PROCEEDINGS OF THE
MERCHANT MARINE COUNCIL
UNITED STATES COAST GUARD

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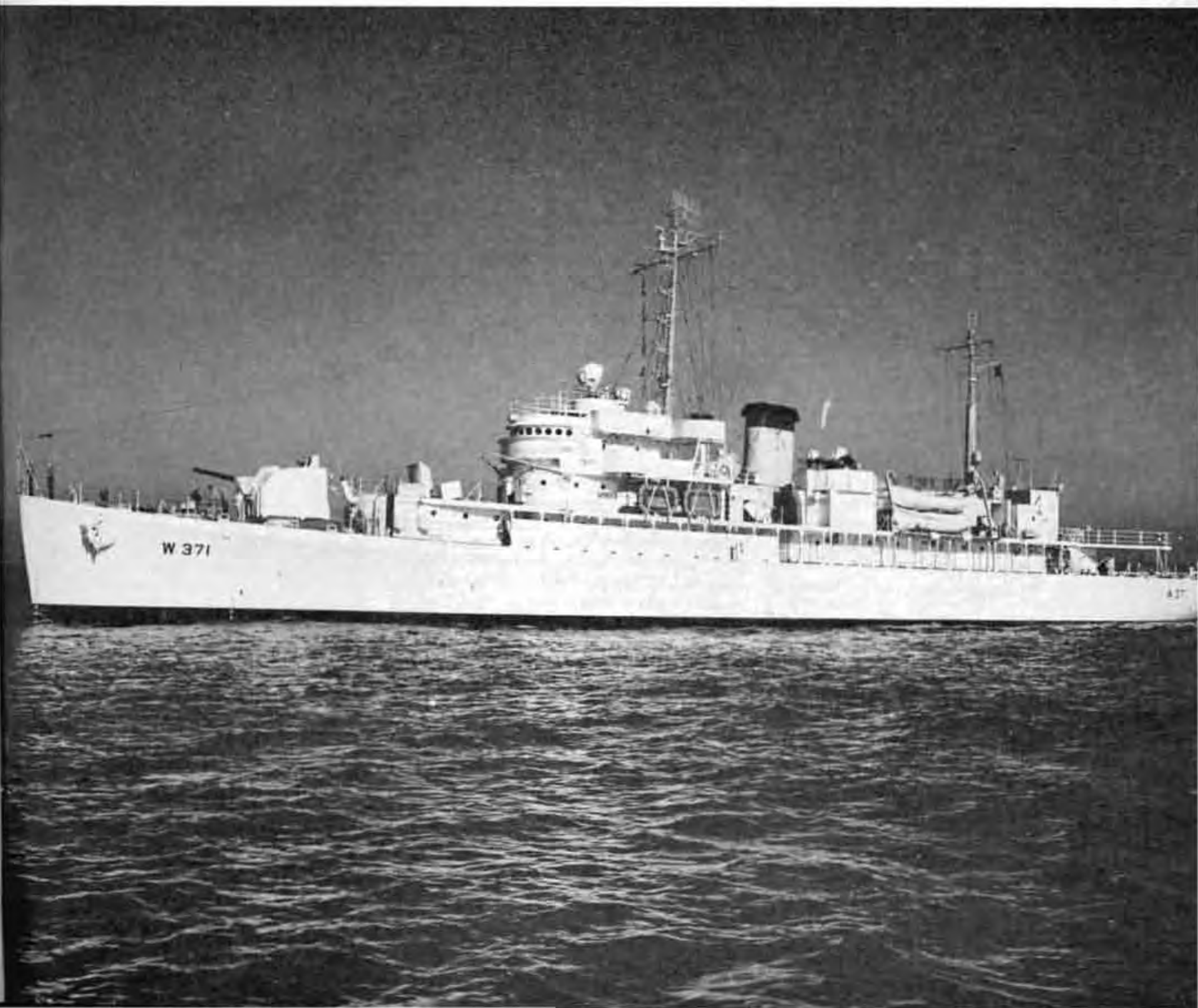

Proceedings of the

MERCHANT MARINE COUNCIL

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The
Merchant Marine Council
of the United States
Coast Guard

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Cover Picture: U. S. C. G. C. *Mackinac* (WAVP 371), recently converted for use as an ocean weather station vessel by the U. S. Coast Guard, is a former Navy Small Seaplane tender. She was built by the Navy in 1942, converted for Coast Guard use at Coast Guard Yard, Curtis Bay, Md., in April 1949, and commissioned in June 1949. *Official Coast Guard Photo.*

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RADAR AND THE RULES OF THE ROAD

Radar is a modern application of a simple and well-known scientific phenomenon, namely, that electro-magnetic waves are capable of being reflected by solid objects.

James Clark Maxwell, a Scot, living in the middle of the nineteenth century and probably the best mathematical physicist since Newton, wrote a series of scientific papers at about the time of the American Civil War putting into mathematical form the empirical data of Michael Faraday on electric and magnetic fields. This series of papers gave to the world of science the electro-magnetic theory of light. This theory also predicted the existence of the then unknown radio waves. But it remained for the German physicist Hertz in 1887, or thereabouts, to verify the existence of radio waves and to discover that these waves would be reflected by solid objects. This property of the reflection of electro-magnetic waves remained a laboratory curiosity for years.

At about a decade prior to World War I a German engineer was granted a patent in several countries on a proposed way of using this property as a detector of objects and as a navigational aid for ships, but nothing seems to have come of it.

In 1922 two American naval scientists working on plane-to-ground communications at the Naval Aircraft Radio Laboratories, Anacostia, D. C., made the accidental discovery that the wave pattern on their oscilloscope was distorted by fluctuations caused by the reflection of moving vessels on the Potomac River. This discovery gave new impetus to the old problem of a practical use for the reflection of radio waves. The U. S. Naval Research Laboratories continued to work on this problem, and as a result of diligent effort a rather crude form of radar was successfully tested aboard the U. S. S. *Leary* in 1937 (about the time of the Munich Agreement). In 1939, the same year that Hitler's horde marched into Poland, a greatly improved form of radar was given extensive sea trials aboard the U. S. S. *New York*.

The worsening of the world situation accelerated the scientific and industrial development of this scientific marvel which was to be an adjunct to our war machine and which was to become the silent sentinel of the sky and the alert watch upon the sea.

As heretofore stated, the basic scientific principle of radar is that radio waves are capable of being reflected by solid objects.

By Francis X. J. Coughlin, Hearing Examiner, United States Coast Guard. A Paper delivered before a meeting of The Maritime Association on April 18, 1950, in New York, N. Y.

For purposes of this discussion this evening we must accept four propositions as postulates.

First. Radar employs radio waves of high frequency and short wave length, known as microwaves.

Second. Microwaves travel through the air with the speed of light, which is about 186,000 miles a second.

Third. Microwaves, like light waves, are propagated in a straight line and hence can be beamed in a manner similar to the way a searchlight is beamed or the headlight on your automobile.

Fourth. These waves are reflected from any discontinuity in the medium through which they are transmitted hence solid objects such as vessels, aircraft, and geographical land masses cause the radio waves to be reflected.

We are familiar with the elementary mathematical formula that velocity multiplied by time equals the distance traversed, so that an aeroplane with the velocity of 100 miles per hour traveling in a straight line for 2 hours will be 200 miles from its starting point at the end of 2 hours. This formula has been "built into" the radar, for that instrument measures distance as a function of time since the velocity of microwaves is constant.

The heart of the radar set then is the device that measures the time difference between the time of the emission of a packet of microwaves and the time of the reception of their reflected "echo" from the "mirror" object. One-half of that elapsed time interval multiplied by the speed of light (186,000 miles per second) equals the distance from the radar vessel to the "mirror" object.

In proceeding with the recitation of the history of the development of radar, I invite your attention to the British contribution. The British scientists working independently of the Americans had succeeded in developing the magnetron tube. This is the device that puts the "punch" in the radar pulse. Without it, or a comparable device, the reflected "echo" would be so weak as to be valueless for practical application to navigation. The reflected "echo" retains only a small amount of the energy of the original radar pulse. The magnetron by packing the original radar pulse with energy had the effect of boosting the energy in the "echo," thus making the use of the reflected radio wave practical. The development of this tube was one of the major achievements of the radar technicians. The British then made this tube available to the Americans, thereby accelerating the development of practical radar by some 2 years.

The problem of how to present radar information in a manner most suitable to the marine navigator was solved by experiment. A plan position indicator scope was considered the most advantageous and desirable way of presenting the information from a mariner's point of view. The distance from the center of the scope to the outer edge represents the range from the radar to the radar horizon and this range may be set to suit the individual needs of the user, depending upon the areas in which he will operate and to suit his navigational need. The size of the PPI scope will to some extent govern the range scales that are used. The size of the scope, however, is essentially a matter of individual preference.

Before considering the information presented on the PPI scope it is advantageous to appreciate a property of radar that is called RESOLUTION. If the RESOLUTION is good then the PPI picture is clear, sharply defined and gives definite "pips" (or as the English call them "paints") of the "mirror" object. If the RESOLUTION is poor the "pips" tend under some circumstances to blend together and have a blurred and fuzzy appearance. In a PPI scope presentation type radar the RESOLUTION has two components.

First. RANGE RESOLUTION, which is the ability of the instrument to distinguish between two "mirror" objects on the same bearing and closely spaced in range.

Second. BEARING RESOLUTION; which is the ability of the instrument to distinguish between two "mirror" objects at the same range and on slightly different bearings.

