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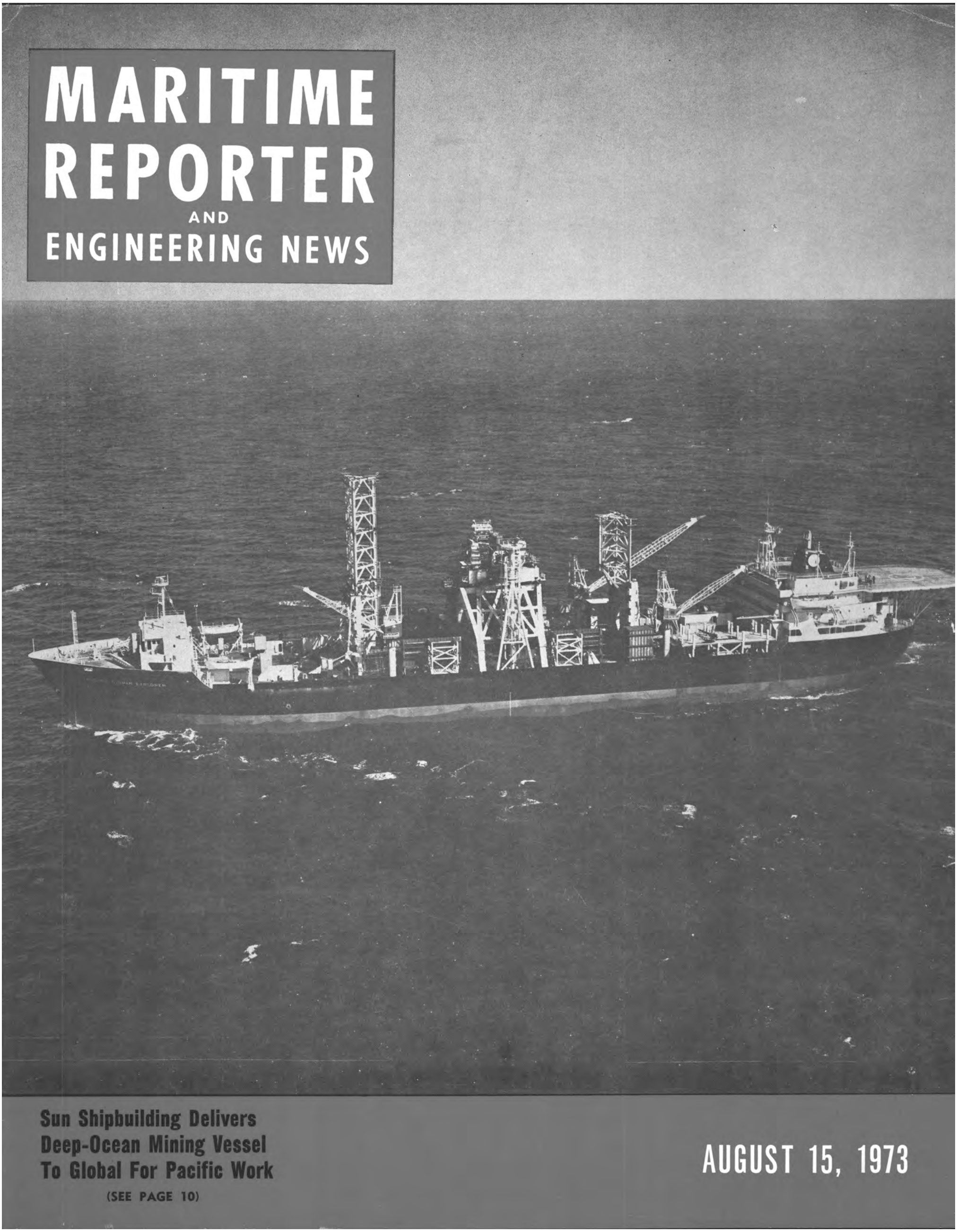
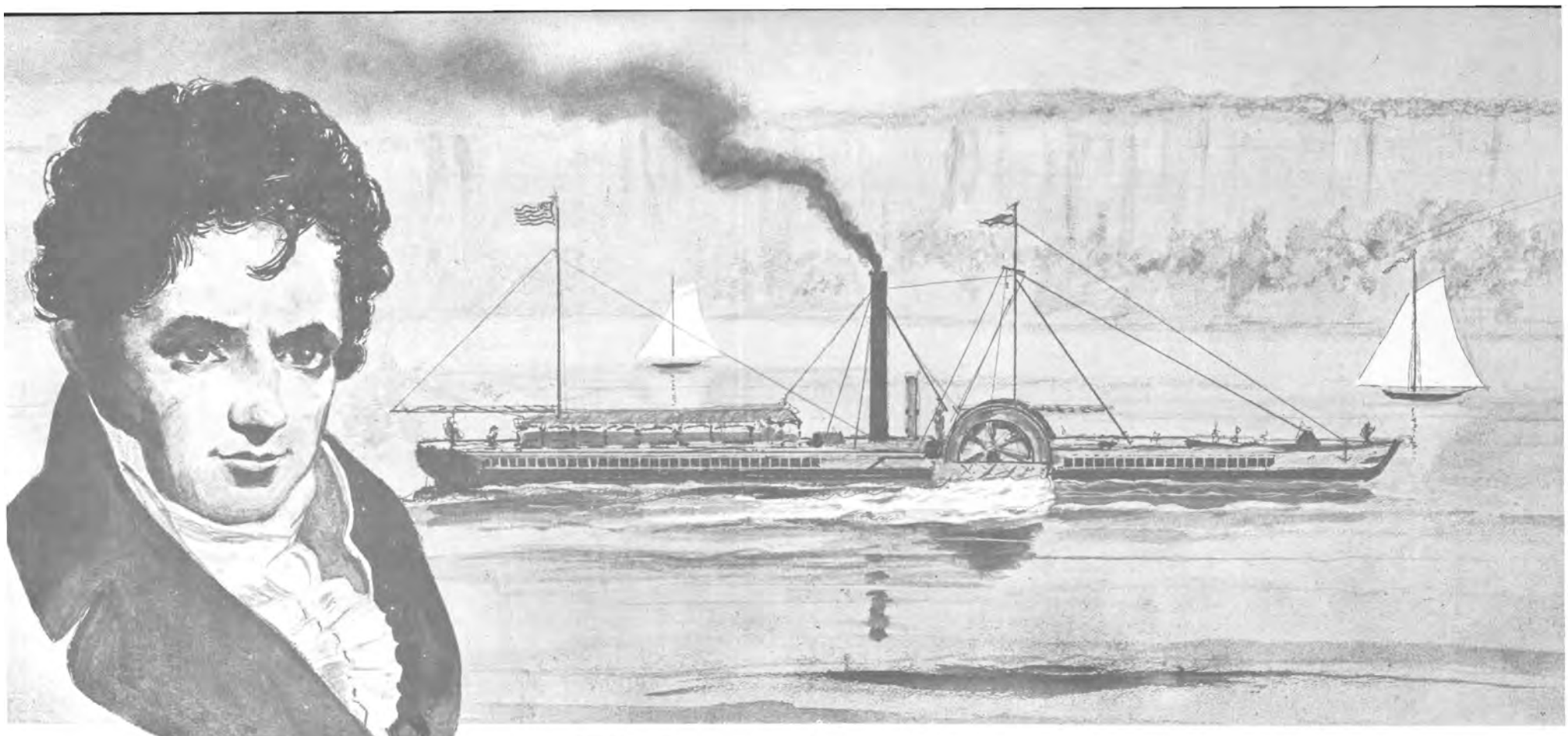


**Sun Shipbuilding Delivers Deep-Ocean Mining Vessel To Global For Pacific Work**

(SEE PAGE 10)

AUGUST 15, 1973



# Robert Fulton had more than a full head of steam

His inventive genius first came to the fore when he made his own pencils by hammering out the lead from bits of sheet metal. At the age of 13, when the town council forbade the use of candles on Independence Day because of their scarcity, he invented a skyrocket.

