PROCEEDINGS
OF THE MERCHANT MARINE COUNCIL

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Feature

SS PINE RIDGE

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The Merchant Marine Council of The United States Coast Guard

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NEW SAFETY AWARD

THE NEW Jones F. Devlin Award, sponsored by the American Merchant Marine Institute and given to any vessel in the American merchant marine which goes 2 years or more without a lost-time accident, was presented recently to the tanker *Flying A New York* in recognition of her 3 years of accident-free performance. Left to right: Charles J. Mellendeck, Tidewater's eastern marine manager; Capt. Erich Richter, Jr., master of the ship; Mr. Mullins; William S. Davidson, eastern transportation manager; and H. F. Tomfohrde, home office transportation manager, both of Tidewater.

DIST. (SDL NO. 73)

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ADMIRAL RICHMOND AWARDED DISTINGUISHED SERVICE MEDAL

PICTURED ABOVE at the award presentation: Admiral Richmond, Mrs. Richmond, and Secretary of the Treasury Douglas Dillon.

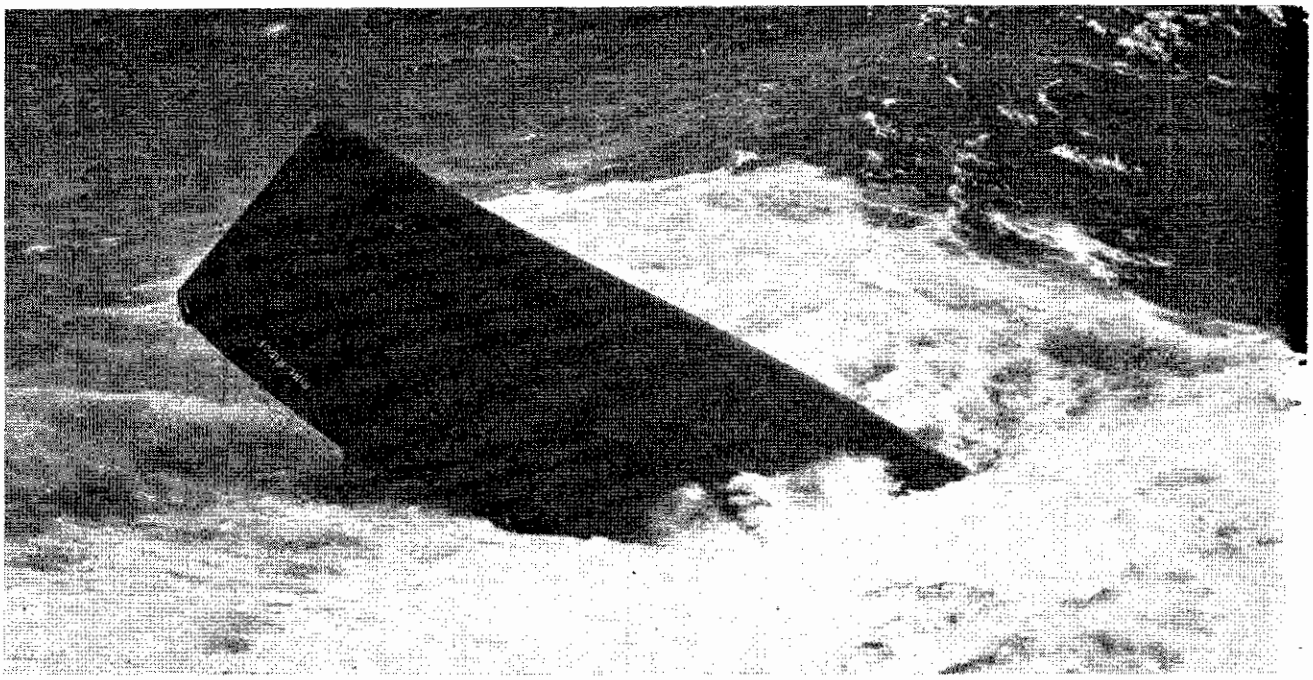
On the 29th of September Douglas Dillon, Secretary of the Treasury, presented the Nation's highest peacetime award, the Distinguished Service Medal, to Admiral Alfred C. Richmond, Commandant of the U.S. Coast Guard.

In making the presentation, Secretary Dillon commended Admiral Richmond for his "exceptionally meritorious service to the Government of the United States" while serving as delegate to the Maritime Safety Committee of the Intergovernmental Maritime Consultative Organization (IMCO) and as Chairman of the United States Delegation to the International Conference on Safety of Life at Sea (SOLAS). The latter conference was held in London, England, between May 17 and June 17, 1960.

The SOLAS Conference was attended by representatives of over 60 nations. Admiral Richmond organized and coordinated the efforts of a task force of over 200 representatives of U.S. agencies, shipping, and ship building industries. The task force worked for 2 years in preparation for the SOLAS Conference. Admiral Richmond's tactful and effective presentation of U.S. proposals won considerable support and pointed the way to improved standards for the world's shipping industries.

Admiral Richmond has been Commandant of the Coast Guard since 1954. During World War II the Admiral served as Commanding Officer of the Coast Guard Cutter *Haida* on convoy escort duty in the North Pacific. Later in Europe, he received the Bronze Star Medal for his part in organizing Coast Guard forces in the Normandy Invasion and contributing to the efficiency of merchant ships sailing the invasion routes. The French Government awarded him the Croix de Guerre for exceptional services in the liberation of France.

SS PINE RIDGE



ON WEDNESDAY, DECEMBER 21, 1960, the 10,417-ton T–2 American tanker SS *Pine Ridge,* which had broken in two, became the object of a large scale search and rescue operation. There were 29 survivors of the 37 persons on board; Captain Clark Snyder, the mates, and the radio officer were among the 8 persons lost. The stern portion of the vessel was successfully salvaged.

Rescue operations included participation by a number of merchant vessels, the U.S. aircraft carrier *Valley Forge,* her escorts and helicopters, Coast Guard cutters, and shore-based aircraft.

From a SAR point of view, the case had one relatively favorable factor, location; and two highly unfavorable ones, (1) weather, and (2) absence of communications with survivors. At 120 miles east of Cape Hatteras, the distance to nearest port (Norfolk) was not excessive, and the area relatively well-traveled. An early AMVER plot showed 32 merchant vessels within a 150-mile radius. Even so, with prevailing visibility, the likelihood of another vessel happening to pass close enough to recognize that the *Pine Ridge* was in distress was poor indeed. Every vessel in the vicinity was making heavy weather of it, and high winds created blinding spindrift. Radar does not help much in these circumstances. Besides having range reduced by ship motion and targets blurred by sea-return, the radar lacks any special signals to show if a target ship is in trouble or not.

In the early stages of the rescue operation, winds from the south of 60 knots and seas in excess of 50 feet were reported—fortunately both subsided as rescue efforts continued. Apparently, *Pine Ridge* lost the use of her radio equipment during the first moments of the disaster; no distress calls were received. Information of conditions aboard the *Pine Ridge* originated from eye-witnesses who were themselves greatly hampered by low visibility and the extreme hazards of approaching the wreck closely.

The first news of the plight of *Pine Ridge* was sent by a passing merchant vessel, the Norwegian tanker *Artemis.* Had it not been for this fortunate sighting, the discovery might easily have been delayed as much as a day. As it was, *Artemis* herself could take no direct action—mountainous seas and high winds prevented a close approach. She could not communicate with survivors, and could not then even identify the ship in distress. She broadcast an SOS at about 1645 GMT. At 1915 GMT two Coast Guard aircraft, on scene as a result of *Artemis'* report, were able to establish that the stricken tanker was the *Pine Ridge.*

The AMVER Center in New York sent periodic lists of predicted positions of merchant vessels to Rescue Coordination Center, Norfolk. Among the vessels on the first list were *Cristobal, Esso Jamestown, Berlin,* and *Ticonderoga,* all of which diverted to the scene and stood by. The 255-foot Coast Guard Cutter *Androscoggin,* proceeding from the time of *Artemis'* broadcast, arrived at 0140 GMT, 22 and assumed on-scene command. Forces on the scene were soon augmented by arrival of the *Amoco Florida,* the aircraft carrier *Valley Forge,* and Destroyers *Conway* and *Eaton.* Each arrival was posted in AMVER's computer, so that later surface plots reflected the presence of vessels standing by as well as those passing farther away. The vessels on scene could do nothing in darkness, but the next morning the presence of *Valley Forge* became a tremendous advantage.

In a daring and highly successful operation, helicopters from the *Valley Forge* evacuated survivors from the *Pine Ridge* stern section. Making 10 separate trips, in the face of high winds, to a moving platform cluttered with obstacles, these aircraft carried 28 survivors to safety. The 29th, Chief Engineer John Richart, remained on the drifting stern section to await tow to Norfolk, as weather moderated. The action by men of the *Valley Forge* was magnificent, certainly deserving of highest praise.

Early that day it was indicated that further help by merchant vessels would not be needed and they were so advised. With the removal of survivors and improving weather, rescue phases ended. The Coast Guard tug-type SAR vessels *Chilula* and *Cherokee* remained on the scene awaiting arrival of a commercial tug and stood by the bow section which had drifted many miles from the upright stern section and menaced navigation. The bow section was last seen at 0354 GMT on December 23d.

Clearly, reducing casualty at sea requires eternal vigilance and adherence to safe procedures. One measure in the direction of safe procedures which we recommend is regular participation in the AMVER system. As in this case, AMVER plots quickly show the names of vessels and up-to-date positions within a desired area. This information is vital for SAR Coordination. When appropriate, the AMVER plots are sent to vessels on the scene, whether merchant or Coast Guard and regardless of nationality. Currently, over 5,500 separate vessels are participating in AMVER, and the number continues to grow.

UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDANT
U. S COAST GUARD
HEADQUARTERS
WASHINGTON 25, D. C

MVI
14 July 1961

Commandant's Action on Marine Board of Investigation; structural failure of tanker *Pine Ridge* on 21 December 1960, off Cape Hatteras, with loss of life

The record of the Marine Board of Investigation convened to investigate subject casualty together with its Findings of Fact, Conclusions, and Recommendations has been reviewed.

At about 1145 EST, 21 December 1960 the SS *Pine Ridge*, a T–2 type tank vessel of U.S. registry, broke in two in heavy weather about 95 miles east of Cape Hatteras. The bow section subsequently foundered with the loss of seven crew members including the master. The stern section of the vessel was later recovered and the 29 remaining crew members survived without any serious injuries.