The United States Coast Guard at the International Meeting on Marine Radio Aids to Navigation held in the United States April 28–May 9, 1947, made certain recommendations concerning the minimal performance of both the 3- and the 10-centimeter radar. Briefly the advisory minimum specifications required by the Coast Guard for the 3-centimeter marine radar is that the RANGE RESOLUTION be at least 100 yards and the BEARING RESOLUTION 2° on the shortest sweep scale; while in the 10-centimeter marine radar the RANGE RESOLUTION should be 100 yards and the BEARING RESOLUTION at least 4° on the shortest sweep scale. This means that the 3-centimeter radar should be able to discriminate between two objects at about 100 yards with a difference of 2° in azimuth and the 10-centimeter radar be able to discriminate two objects 4° in azimuth at the same range. Since RANGE and BEARING RESOLUTION is an inherent limitation within certain degrees of azimuth and distance it is therefore necessary that a "close shaving" be avoided.

Now, let's look at the PPI scope. The observation of that scope at any instant will show the range and bearing of the "mirror" objects in the vicinity. Several successive observations of the radar scope, noting the time range and bearing of the several observations, will disclose whether "mirror" objects are moving or stationary. If it is determined that the object is moving it is imperative to remember that the motion indicated on the scope is relative motion; it is not the absolute movement of the object under observation. Rather, it is the combination of the motion of the radar vessel and the "mirror" object.

One means of translating the range and bearing of the same object observed at several different times on the radar scope is to plot its various positions on a maneuvering board. Since the radar-equipped vessel, which is observing the "mirror" vessel, is to be considered always the center of the scope, then in using a polar coordinate maneuvering board the radar vessel, for plotting purposes, is considered to be at the center of the maneuvering board. If a line of appropriate length is drawn to indicate the speed along a particular bearing indicating the course of the radar vessel, we may now begin to solve the radar problem that is met in navigation. Several observations of an object appearing on the radar scope are made and the time of each observation noted. The observation with its time, range, and bearing may be plotted on the maneuvering board and then by means of solving the vector triangle the course and speed of the "mirror" vessel can be ascertained. With this information, even on occasions of reduced visibility, the seasoned navigator will be able to initiate the appropriate maneuver that may be required by the situation. However, a further use of the maneuvering board plot, once the course and speed of the "mirror" vessel is ascertained, will enable the navigator to determine what course and speed his vessel should take in the event of a crossing or meeting situation so as to prevent the "mirror" vessel from approaching his vessel closer than 2, 3, or 4 miles, or whatever discreet distance the navigator may determine. The use of the maneuvering board for this purpose will take the guesswork out of the maneuver.

Of course, it must not be lost sight of that radar at its present stage of development has certain very definite limitations.

1. Objects appearing on the radar scope cannot be readily identified unless additional radar aids are used in conjunction with the radar. However, identification can quite often be accomplished by implications such as movement, relation to other objects, shapes such as coast lines, and sometimes the initial range of sighting.

2. The radar scope presents a radar chart which requires interpretation due to line-of-sight characteristics which give shadow effects. In other words, larger intervening objects may blank out or "mask" other objects behind them—in their radar shadow.

3. Radar can be used reliably for only slightly over line-of-sight distance.

4. Certain types of objects because of their characteristics or motion may go undetected; for example, small objects which give a low, small silhouette such as buoys or small wooden hulls which bob up and down in the seaway and give relatively poor reflections.

5. Sea return, which is the reflection caused by the wind blowing the sea or by rain storms may "mask" small, low lying objects.

Radar, however, has advantages as well as limitations and they may be listed briefly as:

1. Radar is the best anticollision device yet perfected.

2. It makes for greater safety while piloting or making a landfall during periods of low visibility.

3. It indicates continuous, instantaneous ranges and bearings of objects.

4. It presents a chart-like picture of the surroundings, the presentation being in the nature of a polar chart on the PPI presentation type scope.

5. By observation of the scope, movements of objects may be quickly ascertained.

Now, a few words concerning the application of this scientific marvel to navigation under the Rules of the Road, and particularly in fog. There were literally thousands of court interpretations of the Rules of the Road before the advent of radar but the introduction of that scientific marvel on shipboard has created a host of new problems which sooner or later will require legal interpretation. In 1890 when the International Conference first adopted the Rules of the Road, navigation was conducted by sight and sound and the Rules of the Road were framed accordingly. With the advent of radar a third element has been added to the picture which is comparable to the sense of touch. A man walking in the dark will stretch out his hand before him to be sure he does not walk into a door or a piece of furniture; or a blind man walking along the street with his cane tapping, not to attract attention but to be careful he does not fall from the curb or walk into the side of a building. Certainly as the man in the dark feels the door before him, or the blind man touches the wall or the curb with his cane, they cannot be said to have seen the obstruction, they have ascertained their presence by means of the sense of touch, and if we use the word "see" at all it is only by way of analogy. Now, this comparison of radar to a man in the dark or a blind man on the street is particularly true of a radar vessel that is enshrouded in fog for then the bearing and distance of a "mirror" object is determined in a way analogous to the way in which the blind man or the man in the dark determined the position of the door or the curb or the building. I invite your attention to the caution that is displayed by the blind man approaching the curb or the man in the dark walking toward the door and immediately becomes evident the necessity for the fog-enshrouded vessel to proceed with caution.

The fog-bound radar vessel must reduce speed or run the risk of almost certain condemnation in the event of the casualty. The exception to compliance with article 16 of the Rules of the Road in favor of the radar-equipped vessel has yet to be enunciated by either the court, the conference, or the legislature. The International Conference for the Safety of Life and Property at Sea held in London, England, from April 23 to June 10, 1948, when asked to modify the existing Rules of the Road to provide for radar vessels made the following recommendation: "The Conference while recognizing that the recent advance in radar and electronic navigational aids are of great service to shipping is of the opinion that the possession of such a device in no way relieves the master of a ship from his obligation strictly to observe the requirements laid down in the International Regulations for the Prevention of Collision at Sea and in particular the obligations contained in articles 15 and 16 of these regulations." The Conference further recommended that governments should call the attention of their masters and officers to this opinion.

That recommendation contains, of course, strictly speaking, nothing higher than an opinion. It is, however, the opinion of the Conference comprising experts nominated by some thirty nations of the world. It is an opinion which must, of course, command respect and is founded upon a state of knowledge of this subject in the year of 1948. It may, of course, be that with the development of knowledge the courts of the various countries may reach some decision in due course which will override this authoritative opinion stated in 1948 but such court decisions would be based upon the facts of the collision, and each of us here can only hope and pray that it is not hung on our foreheads that we be involved in collision cases upon which changes in the law as it now stands may be possibly based.

While there have been a respectable number of cases involving radar-equipped vessels only some five have been decided. The first was the *Barry-Medford* which probably stands for the rule that a vessel equipped with radar must use that instrument. Then the *Southport-Finnborg* case which was decided by an English court which probably stands for the proposition that a vessel using her radar is at fault if she fails to interpret correctly the information which it furnishes. The third and fourth cases are the *Sobieski* and the *Hindoo-Australian Star* cases, respectively, which hold that there is a duty owing from the escort to the escortee, and that the *Davila-U. S. S. Wilks* case which probably stands for the proposition that a vessel using her radar and relying upon it and acting in accordance with the information it furnishes is exonerated from blame if the maneuver initiated in reliance upon the information furnished by the radar was the correct maneuver if the information was accurate. It is interesting to note that in the *Finnborg-Southport* cases fog and excessive speed were additional elements. In the *Sobieski*, *Australian Star*, and *Wilks* cases wartime conditions of blackout were principle facts in the case.

I don't think it a hasty conclusion if I say that the master whose vessel is equipped with radar and who is making proper use of it is not likely to find himself in a collision but if his vessel does collide there is little chance of he or his vessel escaping liability. Therefore, I think the added caution should be made that the Rules of the Road are as applicable today to radar and non-radar-equipped vessels alike as they were before the discovery of this aid to navigation.

There are other and additional uses that radar as an aid to navigation is being put to. First, there is a system still under investigation on the Great Lakes, and particularly in the St. Mary's River Reach involving the use of fluorescent charts. These unique charts are constructed from composite photographs made of a standard ship's radar as it ran the St.

Mary's River Reach. This composite photograph was then printed as an overlay in fluorescent ink over a standard type navigational chart. This chart has the advantage of glowing under ultraviolet light and giving a picture such as appears on the radar scope so that a ready comparison between the picture on the scope and a section of the chart may be visually made. Another method of chart matching, and probably the simplest, is Virtual PPI Reflector Scope, which is referred to as VRP. The VRP is an optical device which fits over the PPI scope and the radar or radar repeater. Its principal elements are a set of reflecting mirrors, a chart holder, and a viewing hood. Looking in the viewing hood the navigator sees the chart which he has placed on the chart holder and superimposed on the chart he sees the virtual image of the PPI scope formed there by the reflecting mirrors. By moving the chart he can match the tracing of the short line with the virtual image of the PPI scope pattern. Of course, the shore he is comparing is a VRP chart, which is constructed of blanks made of translucent plastic coated with a black wax. The black wax coating may be cut easily by a tracing point and where cut light may pass. The preparation of this chart is simple but need not be gone into here, it need only to be mentioned to indicate that progress is being made along the line of varied application of radar information.

THE RESOLUTION OF RADAR IN SHIPPING

Probably no other instrument was ever received with greater optimism by the marine industry than radar. With all of the preceding contributions of science, nothing quite captured the imagination of the shipping world as much as did this instrument which could penetrate the gloom of fog and indicate the presence of danger. What condition experienced at sea can be more nerve wracking than fog? What ship master has not stood long vigil on the bridge at sea while his vessel proceeded through obscurity caused by weather conditions? Here was an instrument that could allay that feeling of uncertainty when proceeding through thick weather. Here was a thick weather collision preventer that would eliminate delay also. It is little wonder that radar is rapidly becoming standard equipment on merchant vessels.