He was a painter of portraits and landscapes, a civil engineer and the inventor of a machine for spinning flax, one for twisting hemp rope and another for sawing marble.

Fulton engaged in a variety of engineering ventures connected with the development of inland waterways, received a patent for raising and lowering canal boats and invented a power shovel for cutting canal channels.

He devised a manually-operated mechanism to propel a boat by paddle wheels, built the remarkably successful diving boat Nautilus and the steamboat Claremont, which navigated the Hudson River between New York City and Albany.

Although Robert Fulton is commonly referred to as the inventor of the steamboat, he was instead, the one who devised a practical design for it and demonstrated its commercial value.

# Great ships deserve great service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## SNAME Conducts Full-Scale Tests In Yacht Research

As part of its continuing effort to improve sailing yacht performance, Panel H-13 (Sailing Yachts) of The Society of Naval Architects and Marine Engineers' Technical and Research (T&R) Program conducted full-scale tests on an approximately 39-foot yacht to determine loading on mast and rigging under way to windward. These tests are described in T&R Bulletin 1-30, "Rigging Loads of the 12-Metre Yacht Weatherly."

Until now, such thorough information has not been available and it is hoped that the results of this SNAME comprehensive testing program will aid yacht designers in designing more efficient rigs and spars with more assurance that they will not fail.

The tests, coordinated by members of Panel H-13, were conducted with the cooperation of the U.S. Merchant Marine Academy, Philip L. Rhodes, Inc., Grumman Aircraft Engineering Corp., Sparkman & Stephens, Inc., U.S. Coast Guard, Moran Towing Co., and various insurance underwriters. The testing was designed to record simultaneous measurements of standing and running loads on the rigging and bending and compression loads on the mast under realistic windward sailing conditions. The tests, in addition to covering a wide range of wind conditions and heeling angles, simulated operation in a seaway through the use of the tug Eugenia Moran to produce waves in the relatively smooth water of Long Island Sound. The bulletin includes samples of the data collected and plots of measured loads, as well as an analytical check on the test results. An analysis of the problems encountered in the testing program was also made and suggestions for future testing in this area are included.

Bulletin 1-30, "Rigging Loads of the 12-Metre Yacht Weatherly," was reviewed for publication by the Hydrodynamics Committee of the Society's T&R program and is available through The Society of Naval Architects and Marine Engineers, 74 Trinity Place, New York, N.Y. 10006, for $9 per copy. Members of the Society may obtain a copy for $6. If payment is included with the order, these prices include postage via third class mail in the United States and as "Printed Matter" in all other countries. Shipments will be insured or sent air mail at additional cost only if requested.




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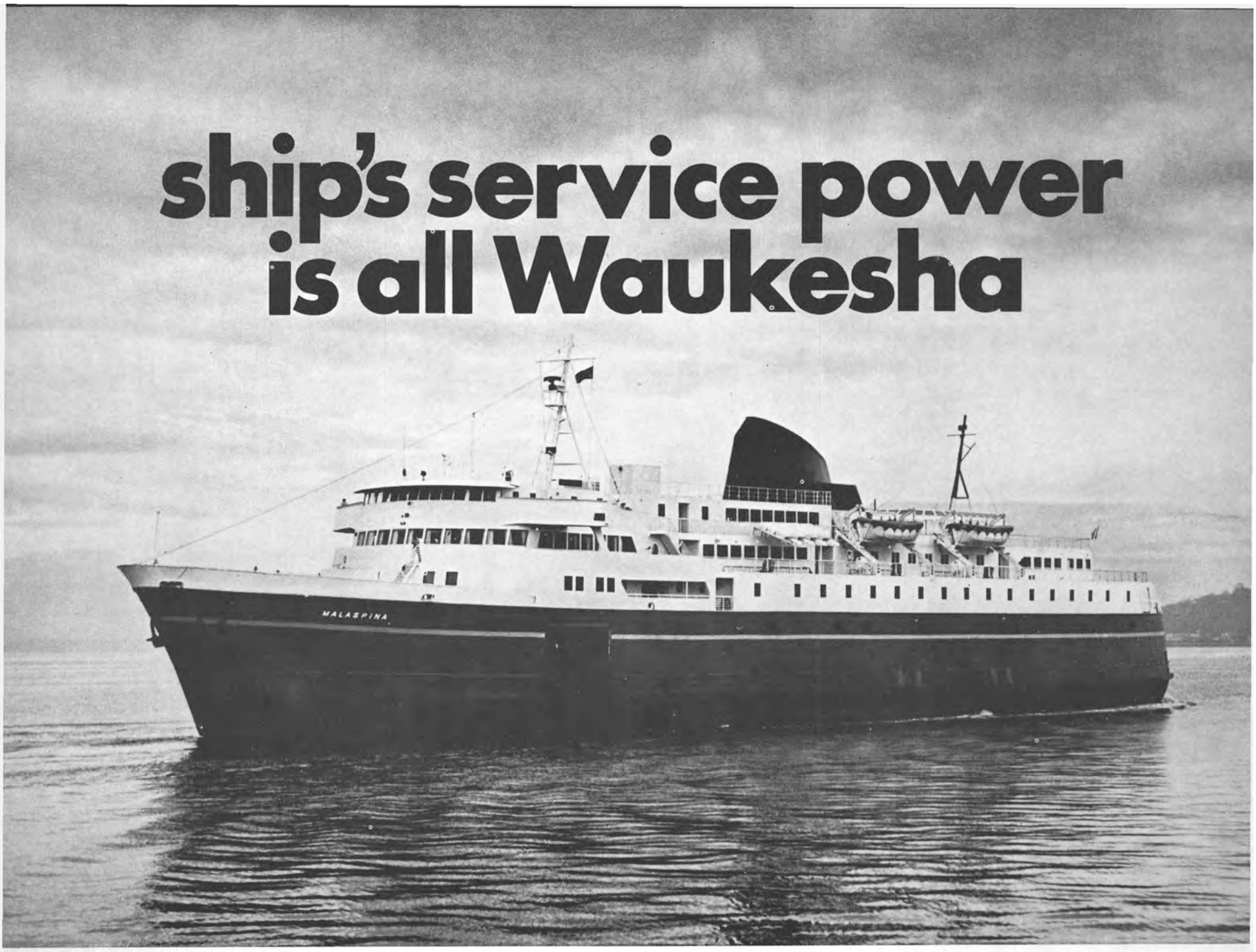
# ship's service power is all Waukesha