The SS *Pine Ridge* departed Tankport, New York, on the morning of 20 December 1960 en route to Corpus Christi, Tex. The vessel was empty of cargo and tanks 4 and 7 across were in full ballast. During the night of 20 December ballast was gravitated into number 3 center and number 8 center tanks. At about 0400, contrary to prior forecasts, the weather started to deteriorate and the vessel while on course 180° T began encountering head winds and seas and began to pound. Orders were given by the master for butterworthing and ballasting and at 0423 speed was reduced from full ahead, about 89 RPM (15 knots) to 80 RPM (12 knots). At 0440 the master ordered 70 RPM but was advised by the first assistant engineer on watch in the engineroom that he would be unable to pump ballast on variable frequencies below 48 or 49 cycles which required approximately 73 to 76 RPM on the propeller. The master then requested that the vessel's speed be slowed as much as possible and permit pumping operations. There was no indication by the master of an emergent situation developing at that time. After the ballasting commenced the vessel began to ride easier. At about 1000 the master and chief mate were heard to mention gale warnings and expectations of worse weather ahead. At this time butterworthing and other work on deck was discontinued as the vessel was secured for heavy weather although ballasting continued in No. 5 tanks. At 1140 the master ordered the ballasting secured and shaft RPM reduced to 60 (9–10 knots) as number 5 tanks had been completely filled. At this time the vessel was now rolling and pitching heavily and possibly taking green seas over the bow but none of the witnesses had the impression that she was pounding or slamming hard. At 1145, without any warning, there was a loud crack or crunch and the bow of the vessel forward of number 6 tank was observed to raise up out of the water. On a subsequent sea the vessel tore across the deck and the bow sheared around to the right, then broke completely off. At the time of the casualty the master, chief mate, second mate, third mate, radio officer, chief steward, and quartermaster were in the midship house which was on the forward section. As the forward section separated the bow was observed to be high out of the water and the after end awash up to the boat deck. No lifeboats were launched from the forward section and sometime during the late afternoon or early evening of 21 December the forward section sank. There were no survivors from the forward section, nor were any bodies recovered.

The Norwegian motor vessel *Artemis* on an opposite parallel course was 4 miles away and observed the *Pine Ridge* as she broke in two. The *Artemis* sent an SOS and remained in the area until released the following morning. In response to the SOS the SS *Esso Jamestown* proceeded to the scene, arriving at 1608 and joined in the search for possible survivors from the forward section.

Aboard the after section the chief engineer, with the assistance of members of the engine department, kept the plant in operation but no effort was made to operate

the engine. On the morning of 22 December the weather moderated and the survivors were removed by Navy helicopter and taken to the USS *Valley Forge* with the exception of the chief engineer who remained aboard the after section until it was towed into Newport News, Va.

The Board found that the failure was primarily of the ductile type which would be indicative of a high stress condition. Some brittle fractures were in evidence on deck port and starboard but were not regarded as directly causative to the failure in sagging. The vessel was fitted with 12 riveted straps, 4 more than required, and there was evidence that successful arrests of almost all of the brittle fractures occurred at the straps concerned.

The Board determined that the loading distribution of the vessel resulted in a sag numeral of almost plus 150 and a hog numeral of almost minus 20, calculated in accordance with the American Bureau of Shipping publication "Guidance Manual for Loading T–2 Tankers." The maximum sag numeral recommended in the manual is 100 and the figure of plus 150 reflects a dangerous condition of stress.

The investigation disclosed that the American Bureau of Shipping had audio-gauged the vessel's main hull structure in 1959. Gauge readings made after the casualty were in substantial agreement with the American Bureau of Shipping average readings and reflected a borderline condition. However, in some areas wastage was excessive.

The *Pine Ridge* was last certificated on 19 October 1959 and was laid up from November 1959 to October 1960. The owners then made plans to jumboize the vessel and desiring to place her back in service prior to that time requested a preliminary examination from the local Officer in Charge, Marine Inspection, to obtain an approximate idea of the repairs required. The Officer in Charge, Marine Inspection, personally conducted this examination 6 October 1960 but as the vessel was not gas-free the requirements issued at that time were of a limited and general nature. When subsequently gas-freed the vessel was attended by a Coast Guard inspector and classification society surveyor and such repairs as in their judgment were necessary to render the vessel seaworthy were required.

REMARKS

Concurring with the Board, it is considered that the principal cause of this casualty was improper ballasting. Since the master had been provided with a copy of the "Guidance Manual for Loading T–2 Tankers" and had considerable experience in this type of vessel, there appears to be no satisfactory explanation for the dangerous ballast condition which existed when the vessel broke in two.

The Board concluded that at the time of the casualty the vessel was encountering extremely severe weather and that the most serious contributing cause was the vessel's course and speed directly into the seas. The Board's finding that the wind was Beaufort 9–10 and the seas were about 30 feet high is supported by the reports of other vessels in the area. Despite this, the consensus of the witnesses aboard the *Pine Ridge* was that the weather, although rough and getting progressively worse, had not reached extreme proportions and the vessel was not laboring greatly. Without further testimony from the master or other navigation personnel the master's choice of course cannot be criticized. That the master recognized the desirability for a reduction of speed was evidenced by his request to the first assistant engineer who was on watch during the 0400 to 0800 watch in the engineroom. In this regard, although the first assistant engineer did not believe a second auxiliary generator could be put on the line to permit reduction of speed while at the same time operating three cargo pumps for pumping ballast without risk of losing all power, the chief engineer was of the opinion such arrangement could have been accomplished without difficulty. Whether or not this would have changed the ultimate outcome of this casualty is speculative.

The Board further concluded that the weakened structural condition of the vessel as a result of wastage was a contributing factor. As the Board suggested, the fact that the *Pine Ridge* was scheduled to receive a new midbody in the course of being jumboized quite probably was in the minds of the owners, the classification surveyors and the Coast Guard inspector while the condition of the internals and the necessity of renewals was being considered. In this connection the Board stated as a fact that repairs to the internal structure did not include all of the items listed by the Officer in Charge, Marine Inspection as a result of his personal inspection. These requirements issued as a result of inspection while the vessel was not yet gas-free were necessarily general. There is nothing in the record to indicate that they were not carried out to the extent that the hull inspector later considered to be necessary after examination of the vessel in a gas-free condition.

Aside from the opinions by the Board, this casualty again points up the fact that the determination of the condition of an aged vessel is particularly difficult. An estimate of the strength remaining in any vessel must include many factors in addition to age, route and trade and does not lend itself readily to specific percentages of wastage or, as set forth in the Board's second recommendation, to requirements for mandatory periodic gauging. The "Notes on Inspection and Repair of Steel Vessels" distributed to the industry as Navigation and Vessel Inspection Circular No. 4–60 was an attempt to point out some of these factors and promote uniformity in the approach to hull repair requirements. Underlying the promulgation of this guide was the premise that there would be a working liaison between the Office in Charge, Marine Inspection, the local representative of the classification society and the owners. Obviously the proper balance between economy of operation and safety can only be achieved with full cooperation, mutual assistance, and a frank exchange of information between those directly concerned. With respect to the Board's recommendation, specifically recommending closer cooperation between the Coast Guard and the American Bureau of Shipping on structural conditions and surveys, it must be recognized that this is and always has been the policy of the Coast Guard.

Concerning the Board's recommendation that Coast Guard inspectors be advised of the importance of closely adhering to the structure repair recommendations contained in the "Notes on Inspection and Repair of Steel Vessels," there is no substantive evidence that they were not adhered to considering the fact that those notes are guidance material. On the other hand, as a matter of policy, it is expected that Coast Guard inspectors will refer to all existing instructions, technical data and background material to insure fulfillment of the Coast Guard's statutory responsibility with respect to seaworthiness and safety of life.

The Board's recommendation that inflatable life rafts be required on all ocean-going vessels will be referred to the Merchant Marine Council.

The manner in which the chief engineer performed his duty after the vessel broke in two will be referred to the Merchant Marine Awards Committee of the Maritime Administration.

Subject to the foregoing remarks the record of the Marine Board of Investigation is approved.

A. C. RICHMOND,
Admiral, U.S. Coast Guard,
Commandant.

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 4–60

MAY 16, 1960

Subj: Notes on Inspection and Repair of Steel Hulls

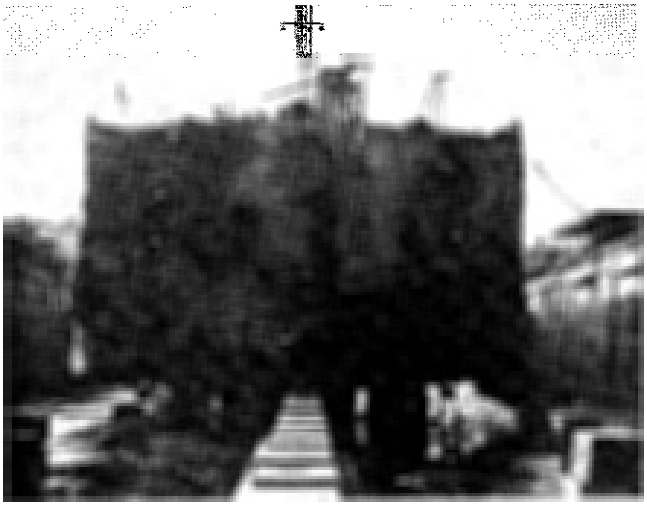
PURPOSE

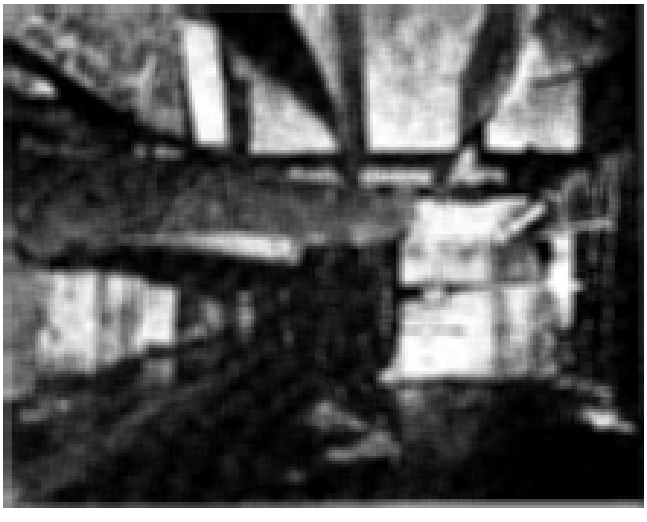
The following "Notes on Inspection and Repair of Steel Hulls" are intended to disseminate to Coast Guard Marine Inspectors, Vessel Owners, and Shipyards general information relating to good practice in the inspection and repair of steel hulled vessels. This information is furnished for guidance purposes. Where specifics are given it should be understood that mandatory application is not necessarily intended. Nothing herein shall be taken as amending the applicable regulations, or as prescribing or limiting the authority and responsibility of the Officer in Charge, Marine Inspection in the exercise of his good judgment.

DISCUSSION

For some time there has been evidence of need for promulgation of guidance material on the inspection and repair of steel merchant vessel hulls. The attached notes, which include some material previously issued in the Merchant Marine Safety Manual, are believed to cover the more important aspects of hull structural inspection and repair as indicated by past experience. However, it is expected that with experience in the use of these notes, need for amendments or additions may become quite apparent. Constructive comments and suggestions will be welcome, and, as necessary, revisions will be issued.