The instrument has not, however, proved itself to be a "collision preventer" during fog. Naval vessels, as well as merchant vessels have been involved in collision during thick weather with radar in operation. In some instances each of the two vessels involved in the collision were equipped with radar which was in operation at the time. Unfortunately this wonderful aid to navigation was found to involve a certain hazard, namely the human equation. The majority of collisions involving radar have been attributed to that human equation—the failure of the operator to evaluate the information which the instrument supplied! In several collision cases the instrument itself was found to have been unable to indicate the object involved due to the low freeboard of same or because of an obstruction to the radar antennae. In several of the collision cases admiralty attorneys have argued that the International Pilot Rules concerning sound signals and speed in fog were inapplicable to vessels equipped with radar. That the wording of said rules are inconsistent with the recognized ability and purpose of the radar instrument. This theory has invariably been overcome by the fact that the radar-equipped vessels did collide!

The International Pilot Rules and the Inland Pilot Rules were designed to prevent collisions. If the rules are complied with there is little chance of collision. Courts have long ruled in cases involving collision in fog that a moderate speed is one which will enable the vessel to come to a dead stop in one-half the distance of visibility. In the Barry-Medford collision, the court did not condemn the Barry for excessive speed as much as it did for failure to use its radar which might have prevented the collision. The pilot rules as they exist are not inconsistent with this new aid to navigation. By the use of radar a navigator can more fully comply with the rules for speed in fog, particularly in reference to approaching vessels.

Until such time as the International Rules and the Inland Pilot Rules are officially changed, the vessel equipped with radar which is involved in a collision during reduced visibility will probably have the burden of proving that the failure to use same or the use of same did not contribute to the collision. It would appear at this time in the light of those collisions which have occurred with vessels equipped with radar, that the rules for speed in fog will not be changed for some years to come

HARBOR RADAR INSTALLATION AT BALTIMORE, MD.

Description of Installation

(1) The following has been prepared by the U. S. Coast Guard for the information of the U. S. Radio Technical Committee for Marine and for the International News Letter for Maritime Radio which is published by the U. K. Ministry of Transport.

This information has been obtained through the courtesy of the Baltimore Harbor authorities and the Westinghouse Electric Co.

(2) The Baltimore installation is the second nonmilitary harbor radar installation to be made in the United States, the first being at Long Beach, Calif. The Baltimore installation has been utilized to date only for test to determine its value as a harbor shipping facility, and has not been placed in operational use.

(3) The radar equipment is the Westinghouse MU-1, the latest model of Westinghouse commercial marine radar. This radar operates in the 3-cm. (X) band and its chief difference from previous models is employment of a 12½" diameter PPI indicator. It is installed in the radio control room of the City Recreation Pier Building in downtown Baltimore, which room also contains standard commercial CW and radiophone transmitters and receivers for ship-to-shore traffic.

(4) The site selection was made on the basis of both short and long range coverage, the first to show details of Baltimore's piers and the second the approaches from Chesapeake Bay, main channels, and anchorages. The ranges of the radar are 1, 2, 4, 8, 20, and 40 miles, minimum range being 80 yards. The antenna is housed in a radome and mounted atop one of the radio towers on top of the building, 140 feet from the water. The radar transmitter is installed at the base of this tower. This relatively great antenna height allows use of the maximum radar range and prevents obstruction of the signals by other waterfront buildings which, because of the wide vertical radiation pattern, still allows observation of targets quite close to the radar. The proximity to Baltimore Harbor's radio stations WHM and WJY, and the fact that the radar station is convenient to the offices of the Chesapeake Bay Pilot's Association in the same building, were important considerations in selecting the radar site.

(5) The radar has been used to guide, by radiotelephone communication, a small motor cruiser in the harbor and around the docks, with windows blacked out to simulate zero visibility. It is understood that this procedure will continue for a period

sufficient to train plotters, radio operators, and radar operators, as well as to determine any dead spots in the harbor coverage.

The exact methods to be used for plotting and directing harbor traffic when the installation is placed in operation use, are not known at this time. Definite procedures will probably be evolved during the testing and training period and will no doubt be similar to methods used at the Long Beach Harbor Radar, in which the harbor pilots carry portable radiophone equipment.

LESSONS FROM CASUALTIES

CARBON MONOXIDE, CARBON DIOXIDE AND OXYGEN DEFICIENCY

Air normally contains about 78 percent nitrogen, 21 percent oxygen, and 1 percent of various other gases, including carbon dioxide. We are so accustomed to breathing reasonably pure air that we seldom give the matter a thought. Only when it is contaminated with some substance which we can see or smell are we actually conscious of air.

Unfortunately, man is not physically equipped to detect a number of hazardous air conditions. Even a gas such as hydrogen sulphide, which in low concentrations is recognized by the odor of rotten eggs, quickly overpowers the olfactory nerves and cannot be smelled in high concentrations.

Three common hazardous air conditions which man's senses cannot detect at all are the presence of carbon monoxide and carbon dioxide and the absence of oxygen. Sight, taste, and smell tell us nothing. Only after the conditions begin to produce an effect on the body is there any warning, and then it may be too late. Only knowledge of the characteristics of these gases, the conditions under which they may be expected, and the precautions necessary to protect men against them can prevent more needless fatalities.

Oxygen Deficiency

The 21 percent oxygen content of normal air can be very greatly reduced in closed compartments aboard ship by a number of conditions, the most common of which are fire, rusting and the drying of paint. Decomposition of organic materials uses up the oxygen and may produce carbon dioxide.

Idle boilers, double bottoms, and deep tanks have all taken a toll of lives of men who opened and entered them without being sure that sufficient oxygen was present.

The test for oxygen is extremely simple. A flame will be extinguished in a flame safety lamp, match or candle when the oxygen content falls to 16 percent. A man can live in an atmosphere containing 13 percent or somewhat less of oxygen. Therefore, if the lamp will burn a man can live (providing there are no dangerous concentrations of other gases present). The flame test will also indicate whether or not there is sufficient oxygen present to make it possible to use a gas mask rather than an oxygen-breathing apparatus as protection against a known air contaminator. If there is insufficient oxygen the gas mask would, of course, be useless.

Every small compartment which has been tightly sealed should be tested with the flame safety lamp before men are allowed to enter. (If there is any reason to suspect an explosive atmosphere the lamp should be carefully checked to see that it is properly assembled.) Oxygen detectors are on the market which quickly indicate the exact percentage of oxygen in the air.

A man overcome by lack of oxygen should be treated as for drowning, using artificial respiration and oxygen if available.

Carbon Monoxide

Carbon monoxide, CO, is a colorless, odorless, tasteless gas which is somewhat lighter than air. It is produced to some extent in the burning or combustion of any carbon-containing material. The most common source is the exhaust gases from internal-combustion engines—as lift trucks, stowing winches, and pumps in the hold. Hold fires, which usually have insufficient oxygen, are likely to produce large quantities of carbon monoxide.

The effect of carbon monoxide is primarily that of depriving the body of oxygen. Hemoglobin, the substance in the blood which carries oxygen, absorbs carbon monoxide about 300 times more readily than it absorbs oxygen. Hence, when the amount of carbon monoxide in the air is as low as 0.03 percent the effects will be felt after several hours, usually in the form of a headache. A concentration of 0.5 to 1.0 percent of carbon monoxide in the air will cause death in from 2 to 15 minutes. The permissible limit for 8 hours exposure is 0.01 percent.

If a man has been overcome but is still breathing, removal to fresh air may be all that is necessary. Recovery is speeded up by letting the man breathe pure oxygen. If breathing has stopped or is irregular, artificial respiration should be started at once and the oxygen given simultaneously if possible. Oxygen from the breathing apparatus or gas-welding outfit can be used in an emergency. (Be sure that there is no grease or oil on the victim's face or clothes as pure oxygen will cause it to burst into flame.) The patient should be kept warm and at rest after he has been revived to avoid strain on the heart.

If men suddenly develop headache, weakness, and nausea as a result of carbon monoxide and then try to climb ladders or otherwise exert themselves, they are likely to collapse because the extra effort requires more oxygen than the blood can supply. Therefore they should be carried from holds or at least have a line around them as a safeguard. Even after reaching the open air, plenty of time should be given for the carbon monoxide to be eliminated from the blood before a man exerts himself.

Aboard ship, carbon monoxide can be expected when gasoline or Diesel engines are used below deck, when there is fire below deck and when organic materials in the cargo have rotted. In the case of fire, the smoke and probable deficiency of oxygen will make it necessary to wear the oxygen-breathing apparatus or else to stay out.

When there is sufficient oxygen and no more than 2 percent carbon monoxide, the gas mask with a type N, or all purpose, cannister, colored red, will give protection. A type D, carbon-monoxide cannister, colored blue, is manufactured but is not likely to be found aboard ship. Do not use the green, type C, cannister, which is protection only against ammonia.

In the case of exhaust gases or decayed organic matter, ventilation should be used to bring the carbon monoxide within permissible limits. For continuous work this is 100 parts per million, or 0.01 percent. A concentration of 400 parts per million is safe for an exposure of one hour per day.

Carbon-monoxide detectors are on the market. They will quickly give the exact concentration of gas within the dangerous limits. Lacking such an indicator, the safe rule is: In case of doubt, ventilate.

Carbon Dioxide

Carbon dioxide, CO_2, is another odorless, tasteless, colorless gas. It is considerably heavier than air and in still air will collect at low places. It occurs as the result of all combustion and is given off by the body in breathing. Aboard ship, it is most likely to be found in dangerous concentrations either as the result of releasing it from the CO_2 fire extinguishers or from the evaporation of dry ice. Carbon dioxide may also be given off in the decomposition of organic compounds, apple gas for example.