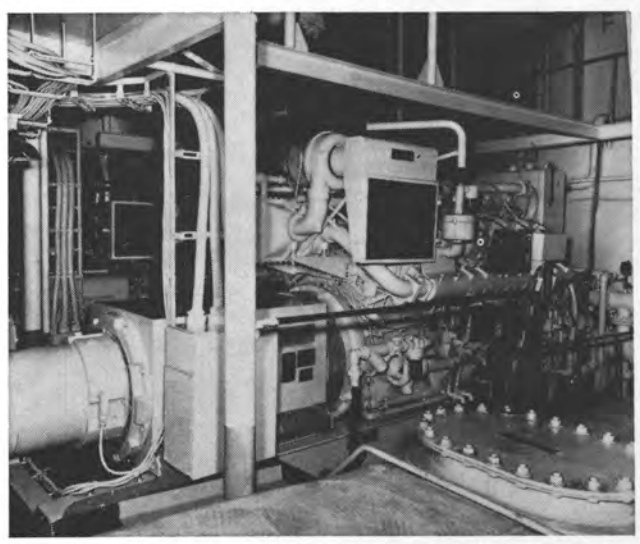

## Third diesel Enginator® is added to jumbo-ized ferry to provide total of 1500 kw

The "Malaspina," owned by State of Alaska, Dept. of Public Works, Division of Marine Transportation, provides service between southeastern Alaska ports and Seattle. To fill increasing demand for deluxe service, she has had 58 feet added to her length and another 500 kw in reserve ship's service power.

The "Malaspina" was originally equipped with two Waukesha V12 diesel Enginators, each rated 500 kw at 900 rpm. When the vessel was jumbo-ized, the owners made the decision to rely again on proved Waukesha power. They added a new, updated VHP V12 diesel Enginator of the same 500 kw rating of the first two units.

The choice of Waukesha for the reserve ship's service power was a natural. In addition to complete parts interchangeability, the performance record of the two original units was exceptional.

Waukesha's marine specialists have a wide range of propulsion and engine-generator sets to offer — all with Waukesha's traditional reliability and long life. For complete information, contact your authorized Waukesha distributor.



One of three VHP V12 L5790 DSIM Enginators on the "Malaspina." For ship's service power, Waukesha offers units from 47 to 1110 kw.

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## TPM Awarded $2.5-Million Navy Contract

Turbo Power and Marine Systems, Inc., Farmington, Connecticut 06032, has received a U.S. Navy contract for $2.5 million to supply two marine gas turbine engines of an advanced design and to conduct an 18-month operational at-sea demonstration program. **William J. Closs**, TPM president, said the Navy purchased the turbines and were supplying them to Turbo Power and Marine Systems, Inc., as Government furnished equipment.

The two turbines will be installed in the Seatrain Lines' containership Asiafreighter, and will increase the shaft horsepower from 30,000 to 35,000 horsepower. Ship modifications and a portion of the equipment installation will be accomplished over a seven-day period when the Asiafreighter goes into dry dock in Rotterdam this month. Since the gas generators can be changed in a matter of hours, the mating of the advanced gas generators and the free turbines will be accomplished on a subsequent visit to a U.S. port while the freighter unloads and loads cargo. Other specialized equipment, including a new demister system to minimize salt air in the vessel's inlet stacks, will be installed by December, at which time a 12,000-hour demonstration program will be conducted.

TPM marine gas turbines have already accumulated over 40,000 hours in a Navy-related program aboard the roll-on/roll-off ship, Adm. Wm. M. Callaghan.

Mr. **Closs** said the Asiafreighter will use FT4C-1 gas turbines in place of the FT4A-12 engines now installed. TPM has sold over 100 of the improved performance FT4s with 50 units now in operation in electric utility applications, but the Navy installation will be the first marine application.

The United States Coast Guard has a 12-vessel fleet of TPM-powered high-endurance cutters and is currently building two icebreakers, each powered by TPM furnished equipment.

TPM is a subsidiary of United Aircraft of East Hartford, Conn.



## Nippon Kokan Receives Order From China For Eight Large Dredges

The China National Machinery Import and Export Corporation of Peking has concluded a contract to purchase eight large-capacity self-propelled bucket-type dredges from Nippon Kokan (NKK), Japan's only integrated shipbuilder-steelmaker-fabricator and the nation's number two steel producer.

NKK's New York shipbuilding department said the 26,500-cubic-feet per hour capacity dredges are to be delivered in 1974 and 1975. The order is the largest of its kind booked by a Japanese shipbuilder for China, according to NKK.

Initial negotiations were completed when a group of NKK shipbuilding division specialists, headed by **Koichi Toyama**, was invited to Peking to exchange technical information on shipbuilding, including dredges. This visit produced an inquiry concerning three dredges.

Later, NKK sent a business and technical group to Peking to finalize negotiations. This development led to the order for eight dredges.

## Everett Stevedoring Names Drinkwater General Manager

Everett Stevedoring Co., Everett, Wash., has named **Harry G. Drinkwater** as general manager, succeeding **Glenn E. Crout** who retired June 30. For the past several years, Mr. **Drinkwater** has been vice president and operations manager of the firm.

Having been connected with the stevedoring business all of his life, Mr. **Drinkwater** first joined his father at the Empire Stevedoring Co. at Vancouver, British Columbia, prior to World War II.

He joined Empire Stevedoring as superintendent in 1962, and worked in various departments prior to relocating at Everett.

## Kaiser Names Johnson To Head LNG Tank Project On Gulf Coast

T.H. Johnson

The project manager for the largest liquefied natural gas project of its type in the history of the industry was announced by Kaiser Aluminum & Chemical Corporation, 300 Lakeside Drive, Oakland, Calif. 94604.

The company said that **T.H. Johnson** will have overall responsibility for the project, which includes construction of 15 huge aluminum tanks for installation in three oceangoing vessels to be built by Avondale Shipyards, Inc., of New Orleans. Total contract awarded Kaiser by Avondale is in excess of $50,000,000.

Mr. **Johnson,** presently senior process engineer for Kaiser Aluminum, assumes his new duties immediately. An electrical engineering graduate of the University of Idaho, he has had 18 years of progressively responsible engineering and management experience with the company.

The tanks will be built by Kaiser Aluminum at a site in the Gulf Coast area of the U.S., with construction beginning in 1974. Avondale will deliver the three LNG vessels in 1976-77 to subsidiaries of El Paso Natural Gas Company for use hauling natural gas from Algeria to the East Coast of the United States.

Kaiser Aluminum's receipt of the major contract is a direct result of a 15-year cryogenics research and development effort carried out by the firm. During that period, the company developed alloys, welding techniques and polyurethane foam products, all of which contribute significantly to aluminum's increasing penetration into the LNG market.

## Shipbuilding Boom Continues In Spain

During the first half of 1973, 112 ships with a total of 892,000 gross tons were launched in Spain, indicating that the shipbuilding boom is continuing in that country. This represents an increase over the same period last year of 88 percent and, including 29 ships with a total of 259,000 gross tons built for foreign buyers, the Spanish shipyards delivered 89 ships with a total of 355,881 gross tons.

For the next 12 months the outlook is also very promising. In the first six months of this year, the keels were laid for 109 vessels, with 625,000 gross tons.