NOTES ON INSPECTION AND REPAIR OF STEEL HULLS





I. PURPOSE

(A) These notes are intended to summarize, in a general way, technical data and background information pertaining to the inspection and repair of steel vessels. They are not intended to specify the degree of thoroughness of any inspection which, of course, must be left to the inspector. Nor are they designed to be a substitute for the exercise of good judgment in the solution of any particular repair problem. They are intended to serve the following purposes:

(1) Summarize and consolidate technical information pertaining to the inspection and repair of steel vessels.

(2) Serve as a training aid for students and the less experienced inspectors.

(3) Promote uniformity in the approach to hull repair requirements among the various marine inspection offices.

II. GENERAL

(A) The performance of an adequate inspection requires a knowledge of where to look and what to look for. With respect to hull structure, the inspector is looking for deficiencies which may affect the strength or integrity of the hull to an extent which would make it unseaworthy. The major categories of these deficiences are as follows:

(1) *Deterioration*
General or local

(2) *Hull Defects*
Fractures, buckling or other deforma-

tion, cracking or tearing, weakening or failure of fastenings

(3) *Hull Damage*
Such as caused by grounding, collision, the employment of the vessel, etc.

(B) While it is logical to expect more of these difficulties on the older vessels and on vessels which have seen rough service, inspection of the newer vessels is also required, because some of these defects can occur even after relatively short service. These notes detail, in section III, some of the particular points which have been the source of trouble in the past and to which special attention should be given in carrying out a hull examination.

(C) When in the course of such an inspection, one or more of these deficiencies is encountered, the inspector must first evaluate if seaworthiness is compromised or not. This calls for considerable discretion because the line of demarcation between what is seaworthy and what is not is necessarily approximate and subject to some range of interpretation. The following factors must be weighed in making this determination:

(1) Whether the deterioration is currently active or has been arrested in whole or in part by protective action.

(2) The period of time involved before the next scheduled inspection of the area in question. Certain areas are accessible to inspection at every drydocking whereas other areas are only exposed during the surveys required by the classification societies. A progressing condition which may be acceptable in one area would not be acceptable in another without repair or, at least, without a pending requirement for further inspection at a prescribed, future date.

(3) Whether the repair work contemplated is necessary to restore seaworthiness or is a maintenance measure to insure prolonged utilization of the vessel. In the first case, repair must be required. In the second case, the details of the condition should be entered in the vessel's records as a matter which should be reconsidered at a future inspection and, possibly, called to the attention of the owner so that he may exercise his own good judgment.

(D) Once a decision has been reached by the inspector that repair is necessary, the specific requirement detailing the nature and extent of the work should be written. The general rule is to "renew as original" i.e., to replace the defective structure so as to restore its original design and condition. However, in cases where the necessity for repair evidently stems from an unsatisfactory structural feature, this feature should be corrected in making the repairs. As an example, following unsatisfactory service experience, square hatch corners have been required to be modified by provision of radiused insert plates. Where such a need for design modification exists, plans covering the change should normally be prepared and approved before the work is undertaken, insofar as practicable.

(E) In some instances, the owner may desire to reduce the structural work corresponding to renewal in kind by provision of supplementary structural reinforcement. When one considers the complicated and costly nature of repairs involving extensive renewals, it is evident that consideration should be given to such alternate means of repair proposed by the owner or by the shipyard in his behalf if they are generally in line with the procedures and methods set forth in section IV of these notes.

(F) If the vessel is in class, and/or is assigned a load line, the nature and extent of the repairs as determined by the classification society surveyor is to be given full consideration. However, if there is a difference of opinion as to what should be required, the inspector cannot discharge his responsibility by deferring to anyone else's judgment. Instead, in such cases, he should refer the matter to his superior officer for assistance and/or decision before the final requirements are written. A working liaison between the Officer in Charge, Marine Inspection and the local representative of the classification society will generally serve to iron out such difficulties. The repair measures set forth in Section IV of these notes are to be considered as general principles rather than specifics to be rigidly enforced in all cases. They should be employed as a guide in a manner which will take account of interests of the ship owner while, at the same time, fulfilling the Coast Guard's statutory responsibility with respect to seaworthiness and safety of life.

III. NOTES ON INSPECTION

(A) DETERIORATION:

Deterioration of the metal structure is probably the most common, single defect in steel vessels. It can be due to a number of different causes or combinations thereof including age, inadequate maintenance, working of the hull structure, chemical or erosive action of the cargoes carried, electrolysis, local wear, some improper feature of design, etc. In some cases, such as deep pitting, it is easy to detect. In other cases, such as the general erosion of age, it is impossible to ascertain without actually gaging. In any case, once found, it requires judgment to evaluate and to determine if and to what extent repair is necessary.

(B) GAGING:

(1) The only practical way of determining the degree of deterioration is to measure the thickness of the member in question and compare it with the thickness which was originally provided. Since this determination usually requires drilling of the hull or other expensive preparation, it should not, in general, be undertaken unless there is a reasonable basis for doubt as to the present scantlings. Deep pitting over an area, excessively thin edges on structural shapes, fractures, bands or belts of corrosion across bottom plating which may indicate heavy working, marked local corrosion are all justifiable bases for requiring gaging of the affected plates. In the case of tank vessels which have been primarily in light products trade or freight vessels which have been carrying sulphur or similar corrosive cargoes, deterioration may be expected to be more rapid than in other types.

(2) General gaging around one or more complete transverse sections of a vessel, frequently referred to as belt gaging, provides a means of assessing the average wastage of the hull envelope at the section concerned, and its consequent effect on hull strength. However, indiscriminate belt gaging, particularly of recently built vessels showing little evidence of deterioration is unnecessary and should be avoided. On the other hand, in the case of an existing vessel undergoing inspection for her original certificate, or in the case of a vessel upgrading her service to a more exposed route; belt drilling should normally be undertaken to determine general condition. In addition to gaging on representative transverse belts it is also well to take a belt between "wind and water" as this is an area highly susceptible to corrosion.

(3) Section 43 of the American Bureau of Shipping Rules for Building and Classing Steel Vessels also provides guidance in the matter of gaging. At the special survey occurring approximately 8 years after build, and thereafter, surveyors may require gaging where considered necessary. At the special survey occurring ap-

proximately 12–15 years after built for tankers and at the one occurring approximately 24 years after build for ordinary vessels, general gaging to determine the thickness of shell, deck, and other main scantlings is required. The results of these gagings are submitted to the American Bureau home office for evaluation. The foregoing provisions apply to vessels on salt water. The American Bureau Rules contain no mandatory periodical gaging requirements for fresh water vessels, the necessity for gaging being left entirely discretionary with the surveyor. Where possible, to minimize expense to the owner, the inspector should witness such periodic surveys and make use of the results obtained. However, care should be taken to insure that the belts, which he is to accept for his purposes, are drilled in sections of the hull wherein the seaworthiness is most in question. For example, in a light products tanker, a belt gaged in way of the machinery space or a cofferdam would probably not be representative of the condition prevailing in the cargo tanks.

(4) This brings up the point that for gaging to be of value in judging the seaworthiness of a vessel, the locations should be chosen with a view towards determining the weakest section, not towards finding the unique spots of minimum thickness. However, the worst single spots should be sought out first to determine whether or not more extensive gaging is necessary.

(5) Where gaging is indicated, either belt or local, it may be accomplished by drilling holes in locations specified by the inspector thus permitting the actual thickness of the plate or member to be measured by the inspector. Ultrasonic measurement may be used in lieu of drilling and gaging if it is authorized by the local Officer in Charge, Marine Inspection. However, when this method is used to comply with a specific requirement for gaging, the inspector should choose the locations and witness the gaging. Also, he should satisfy himself as to the accuracy and adjustment of the instrument by comparing results with the actual gaging of test holes. Test pieces may also be used to check the calibration of the instrument.

(C) CORROSION LIMITS—GENERAL

Service experience forming the basis of the classification society rules for the construction of ships indicates that, in general, for most portions of a vessel, and without other weakening factors, a thickness deterioration of up to about 25 percent may be accepted before replacement is necessary. This is based in part on the condition usually found aboard ship that all structural members do not deteriorate uniformly. This means that, in the application of this percentage, considerable judgment is called for depending upon the location and extent of wasted material. Localized wastage of some portions of plates or structural members in excess of 25 percent may be accepted in many cases, if the condition of the adjacent material is sufficiently good to maintain an adequate margin of strength. On the other hand, there may be instances where either general or localized wastages of less than 25 percent would call for replacement of material. These exceptions are dealt with in paragraph (D) and (E) and in the discussions of the individual major hull components.

(D) OVERSIZE OR UNDERSIZE SCANTLINGS

There are some vessels in existence which were built to scantlings differing from those required by the current American Bureau of Shipping Rules. In evaluating the necessity for replacing deteriorated structure in such vessels allowance needs to be made for the fact that the vessel was built to scantlings differing from the current requirements. Where the original scantlings are known to be in excess of requirements, a corresponding increased corrosion allowance is acceptable. Conversely, where original scantlings are below requirements, the maximum acceptable deterioration is reduced. As an example, for converted LST's, originally built to less than commercial scantlings, ¼" deck plating, ⅜" stringer and sheer strakes, and ⅜" bottom plating including the bilge strakes should generally be replaced when wasted more than 15 percent. In dealing with ex-LCT's and other lightly built vessels converted to merchant service similar reduced corrosion allowances are in order. Also, it is to be noted that individual members may sometimes be made oversize to compensate for some other feature of the overall design and, consequently, an extra corrosion allowance would not be in order. Because of these ramifications, it is not considered practical for inspectors to attempt to determine whether a vessel's original scantlings are under or over requirements. When it is believed that the original scantlings may have been light, the matter should be referred to the Area MMT office or to the Commandant (MMT) before a full corrosion allowance is permitted. On the other hand, if the owner requests an increased corrosion allowance because of oversized scantlings, he should offer suitable verification. Proper notation on the original plans of the vessel or documentary evidence from the classification society would be acceptable for this purpose.

(E) ALTERNATIVES

In some instances owners may desire to install supplemental structural reinforcement rather than replace deteriorated material. This may be feasible but, since it constitutes a modification of design, plans detailing the proposed changes should be approved before the work is carried out.

(F) DECK PLATING

Deck plating, although not normally subject to either excessive corrosion or to mechanical abuse, represents highly stressed critical hull girder material. The corners of hatch or other deck openings, corners of deck erections, pads, or other items producing discontinuities or hard spots should be examined for evidence of cracking. Wherever practicable the detail concerned should be eased and made less abrupt when repairs are made. In the case of riveted construction, special attention should be paid to the riveting of the butts. Discovery of evidence of working or loose rivets in butts calls for prompt corrective action. This may be evidence of cracking at the rivet holes not yet sufficiently extensive to extend beyond the rivet head. Cracking of the plate will, in general, call for replacement of that portion of the plating. Buckling of deck plating is uncommon. However, any such buckling can seriously impair the strength of the vessel and calls for corrective action.