In frozen form carbon dioxide is called dry ice. The material goes directly from the solid to the gaseous state at —110° F. and therefore under any conditions in which men are working with or around dry ice, the gas will be given off. The white cloud often seen around dry ice is not carbon dioxide but is frozen water vapor in the air and is no indication of the amount of gas given off.

The rate of breathing is controlled mainly by the amount of carbon dioxide in the blood. When a man exercises, the muscles burn more fuel and give off more carbon dioxide than when he rests. Breathing becomes rapid to get rid of this excess carbon dioxide and at the same time increase the supply of oxygen. If the air contains a large amount of CO_2, less can be given off by the blood and heavy breathing or panting results.

Normal air contains only about 0.04 percent carbon dioxide. If this percentage is increased 10 times to 0.4 percent there is little noticeable effect, but if it is increased 100 times to 4 percent, the breathing is hard and rapid, and men would tire quickly. At an 8 percent concentration of carbon dioxide, a few minutes exposure produces panting, headache, dizziness, and sweating. A few minutes exposure to 10 percent carbon dioxide is all that a man can stand. Shaking and dim vision are added to the symptoms. Higher concentrations cause unconsciousness after a few breaths and death results in concentrations of 20 to 25 percent, after about half an hour unless the man can be taken into fresh air and revived, by artificial respiration if necessary. The permissible limit for 8 hours exposure is 0.5 percent.

It can be seen that men can stand 10 or 20 times as high a concentration of carbon dioxide as of carbon monoxide. It should be noted, however, that when the concentration is high enough a man is overcome suddenly by either gas. Because of the weight of carbon dioxide, it is very likely to be heavily concentrated at low levels. Hence, a man who is only slightly affected while standing up may be killed should he lie or fall down.

Wherever there is dry ice there will certainly be carbon dioxide gas since to restrict its escape would build up pressures of about 800 lbs. per square inch. Either a pound of dry ice or a pound of liquid carbon dioxide from an extinguisher will produce 8.5 cubic feet of gas.

Ventilation will be necessary when men are working around dry ice but it is very unlikely that the men would fail to note the shortness of breath before the concentration became high enough to be dangerous. On the other hand, to enter a compartment in which dry ice has been stowed without testing for carbon dioxide is extremely dangerous. If a flame safety lamp will not burn at the very bottom of such a compartment, men should not enter it. Even if the lamp burns there may be a high enough concentration of CO_2 to make a man unconscious, so he should enter cautiously and with a life line. Devices for determining the exact concentration of CO_2 are on the market and should be used.

When rescue is necessary the only useful protection is an oxygen breathing apparatus or hose mask since there will undoubtedly be too little oxygen and/or too high a carbon dioxide content to make a gas mask of any value whatever.

Ventilation

In many cases sufficient ventilation will be provided naturally if ventilators are trimmed and hatches opened completely. When this must be supplemented with forced ventilation, it will be found that forcing fresh air in will be more effective than trying to exhaust the foul air.

Blower hose outlets should be placed back in the corners of the hatch or compartment, low for heavy gases, like carbon dioxide, but may be high for light gases, like carbon monoxide. The stream of air should be directed against the bulkhead to create as much turbulence as possible. The end of the hose should be from 15 to 20 diameters away from the bulkhead.

In testing for effect it should be remembered that a small pocket of high concentration may exist in a compartment of relatively good air. It is these pockets which must be looked for in testing.

One case in which an exhaust might be used effectively is in removing carbon dioxide which escapes through special outlets from vans or containers packed with dry ice. In such a case, the inlet of the exhaust hose could be placed close to or around the outlet and so pick up all the gas as it was given off. Exhaust hoses do not pick up gases effectively from distances greater than 1½ or 2 diameters of the hose.

General

When a man has been overcome by a gaseous or oxygen deficient atmosphere it is futile for others to attempt rescue without suitable protection. Just to climb down into a hold or tank will invariably add additional victims to the final rescue work and do no good. Even when equipped with oxygen-breathing apparatus the rescuer should have a line around himself so that he can be hauled from the hold or tank in case anything goes wrong.

It is recognized that it would be difficult to watch a man die in the bottom of a hold and make no effort to rescue him because of lack of proper equipment. If the rescuer could be lowered quickly by ship's gear or by hand and were willing to accept the great likelihood of passing out himself after getting a line secured to the victim, he might be justified in making the attempt as long as he could keep his own lines in the clear so he could be hauled out even if unconscious.

In many cases the need for rescue arises while the vessel is in port where shoreside help can be obtained. In such cases the fire department should be called. Police and ambulance crews do not have the breathing apparatus needed and precious time is wasted if they are called first. Get the fire department and tell them of the conditions existing so that they may have the proper gear ready to use as soon as they arrive. *Courtesy of Marine Safe Practices Pamphlet, Accident Prevention Bureau, February 1950.*

SHELLAC INTOXICATION

A shipyard painter using shellac in a confined space felt himself becoming dizzy. In his efforts to get out of doors so as to cleanse his lungs with fresh air, he tripped and severly injured himself in the resultant fall.

The cause of this accident is obvious—insufficient air change in a confined area and the use of a toxic vapor substance in this inadequately ventilated area.

Here it appears that it was the responsibility of both the painter and his supervisor to see that available mechanical methods were brought into play to insure an adequate fresh air supply and for the prompt removal of undesirable fumes. *Courtesy of Safety Review*, Navy Department.

Know
Practice
Teach
SAFETY

WATCH WHERE YOU ARE GOING

There has recently come to the Coast Guard's attention, a casualty resulting in the drowning of an able seaman which was caused by his ignoring of the simple old safety rule of "Watch where you are going!" In the accident referred to, two able seamen were engaged in chipping rust on one of the boat platforms on a large oil tanker while at sea. Both of these men were using air hammers and during at least part of the time were working on their knees. A safety rope was stretched across the space outboard of where they were working and this was still intact after the casualty.

It seems that instead of facing the edge of the deck and chipping rust from outboard toward the inboard part of the ship one man was doing just the opposite and backed himself over the side of the ship under the safety rope. His partner had spoken to him a minute or two previous to the accident but was not looking toward him at the time he fell. However, the surviving man's attention was attracted by the stoppage of his mate's air hammer and, looking around, he actually saw him swimming in the water alongside the vessel and promptly gave the alarm. A 6-hour search ensued, but in spite of this the man was not found.

On shipboard, even more than on land, one must know what he is getting into. No man has eyes in the back of his head. Had this unfortunate A. B. kept this truism in mind he would probably still be alive today.

DO PEOPLE RESIST SAFETY?

The answer to this very provocative question must be, some people certainly resist safety. By resistance, however, we must not understand active resistance in every such case. We must include in the concept of resistance any failure to comply with the principles of safety, which failure is practically tantamount to resistance. The fact of resistance is demonstrable through the analyses of innumerable investigated accidents. Our interest must lie in investigating some of the reasons for resistance, as well as practical ways in which the resistance can be overcome. To aid our thinking, I shall divide the "reasons why" of resistance into certain categories.

General Reasons for Resistance

People, for whatever reasons, frequently resist what is ultimately for their own good. This is true of religions, social betterment, enlightened laws. Safety, as a concept, is resisted because of illogical, inarticulate, and frequently unconscious reasons. Part of the resistance is due to the fact that the purpose of safety is misunderstood, due to the lack of intelligent and persuasive explanations. Safety is too often identified with prohibition or inhibition, often felt by the individual to limit his right to self-determination. It is true that for many the "Stop" sign has become the sign manual of safety.

Safety is resisted for another interesting reason. We are said to recognize self-preservation as a controlling motive. Yet, many people who feel the urge for self-preservation, will disdain the practices of safety when such practices concern activities which they feel do not threaten either their survival or well-being. In other words, some persons tend to depreciate hazards which they consider insignificant. Many who would hesitate to touch a "hot" power line, will blithely drive an automobile without adequate knowledge of their own, or the car's limitations, the rules of the road, what to do in emergencies, or other vital knowledge essential to their welfare.

Finally, groups will often exhibit the same traits of resistance as characterize individuals. As some of these traits will be discussed later, we will omit discussion here.

Reasons for Resistance Among Administrators and Managers

It is an axiom of industrial safety that safety programs to be successful need the active leadership and support of top management. This principle is equally valid in any phase of administration.

We may assert at the outset that failure of administrators to initiate and support accident prevention programs is not a failure in humanitarianism, not a lack of concern for the welfare of people, not a careless attitude towards damage and waste. It is frequently a failure to see how synonymous are efficiency and safety. What is resisted as something new or unnecessary, an additional "program" to use a badly mangled word, is so resisted because there is a lack of comprehension of how inseparable safety is from intelligent administration and operation. This failure, which is laid all too frequently at the door of subordinates, must be placed squarely at the door of top administration.

We may list the following specific reasons for administrative resistance to safety:

Failure to comprehend either its meaning or its significance to their operations.

Indifference which results from apathy which results from a lack of desire to find out what safety's all about.

Antipathy because the program is sponsored or recommended by someone who is unpopular with the administrator.

Faulty calculation: The administrator looks at safety, thinks of all his other responsibilities, asks, "What's in it for me," cannily answers, "Nothing," and goes on his unsafe way.

Acceptance of the resounding fallacy that "safety takes too much time" or "it interferes with operations."

The feeling that the savings from safety will not justify the planning and effort.

The probability of accidents is too low to justify planning and effort.

The belief that if accident costs are not unduly large, they can be absorbed as one of the normal costs of operation.

The opinion that safety is a matter for the individual and not for official concern.

The above reasons do not represent all the possible reasons for administrative and managerial resistance, but they may be considered fairly typical. Their validity will be considered directly and by implication in the latter part of this discussion which deals with what we can do about this resistance.