## Gen. Dynamics Reports Increased Earnings For Second Quarter

General Dynamics Corporation, St. Louis, Mo., has reported second quarter earnings at the highest level in five years and 43 percent above those for the same period of 1972.

Second quarter earnings were $9,084,000 on sales of $428,827,000, equal to 86 cents per common share. This compares with earnings of 60 cents per common share or $6,332,000 on sales of $386,859,000 for the second quarter of 1972.

It was the company's 10th consecutive profitable quarter.

Earnings for the first six months of 1973 were $16,450,000 on sales of $826,860,000, equal to $1.56 per common share. In the same period last year, earnings were $1.08 per common share or $11,436,000 on sales of $769,147,000.

**David S. Lewis,** chairman of the board and chief executive officer, said the increased earnings were due primarily to the strong performance of the company's commercial businesses, particularly in telecommunications, lime and building materials.

Total backlog, funded and unfunded, totaled $2.392 billion at the end of 1973's second quarter, compared with $2.140 billion at the same time last year, Mr. **Lewis** said.

## Hillman-Built Towboat Joins Mon River Towing, Inc. Fleet


The M/V Leo D. Guttman, which provides living quarters for a crew of eight, has a pilothouse with an eye level of 24 feet.

Named for the late vice president of Mon River Towing, Inc., the M/V Leo D. Guttman is a 1,130-hp towboat built by Hillman Barge & Construction Company, Pittsburgh, Pa. The 84-foot by 26-foot by 9-foot M/V Leo D. Guttman is powered by two Caterpillar (Model D-379, Series B) turbocharged and aftercooled diesel marine engines. These are furnished with 4.34:1 ratio forward and 3.95:1 ratio reverse reduction gears and WABCO air controls. Engine cooling is accomplished by Fernstrum skin cooling units installed on the hull exterior.

Storage tanks provide a capacity for 18,500 gallons of fuel, 3,500 gallons of potable water and 300 gallons of lube oil. The hull of the boat from the stern tubes aft is fabricated of 20 percent stainless clad plate.

The stainless steel propellers are 69-inch diameter four-blade type. The shafts, in way of the strut, stern tube bearings and packing glands are fitted with ceramaloy sleeves. Goodrich Cutless Rubber Bearings are used in the strut and stern tube housings.

Two 55-kw Caterpillar diesel-driven generator sets provide electrical power for two 25-ton deck winches, an all-electric galley, individual electric heating units for all compartments, electric hot water heater, plus the standard requirements of machinery space motors, ship's lighting and navigational equipment.

The pilothouse, with an eye level of 24 feet, contains a navigational light panel, alarm panel, and an operating console on which are mounted engine controls, rudder levers, tachometers and air gages, and electric winch controls.

This class towboat is distinguished by its compactness in relation to rated horsepower and exceptional maneuverability. It is especially well-suited for short line hauls, yet fully capable of pushing large tows.

The addition of the M/V Leo D. Guttman brings the Mon River Towing fleet to a total of seven towboats actively engaged in moving coal and petroleum products on the Monongahela, Allegheny, and Ohio Rivers.

## Marathon Yard In Scotland To Build Drilling Vessel For Key International

Marathon Shipbuilding Co. (U.K.) Ltd. of Clydebank, Scotland, will build a jackup drilling vessel for Key International Drilling Co. Ltd., Coral Gables, Fla. The new vessel will work offshore West Africa and will be capable of constructing offshore platforms and laying offshore pipelines.

**ACCURACY-CHECK BUOY:** Crewmen of the Lockheed research vessel Sea Quest (top photo) prepare to lower the top half of the 64-foot Measurements Comparisons System buoy over the side during sea trials off San Diego, Calif. The top section is mated with the lower section already lowered into the water (lower left). The Sea Quest (lower right) stands off from the buoy as it transmits meteorological and oceanographic data to the vessel. Built for the National Oceanic and Atmospheric Administration's Data Buoy Office by Lockheed Ocean Laboratory, San Diego, the mobile measurements buoy is designed to be used by vessels performing maintenance on permanently moored environmental buoys to check the accuracy of sensor measurements radioed to shore stations.

## Slocum Iron Works Converting Four C-4 Midbodies Into Heavy-Duty Barges


The midsection of the World War II troopship Marine Tiger was transformed into this sleek, white 300-foot namesake barge by Slocum Iron Works, Inc. The Marine Tiger and three sister barges will be used to service offshore rigs.

The midsections of four great World War II troopships will again return to ocean service as a result of major conversion jobs now being done at Slocum Iron Works, Inc. in Mobile, Ala.

Slocum is converting the midbodies into barges measuring 300 feet by 70 feet by 26 feet for World Services Inc. of New Orleans, La., to service offshore rigs on the Gulf of Mexico's continental shelf.

Capable of carrying a 2,000-ton deck load, each of the four barges will retain the names of the World War II C-4 vessels so all will have useful lives again carrying machinery and supplies to the offshore oil fields.

**G.A. (Buddy) Slocum,** owner and operator of Slocum Iron Works, Inc., is an old hand at ship conversions. He was superintendent at Mobile Ship Repair, formerly the old Gulf Shipyard, when it converted the first C-2 cargoships and tankers in 1957 to "trailerships," now known as containerships, for the **McLean** brothers **Malcom** and **James,** owners of Pan-Atlantic Steamship Co., which later became Sea-Land. Several of the converted containerships are still in service.

Mr. **Slocum** established his yard at the same site about 12 years ago. After completing conversion of the midbodies into barges later this year, the yard will begin building supply boats for the offshore drilling rigs.

## U.S. Ship Financing Package Praised In Study Conducted By First Nat'l Bank Of Chicago

The First National Bank of Chicago, in a report to The Commission on American Shipbuilding on a study of Ship Construction and Acquisition Financing, concluded that "the U.S. ship financing package is excellent and it has a significant, positive impact on the competitiveness of U.S. shipyards."

The Commission, whose members were appointed by President **Nixon** under terms of the 1970 Act, appointed the First National Bank of Chicago to do the study as part of its effort to produce a report on the shipbuilding industry. That report is scheduled to be delivered to the White House this year, and it will include the bank study on ship financing.

The report is designed to aid in the broad study of conditions in the American shipbuilding industry as a result of enactment of the Merchant Marine Act of 1970. The law broadened Government subsidy aid for the building and operation of American ships in domestic shipyards and established financial and other conditions to enhance the competitiveness of U.S. shipbuilding in particular.

At a recent press conference, and later at a luncheon gathering of maritime industry leaders in New York, details of the financing report were discussed by bank officials. They included board vice chairman **Chauncey E. Schmidt, Richard W. Stranger, Terry L. Feder,** and consultant **Donald L. Caldera,** of Qualpeco Services, all of whom took part in its preparation.

The report points out that the financial aids possible under U.S. law for building ships in U.S. shipyards is far more attractive than that of any other major shipbuilding nation. It noted that the U.S. provides assistance in the form of construction differential subsidies, loan guarantees under Title XI of the Merchant Marine Act, tax deferments for capital construction funds, investment tax credits and accelerated depreciation. In addition, the optimum terms of the U.S. Ship Financing Package are 100 percent financing for 20 to 25 years at an effective rate of 4 to 4.5 percent. This compares with foreign shipbuilding financing that provides a maximum of 80 percent at 6 to 8 percent for eight to ten years.