(G) DECK LONGITUDINALS

In tank vessels the corrosive deterioration of deck longitudinals may be much more rapid than that of the deck plating. These longitudinals are necessary to support the deck plating so that it can carry local hydrostatic loading, to provide panel stiffness to the deck plating so that, as a part of the hull girder, it can carry compressive loading without buckling, and also to directly contribute to the hull girder stiffness and strength. Because the relative importance of these

factors may be different when dealing with different designs, it is very difficult to lay down any generally applicable wastage limits. However, for the usual proportions of longitudinals to plating and usual spans, deterioration of some deck longitudinals up to a maximum of about 40 percent or about 0.18'' wastage, whichever is the lesser, may be accepted provided the average deterioration is not more than about 30 percent or about 0.14'' wastage, whichever is the lesser. For a single voyage, maximum deterioration of some longitudinals as high as about 50 percent or about 0.22'' wastage has been accepted. In the case of river tank barges not carrying any deck cargo, general deterioration of deck longitudinals up to about 40 percent may be accepted. Since the obvious necessity for maintaining oiltightness does not apply to the rake ends they tend to be neglected. This should not be permitted since the rake ends provide the major buoyancy of the vessel and are, therefore, vital to seaworthiness.

(H) LONGITUDINAL AND TRANSVERSE BULKHEADS

In the case of tank vessels, deterioration up to about 35 percent, or in some cases somewhat more, may be accepted for longitudinal and transverse bulkheads provided there is no evidence of deformation when subjected to hydrostatic test. A somewhat lower corrosion allowance would be applicable to deep tank bulkheads in other types of vessels. Ordinary watertight bulkheads are usually not troubled by excessive corrosion, however, they should be checked along the lower boundaries and in way of bilge wells.

(I) BOTTOM PLATING, INNER BOTTOM PLATING AND BOTTOM INTERNALS

(a) As well as functioning as primary hull girder material, bottom plating is subjected to increased stress due to water pressure. Its strength may be reduced either by general or localized corrosion and by buckling. In view of the prime importance of this plating the maximum average reduction in thickness to be permitted in about the midships half-length is about 20 percent. If the wastage exceeds this amount the plating should be renewed. Alternate measures or means of reinforcement can be considered but since they would constitute a major change in the design of the vessel, plans for same should be submitted for approval to the Area MMT office or to the Commandant (MMT). After dealing with the bottom shell plating to insure that the main longitudinal strength has been maintained, if there should remain local areas or plates requiring attention, these may be dealt with on the basis of a maximum average wastage, say about 25 to 30 percent from original, provided the plates and supporting structure are otherwise in satisfactory condition. Welded butts which exhibit excessive wastage (grooving) as compared to the balance of the plate should be rewelded after excavation to sound metal.

(b) Unfair or set-in plating is not uncommon forward. A fair degree of deformation of the hull plates in the forward portion of a vessel ordinarily may be accepted without resulting in serious impairment of structural function. However, for transversely framed ships, severe buckling or set-in condition of bottom plating within approximately the amidships half length can seriously impair strength. In general the athwartship extent of buckling the greater the impairment in hull strength. Any appreciable buckle of sufficient athwartship extent to cross a center vertical keel or inner bottom girders is serious. Such a buckle should be corrected by fairing and/or replacement of plating and the buckled portions of girders. If there is no evidence to indicate the buckle was caused by grounding or other excessive local loading, or is associated with excessive wastage, it may be an indication of need for providing additional stiffening. In such instances, the Commandant (MMT) should be advised of the circumstances and proposed corrective measures. Buckles of shorter athwartship extent may also require correction, depending upon the depth or height of buckles, the number of buckles, and their relative locations. For instance several bottom buckles within the same frame space are more serious than the same number of the same size buckles would be if distributed in a random manner. Localized transverse bands of accelerated corrosion or grooving may be found in association with buckles. These are indicative of localized excessive stress which experience indicates may lead to cracking. Consequently plating replacement may be called for even though the deterioration may be less than 25 percent. In such case it is usually sufficient to replace less than a full plate.

(c) In the case of riveted construction such bands of stress corrosion may be observed, mostly immediately adjacent the riveted lapped butts, even where the plating surface is generally quite fair. Experience has shown that cracking develops in these areas. Since such cracks are in primary hull girder material, their occurrence must be regarded as a very serious matter. Where zones of serious corrosion are noted, appropriate preventative action in the form of plating replacement should be taken before any actual cracking develops. In making such replacements, as in the case of welded construction, renewal of less than a complete plate is acceptable if the condition of the balance of the plate is satisfactory. The butts of such renewal inserts should be flush welded, care being taken to insure 100 percent penetration. Originally riveted seams should be riveted, with sufficient existing riveting adjacent to welds released and re-driven to insure 100 percent sound riveting.

(d) Tank tops have been and are considered in the computation of scantlings for load line assignment both by ABS and the Coast Guard and must of necessity be maintained in reasonable condition consistent with their inclusion in assessment of the section modulus. Apart from the function of the tank top and the double bottom internals in contributing directly to the section modulus there are two other structural functions which are equally important. First, without support by the bottom transverses and longitudinals, the bottom plating has insufficient rigidity to carry compressive loading and tends to buckle when the vessel is subjected to a hogging bending moment. Secondly, the entire bottom structure has the function of resisting water pressure when the vessel is in ballast and of bearing the weight of cargo when loaded. It must be maintained in efficient condition to safely perform these functions.

(e) A moderate amount of buckling of tank tops is acceptable provided buckling is confined to the plating between transverse and longitudinal girders. Fairness of transverse and girders may be checked by sighting or use of a taut line along the frame and girder lines. If floors or girders are found to be appreciably deformed or cracked they should be repaired or replaced. In doing such work, any obvious defects such as sharp cornered or raggedly cut lightening holes or other cut-outs should be made fair. Buckling of floors or girders not associated with grounding or other external damage may be an indication of structural weakness and of need for structural modification or reinforcement, in addition to repair. In riveted construction, loosening and failure of the riveting within the double bottom may be observed. It is apparent that once the fastenings begin to fail the stress levels and corrosion rates in adjoining structure increase rapidly.

The practical solution to this problem is the early detection of the failing fastenings and the timely and adequate replacement of these fastenings in order that the existing material in the vessel can be made to perform to its capacity. The old adage that "a stitch in time saves nine" is certainly applicable here.

(J) FRAMES, BEAMS, AND STIFFENERS

Generally the flanges and portions of the webs next to the flanges are more highly stressed, more subject to mechanical damage, and corrode faster than the balance of the member. If excessive wastage has occurred but is limited to the flange and outer portion of the web, cropping of the defective section rather than complete renewal may be permitted. Details on this are included in section IV. Often times projecting frames or beams are deformed due to hook pulls, damage by cargo, etc. Such conditions, if they are scattered and not serious to the extent that the members are torn or broken loose from their fastenings, may be permitted to remain until there is other work required in the area. However, this principle would not apply to structural columns.

IV. NOTES ON REPAIRS

(A) FRACTURES

(1) Fractures in hull plates, etc., usually start in localized, highly stresed areas. In the preliminary inspection, the first thing to be determined is whether or not the fracture started in a notch or sharp angle (stress raiser), and if it did, to eliminate this feature.

(2) Major fractures. When major fractures occur and where considerable material is to be removed and new plates, frames, etc., are to be inserted, the repair may involve appreciably more restraint and less favorable welding conditions than for new construction. The type of repair to be made and welding procedure to be used should be carefully evaluated.

(3) Cracks. Cracks in the deck or in the bottom within about the amidships half length and which originate in structural discontinuities will frequently require the fitting of a suitable repair insert in order to minimize weld restraint in the local area of stress concentration. Cracks which have opened too far or are too irregular to permit satisfactory weld preparation, or which are located so that access is insufficient for producing sound, full penetration welds also call for the fitting of inserts, as does evidence of deterioration or poor quality of the fractured plate.

(4) As previously noted, localized bands of accelerated corrosion should ordinarily be taken as evidence of such deterioration and the affected portion of plating replaced. Where none of the foregoing conditions exist, the crack may be repaired by welding without replacement of plating.

(5) In repairing cracks which do not involve steel replacement the following procedure should be followed:

(a) Locate the ends of the crack, and at least two plate thicknesses beyond the end, drill a hole to prevent its extension. The diameter of the drilled hole should be about the same as the plate thickness. Then, V out the crack by chipping or gouging to an accepted edge preparation for welding plates of the particular thickness involved.

(b) Gas free, remove ceiling, etc., as necessary to provide full access to both sides of the crack. Thorough inspection of both sides of the crack should always be carried out.

(c) After V-ing out, if a crack has a root opening too wide for closing with the first bead, do not draw the edges of the plate together by means of a steamboat ratchet or other means preliminary to welding. Instead, build up the groove with light beads, until a groove of usual proportions is obtained, then the joint is ready to weld up as usual.

(d) Where the crack in the plating crosses stiffeners, framing or girders, the welds connecting these members to the plating should be released. This should be done by burning through the weld for a distance of at least 6 inches on each side of the crack before welding of the crack is commenced. In way of gunwale or hatch side assemblies, it may be desirable to increase the length of release.

(e) If the crack extends into the framing member, it should be suitably prepared and welded. If the resulting butt is welded after the plating or poor accessibility exists, the butt in the frame should be smoothly scalloped out adjacent to the plating.

(B) REPLACEMENT OF AND WORK ON SHELL AND DECK PLATING

(1) The following precautions apply to repairs or alterations on both riveted and welded hulls:

(a) Sheer strake. The sheer strake, insofar as practicable, should be kept clear of welded fittings. Where there is no alternative but to make attachments in this region, the attachment should be suitably faired with curved brackets, as applicable, and at least 150° F. preheat should be maintained during welding. However the use of preheat may ordinarily be omitted if low hydrogen electrodes are used. The upper edge of the sheer strake should be fair and smooth, i.e., free of notches, nicks and cuts, weld craters, and any irregular edge burning. Because of the change in ship steel requirements which became effective at that time, the foregoing precautions are particularly applicable to ships built prior to 1947.

(b) Stringer plate. Insofar as practicable the stringer plate should also be kept free of welded attachments.

(c) Welding of deck fittings. Where heavy deck fittings, such as chocks, bitts, and cleats, are to be welded to the strength deck, pre-heat of at least 150° F. should be employed during welding or low hydrogen electrodes should be used. Such heavy fittings should only be installed in accordance with approved plans. Ends of deck fittings should be kept well clear of deck butts and seams. When a number of fittings are installed on deck, positioning them in a direct line athwartships should be avoided. Also, if they are required to be in a longitudinal line, there should be sufficient interval between each so as to avoid creating areas of high stress concentration in the plating between the fittings.