Reasons for Supervisory Resistance

Supervisor here means that person in the administrative structure who stands between the two levels of top administration and the workers. He is properly termed the last echelon of management and the first contact with the workers. He must please top administration and in some fashion "get along" with the workers. As an embryo administrator he will tend to reflect the types of resistance which characterize top administration, plus some others. Some of these are:

The viewing of acident prevention activity as an added burden to his already heavy load of duties.

Failure to see accidents as an evidence of faulty planning and execution and as much of an indictment of supervision as a faulty product or an unsuccessful operation.

A corollary failure to see accidents as a misuse of personnel, machines and material.

To give point to supervisory failure, may I just recite certain worker grievances which constitute a clear exhibition of supervisory resistance to safety. These are selected from a list of twenty-nine in Glenn Gardiner's book "Better Foremanship":

By Walter A. Cutter, Ph. D., Center for Safety Education, New York University

Unguarded work hazards.

Unhealthy working conditions.

Uncomfortable working conditions that could be corrected.

Tools and equipment not in condition for worker to maintain his earnings. (This means that the tools and equipment were not safe.)

Hard-boiled disciplinary action.

Careless or inadequate instruction by supervisors.

Misfitting men to jobs.

Ignoring complaints.

Lack of human interest and sympathy on part of supervisors.

There are two or three aspects of these grievances to which I would like to call your attention. One is that these selected reasons, as well as the others in Gardiner's list, are the very same reasons which militate against production schedules and successful operations generally. A second is that while some of these complaints directly indicate a supervisory resistance, they also suggest top administrative failures. We may take it for granted that the supervisory level will directly reflect the degree of administrative concern for safety. If these worker grievances have any validity, then we must say that top administration permits the supervisor to do or not do certain things which cause the complaints.

The Workers

Because we are primarily concerned with administration, I am not discussing the detailed elements in worker resistance to safety. Workers have many of the previously mentioned reasons for not being safe, plus individual mental or physical conditions and faulty attitudes. While it is true that it is on the worker level that we have the largest number of accidents, it is also true that we can do much to correct these conditions from the top down. It can be shown that the majority of workers will take on the complexion which characterizes an activity. If policy, administrative leadership and supervisory practice support the impression that the worker is expected to be safe, he will in all probability be safe. Conversely, if workers get the impression that safety is a matter of administrative indifference, they won't try too hard. For those who cannot be appealed to by normal persuasions, special compulsive persuasions can be doubtless arranged.

What to do About Resistance to Safety

This is a very large subject, and an essay of very considerable length could be written on this topic alone. So as not to transgress on your patience, I shall state these suggestions topically. There is no originality which can be claimed for these ideas, nor is there any facile or foolproof formula which I may suggest. However, the more I reflect on accident prevention and its progress the more convinced I am of the fact that effective coordination and utilization of present knowledge will work wonders in decreasing our accident rates. There is much psychological exploration going on presently which will aid us in understanding the nature and control of human behavior. However, we cannot postpone action until our knowledge is perfected. It is my contention that we know enough now to prevent the greater number of accidents, if we put our present knowledge to work.

1. There should be a clear understanding of the nature and purposes of accident prevention

If accident prevention is viewed simply as preventing accidents it falls short of its complete possibility. If it is viewed as part of the general effort to explore and amend the whole groundwork of faulty planning, faulty execution and other inefficiencies which characterize administration, it will reach its fullest possibilities. Too much of what should be accident prevention is really corrective action. If we understand that *accidents are inefficiencies and not inevitable occurrences*, we will comprehend better the corollary that efficiency is dependent upon safety in operations. Instead of limiting our attention to isolated correction of accidents, we should let accident prevention take its place in the total war against all inefficiency.

2. There should be a clear, comprehensive and comprehensible safety policy

A blueprint is necessary for a finished structure. A blueprint of policy, enunciated and endorsed by top administration is as essential. It should have these elements:

What is accident prevention as understood in its larger meanings?

How does it tie in to this agency or department?

What are the main features of the agency's program to accomplish accident prevention?

What is each administrator's and administrative level's precise responsibility?

What are the mechanics of administration as concerns graded responsibility in relation to such elements as accident investigation and reporting and corrective or prevention action?

There are two matters about which I should like to be particularly emphatic in connection with policy. The first is one of semantics, and it is a difficult one. It is that policy should be couched in simple, clear unequivocal terms which will mean the same thing to all levels of administration and operation. Failure in administration is often failure in communication. Our ability to communicate ideas is frequently the measure of our success.

The second point is the clear and definite statement in the published policy that persons connected with the undertaking are expected to be safe, and that instruction and the other means of keeping safe will be provided by the agency. It is comparatively as easy to orientate a person to an efficient and safe operation as it is to permit him to fall below desirable operating levels and then try to raise him. No tolerance in compliance should be permitted at any level.

3. There should be a specific orientation of the accident prevention program to all departments of administration and operations

Successful accident prevention like any other element of successful administration depends mainly on corporate effort. Accident prevention is not, nor should it be, the exclusive responsibility of the safety department. A clear and intelligent policy will show what parts of the total program should appertain to various departments. For illustration, we will look at the personnel department. People have accidents. The securing and assigning of persons is the work of personnel. People have limitations. Many such limitations can be determined by physical and mental tests. Undetected and hence uncompensated limitations may be subcauses of accidents. Hence, at the very first contact with the agency, personal abilities and characteristics should be carefully matched with job requirements. A capable worker, intelligently trained and assigned and supervised is most likely to be accident free.

Here is the first place that worker resistance can be overcome. Through intelligent procedures, intelligently interpreted to the worker, the provisions for his safety can be explained, and his own major responsibility for his own safety emphasized.

The same consideration should apply to operations of any type. Those in charge of operations must be convinced of accident prevention as a normal part of operation. Active measures to maintain efficiency by combating accidents must be made a part of efficiency rating. Supervisors should be instructed in their responsibilities and opportunities for accident prevention and should be trained in training techniques. In this way the instruction of new workers, or the retraining of workers will proceed along methodical, rather than personal and highly subjective lines.

Physical, mechanical and structural conditions should be as safe as possible. Frequent opportunities should be provided for interchange of information and suggestions between supervisors and workers. Every element in operations can be made to reinforce the concept of efficiency of which safety is an essential part.

In this same way, the responsibilities for the accident prevention program should be assigned to each department, and the detail of these responsibilities outlined by policy. In the total picture, the safety department is a part, an important part but only a part. It is the province of the safety department to represent top management; to keep top management informed; to collect accident facts, interpret these facts and recommend needed corrective and preventive action; to recommend necessary training; and in general to coordinate the whole accident prevention program. May I say again that is not the responsibility of the safety department to "make the place safe." It is everyone's responsibility, coordinated by the safety department. When it is realized that safety is everybody's business, and is expected to be everybody's business, I anticipate that a considerable part of resistance to safety will be broken down.

4. All auxiliary means of creating and maintaining interest in safety should be used

People will interest themselves in what is agreeable, comfortable and popular and will conform more often than not to group thinking, if such thinking is shown to be to their advantage. Similarly, we are not too much swayed by abstract truths or values until these are translated into familiar and attractive forms. It is not accidental that, whether we look at a picture of a locomotive, a steamship, or some mighty phenomenon of nature, there will be somewhere around a luscious maiden largely out of a bathing suit. The lads who concoct these displays know that in selling, it is the package that makes the first appeal.

There is a statement made about safety which can be made of any idea which we want to propagate. Safety, it is said, is 50 percent technical knowledge and 50 percent selling. We may say with confidence that the type of considerations presented earlier in this paper and the way that I have discussed them would make little appeal to other types of audiences. So, we must absorb these administrative and methodological principles and then translate them into attractive and persuasive forms.

Posters, bulletins, newspapers, contests, meetings, incentive awards, and all of the paraphernalia of beneficent persuasion have their place, in appropriate degrees in safety programs. We will find that the judicious use of these and similar devices as adjunct to an intelligently organized program, will not only aid the program, but will do much to overcome resistance to safety. So much of so-called resistance, or failure in compliance, is not the result of clearly enunciated reasons. Therefore, we may reasonably expect that any aggressive forward moving program will do much to convert such opponents and doubters into supporters.

Conclusion

In this brief inspection of resistance to safety, we have merely rehearsed certain standard and unoriginal attitudes and shown some ways in which these attitudes can be changed. It is unthinkable to me that there should be any significant resistance in a group of high caliber. Rather it is true I am sure that what we all want to do is to do this job better. There is another and controlling reason for your interest. All eyes are always focused on government and the agencies of government. It is my belief that the greatest aid in overcoming resistance, as well as the greatest inspiration to the rest of the country, would flow from a combined Federal determination to achieve and maintain the best safety records in the country.

(EDITOR'S NOTE.—This talk was presented at the Eleventh Annual Meeting of the Federal Interdepartmental Safety Council.)

YOUR SHIP IS YOUR HOME—TREAT IT ACCORDINGLY

APPENDIX

Epuipment Approved by the Commandant

[CGFR 50-17]

APPROVAL OF EQUIPMENT

By virtue of the authority vested in me as Commandant, United States Coast Guard, by R. S. 4405 and 4491, as amended, 46 U. S. C. 375, 489, and section 101 of Reorganization Plan No. 3 of 1946 (11 F. R. 7875, 60 Stat. 1097, 46 U. S. C. 1), as well as the additional authorities cited with specific items below, the following approvals of equipment are prescribed and shall be effective for a period of five years from date of publication in the Federal Register unless sooner canceled or suspended by proper authority:

BUOYANT CUSHIONS, KAPOK, STANDARD

Approval No. 160.007/95/0, Standard kapok buoyant cushion, U. S. C. G. Specification 160.007, manufactured by Willis Manufacturing Co., 3007 Huldy, Houston, Tex.