"There is general agreement that the total package of American-flag Merchant Marine Act financing techniques is a formidable competitive weapon and a great attraction," the bank report said. "The Title XI program is particularly critical because it perfects the credit for a large percentage of a given transaction."

The report recommended that greater efforts be made to spread the word of the financial benefits in building in U.S. yards. "The Maritime Administration in conjunction with U.S. shipyards should undertake a promotional program to educate potential ship buyers on the economic advantages of the U.S. Ship Financing Package."

## Sun Ship Delivers Deep-Ocean Mining Vessel

The Hughes Glomar Explorer may be conned from either the forward or aft bridge. Under normal operating conditions, the mining ship will be conned from the forward bridge while under way, and from the aft bridge while mining.

The Hughes Glomar Explorer, a prototype deep-ocean mining ship owned by the Summa Corporation, recently departed Sun Shipbuilding and Dry Dock Co., Chester, Pa., following the shipyard's delivery of the vessel to Global Marine, Inc. of Los Angeles, Calif., who will operate the ship for Summa. Sun's delivery of the vessel brought to a close a new ship construction program that was heavily engineering oriented. The fundamental engineering concepts for the vessel were supplied by Global Marine. Global Marine engineers, working in conjunction with Sun engineers, refined the plans before actual construction began. A major result of this engineering teamwork was the decision to increase the size of the deep-ocean mining ship.

The top of the deep-ocean mining ship's derrick is lifted into position by Sun Ship's floating derrick barge.

The Hughes Glomar Explorer, a 36,000-ton experimental mining ship, has an overall length of 618 feet, a beam of 115½ feet, and an assigned navigational draft of 46 feet. The vessel is propelled by five Nordberg Diesel-driven main generators and six propulsion motors capable of delivering a combined total of 12,000 horsepower to the ship's two shafts. The deep-ocean mining ship is capable of operating at very slow speeds or at speeds up to 12 knots.

Features of the Hughes Glomar Explorer include automation permitting control of engine speed, direction and position from either of the ship's two complete bridges, as well as a center well and a derrick to handle the pipe from which the mining equipment will be suspended.

The vessel also has a sophisticated navigation system permitting exact location of the ship at all times and a dynamic positioning system built by Honeywell that will allow the vessel to move slowly and precisely during mining operations.

The vessel is equipped with modern messing, berthing and operating space, with a capacity to accommodate up to approximately 125 crew members and technicians required during the testing phase.

The shipyard used its 800-ton lifting capacity derrick barge, the Sun 800, in a series of heavy lifts that resulted in the positioning of heavy equipment and numerous structures on the vessel's topside. These included lifts of the afterdeck house, the vessel's own derrick sub base, the lift cage structure, the gimbal, the A-frame structure, the mining equipment docking legs and the tripod masts. The most notable lift, in terms of weight, was the 750-ton lift, a record lift by Sun Ship personnel.

The keel for the Hughes Glomar Explorer was laid on December 9, 1971, and the vessel was launched on November 4, 1972. Following its departure from the Sun shipyard and completion of sea trials, the Hughes Glomar Explorer will transit to the West Coast, where it will be outfitted with mining equipment fabricated by Lockheed. The ship will then engage in a program of experimental deep-ocean mining and testing of various mining systems and equipment in the Pacific.

## SNAME T&R Report On Longitudinal Stiffness Of Main Thrust-Bearing Foundations

Vibrations on a ship are a matter of concern to ship operators, as well as ship and machinery designers and manufacturers, because of the negative effects severe vibration may have on the operation of a ship, as well as personnel comfort. The difficulty in estimating the longitudinal vibration characteristics of a ship is the need to accurately calculate or estimate the required masses and stiffnesses to establish a useful spring-mass system. The Society of Naval Architects and Marine Engineers Technical and Research Program, through Panel M-20 (Machinery Vibrations) of the ship's machinery committee, presents a method to determine one of the most difficult stiffnesses in Report R-15 "Longitudinal Stiffness of Main Thrust-Bearing Foundations."

The stiffness of the thrust-bearing foundation is perhaps one of the more difficult quantities to calculate due to the wide variation in foundation arrangements and the continuity of the thrust-bearing and machinery foundation with the ships' innerbottom. Although there are several different types of mounting arrangements for the thrust-bearing, the basic procedure presented in Report R-15 may be used to analyze any foundation stiffness.

The procedure involves calculating the rotational deflection of the innerbottom, and the bending and shear deflection of the foundation, based on an axial unit load. These deflections are then combined to calculate the overall stiffness of the foundation.

The report not only presents a method, with discussion, for calculation of thrust-bearing foundation stiffness, but gives an example calculation of the method. An annotated bibliography on foundation stiffness consisting of some 25 references is included.

T&R Report R-15, "Longitudinal Stiffness of Main Thrust-Bearing Foundations," was reviewed and approved for publication by the ship machinery committee and is available through The Society of Naval Architects and Marine Engineers, 74 Trinity Place, New York, N.Y. 10006, at $6 per copy. Members of the Society may obtain the report at a price of $4 per copy. If payment is included with the order, the price includes postage via third class mail in the United States, and as "Printed Matter" in all other countries. Shipments will be insured or sent air mail at additional cost only if requested.

## ABS Publishes Guide For Inert Gas Installations On Vessels Carrying Oil In Bulk

In view of the worldwide interest in inert gas installations and the requests received for information regarding the position of the American Bureau of Shipping on this matter, a booklet has been published entitled "Guide for Inert Gas Installations on Vessels Carrying Oil in Bulk." This guide is based on the recommendations of the International Association of Classification Societies (IACS) and the Inter-Governmental Maritime Consultative Organization (IMCO).

Although the "Rules for Building and Classing Steel Vessels" has no specific requirements for inert gas systems, it is stated therein (Section 36) that when an owner elects to install such a system it is to be an approved type. Inert gas installations which are fitted in accordance with this guide are considered to be an approved type. A certificate will be issued by the bureau, where the design and installation of these systems is in accordance with this guide, when requested by the owners or builders, and a notation will be made in the record.

The "Guide for Inert Gas Installations on Vessels Carrying Oil in Bulk" sells for 50 cents and may be ordered from any office of the bureau or from the Book Order Department, American Bureau of Shipping, 45 Broad Street, New York, N.Y. 10004.

**ANOTHER VIKING FROM DRAVO:** The 4,200-horsepower Wisconsin is the fourth of Dravo Corporation's new Viking line of towboats to hit the water. It was recently launched from Dravo's marine ways at Neville Island, near Pittsburgh. Wisconsin Barge Line, Cassville, Wis., will operate the vessel on the Mississippi River System.

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## NASSCO To Build Three Tankers For Moore And McCormack

Moore and McCormack Co., Inc. (NYSE) has announced that it will build three tankers at a cost in excess of $63 million. **James R. Barker,** chairman of Moore and McCormack, said the move "is consistent with our long-term program of expanding the use of the company's transportation capabilities into energy-related activities."

Mr. **Barker** said that each of the new vessels will be in excess of 38,000 tons, with a shallow draft of 35 feet, have a service speed of 16 knots, and feature an automated engine room and a semiautomatic cargo control system. The ships are designed for transport of crude oil and products such as gasoline or kerosene. They will be built at the San Diego, Calif., shipyard of National Steel and Shipbuilding Co. and are scheduled for delivery in October 1975, June 1976 and January 1977.