(C) INSERT PLATES

(1) In welded construction, repairs involving less than full plate should generally be made by means of an insert plate installed in accordance with the following principles:

(a) While less than complete plates may be replaced the lines of cut and new welding should, as far as practicable, lie in existing lines of welding. Inserts should ordinarily not be less than one frame space in longitudinal extent.

(b) The existing plate should be cut back to good material. (No less than three-fourths thickness of plate being inserted.) The existing plate edge and the internals in way of the cut-out should always be examined before the insert is installed.

(c) The shipfitting and plate edge preparation should be such that welding grooves of proper proportions are provided so that acceptable welds can be made.

(d) The weld metal of intermediate passes on butts and seams of restrained insert plates may be peened. The finish pass should not be peened but may advantageously be made using low hydrogen electrodes.

(e) A welded lapped patch plate may be used in lieu of an insert plate for the permanent repair of small damaged areas which lie wholly

within an individual panel of the plate. However, their use should generally be avoided in bottom and deck plating. In making the installation, the old plate should be cut away to a sufficient thickness of sound metal so that the existing metal at the edge of the patch is at least as good as would be required if an insert were used. If the opening required to achieve this exceeds that appropriate to use of a patch plate, an insert plate should be used. Patch plates should be continuously fillet welded both inside and outside. In order to reduce heavy stress concentrations in the vicinity of patch plates, such plates and the holes which they cover should have their corners rounded to a radius at least equal to one-eighth of their transverse dimension or 3 inches whichever is the greater.

(D) WELDED DOUBLER PLATES

(1) Welded doubler plates are not, in general, considered suitable as a permanent repair measure. They may properly be used to provide local reinforcement at hatch corners, overboard discharges, seachests, mast or kingpost foundations, etc. They may also be used in accordance with approved plans, in the form of strapping fitted to increase the hull girder strength and stiffness. Where so used the plating to which they are attached should be in good condition to insure that efficient attachment by fillet welding along the edges and by plug welding in the body of the doubler can be made.

(2) On vessels operating on protected waters without double bottoms, or in other similar circumstances on such vessels, doublers may be accepted for repairs in way of engine or boiler rooms where it would be necessary to remove heavy equipment, etc. in order to provide access for plating replacement. However, in such cases care should be taken that existing plating has enough thickness for efficient attachment.

(3) Except as noted in the preceding paragraph and for emergency repairs made with the approval of the cognizant Officer in Charge, Marine Inspection, doublers should not be used as reinforcement for locally cracked or wasted plating. Where used for emergency repairs over a crack, the ends of the crack should be drilled and, if possible, the crack should be veed and welded. It is to be especially noted that wherever doublers are used the corners are to be well rounded.

(E) CROPPING AND RENEWING

(1) In the case of structural members such as frames, beams, stiffeners, etc., it is a practical repair measure to crop out the distorted or wasted section of the member or even just the defective part, the outer flange for example, and replace with new material. Where this method is used, the following conditions should prevail:

(a) There should be sufficient material in the remaining portion of the member to permit sound attachment of the new metal.

(b) The new portion should be in good alignment with the adjoining old portion. Particular care should be exercised in this regard in way of flanges.

(c) There should be sufficient clearance to permit the making of good welds. If this is not the case, the member should be renewed.

(d) If the attachment of the member to the adjoining plating is by riveting, this will have to be checked for tightness and corrected as necessary after completion of welding.

V. WELDING

(A) GENERAL

Section 26, Parts I and III of the American Bureau of Shipping Rules For Building and Classing Steel Vessels contains the requirements and instructions for the production of acceptable hull welds and the qualification of welders. These rules are not repeated here because they are available to and should be used by inspectors engaged in construction or repair work. Some points which require special note are discussed in the following paragraphs.

(B) WELDERS

In view of the importance of obtaining sound welds in repair work, only welders qualified by the Coast Guard. the American Bureau of Shipping or the Bureau of Ships (Navy Department) should be employed.

(C) STEEL

Steel plate which is to be welded should meet the applicable requirements for structural steel for hulls as set forth in section 39 of the American Bureau of Shipping Rules For Building and Classing Steel Vessels. Half rounds, rounds and bulb bars are usually produced from Bessemer steel which is likely to be very notch bittle at ordinary operating temperatures. Their use for welded attachment to hatch coamings, strength decks, cap rails, sheer strakes, and bottom shell, including bilge should accordingly be avoided. Half rounds and rounds known to have been produced from open hearth steel having properties similar to those of American Bureau classes B and C hull plate may be used. In such case, particular attention should be taken that all welding is sound and especially that welded butts have full penetration. The ends of half-rounds and bulbs should be kept clear of existing

THE STERN SECTION of the American tanker *Pine Ridge* wallows in heavy seas some 125 land miles east of Cape Hatteras, N.C., after the vessel split in two.

structural discontinuities. Half-round installations which disturb the smooth, unnotched edge of the sheer strake should not be fitted.

(D) ELECTRODES

Electrodes should be suitable to the steel to be welded. Except where special steels or approvals are involved, the welding electrodes should be among those listed in "Equipment Lists" CG–190, suitable for the welding involved. Electrodes should be kept dry while in storage. Where low hydrogen electrodes are used, it is especially important that they be dehydrated before use. Otherwise, moisture picked up from the atmosphere alone without any direct wetting may result in very faulty welds.

(E) EDGE PREPARATION

The preparation of the edge of the base metal before welding depends upon the thickness of the plate and the design of the joint. The requirements are specified in section 26 of the American Bureau of Shipping Rules. The following are some points which require special attention:

(1) Rough or irregular preparation of the edge should not be accepted.

(2) The dimensions of the root opening should be within the specified tolerances. Excessive root face, insufficient root gap, or insufficient bevel angle will result in poor penetration. Too wide a root gap will result in difficulty in making a satisfactory root pass unless one face of the joint is first built up by welding or a backing strip is used. All of these deficiencies are readily apparent if the fit-up is examined before the welding is commenced and all are correctable.

(3) The surface to be welded should be clean and dry. This includes both the base metal and previous beads of welding. A clean surface is one free of dirt, slag, oil, rust, scale, or paint.

(F) WELDING SEQUENCE

(1) In most repair work locked-in welding stresses cannot be avoided. However, they can be minimized if some attention is given to working in accordance with a planned welding sequence. In general, this must be left to a welding engineer. But, when major repairs are undertaken, the inspector should ascertain that a welding sequence has been prepared and he should check to see that it is followed on the job. Some of the fundamental considerations in this regard are as follows:

(a) It is poor practice to weld across an open butt.

(b) Where extensive work is required on both sides of the vessel, it is better practice to have the welding progress simultaneously on both sides rather than to complete one side before starting the other.

(c) In general the order of welding should be such as to allow the maximum freedom for contraction of the weldment. For example, it would be poor procedure to fix both shorter edges of a plate before welding the longer edges.

(d) Temperature is an important factor in welding. Where welding is done at temperatures appreciably below freezing, pre-heat and/or shelter should be provided to reduce the rate of chilling. More caution in this regard is necessary when welding on thick plating than on thinner plating. For ordinary thicknesses and temperatures not far below freezing, work within a ship or on a ship's bottom within a graving dock may usually be regarded as sufficiently sheltered.

(G) PROCEDURE

(1) Besides proper shipfitting and edge preparation, there should be careful alignment of the structure. Local eccentricity in butts of intercostal longitudinal beams, girders, and bulkheads attached to strength deck and shell is conducive to service cracking. The webs of such members should be carefully aligned on both sides of the interrupting (transverse) structure before welding, and changes of girder depth and flanges occurring at the interrupting sections should be provided with transition fairing.

(2) Tack welds which are used to position the weldment in the fit-up should be chipped out before making the final weld. Frequently, they have been overstressed and may contain subsurface cracks. The welding machines employed should be adequate for the job, should be in good condition and should be operated at the correct setting for the work at hand. Butt welds, except in very thin plates, call for back chipping with a round-nosed tool or by means of flame gouging in order to insure complete penetration. The use of a backing strip is the one satisfactory alternative.

(H) WELDING DEFECTS

(1) Particular attention is called to weld deficiencies which can occur if correct procedures are not followed. These weld deficiencies can and do lead to cracking of the main hull girder of the vessel and are among the most effective crack initiators known. The destructive potential of the deficiencies often lies dormant for protracted periods while awaiting the necessary conditions of temperature and/or service stress magnitude to trigger a crack which can instantaneously propagate into a serious hull failure. Such failures can occur under fairly moderate stresses, arising from sea action or from cargo distribution alone, on a cold winter day.

(a) Subsurface weld defects in butts and seams which include interpass weld bead cracks, slag inclusion, incomplete penetration and lack of fusion must be avoided.

(b) Slugged welds. Slugged welds involve laying welding rods, cable, bolts and other extraneous material in a welding groove and then welding over it. Such a procedure obviously creates a serious cavity in the heart of the weld which is not readily detectable from surface appearance. Supervisors and workmen who have been well informed as to the critical nature of such a condition are the best protection against slugged welds. Welders turning out very high footage should have their welding subjected to radiographic examination as a precaution against "slugging."

(c) Caulking of leaky or cracked welds. Caulking or peening in no way reduces the crack initiating properties of a defective weld nor does it reduce the liability of an existing crack to propagate further. Such an operation only serves to "conceal" and thereby "build" into the vessel a potential source of serious structural failure. Accordingly, all peening or caulking of leaky or cracked ship welds should be prohibited. Leaky or cracked welds should be chipped out and rewelded.

(d) Square corners. Welding into or around square corners, such as can occur in the installation of insert and doubler plates, should not be permitted for attachments to shell, strength decks, or tank top. Such square corners should be rounded to a 3-inch minimum radius. Corners of openings should be rounded to the largest practicable radius, generally not less than one-eighth the transverse dimension but not ordinarily more than 24 inches. Cuts should be made either by guided burning or should be ground to a fair smooth contour. An exception to this is in the case of welding in an entire plate section. Generally, the corners are not rounded but the seams in the adjacent plates are released as shown below to minimize locked-in stresses and then rewelded in suitable sequence.

(e) Undercut welds. Undercut butt and seam welds of shell, inner bottom and strength deck, or undercut fillet welds attaching structural members thereto, should be avoided. This is particularly important for fillet welds near or at the end of discontinuous longitudinal members, such as bilge keels, tanker longitudinals, deck clips, or foundation members.

Undercutting in these locations has contributed to complete hull girder fractures.

(f) Arc-strikes and light beads of welding. Arc-strikes and light beads of welding should be avoided on the surface of strength deck, shell or tank-top plating, due to quench effect with possible subsequent crack stimulation. Arc-strikes produce hard, brittle metal locally, containing microscopic cracks. It is recommended that such areas be chipped out and re-welded using a pre-heat of at least 150° F.

(g) Projections or cavities. Very often pads or lugs are welded to plates for the purpose of jacking the plates into alignment and afterwards are knocked loose with a sledge. Any projections resulting from knocking off the lugs should be chipped off and ground fair if necessary. If there are any cavities these should be welded flush.