(54 Stat. 164, 166; 46 U. S. C. 526e, 526p; 46 CFR 25.4-1, 160.007)

NOTE.—Cushions are for use on motorboats of classes A, 1, or 2 not carrying passengers for hire.

GAS MASKS, SELF-CONTAINED BREATHING APPARATUS, AND SUPPLIED-AIR RESPIRATORS

Approval No. 160.011/19/1, "CHEMOX," 45-minute self-contained oxygen-generating breathing apparatus, with standard facepiece assembly or with Cleartone speaking diaphragm facepiece assembly, Bureau of Mines Approval No. BM-1307, MSA Assembly Dwg. No. A-1212-1 dated November 28, 1945, Rev. 12 dated December 13, 1949, manufactured by Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa. (Supersedes Approval No. 160.011/19/0, published in the Federal Register dated July 31, 1947.)

(R. S. 4417a, 4426, 49 Stat. 1544, 54 Stat. 1028, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 463a, 50 U. S. C. 1275; 46 CFR 35.4-5, 61.16, 77.18, 95.17, 114.18, 160.011)

DAVITS, LIFEBOAT

Approval No. 160.032/112/0, gravity davit, type 36.5-150, approved for maximum working load of 35,000 pounds per set (17,500 pounds per arm), using 2 part falls, identified by General Arrangement Dwg. No. 451-1, Alt. F, dated November 24, 1948, and revised April 10, 1950, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4417a, 4426, 4481, 4488, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 474, 481, 1333, 50 U. S. C. 1275; 46 CFR 37.1-4, 59.3, 60.21, 76.15, 94.14, 113.23)

MECHANICAL DISENGAGING APPARATUS, LIFEBOAT

Approval No. 160.033/38/0, Mills type R releasing gear, approved for maximum working load of 20,000 pounds per set (10,000 pounds per hook), identified by Assembly Dwg. No. M-105-1, dated August 31, 1949, and revised April 27, 1950, for use on all vessels other than Ocean and Coastwise over 3,000 gross tons, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

Approval No. 160 033/43/0, Rottmer Type L-1-A releasing gear, approved for maximum working load of 36,600 pounds per set (18,300 pounds per hook), identified by Hoist Gear Assembly Dwg. M-125-1-A dated March 27, 1950, and revised April 12, 1950, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4417a, 4426, 4488, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 481, 1333, 50 U. S. C. 1275; 46 CFR 37.1-7, 59.68, 76.62, 94.59)

HAND PROPELLING GEAR, LIFEBOAT

Approval No. 160.034/10/0, Type X hand propelling gear, identified by hand propelled gear unit Dwgs. No. 99-2, dated July 7, 1949, revised April 17, 1950, and No. 99-2A, dated August 7, 1949, revised April 17, 1950, submitted by Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4417a, 4426, 4488, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244; 46 U. S. C. 367, 391a, 404, 481, 1333, 50 U. S. C. 1275; 46 CFR 33.3-1, 59.11)

LIFEBOATS

Approval No. 160.035/239/0, 28.0' x 9.79' x 4.13' steel, hand-propelled lifeboat, 68-person capacity, identified by Construction and Arrangement Dwg. No. 28-4, dated February 11, 1949, and revised March 3, 1950, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

Approval No. 160.035/241/0, 36.5' x 12.5' x 5.33' aluminum, hand-propelled lifeboat, 150-person capacity, identified by Construction and Arrangement Dwg. No. 36-7C dated March 20, 1950, and revised May 1, 1950, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4417a, 4426, 4481, 4488, 4492, 35 Stat. 428, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 396, 404, 474, 481, 490, 1333, 50 U. S. C. 1275; 46 CFR 37.1-1, 59.13, 76.16, 94.15, 113.10)

TELEPHONE SYSTEMS, SOUND POWERED

Approval No. 161.005/39/0, Telephone station relay, electrical release, splashproof, Dwg. No. 17, Alt. 1, dated February 1950, manufactured by Hose-McCann Telephone Co., Twenty-fifth Street and Third Avenue, Brooklyn 32, N. Y.

(R. S. 4417a, 4418, 4426, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 392, 404, 1333, 50 U. S. C. 1275; 46 CFR 32.9-4, 63.11, 79.12, 97.14, 116.10)

[CGFR 50-8]

REINSTATEMENT OF APPROVAL OF EQUIPMENT

By virtue of the authority vested in me as Commandant, United States Coast Guard, by R. S. 4405 and 4491, as amended, 46 U. S. C. 375, 489, and section 101 of Reorganization Plan No. 3 of 1946, 11 F. R. 7875, 60 Stat. 1097, 46 U. S. C. 1, as well as the additional authorities cited with the specific items below, the listings of termination of approval Nos. 162.005/15/0 and 162.005/16/0, contained in a notice of termination of approval of equipment published in the FEDERAL REGISTER dated March 25, 1950, in Document CGFR 50-8, 15 F. R. 1682, are hereby voided because these two items were listed in error and no effect shall be given to the listing of termination of approval for these two items, which are set forth below for information purposes and will remain in effect for a period of five years from September 18, 1947, unless sooner canceled or suspended by proper authority:

FIRE EXTINGUISHERS, PORTABLE, HAND, CARBON-DIOXIDE TYPE

Approval No. 162.005/15/0, Kidde Model 10T, 10-lb. carbon dioxide hand portable fire extinguisher, Assembly Dwg. No. 82507, Rev. A., dated September 27, 1945, Name plate Dwg. No. 82508, Rev. A, dated October 4, 1945, manufactured by Walter Kidde & Co., Inc., 675 Main Street, Belleville 9, N. J. (Approved, FEDERAL REGISTER, September 18, 1947.)

Approval No. 162.005/16/0, Kidde Model 15T, 15-lb. carbon dioxide hand portable fire extinguisher, Assembly Dwg. No. 82088, Rev. B, dated August 29, 1945, Name plate Dwg. No. 82307, Rev. A, dated September 19, 1945, manufactured by Walter Kidde & Co., Inc., 675 Main Street, Belleville 9, N. J. (Approved, FEDERAL REGISTER, September 18, 1947.)

(F. R. 4417a, 4426, 4479, 4492, 49 Stat. 1544, 54 Stat. 165, 166, 346, 1028, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 463a, 472, 490, 526g, 526p, 1333, 50 U. S. C. 1275; 46 CFR 25.5-1, 26.3-1, 27.3-1, 34.5-1, 61.13, 77.13, 95.13, 114.15)

Dated: May 9, 1950.

[SEAL] MERLIN O'NEILL,
Vice Admiral, U. S. Coast Guard,
Commandant.

[F. R. Doc. 50-4196; Filed, May 16, 1950; 8:50 a. m., 15 F. R. 2958-5/17/50]

[CGFR 50-15]

TERMINATION OF APPROVAL OF EQUIPMENT

By virtue of the authority vested in me as Commandant, United States Coast Guard, by R. S. 4405 and 4491, as amended, 46 U. S. C. 375, 489, and section 101 of Reorganization Plan No. 3 of 1946, 11 F. R. 7875, 60 Stat. 1097, 46 U. S. C. 1, as well as the additional authorities cited with the specific items below, the following approvals of equipment are terminated because the items of equipment covered are no longer being manufactured:

SIGNAL PISTOLS

Termination of Approval No. 160.028/6/0, Sklar signal pistol, Dwg. No. Z-100A, dated August 26, 1944, manufactured by Sklar Signal Pistol Co., 1017 Market Street, San Francisco, Calif. (Approved FEDERAL REGISTER dated July 31, 1947).

(R. S. 4417a, 4426, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 1333, 50 U. S. C. 1275; 46 CFR 33.3-1, 33.3-2, 59.11, 76.14)

TELEPHONE SYSTEMS, SOUND POWERED

Termination of Approval No. 161.005/14/0, Sound powered telephone station, selective ringing, common talking, 11 station maximum, bulkhead mounting, splashproof, with separately mounted hand generator cowbell and relay for externally powered howler, Dwg. No. 4, Alt. 2, Type A, Model E, manufactured by Hose-McCann Telephone Co., Inc., Twenty-fifth Street and Third Avenue, Brooklyn 32, N. Y. (Approved FEDERAL REGISTER dated July 31, 1947)

(R. S. 4417a, 4418, 4426, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended, 46 U. S. C. 367, 391a, 392, 404, 1333, 50 U. S. C. 1275; 46 CFR 32.9-4, 63.11, 79.12, 97.14, 116.10)

CONDITIONS OF TERMINATION OF APPROVALS

The termination of approvals of equipment made by this document shall be made effective upon the thirty-first day after the date of publication of this document in the FEDERAL REGISTER. Nothwithstanding this termination of approval on any item of equipment, such equipment manufactured before the effective date of termination of approval may be used on merchant vessels so long as it is in good and serviceable condition.

Dated: May 1, 1950.

[SEAL] MERLIN O'NEILL,
Vice Admiral, U. S. Coast Guard,
Commandant.

[F. R. Doc. 50-3928; Filed, May 8, 1950; 8:52 a. m., 15 F. R. 2760-5/9/50]

AFFIDAVITS

The following affidavit was accepted from April 15 to May 15, 1950:

Kerotest Manufacturing Co., 2525 Liberty Ave., Pittsburgh, Pa. Fittings.

The following affidavits were accepted from May 15 to June 15, 1950:

The Lunkenheimer Co., P. O. Box 360 Annex Station, Cincinnati 14, Ohio. Castings.

Nash Engineering Co., South Norwalk, Conn. Valves.

West Michigan Steel Foundry Co., Muskegon, Mich. Castings.

FUSIBLE PLUGS

The Marine Engineering Regulations and Material Specifications require that manufacturers submit samples from each heat of fusible plugs to the Commandant for test prior to plugs manufactured from the heat being used on vessels subject to inspection by the Coast Guard. A list of approved heats which have been tested and found acceptable during the period from April 15 to May 15, 1950, is as follows:

The Lunkenheimer Co., P. O. Box 360 Annex Station, Cincinnati 14, Ohio. Heats Nos. 353, 354, and 355.