Mr. **Barker** also noted that the vessels, which will be operated by Moore-McCormack Bulk Transport, Inc., will feature segregated ballast so that oil and ballast water storage tanks will not be comingled.



## Additional Post To Donald J. O'Rourke At Sperry Vickers

**Donald J. O'Rourke**

**Donald J. O'Rourke,** manager of marine marketing for Sperry Vickers, has been given additional responsibilities by the Sperry Rand Division at its world headquarters in Troy, Mich.

Mr. **O'Rourke,** whose new position is manager of product support and marine marketing, will now direct the product support activity for the company's marine, military aerospace, and ordnance markets, in addition to his current duties as marketing manager for Sperry Vickers DOL-FIN marine product line. He has an extensive background in both marine and aerospace hydraulics. Formerly an application engineer, district sales manager, regional sales manager, as well as marketing manager, Mr. **O'Rourke** has been with Sperry Vickers for 15 years.

The holder of a B.S. degree in aeronautical engineering from the University of Notre Dame, he is a member of the American Management Association, the American Society of Naval Engineers, the National Security Industrial Association, the Association of the United States Army, the American Ordnance Association, and the National Association of Engine and Boat Manufacturers.

## Exxon Offers New Fuel And Lubricant Tables

A simplified temperature-viscosity chart for typical marine fuels and new viscosity blending chart are features of the 1973 Conversion Tables and Charts published by Exxon.

The 36-page booklet, which the company has published in various forms for nearly 40 years, contains all the data ordinarily needed for shipboard calculations involving fuels and lubricants. There are eight tables, most of them taken from the ASTM-IP Petroleum Measurement Tables, and four charts, plus an explanation of quantity calculations encountered in the marine trade and new glossary of petroleum terms. The final pages contain brief descriptions of the company's lubricants and fuels.

Copies of the new Conversion Tables and Charts are now available from Exxon Marine Sales Department, 1251 Avenue of the Americas, New York, N.Y. 10020, and from Exxon marine sales affiliates around the world.


# More power for you!

The CAPE CHARLES. First of the Blue Diamond Fleet's three new 3,300 horsepower twin screw tugs. Now operating in Hampton Roads. With two sister tugs, the CAPE HENLOPEN in Baltimore and the CAPE MAY, entering the fleet soon. These three powerful tugs are the latest of eight additions to the Curtis Bay fleet in the past five years. Solid evidence of Curtis Bay's commitment to offer you the finest equipment and the most reliable service. There is a difference in tugboat companies!

**Curtis Bay Towing Company**

Philadelphia □ Baltimore □ Hampton Roads

## Do Existing Regulations Properly Define

# Requirements For Shafting Eccentricity?

### Based On Naval And Merchant Standards For Main Propulsion Shafting Eccentricity, One Is Underspecified And The Other Is Overly Restrictive

**J.E. Ancarrow and R.L. Harrington***

There is an obvious requirement for acceptance criteria regarding design tolerances for main propulsion shafting sections while the shafting is being manufactured; however, a less obvious type of requirement for such criteria, but one no less important, occurs when shafting becomes eccentric in service and a decision must be made to either take corrective action or to continue operation.

In the past, not only have the acceptance criteria employed varied considerably in terms of sophistication, but also the implementation of the acceptance criteria has varied from formal procedures (those requiring no personal judgment) to informal procedures (which rely upon the considered judgment of experienced personnel). However, irrespective of the approach taken, there can be no doubt that all acceptance criteria should be based on sound engineering fundamentals. This being the case, and recognizing that it is a practical impossibility to machine sections of shafting such that they are absolutely true and to also maintain them in this condition throughout their service life, it becomes necessary to establish acceptance criteria for the eccentricities associated with propulsion shafting.

*Mr. **Ancarrow** and Mr. **Harrington** of Newport News Shipbuilding and Dry Dock Company presented the paper condensed here before a meeting of the Hampton Roads Section of The Society of Naval Architects and Marine Engineers.

Several different approaches may be taken to the problem of establishing eccentricity acceptance criteria. The basic alternatives are as follows:

1. Insist upon the highest degree of precision that can possibly be achieved.

2. Require the highest degree of precision that can be achieved in a practical sense.

3. Determine the acceptance of an eccentricity measurement based on a comprehensive assessment of the effects of the eccentricity under consideration.

From an ideal point of view, the tolerances for shafting should be sufficiently restrictive to ensure satisfactory performance in service, but should not be so restrictive as to increase costs unnecessarily. To impose excessively restrictive tolerances, relative to those which are necessary to meet the functional requirements, can only lead to unusable quality which is not cost effective.

Figure 1 is a summary of the shafting tolerances specified in "Propulsion Shafting and Components," NavShips Standard Drawing 810-2145807, July 1967. It may be observed that the overall basic philosophy of the tolerances shown, does not clearly place the tolerances in any of the categories listed above; however, this is not entirely unexpected. The basic tolerances shown are a carryover from earlier work which was developed before the application of sophisticated computer techniques to shafting design. Consequently, the tolerances shown would be expected to be based on "typical" shafting arrangements because no other approach would have been feasible at that time—even the most elementary shafting calculations routinely done by the computer programs presently available represent an interminable task if attempted by hand.

Shafting eccentricity tolerances are normally not explicitly specified in connection with merchant ships; in general, only a shaft dimensional tolerance (tolerance 5 in Figure 1) and a journal surface finish tolerance are specified. Consequently, the results achieved in merchant work are largely dependent upon the judgment of experienced personnel.

When the tolerances shown in Figure 1 are analyzed from a cost effectiveness viewpoint, it may be observed that the first five tolerances are generally not costly to achieve from a practical standpoint, yet they are sufficiently restrictive to ensure satisfactory performance in service; this being the case, the first five tolerances are fully endorsed. However, attention is directed to the last three tolerances given as they are considered to warrant further study.

#### Outside Diameter Eccentricity

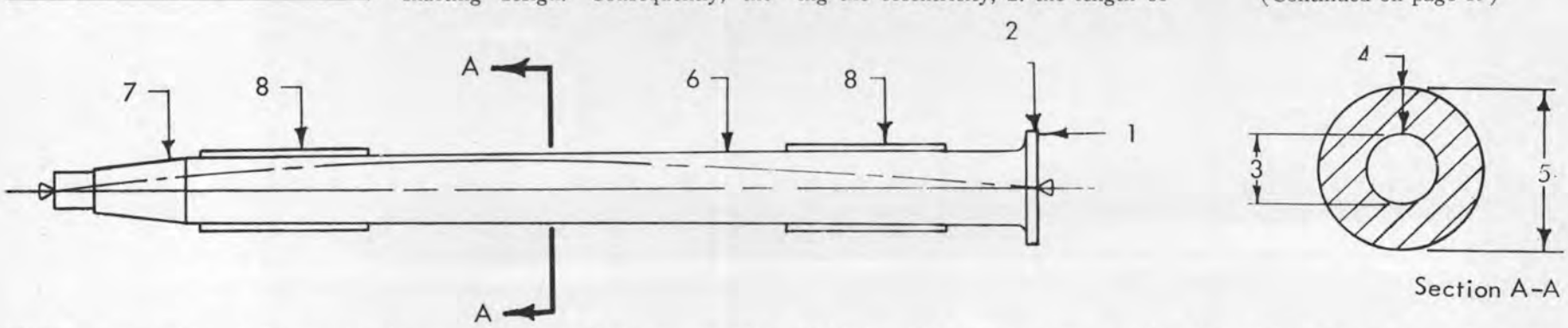
Tolerance 6, that dealing with the eccentricity of the shafting outside diameter, is of questionable origin. Several considerations warrant careful thought relative to this tolerance, namely: 1. the procedure for assessing the eccentricity, 2. the length of the shaft, and 3. the consequences of the eccentricity.