VI. RIVETING

(A) The renewal of deck and shell plating is best accomplished from an overall structural viewpoint by replacement in kind (i.e.), riveted replacements in riveted hulls to avoid hard spots or points of high stress concentration in an otherwise less restrained hull structure. However, riveting is becoming increasingly difficult and costly. Hence, it becomes necessary to make welded repairs to riveted ships. Extensive experience and tests indicate that the steel in the existing *riveted* ships may be more sensitive to brittle fracture initiation and propagation, when welded, than is shipbuilding steel presently being supplied under American Bureau of Shipping requirements for classes B or C hull steel. *Because of this,* the use of welding in the repair or alteration of existing *riveted* hulls should be limited as follows:

(1) Shell and deck seams involving existing plating thicker than ½" should ordinarily not be welded.

(2) As previously noted, flush butts between new and existing strakes of shell and deck may be welded. Such welds must have full penetration.

(3) Lapped butts involving the use of fillet welds should not be used. Welded lapped seams may be used where plating is one-half inch or less in thickness.

(4) Where riveting is necessary and the rivet holes are punched, the holes should be reamed in order to remove the excessively cold-worked material which can be a source of crack initiation. The holes need to be reamed between 1/16" and ¼" on the diameter depending on the thickness of plate and the diameter of the hole. In most cases a ream of ⅛" will be suitable.

(5) The replacement of deteriorated or missing rivets, which were marginal in size in original construction, with undersize bolts is unsatisfactory. However, upon approval by the Officer in Charge, Marine Inspection, bolts may be used for such fastenings for emergency purposes but they should be oversized bolts closely fitted into oversized, reamed holes. Often the ringing of rivets by means of welding is proposed as a repair measure for leaking or otherwise defective rivets. Rivets which do not completely fill and are not firm and tight in their holes fail to effectively carry their share of the load, and ringing with welding does not improve this situation. Accordingly, any ringing of rivets by welding must be regarded as a temporary measure acceptable only where not more than a few scattered frame or seam rivets are involved. Ringing of rivets by welding should not be permitted in way of lapped or strapped butts, or for any riveting of deck plating outboard of the hatches. The use of welding in building up the deteriorated points of otherwise sound rivets is permissible, however, provided the corroded metal can be and is removed prior to the building up being done.

MARINERS MUSEUM TOUR

REAR ADMIRAL GEORGE DUFEK, USN, (Ret.) (second from left) Director of the Mariners Museum, Newport News, discusses a museum model of a gravity davit and lifeboat with a group of Coast Guard officers from the Merchant Marine Safety Indoctrination School at Yorktown, Va.

With Admiral Dufek are (left to right): Lt. Comdr. Eugene Carlson, USCG, officer-in-charge of the Merchant Marine Safety Indoctrination course, Lt. Joseph Hamilton, USCG, of New York City, Lt. Robert Finnie, USCG, of San Francisco, and Lt. James A. Atkinson, USCG, of Norfolk. The three Lieutenants are former merchant mariners who received direct commissions from the Coast Guard.

Twenty-three students from the current Indoctrination class toured the museum as part of their 12-week training course.

The Mariners Museum, established in 1930 on a wooded tract of land facing the James River, contains a wide range of nautical exhibits. The museum Library has some 40,000 volumes and the print department stores and cares for nearly 10,000 prints, drawings, oil paintings, and water colors.

MARITIME SIDELIGHTS

Formal dedication ceremonies for the new $8 million terminal at the Port of Anchorage were held earlier this year.

Construction on the new Port of Anchorage started in 1958. Substantial completion of the project by the spring of 1961 enabled the Port of Anchorage to handle its first commercial cargoes via carriers serving from the Puget Sound area as well as inbound movement of construction materials from Japan.

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The Port Newark Station and Sports Field of the Seamen's Church Institute of New York officially opened recently.

The new building, the first of two construction stages, provides a snackbar, lounge, showers, and dressing rooms. The second stage of the building program will provide additional recreation rooms, offices, and a chapel.

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The Coast and Geodetic Survey project, which may continue for as long as 2 years, is an outgrowth of a study being made by Mr. David W. Moody, a Ph. D. candidate at the Isaiah Bowman Department of Geography of the Johns Hopkins University in Baltimore. Results of the sand wave study will be assembled by Mr. Moody and members of the Johns Hopkins staff.

Restricting their activities to a patch of ocean about three times the size of New York's Central Park, Mr. Moody and oceanographers, equipped with cameras and instruments, plunge themselves into the sea to observe the effect of currents and other phenomena on the sandy bottom topography. This project, Survey officials say, is the first systematic and continuing research approach to the study of sand wave morphology, and is important to increase man's understanding of the sea.

The individual sand waves in the study area are very broad formations rising and falling from ridge to trough in heights of 10 feet or more, over ½-mile intervals. Very little is known about this phenomenom.

Skin diving oceanographers will release colored dyes near the shallow ocean floor and make film records of subsurface currents and turbulence which, perhaps, contribute to the formation of the sand waves. Some oceanographers have advanced the theory that these waves may be old beach stands, drowned in geologic time by a rising sea level. The 10-square-mile project area along the Delaware coast contains some of the best examples of sand wave formations known to marine researchers today.

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The master, officers, and crew of the United Fruit Co.'s ship *Yaque* were honored recently for their rescue of four men lost without food or water for 18 days aboard a small launch in the Caribbean, 70 miles north of Cristobal, Panama, last March.

SAFETY AT SEA

THE SHIP SAFETY Achievement Citation of Merit was presented recently to the SS *President Van Buren* of American President Lines by the National Safety Council and the American Merchant Marine Institute. The vessel was honored for transferring a surgeon from the Japanese *Yamakiku Maru* by lifeboat to aid a gravely ill passenger. Shown are L. C. Fleming (left), Pacific Coast Director of the U.S. Maritime Administration; Capt. George Pederson (center), master of the *President Van Buren;* and Capt. T. C. Conwell, vice president, American President Lines.

A citation in recognition of their alertness and seamanship was presented to Capt. P. T. Jensen on behalf of the *Yaque* officers and crew at a ceremony aboard the ship at Weehawken, N.J.

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The National Safety Council Certificate of Commendation has been presented to SS *Golden State* of States Marine Lines, Inc., for achieving a total of 380,880 man-hours of operation without a disabling injury from February 1958 through December 1960.

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The largest graving dock on the Great Lakes went into operation recently. The dock owned by the Fraser-Nelson Shipbuilding & Drydock Co. is 831 feet long and 95 feet wide.

nautical queries

DECK

Q. A vessel steams 700 miles on 560 barrels of fuel at a speed of 10 knots. Having left only 400 barrels of fuel and 800 miles to go, what speed must she make to reach port?

A.

$$Co:Cn::So^2\times d:Sn^2\times d$$

$$560:400::10^2\times 700:x^2\times 800$$

$$x^2=\frac{400\times 10^2\times 700}{560\times 800}=62.5$$

$$x=7.905 \text{ knots}$$

Q. (a) What is meant by "damping" of a gyro-compass and what is the purpose of "damping"?

(b) How is "damping" of a gyro-compass accomplished?

A. (a) "Damping" is the progressive diminishing of amplitude of oscillations of the gyro-compass axis when it has been displayed from the meridian. "Damping" serves to prevent the gyro-compass from swinging back and forth across the meridian indefinitely without settling down.

(b) "Damping" is accomplished by offsetting the connection between the mercury ballistic and sensitive element slightly to the east of the centerline of the latter. Some gyro-compasses, designed with pendulous ballistics, use magnetic damping devices.

Q. (a) What is a ground wave?

(b) What is a sky wave?

(c) 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?

A. (a) A ground wave is a radio wave that travels parallel to the surface of the earth in an essentially direct path from the transmitter to receiver.

(b) A sky wave is a radio wave which travels from the transmitter into the sky, where it is turned back toward the earth by the ionosphere.

(c) The critical range is the area between 500 and 700 miles from a loran station, where the first signal which the receiver picks up may be either a ground wave or a sky wave. Particular care must be exercised in identifying signals in this area.

Q. (a) What is the base line, as it is used in the loran method of navigation?

(b) What is the base line extension, as used in the loran method of navigation?

A. (a) The base line of a pair of loran stations is the shorter arc of the great circle through the two stations.

(b) The base line extension of a pair of loran stations is the longer arc of the great circle through the two stations.

ENGINE

Q. Describe the Kingsbury thrust bearing and tell where it is generally placed in a steam turbine installation in order to absorb the propeller thrust.

A. The Kingsbury thrust bearing consists of a collar as a part of, or keyed to, the shaft. The thrust shoes are in segments having babbitted faces and fitted on the back with a spherically-faced, hardened, steel button. These buttons rest against rings, on either side of the collar, which are held firmly against the casing or in an adjustable cage. The seats or buttons are so located as to permit the shoes to adjust themselves to give a greater opening for the oil on the supply side and thus secure the desired wedge-shape action. This gliding or skimming over a film of oil adheres to and moves with the collar, allows a much higher thrust load to be carried than is the case with the horse-shoe type of thrust bearing.

In the marine service the thrust bearing is fitted to either the forward end of the main reduction bull gear or in the propeller line shafting abaft the gear.

Q. What is pitting and what is its cause and effect on turbine reduction gears?

A. Pitting is the flaking of metal from the surface of the teeth or the loss of metal due to corrosion. Pitting, particularly along the pitch line, may occur in the first few months of service. This pitting, usually slight, ceases after this time and does not seriously affect the operation of the gears. Pitting in older gears is usually caused by corrosion due to water or an acid condition in the lubricating oil and must be stopped immediately before the tooth bearing surface is destroyed.

AMENDMENTS TO REGULATIONS

[EDITOR'S NOTE.—The following regulations have been promulgated or amended since the last issue of the PROCEEDINGS. A complete text of the regulations may be found in the Federal Register indicated at the end of each article. Copies of the Federal Registers containing the material referred to may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.]

TITLE 46—SHIPPING

Chapter I—Coast Guard Department of the Treasury

[CGFR 61-39]

SMOKE DETECTING SYSTEMS ON PASSENGER VESSELS

The Merchant Marine Council held a public hearing on March 27, 1961, for the purpose of receiving comments, views and data with respect to miscellaneous vessel inspection proposals. The notice of proposed rulemaking was published in the Federal Register on February 15, 1961 (26 F.R. 1278–1286). The Merchant Marine Council Public Hearing Agenda (CG–249), dated March 27, 1961, sets forth the proposed regulations in detail and copies thereof were furnished to all who indicated an interest in the subjects set forth therein.