H. B. Sherman Manufacturing Co., 22 Barney Street, Battle Creek, Mich. Heats Nos. 637, 638, and 695 through 698.

A list of approved heats which have been tested and found acceptable during the period from May 15, 1950, to June 15, 1950, is as follows:

The Lunkenheimer Co., P. O. Box 360 Annex Station, Cincinnati 14, Ohio. Heats Nos. 356, 357, 358, and 359.

H. B. Sherman Manufacturing Co., 22 Barney Street, Battle Creek, Mich. Heats Nos. 699, 700, and 701.

ARTICLES OF SHIPS' STORES AND SUPPLIES

Articles of Ships' Stores and Supplies certificated from April 25, 1950, to May 25, 1950, inclusive, for use on board vessels in accordance with the provisions of part 147 of the regulations governing explosives or other dangerous articles on board vessels, are as follows:

The Perolin Co., Inc., 10 East Fortieth Street, New York 16, N. Y., Certificate No. 308, dated May 1, 1950. "Pera-clean Marine Cleaner."

American-Sand-Banum Co., Inc., 9 Rockefeller Plaza, New York 20, N. Y., Certificate No. 309, dated May 1, 1950. "Sabanol."

Burton Marine Corp., 50 Church Street, New York 7, N. Y., Certificate No. 310, dated May 9, 1950. "Lektro Cleaner."

WELDING ELECTRODES

The following type of electrode has been tested in accordance with the requirements of ASTM designation A233-48T for mild steel arc-welding electrodes in the presence of an American Bureau of Shipping Surveyor and the test report indicates that the requirements were met.

Weld-Well Service Co., Lancaster, Pa., *Reid Avery Co.* (manufacturer), Weld-Well 6010, Type E6010; Weld-Well 6011, Type E6011; Weld-Well 6012, Type E6012, and Weld-Well 6020, Type E6020.

OPERATING POSITIONS AND ELECTRODE SIZES

The Type E6010 $\frac{3}{32}$-, $\frac{1}{8}$-, $\frac{5}{32}$-, and $\frac{3}{16}$-inch diameter electrodes will be allowed for all position welding on direct current and reversed polarity; the $\frac{7}{32}$- and $\frac{1}{4}$-inch diameter electrodes will be allowed for horizontal fillet and flat positions on direct current and reversed polarity; and the $\frac{5}{16}$-inch diameter electrodes will be allowed for flat positions on direct current and reversed polarity.

The Type E6011 $\frac{3}{32}$-, $\frac{1}{8}$-, $\frac{5}{32}$-, and $\frac{3}{16}$-inch diameter electrodes will be allowed for all position welding on alternating and direct current; the $\frac{7}{32}$- and $\frac{1}{4}$-inch diameter electrodes will be allowed for horizontal fillet and flat positions on alternating and direct current; and the $\frac{5}{16}$-inch diameter electrodes will be allowed for flat positions on alternating and direct current.

The Type E6012 $\frac{3}{32}$-, $\frac{1}{8}$-, $\frac{5}{32}$-, and $\frac{3}{16}$-inch diameter electrodes will be allowed for all position welding on alternating and direct current; the $\frac{7}{32}$- and $\frac{1}{4}$-inch diameter electrodes will be allowed for horizontal fillet and flat positions on alternating and direct current; the $\frac{5}{16}$-inch diameter electrodes will be allowed for flat positions on alternating and direct current.

The Type E6020 $\frac{5}{32}$-, $\frac{3}{16}$-, $\frac{7}{32}$-, and $\frac{1}{4}$-inch diameter electrodes will be allowed for horizontal fillet and flat positions on alternating and direct current; and the $\frac{5}{16}$-inch diameter electrodes will be allowed for flat positions on alternating and direct current.

CORRECTION OF PRIOR DOCUMENT

In Federal Register Document 50-3975, Coast Guard Document CGFR 50-11, appearing on pages 2784 and 2785 of the FEDERAL REGISTER for Wednesday, May 10, 1950, under the center heading of "Fire Indicating and Alarm Systems" change the drawing number on the sixth line from "50-182, Alt. 2," to "50-082, Alt. 2."

Dated: June 7, 1950.

[SEAL] MERLIN O'NEILL,

Vice Admiral, U. S. Coast Guard, Commandant.

[F. R. Doc. 50-5055; Filed, June 12, 1950; 8:51 a. m., 15 F. R. 3703, June 13, 1950]

A motorboat in the hands of an apprentice is like unto a loaded gun in the hands of a child.

ELECTRICAL APPLIANCES

The following list supplements that published by the United States Coast Guard under date of May 15, 1943, entitled "Miscellaneous Electrical Equipment Satisfactory for Use on Merchant Vessels," as well as subsequently published lists and is for the use of Coast Guard personnel in their work of inspecting merchant vessels. Other electrical items not contained in this pamphlet and subsequent listings may also be satisfactory for marine use, but should not be so considered until the item is examined and listed by Coast Guard Headquarters. Before listings of electrical appliances are made it is necessary for the manufacturer to submit to the Commandant (MMT), United States Coast Guard Headquarters, Washington 25, D. C., duplicate copies of a detailed assembly drawing, including a material list with finishes of each corrosive part of each item.

Manufacturer and description of equipment	Location apparatus may be used				Date of action
	Passenger and crew quarters and public spaces	Machinery, cargo, and work spaces	Open decks	Pump rooms of tank vessels	
The Anchor Clamp Corp., Los Angeles, Calif.: Cable clamps, Dwg. No. 3000, alt. 0	x	x			May 16, 1950
Control Instrument Co., Inc., Brooklyn, N. Y.: Salinity indicator panel, type 55-A-4 (comm.) Dwg. Nos. 23010, alt. 1 and 23011, alt. 0	x	x			May 30, 1950
Crouse-Hinds Co., Syracuse, N. Y.: Searchlight, nonmagnetic, high pedestal, pilot house control, type DCX-24, cat. No. 14571, waterproof, for 1,000/1,000-watt, 115-volt G-40 mogul screw 2-filament lamp, Dwg. No. 92-KH2	x	x	x		May 1, 1950

Manufacturer and description of equipment	Location apparatus may be used				Date of action
	Passenger and crew quarters and public spaces	Machinery, cargo, and work spaces	Open decks	Pump rooms of tank vessels	
Detroit Lubricator Co., New York, N. Y.:					
Temperature control switches, No. 220-10, models NL, NN, NLM, and NNM, waterproof, 540° F. maximum, noninductive electrical rating—115V, 15A; 230V, 10A; 440V, 5A AC or DC, Dwg. No. TS-1215, alt. 2	x	x	x	----	Apr. 27, 1950
Pressure control switches, No. 220-10, models NA-2, NA-3, NB-1, NB-3, NB-4, NB-5, NB-6, and NB-9, waterproof, 650 p. s. i. maximum, noninductive electrical rating—115V, 15A; 230V, 10A; 440V, 5A; AC or DC, Dwg. No. TS-1214, alt. 4	x	x	x	----	Do.
Felbick Electric Co., Union, N. J.:					
Running light panel, semiautomatic, for 2-section double-lamp type, double-filament type, and single-filament type navigation lights, 11-circuit maximum, 115V AC or DC and 220V DC, Dwg. No. 206, alt. 2	x	x	----	----	May 16, 1950
Henschel Corp., Amesbury, Mass.:					
Mechanical telegraph wrong direction signal contact maker, Dwg. No. 11-119, alt. 4, 115-volt maximum	x	x	----	----	Apr. 20, 1950
Bells, vibrating, 6 inch, 8 inch, 10 inch, and 12 inch and cow gong, waterproof, 115-volt maximum, AC and DC, Dwg. No. 20-163, alt. 3	x	x	x	----	Apr. 25, 1950
Luminator, Inc., Chicago, Ill.:					
Berth light, nonwatertight, 1 25-watt lamp maximum, Dwg. No. 9152, alt. 3	x	----	----	----	Apr. 26, 1950
Magnetrol, Inc., Division of Fred H. Schaub Engineering Co., Inc., Washington, D. C.:					
Float switch, model W-127-M4, 30 p. s. i. maximum with cast iron body, 250 p. s. i. maximum with cast steel body, switch rating—10A, 125V; 5A, 250V, AC, Dwg. No. F-4740, alt. 0	x	x	----	----	May 16, 1950
Float switch, model W-126-M4, 30 p. s. i. with cast iron body, 250 p. s. i. maximum with cast steel body, switch rating—10A, 125V; 5A, 250V, AC, Dwg. No. D-1033, alt. 0	x	x	----	----	Do.
Marine Electric Corp., New York, N. Y.:					
Disconnect switch, enclosed, 30-ampere, 250 volts maximum, fused or unfused, Dwg. Nos. C-750, alt. 0 and C-750-A, alt. 0	x	x	----	----	June 12, 1950
Murlin Manufacturing Co., Philadelphia, Pa.:					
Ceiling light, nonwatertight, type N-1, 1 60-watt and 1 7-watt lamp maximum, Dwg. No. 1375 N. L., alt. 0	x	----	----	----	June 1, 1950
Oceanic Electric Products Corp., New York, N. Y.:					
Pendent lighting fixture with fresnel globe, less guard, waterproof, 1 60-watt lamp maximum, cat. Nos. 5100, 5100R, and 5100G, Dwg. No. 4165, alt. 0	x	x	x	----	June 14, 1950
Box type lighting fixture with fresnel globe, less guard, waterproof, 1 60-watt lamp maximum, cat. Nos. 5102, 5102R, and 5102G, Dwg. No. 4166, alt. 0	x	x	x	----	Do.
Bulkhead type lighting fixture with fresnel globe, less guard, waterproof, 1 60-watt lamp maximum, cat. No. 5107, Dwg. No. 2222, alt. 0	x	x	x	----	Do.
Bulkhead type lighting fixture with fresnel globe, less guard, for mounting on waterproof junction box, 1 60-watt lamp maximum, cat. No. 5105, Dwg. No. 2220, alt. 0	x	x	x	----	Do.
Pilot Marine Corp., New York, N. Y.:					
Salinity indicator panel, model SNA-1, 115V AC, Dwg. Nos. PM-1150, alt. 0, and PM-1144, alt. 1	x	x	----	----	May 2, 1950
Salinity indicator panel, model SNA-5, 115V AC, Dwg. Nos. PM-1151, alt. 0 and PM-1147, alt. 0	x	x	----	----	Do.
Salinity indicator panel, model SNA-7, 115V AC, Dwg. Nos. PM-1152, alt. 0 and PM-1386, alt. 0	x	x	----	----	Do.
Salinity indicator system cell and valve assembly, Dwg. No. PM-1305-A, alt. 0	x	x	----	----	Do.
Salinity indicator system dumping valve relay and housing, model SNA-PR, 115V AC, Dwg. No. PM-1153, alt. 0	x	x	----	----	Do.
Russell & Stoll Co., Inc., New York, N. Y.:					
Berth light, nonwatertight, cat. Nos. 3546 and 3546-A, Dwg. No. B-7897, alt. 3	x	----	----	----	June 2, 1950
Emergency switch for lifeboat winches, main line, 100 amperes, 250V DC, maximum, waterproof, Dwg. No. B-8120, alt. 4	x	x	x	----	June 19, 1950
Welin Davit & Boat Division of Continental Copper & Steel Industries, Inc., Perth Amboy, N. J.:					
Limit switch for lifeboat winch, main line, 100 amperes, 600 volts AC, 250 volts DC, maximum, waterproof, Dwg. No. 3243-6 dated May 4, 1950	x	x	x	----	May 23, 1950
Lifeboat winch, power-operated, wiring diagram, Dwg. No. 3243-11, alt. 0	----	----	----	----	May 26, 1950