Shafting eccentricity tolerances have no meaning unless the method of establishing the eccentricities is stipulated. While it may at first appear that there is little latitude in taking eccentricity measurements, such is far from the case. It is reported that eccentricity measurements have been officially taken with shaft sections rotated while being supported at the 2/9 points from the two ends (the support points which minimize the shaft static deflection and slope); this procedure causes the support points to be nodes and tends to reduce the maximum eccentricity measurements. And it is known that shaft eccentricity measurements have been taken with the shaft supported in lathe centers but also restrained by the steady rests which were used during the machining operations.

It has been reasoned that naval specifications obviously intended steady rests to be in place while eccentricity readings were taken for two reasons: One was that in the case of long shafts the small eccentricities specified were impractical if steady rests were not used. A second reason was that the Navy standard permitted the use of a steady rest while taking runout readings.

Shafting sections are machined with the use of a steady rest(s) which provides an intermediate support of the shaft between lathe centers so as to reduce tool chatter. One steady

(Continued on page 19)




(1) Flange mating faces shall be machined normal to the axis of rotation to within 0.001 inches total indicated runout.

(2) The periphery of each coupling shall be concentric with the axis of rotation to within 0.0005 inches (0.001 inches runout).

(3) The bore of hollow shafting shall not be more than 0.125 inches undersized or more than 0.0625 inches oversized.

(4) The variation of wall thickness of hollow shafting at any cross section shall not exceed 0.078 inches.

(5) Shaft outside diameters other than line shaft journals shall be accurate to within minus 0.000 plus 0.050 inches.

(6) The outside diameter of each shaft section shall be concentric with the axis of rotation to within 0.0075 inches (0.015 inches runout). The change in eccentricity in any 48 inches shall be limited to 0.0025 inches (0.005 inches runout).

(7) Shaft tapers shall be concentric with the axis of rotation to within 0.0005 inches (0.001 inches runout).

(8) Shaft Journal and sleeve fit area outside diameters shall be concentric with the axis of rotation to within 0.0005 inches (0.001 inches runout).

**Figure 1—Shafting Eccentricity Tolerances**
(as specified in NavShips Standard Drawing 810-2145807, July 1967)

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## Shafting Eccentricity—

(Continued from page 14)

rest is generally used on short shafts (shafts up to about 30 feet long), whereas two steady rests are required on longer shafts such as stern tube and propeller shafts.

The machining process is begun by locating the rough work in lathe centers, then with the shaft allowed to sag freely, a cut is made at the steady rest positions desired. When a smooth surface is obtained, the steady rest is put in place and shifted to position the shaft in a straight line. Then the remaining length of the shaft can be cut without tool chatter.

After each cut, there is a possibility that the material removed from the shaft may have contained residual stresses such that their removal would have tended to cause the shaft to bow; consequently, the steady rests must be removed so that the steady rest positions can be checked and corrected as required. If these steps are not carefully followed, it is possible to machine a shaft that is perfectly true with a steady rest in place, but in fact contain a significant bow when the steady rest is removed. This consideration has been recognized by NavSec personnel, and it is reported that the use of steady rests when taking eccentricity measurements will not be permitted by the next revision of the NavShips Standard.

It may be noted that tolerance 6 allows a shaft outside diameter eccentricity of 0.0025 inches in any 48 inches with an eccentricity upper limit of 0.015 inches. This means that an 8-foot shaft would be permitted to have an eccentricity of 0.0025 inches at the shaft midpoint (i.e., a 0.0025-inch change in eccentricity going from one lathe center to the shaft midpoint which is counteracted by a 0.0025-inch change in eccentricity going to the other lathe center). Similarly, a 16-foot shaft could have an eccentricity of 0.005 inches, and the eccentricity of a 24-foot shaft could be 0.0075 inches. But, irrespective of the shaft length, the 0.0075-inch eccentricity cannot be exceeded, and this is when the trouble begins.

Shaft length is an important consideration insofar as the measured eccentricity of shaft diameters is concerned. Figure 2 shows that the allowable eccentricity of an 8-foot shaft is 0.0025 inches; however, such a tolerance for an 8-foot shaft would be so loose as to be meaningless (unless the shaft had some assistance in becoming eccentric). On the other hand, a 0.0075-inch permissible eccentricity is reasonable for a 32-foot shaft, and it is conjectured that this is approximately the length upon which the tolerance was established. However, by linearly reducing the allowable eccentricity for shorter lengths, the tolerance becomes excessively relaxed (to be consistent); and for longer shaft lengths, the tolerance becomes too severe by a considerable margin when it is held constant.

If, as has been done in the past, the position of bearings in the shafting arrangement are to be ignored and the length of shafting sections is the only criterion considered in establishing the allowable eccentricity of the shaft outside diameter, then another approach may be considered, i.e., a shaft with a continuous bend.

It can be shown that for any radius of curvature that is established to be acceptable, the maximum shaft eccentricity allowable should vary with the shaft length squared. This general concept is easily visualized. Consider, for example, that a 48-foot shaft was planned but difficulty was expected in meeting the 0.0075-inch eccentricity requirement. The problem could easily be avoided by simply making two shafts, each of a 24-foot length. The eccentricity permitted would still be 0.0075 inches for each of the two shorter shafts, but theory and experience indicate that the 0.0075 inches for each of the two shorter shafts will be four times easier to meet with the shorter shafts than with shafts twice as long. The shorter shafts would be easier to manufacture, but shaft reliability would be degraded (due to the additional flanged joint introduced); consequently, this alternative is undesired.

Several observations can be made relative to the eccentricity of shaft bodies (not bearing surfaces); but the one which is most relevant is that when a balance tolerance is specified and journal and flange eccentricities are specified, the shaft body maximum eccentricity tolerance appears to serve no practical purpose. Shaft eccentricity, as such, does not denote unbalance. Therefore, aside from the possibility of the off-center mass of the shafting eccentricity (etc.), no inherently objectionable aspects of shafting eccentricity can be identified. However, studies show that it is inconceivable that a shafting section would be eccentric to such a degree that the eccentric mass of the shaft would result in an additional deflection of a significant magnitude.

While there is no practical justification for specifying a maximum permissible shafting runout (e.g., 0.015 inches), there is some degree of justification for maintaining the specified maximum permissible change in eccentricity of 0.0025 inches in any 48 inches of shaft length. This latter criterion would tend to identify abnormal conditions, and consequently, may be of value.

### Taper Eccentricity

In order to establish the shafting taper eccentricity requirements which should be specified, it is necessary to ascertain the degree of machining accuracy required to ensure satisfactory service performance with proper regard to cost considerations.