This document is the eighth of a series regarding the regulations and actions considered at the March 27, 1961, Public Hearing and Annual Session of the Merchant Marine Council. This document contains the final actions taken with respect to revision of the smoke detecting system details for passenger vessels in Item VIII (CG–249, page 271). The amendments to 46 CFR 76.33–20 and 113.30–5 will require some means of direct communication between the pilothouse and those spaces containing smoke detecting cabinets where the smoke detecting cabinets are not located in the pilothouse. These requirements become effective for installations contracted for on or after January 1, 1962. Where an efficient means of communication is established between the pilothouse and remotely located smoke detecting cabinets, it is not considered necessary to require olfactory sense detection in the pilothouse or in an adjacent fire-control station as well as at the smoke detecting cabinet. For vessels having this efficient means of communication between the pilot-

house and remotely located smoke detecting cabinets, it is necessary that such vessels have, in addition, automatic visual indicators (alarms) in the pilothouse and an automatic audible alarm in the engine room. Changes were made in 46 CFR 76.33–20 and a cross-reference added to 46 CFR 113.30–5 by the Merchant Marine Council and as revised are approved. Some of these changes are based on comments received.

(Federal Register of September 23, 1961.)

TITLE 46—SHIPPING

Chapter I—Coast Guard Department of the Treasury

[CGFR 61–15]

VESSEL INSPECTION REGULATIONS

Miscellaneous Amendments

The Mercahnt Marine Council held a public hearing on March 27, 1961, for the purpose of receiving comments, views and data with respect to miscellaneous vessel inspection proposals. The notice of proposed rule making was published in the Federal Register on February 15, 1961 (26 F.R. 1278–1286). The Merchant Marine Council Public Hearing Agenda (CG–249), dated March 27, 1961, sets forth the proposed regulations in detail and copies thereof were furnished to all who indicated an interest in the subjects set forth therein. The following subjects were considered:

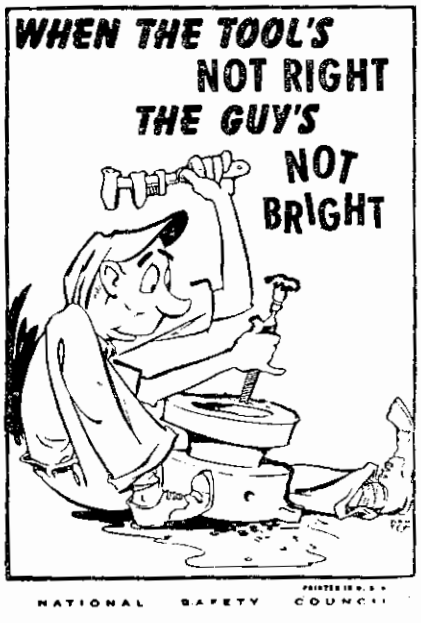
Item I—Shipboard Cargo Gear.
Item II—Power-Operated Industrial Trucks.
Item III—Dangerous Cargoes.
Item IV—Marine Engineering.
Item V—Electrical Engineering.
Item VI—Bulk Grain Cargoes.
Item VII—Tank Vessels.
Item VIII—Fire-Fighting Equipment or Fire Prevention.
Item IX—Lifesaving Appliances.
Item X—Construction and Inspection.
Item XI—Manning of Vessels.
Item XII—Rules of the Road.

This document is the seventh of a series regarding the regulations and actions considered at the March 27, 1961, Public Hearing and Annual Session of the Merchant Marine Council. This document contains the final actions taken with respect to the proposals in Items IV, V, VII, VIII, IX (portion), and X.

The proposals in Item IV regarding "Marine Engineering" as revised are approved. Changes in 46 CFR 52.05–10(a), 55.07–25(d), 55.10–25 (c), (f), 55.10–30, 56.01–30, 56.05–3(c), 56.05–5 (e), (f), (1), 57.10–15, 57.25–5(c), 57.25–10(b), 57.25–45, and 61.05–25 were made by the Merchant Marine Council. Some of these changes are based on comments received.

The proposals on Item V regarding "Electrical Engineering" as revised are approved. Changes in 46 CFR 32.45–1(i), 111.50–1(a), 111 50–15(e)(3), 111.55–15(e)(6), 111.60–35(b)(1), and 112.05–1(a) were made by the Merchant Marine Council. These changes are based on comments received. The Council deferred action with respect to the proposal designated 46 CFR 35.10–15, regarding emergency lighting and power systems for all tankships, and 46 CFR 111.60–10(b)(8), regarding feeder and branch circuit cables. These deferrals were requested and are granted in order to permit a further study of the problems involved.

Comments were received requesting withdrawal of a proposal designated 46 CFR 35.10–7(b) and 35.10–15(d) to require entries in a tank vessel's official logbook regarding dates of examination and statement of condition of electric power-operated lifeboat winches and emergency lighting and power systems (Item V, page 138, CG–249). The reason expressed was that such logs are not required on all tank vessels. This proposal is similar to requirements in 46 CFR 97.15–40 and 97.15–30 applicable to cargo and miscellaneous vessels. The official logbook is required by R.S. 4290, as amended (46 U.S.C. 201), for every vessel (which includes any tank vessel) making voyages from a port in the United States to any foreign port, or being of the burden of 75 tons or upward, from a port on the Atlantic to a port on the Pacific or vice versa. The amendments in this document designated 46 CFR 35.07–1 to 35.07–15, inclusive, describe present practices and group together for convenient reference the present requirements with respect to logbook entries. In addition, changes in 46 CFR 78.37–3, 97.35–3, and 97.35–10 are made to describe present practices for passenger and cargo vessels. As these changes do not extend or alter present requirements, it is hereby found that the requirements of the Administrative Procedure Act (respecting notice of proposed rule making, rule making procedure thereon, and effective date requirements thereof) do not apply.



The proposals in Item VII regarding "Tank Vessels" as revised are approved. Changes in 46 CFR 31.10–18 (b), (g), 34.10–5(a), 34.10–10, 34.10–90(a) (10), (13), 34.13–90(a)(4), 34.15–5(e)(4), 34.15–35(a), 34.17–5 (c), (d), 34.17–10(b), 34.20–5, 34.20–15, 34.50–5(c), and 34.50–15(a) were made by the Merchant Marine Council. Most of these changes are based on comment received.

The proposals in Item VIII regarding "Fire-Fighting Equipment or Fire Prevention" as revised are approved. Changes in 46 CFR 92.07–10 (b), (c), (d), 95.05–10 (b), (c), and 164.012–5(c) were made by the Merchant Marine Council. Most of these changes are based on comments received. In order that requirements will be better understood, the regulations for structural fire protection on passenger vessels in 46 CFR Subpart 72.05 as revised are restated in their entirety in this document. The revision of 46 CFR 76.33–20, regarding smoke detecting systems, will be published in a separate document.

The proposals in Item IX regarding "Lifesaving Appliances" as revised are approved. Changes in 46 CFR 160.051–6(d)(e), 160.056–2(e), 160.056–4(a), 160.056–5, 160.056–6, and 160.056–7(e) were made by the Merchant Marine Council. Most of these changes are based on comments received. To clarify requirements with respect to lifesaving equipment, miscellaneous changes were also made and in this document are designated 46 CFR 33.15–10(z), 75.20–30(a), 94.10 (heading), 94.10–5 (heading), Table 94.10–40(a), 94.15 (heading), 94.15–5, 94.15–10, 94.20 (heading), 94.20–5, 94.20–15(z), 94.20–30, 94.20–35, and 97.37–40. By regulations published in the FEDERAL REGISTER of November 5, 1960, buoyant apparatus and lifefloats were permitted as lifesaving equipment on cargo vessels and changes were also made in the number of sea painters required for

lifeboats on Great Lakes' cargo and tank vessels. At the present time the specific requirements for individual vessels based on the general regulations published November 5, 1960, are handled on an individual basis. These changes standardize and clarify the requirements and are the same as those applied to other types of vessels previously permitted to use buoyant apparatus and lifefloats. These changes reflect present practices followed by the Coast Guard, and do not alter present requirements. It is hereby found that the requirements of the Administrative Procedure Act (respecting notice of proposed rulemaking, rulemaking procedure thereon, and effective date requirements thereof) do no apply.

The proposals in Item X regarding "Construction and Inspection" as revised are approved. Changes in 46 CFR 73.05–11, 72.35–20(c), 74.10–15 (c), 93.10–1(a), 163.001–4(b), 163.001–6(a), 164.006–4(e)(1), 164.008–3(c), and 164.009–3(d), were made by the Merchant Marine Council. Most of these changes are based on comments received. The proposals designated 46 CFR 35.01–1, 71.60–1, and 91.50–1 regarding inspection and testing required when making alterations, repairs, or operations involving riveting, welding, burning, or any other fire or spark producing actions are not included in this document. These proposals are being studied further and revised proposals will be placed in the 1962 Merchant Marine Council Public Hearing Agenda.

The disposition of the other proposals described in the notice of proposed rule making published in the FEDERAL REGISTER on February 15, 1961 (26 F.R. 1278–1286), and the Merchant Marine Council Public Hearing Agenda (CG–249), dated March 27, 1961, is as follows:

A. Item I regarding "Shipboard Cargo Gear" was the subject of many comments and in accordance with a notice published in the FEDERAL REGISTER on May 2, 1961 (CGFR 61–10), an extension of time until July 1, 1961, was granted in which additional comments may be submitted. The major changes under consideration were also set forth therein. The regulations based on this item will be published in a subsequent document.

B. Item II regarding "Power-Operated Industrial Trucks" was the subject of numerous comments and in accordance with a notice published in the FEDERAL REGISTER on May 2, 1961 (CGFR 61–10), an extension of time until July 1, 1961, was granted in which additional comments may be submitted. The major changes under consideration were also set forth. The changes in the regulations based on this item will be published in a subsequent document.

C. Item III regarding "Dangerous Cargoes" as revised by the Merchant Marine Council was adopted. These regulations are in document CGFR 61–11 and published in the FEDERAL REGISTER May 5, 1961 (26 F.R. 3922–3925).

D. Proposals affecting small passenger vessels subject to the act of May 10, 1956 (P.L. 519, 84th Congress), were included as a part of Item IV and Item VIII and dealt with construction, arrangement and machinery installations. These changes were published in the FEDERAL REGISTER on May 5, 1961 (26 F.R. 3927, 3928), as document CGFR 61–13.

E. Item VI regarding "Bulk Grain Cargoes" will be the subject of a subsequent document as these proposals are still being studied.

F. Specification changes for kapok, fibrous glass, and unicellular plastic foam buoyant cushions in Item IX regarding "Lifesaving Appliances" were published in the FEDERAL REGISTER on June 28, 1960 (26 F.R. 5759, 5760), as document CGFR 61–16. These changes apply primarily to manufacturers of buoyant cushions and will be in effect on and after October 1, 1961.

G. Item XI regarding "Manning of Vessels" was published in the FEDERAL REGISTER of May 5, 1961 (26 F.R. 3925–3927), as document CGFR 61–14.

H. Item XII regarding "Rules of the Road" was published in the FEDERAL REGISTER of April 25, 1961 (26 F.R. 3527, 3528), as document CGFR 61–12. This document redefined the boundary lines of inland waters for the Pacific Coast of the Continental United States.