INVESTIGATING UNITS

Coast Guard Merchant Marine Investigating Units and Merchant Marine Details investigated a total of 601 cases during the month of May 1950. From this number, hearings resulted involving 21 officers and 49 unlicensed men. In the case of officers, no licenses were revoked, 4 were suspended, 7 were suspended with probation granted, 1 was voluntarily surrendered, 6 cases were dismissed after hearing and 1 hearing was closed with an admonition. Of the unlicensed personnel, 7 certificates were revoked, 14 were suspended, 19 were suspended with probation granted, 12 were voluntarily surrendered, none were closed with an admonition and 11 were dismissed after hearing.

MERCHANT MARINE LICENSES ISSUED DURING MAY 1950

DECK OFFICERS

		Region								Total	
		Atlantic coast		Gulf coast		Great Lakes and rivers		Pacific coast			
		O	R	O	R	O	R	O	R	O	R
Master	Ocean	10	70	1	12	0	4	7	41	18	127
	Coastwise	2	17	1	0	0	0	1	2	4	19
	Great Lakes	0	1	0	0	1	12	0	0	1	13
	B. S. & L.	14	44	1	2	1	1	3	11	19	58
	Rivers	1	4	1	2	1	12	0	0	3	18
Chief mate	Ocean	12	49	4	12	0	3	9	17	25	81
	Coastwise	0	1	0	0	0	0	0	0	0	1
Second mate	Ocean	13	33	1	8	0	5	5	16	19	62
	Coastwise	0	0	0	0	0	0	0	0	0	0
Third mate	Ocean	7	32	1	1	0	9	8	20	16	62
	Coastwise	0	0	0	0	0	1	0	0	0	1
Mate	Great Lakes	0	0	0	0	0	0	0	0	0	0
	B. S. & L.	3	4	1	0	0	0	3	4	7	8
	Rivers	0	0	1	1	7	4	1	1	9	6
Pilots	B. S. L. & R.	86	117	30	23	29	33	21	48	166	221
Master	Uninspected vessels	1	3	0	0	0	0	5	5	6	8
Mate	Uninspected vessels	1	1	0	0	0	0	3	0	4	1
Total		150	376	42	61	39	84	66	165	297	686
Grand total		526		103		123		231		983	

ENGINEER OFFICERS

		Atlantic coast O	Atlantic coast R	Gulf coast O	Gulf coast R	Great Lakes and rivers O	Great Lakes and rivers R	Pacific coast O	Pacific coast R	Total O	Total R
Steam	Chief engineer:										
	Unlimited	10	91	4	40	0	19	8	67	22	217
	Limited	3	44	0	11	2	24	0	9	5	88
	First assistant engineer:										
	Unlimited	15	30	5	15	1	4	5	33	26	82
	Limited	2	1	0	1	2	3	0	2	4	7
	Second assistant engineer:										
	Unlimited	16	54	6	16	0	25	7	27	29	122
	Limited	0	0	0	0	0	3	0	1	0	4
	Third assistant engineer:										
	Unlimited	8	81	2	22	1	32	3	38	14	173
	Limited	0	2	0	0	0	0	0	0	0	2
Motor	Chief engineer:										
	Unlimited	2	17	0	10	1	2	1	11	4	40
	Limited	9	26	1	8	0	7	8	8	18	49
	First assistant engineer:										
	Unlimited	3	3	0	2	0	1	1	4	4	10
	Limited	2	1	0	0	0	1	0	1	2	3
	Second assistant engineer:										
	Unlimited	1	5	0	2	0	0	2	1	3	8
	Limited	0	0	0	1	0	0	2	0	2	1
	Third assistant engineer:										
	Unlimited	1	76	1	21	0	39	0	42	2	178
	Limited	0	6	0	0	0	0	0	0	0	6
Uninspected vessels	Chief engineer	0	0	0	0	0	0	4	6	4	6
	Assistant engineer	0	0	0	0	0	0	5	1	5	1
Total		72	437	19	149	7	160	46	251	144	997
Grand total		509		168		167		297		1141	

RADIO OFFICERS

Total	28

ORIGINAL SEAMEN'S DOCUMENTS ISSUED MONTH OF MAY 1950

Region	(1) Staff officer	(2) Continuous discharge book	(3) U. S. merchant mariner's documents	(4) AB any waters unlimited	(5) AB any waters 12 months	(6) AB Great Lakes 18 months	(7) AB tugs and towboats any waters	(8) AB bays and sounds [1]	(9) AB seagoing barges	(10) Lifeboatman	(11) Q. M., E. D.	(12) Certificate of service	(13) Tankerman
Atlantic coast	22		400	107	41		2	1	1	144	92	278	33
Gulf coast	4	5	114	67	11	3			12	33	27	79	27
Pacific coast	6	2	184	74	19	2				74	43	146	3
Great Lakes and rivers	4		686	22	58	33				60	46	613	44
Total	36	7	1,384	270	129	38	2	1	13	311	208	1,116	107

[1] 12 months, vessels 500 gross tons or under not carrying passengers.

NOTE.—Cols. 4 through 13 indicate endorsements made on U. S. merchant mariner's documents.

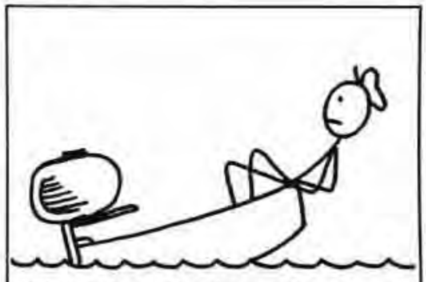
WAIVERS OF MANNING REQUIREMENTS FROM MAY 1 TO 31, 1950

Region	Number of vessels	Deck officers substituted for higher ratings	Engineer officers substituted for higher ratings	Able seamen substituted for deck officers	Ordinary seamen substituted for able seamen	Qualified members of engine department substituted for engineer officers	Wipers or coal passers substituted for qualified members of engine department	Wipers, coal passers, or cadets substituted for engineer officers	Ordinary seamen or cadets substituted for deck officers	Total
Atlantic coast										
Gulf coast										
Pacific coast	1		1							1
Great Lakes										
Total	1		1							1

NOTE.—In addition, no individual waivers were granted to permit the employment of able seamen holding certificates for "any water—12 months" in excess of the 50 percent authorized by general waiver.

"To tempt fate—just overload."

"Just one more fish," may result in one "poor fish."



"If I only had a larger boat . . ."

CONSTANT VIGILANCE IS THE PRICE OF SAFETY

Good Seamanship Means:

*Doing what the other fellow expects you to do before he has time to prevent it

*Taking your vessel where it is safe, when it is safe at the speed of a prudent seaman

---

THE CAREFUL MAN

He'd walk round the block to avoid a black cat,
But watch for oil spilled on the deck? never that.
Walk under a ladder? He'd rather be dead,
But to lash one he's climbing ne'er enters his head.
It's no use to offer third light on a match,
But he'll flick a hot butt down the square of the hatch.
To break an old mirror would frighten him stiff,
But broken glass on the deck—hell, what's the diff?
Dark glasses in fashion? Then that's what he uses,
But goggles for chipping he flatly refuses.
He's worked out a method of rolling the cubes,
But thinks that safe lifting is only for rubes.
He'd lay his whole stake on a tip from a tout,
But never give heed to the warning, "Look Out!"
He reads every word of each new comic book,
But a sign for his safety gets nary a look.
A lot of small things get his careful attention,
Why not just a little to injury prevention?

Shipboard Safety, June 1949.

Courtesy, Outboard Boating Club of America

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