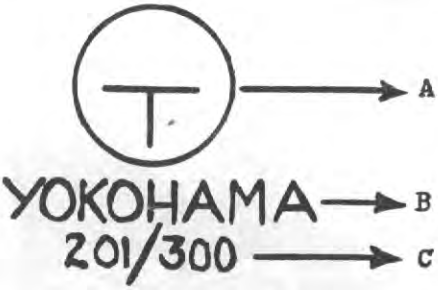
A vessel loads frozen ice cream which comes aboard packed in dry ice. What precautions would be necessary in stowing and discharging such cargo?

After the bales for port "A" had been discharged at that port, how would you protect the cartons for port "B" against damage from the rolling or pitching of the ship enroute to port "B", if shoring material was not at hand?

NOTE: The separation between "A" and "B" is thwartship.



If a case is marked as sketched, what is the meaning of "A," "B," and "C"?



What are the three necessary conditions that must be maintained in a refrigerated compartment in order to have good cargo turnout?

What are the duties of the senior deck officer during oil transfer operations?

Why is it important that the ventilation ducts in pump rooms extend below any floor plates so that air is circulated through the lowest part of the pump room?

A vessel is fitted with insulating mats which enable her to make a refrigerated space in the square of a 'tween deck whose wings and ends are refrigerated. In using such mats, would you consider the tightness of the bottom mats or the top mats of the space as being more important?

What inspection is required prior to making repairs involving riveting, welding, burning, etc., on a tank vessel?

What provisions are made in the bilge system of a vessel to protect the pipes from becoming clogged or the pumps being damaged?

How can the possibility of clogging the bilge suction be reduced when carrying granular cargo such as grain, coal, rock ballast, etc?

In supervising the stowage of bagged cargo in a hold:

(a) When would you stack the bags as in "A"?

(b) When as in "B"?