By virtue of the authority vested in me as Commandant, United States Coast Guard, by Treasury Department Orders 120, dated July 31, 1950 (15 F.R. 6521), 167–9, dated August 3, 1954 (19 F.R. 5915), 167–14, dated November 26, 1954 (19 F.R. 8026), 167–20, dated June 18, 1956 (21 F.R. 4894), CGFR 56–28, dated July 24, 1956 (21 F.R. 5659), and 167–38, dated October 26, 1959 (24 F.R. 8857), the following actions are ordered:

1. The vessel inspection regulations shall be amended in accordance with the changes in this document.

2. Unless specified otherwise, the regulations in this document shall become effective on and after 90 days after the date of publication of this document in the Federal Register.

3. Regulations containing specific effective dates shall become effective on and after such dates.

4. The regulations in this document may be complied with on and after the date of publication of this document in the Federal Register in lieu of existing requirements. However, the new or revised requirements in this document must be met by no later than the effective dates specified herein.

(Federal Register of September 30, 1961. Part II.)

EQUIPMENT APPROVED BY THE COMMANDANT

[EDITOR'S NOTE.—Due to space limitations, it is not possible to publish the documents regarding approvals and terminations of approvals of equipment published in the Federal Register dated September 8, 1961 (CGFR 61–38), and Federal Register dated September 9, 1961 (CGFR 61–35). Copies of these documents may be obtained from the Superintendent of Documents, Washington 25, D.C.]

ARTICLES OF SHIPS' STORES AND SUPPLIES

Articles of ships' stores and supplies certificated from 1 August to 30 September 1961, 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:

CERTIFIED

Montgomery Chemical Co., P.O. Box 187, Jenkintown, Pa., Certificate No. 267, dated 14 August 1961, RUSTOP "C".

Aetna Chemical Corp., Wallace Street Extension, East Paterson, N.J., Certificate No. 292, dated 13 September 1961, ACTEMUL or FLYING A DEGREASE SOLVENT A.

Tect, Inc., Northvale, N.J., Certificate No. 295, dated 25 September 1961, VYTHENE D.

AFFIDAVITS

The following affidavits were accepted during the period from 15 August 1961 to 15 September 1961:

Wells Equipment Manufacturing Corp., Box 19465, Houston 24, Tex., VALVES.

F. C. Kingston Co., 1007 North Main St., Los Angeles 12, Calif., VALVES.

Sinclair-Collins Valve Co.,[1] 1913 E. State St., Salem, Ohio, VALVES.

[1] This company was formerly listed as the Hunt Valve Co., for fittings.

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications that are directly applicable to the Merchant Marine are available and may be obtained upon request from the nearest Marine Inspection Office of the United States Coast Guard. The date of each publication is indicated in parenthesis following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

CG No.	TITLE OF PUBLICATION
101	Specimen Examination for Merchant Marine Deck Officers (7–1–58).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (8–1–58).
115	Marine Engineering Regulations and Material Specifications (2–1–61).
123	Rules and Regulations for Tank Vessels (12–1–59). F.R. 3–30–60, 10–25–60, 11–5–60, 12–8–60, 7–4–61, 9–30–61.
129	Proceedings of the Merchant Marine Council (Monthly).
169	Rules of the Road—International—Inland (5–1–59). F.R. 5–21–59, 6–6–59, 5–20–60, 9–21–60, 4–14–61, 4–25–61.
172	Rules of the Road—Great Lakes (5–1–59). F.R. 1–7–60, 3–17–60, 5–20–60, 9–21–60.
174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (7–2–51).
175	Manual for Lifeboatman, Able Seamen, and qualified Members of Engine Department (9–1–60).
176	Load Line Regulation (9–2–58). F.R. 9–5–59, 8–2–60, 11–17–60.
182	Specimen Examinations for Merchant Marine Engineer Licenses (12–1–59).
184	Rules of the Road—Western Rivers (5–1–59). F.R. 6–6–59, 5–20–60, 9–21–60, 10–8–60, 12–23–60, 4–14–61, 4–25–61.
190	Equipment Lists (4–1–60). F.R. 6–21–60, 8–16–60, 8–25–60, 8–31–60, 9–21–60, 9–28–60, 10–25–60, 11–17–60, 12–23–60, 12–24–60, 5–2–61, 6–2–61, 6–8–61, 7–21–61, 7–27–61, 8–16–61, 8–29–61, 8–31–61, 9–8–61, 9–9–61.
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (11–1–60). F.R. 11–30–60, 1–4–61, 4–19–61.
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (7–1–58). F.R. 3–30–60, 5–6–60, 12–8–60, 7–4–61.
220	Specimen Examination Questions for Licenses as Master, Mate, and Pilot of Central Western Rivers Vessels (4–1–57).
227	Laws Governing Marine Inspection (7–3–50).
239	Security of Vessels and Waterfront Facilities (8–1–61).
249	Merchant Marine Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (3–2–59). F.R. 4–25–59, 6–18–59, 6–20–59, 7–9–59, 7–21–59, 9–5–59, 1–8–60, 5–6–60, 8–18–60, 10–25–60, 11–5–60, 11–17–60, 12–8–60, 12–24–60, 12–29–60, 4–19–61, 7–4–61, 9–30–61.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (3–2–59). F.R. 4–25–59, 6–18–59, 6–20–59, 7–9–59, 7–21–59, 9–5–59, 5–6–60, 5–12–60, 10–25–60, 11–5–60, 11–17–60, 12–8–60, 12–24–60, 7–4–61, 9–30–61.
259	Electrical Engineering Regulations (12–1–60) F.R. 9–30–61.
266	Rules and Regulations for Bulk Grain Cargoes (5–1–59).
268	Rules and Regulations for Manning of Vessels (9–1–60). F.R. 5–5–61, 6–28–61.
269	Rules and Regulations for Nautical Schools (3–1–60). F.R. 3–30–60, 8–18–60, 11–5–60, 7–4–61, 9–30–61.
270	Rules and Regulations for Marine Engineering Installations Contracted for Prior to July 1, 1935 (11–19–52). F.R. 12–5–53, 12–28–55, 6–20–59, 3–17–60.
293	Miscellaneous Electrical Equipment List (3–7–60).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (10–1–59). F.R. 10–25–60.
323	Rules and Regulations for Small Passenger Vessels (Not More than 65 feet in Length) (7–1–61).
329	Fire Fighting Manual for Tank Vessels (4–1–58).

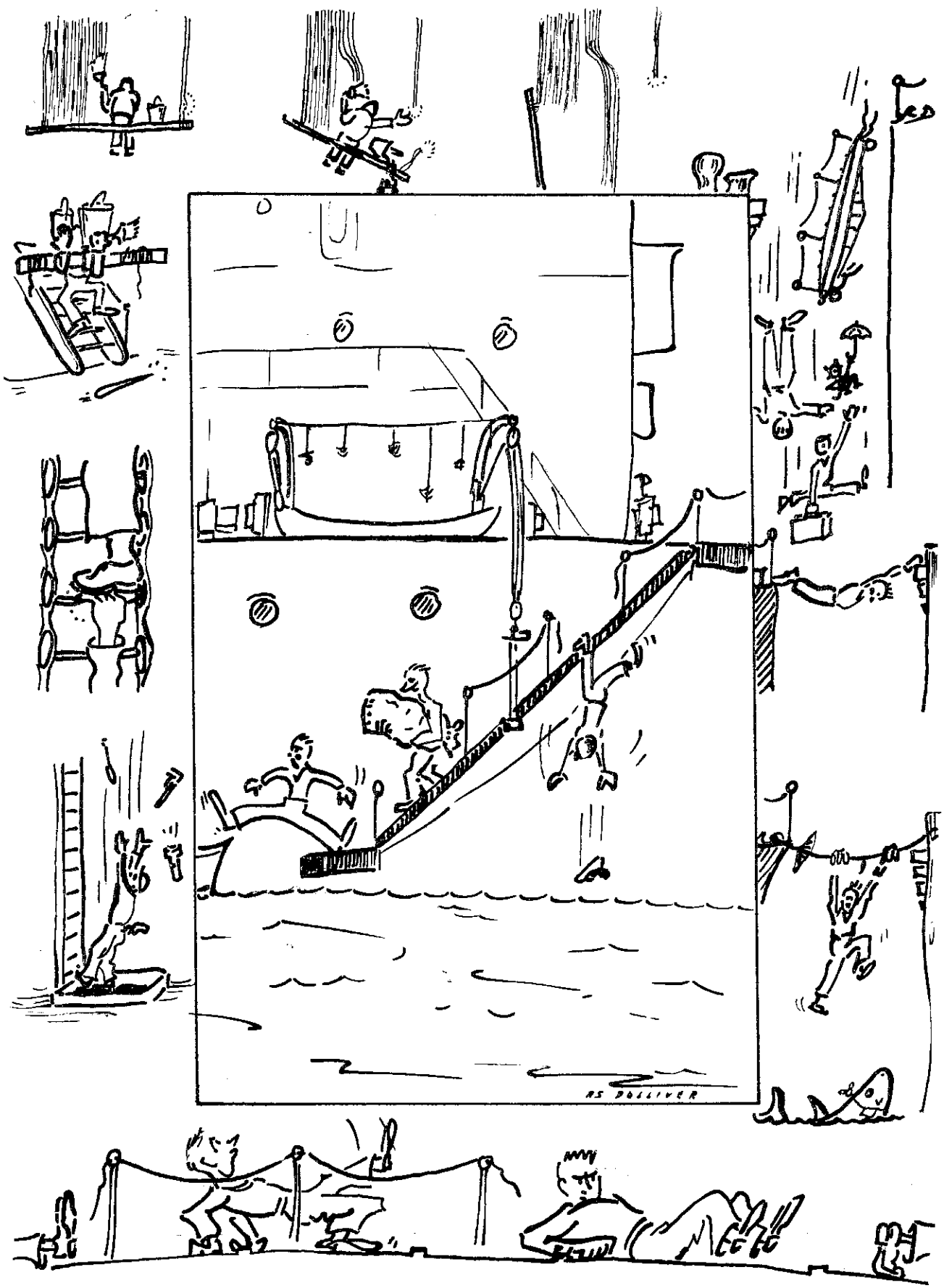
Official changes in rules and regulations are published in the Federal Register, which is printed daily except Sunday, Monday, and days following holidays. The Federal Register is a sales publication and may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. It is furnished by mail to subscribers for $1.50 per month or $15 per year, payable in advance. Individual copies desired may be purchased as long as they are available. The charge for individual copies of the Federal Register varies in proportion to the size of the issue and will be 15 cents unless otherwise noted in the table of changes below.

CHANGES PUBLISHED DURING SEPTEMBER 1961

The following have been modified by Federal Registers:

CG–190 Federal Registers, September 8, 1961, and September 9, 1961.
CG–123, CG–256, CG–257, CG–259, and CG–269 Federal Register September 30, 1961, Part II, (20 cents).

U.S. GOVERNMENT PRINTING OFFICE: 1961


AS DOLLIVER