In the past, the practice has been to specify the eccentricity of the propeller shaft taper with respect to the position in which the shaft is supported in the lathe. However, this eccentricity measurement has no practical significance. On the other hand, the eccentricity of the propeller shaft taper centerline with respect to its running position when installed in the ship is an important dimension.

The shaft taper eccentricity tolerance of 0.0025 inches, as specified in "Shafting, Propulsion, and Components," BuShips Standard Drawing 5000-S4300-F-1385661, March 1955, would not inordinately increase the cost of shafting. However, such a value is sufficiently restrictive to ensure satisfactory performance in service for the range of propeller speeds normally used. It is, therefore, suggested that the shaft taper eccentricity tolerance be specified as 0.0025 inches (0.005 inches runout) and, in the case of propeller tapers, it is suggested that this tolerance be applied to the difference between the maximum eccentricity of the aftermost bearing and the eccentricity of the propeller taper at the propeller center of gravity.

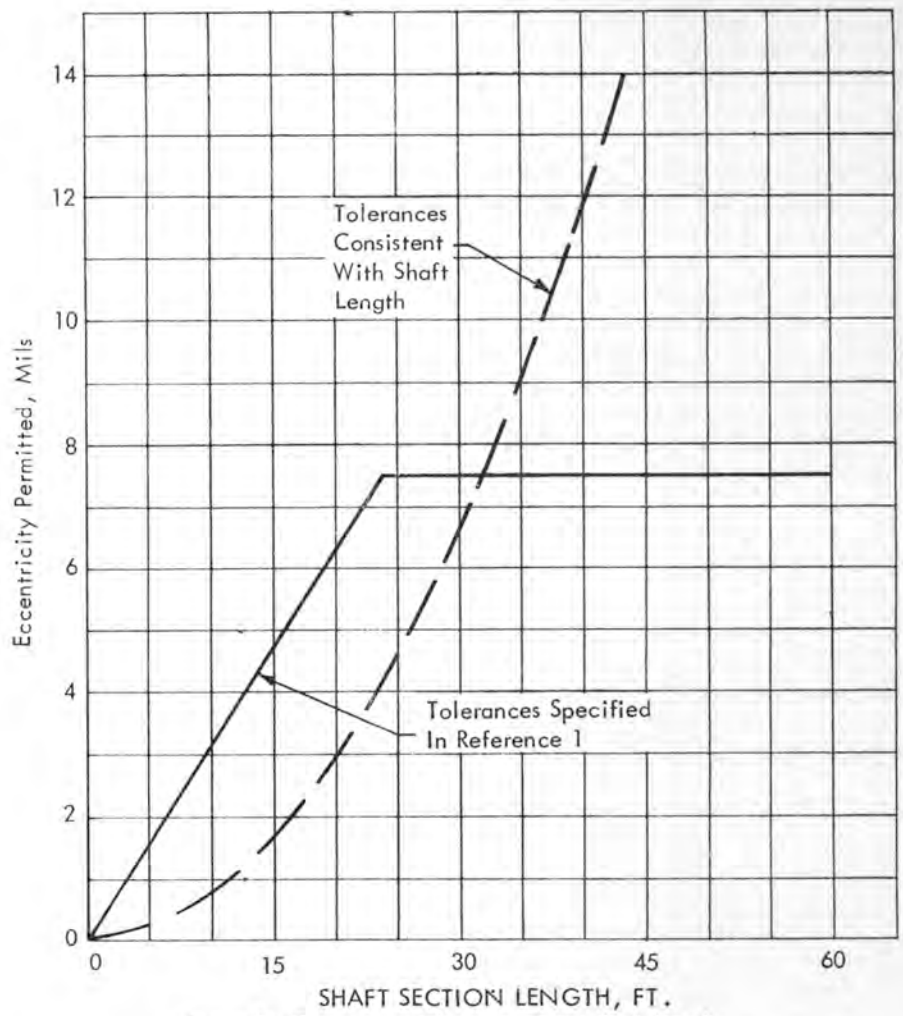



Figure 2—Eccentricity tolerances versus shaft length.
(Reference 1 refers to NavShips Standard Drawing 810-2145807, July 1967)

### Journal Eccentricity

The undesired effect of journal eccentricity is an alternating bearing load. Bearing reactions have an alternating component due to the residual unbalance in the propeller or shafting. However, journal eccentricity introduces two additional components of bearing load variation which conceivably could add to the variable bearing load due to residual unbalance.

Since the rotating journal is forceably held concentric by the bearing when installed in the ship, there is a bearing reaction variation equal in magnitude to the force required to hold the rotating journal concentric. This force is readily assessed by means of the bearing reaction influence numbers which are routinely calculated when analyzing shafting systems.

A second effect of journal eccentricity is to displace the shaft (and propeller) center of gravity with respect to the axis of rotation and thereby introduce an alternating bearing load due to the off-center rotating mass of the shaft (and propeller).

It is suggested that the practice of specifying a single value (e.g., 0.0005 inches) for the journal eccentricity tolerance of all journal bearings, irrespective of the circumstances of the particular case, be discontinued. Instead, it is suggested that the journal eccentricity tolerance be specified as that value which will limit the load variation (including the effects of residual unbalance) at the bearings to 2 percent of the mean load or 500 pounds, whichever is greater. (The alternative limitation of a 500-pound load variation prevents unreasonable tolerances from being imposed on lightly loaded bearings.)

Recognizing the effects which shafting eccentricity can have on the slow-speed gear bearing reactions, it is suggested that a bearing journal eccentricity tolerance of 0.0005 inches be retained for the first line-shaft journal aft of the slow-speed gear. Additionally, it is suggested that in no case should a journal eccentricity tolerance be permitted to exceed 0.005 inches (0.010 inches runout), because this is a reasonable tolerance which can be achieved in a cost-effective manner.

### Conclusions

The criteria presently used to establish eccentricity tolerances for propulsion shafting should be reviewed. The arguments presented indicate that many of the tolerances historically required for naval shafting are overspecified (overly restrictive) whereas those used for merchant shafting are underspecified (they rely heavily on the judgment of individuals). Criteria which are satisfactory for both naval and merchant shafting are proposed.

## Regional Realignment Announced By APL

A major reorganization in American President Lines' regional offices to strengthen functional responsibility between the area offices and San Francisco headquarters has been announced by **Norman Scott,** president and chief executive officer of the big steamship company.

Mr. **Scott** said directors of marketing, operations and administration have been appointed for the company's Atlantic, Midwest, Pacific and Asian offices. Each regional director will be responsible directly to the San Francisco division head—**Peter T. Albert,** vice president-marketing; **Leslie A. Harlander,** vice president-operations; and **Howard F. Lucas,** vice president-finance.

Additionally, the director of marketing will assume the responsibility of managing director, and will be the senior representative of APL for the area.

"The primary objective of this realignment is to provide clear functional lines of authority which tie field office responsibilities directly to the appropriate officer in San Francisco headquarters," Mr. **Scott** stated. "APL has developed a strong competitive position with its new containership capability. Changes in the regional organization have been made to provide a more responsive and efficient structure for our container service customers."

Initial reorganization assignments are as follows, with other appointments to be announced later.

**George O. Perry** transfers to New York from Hong Kong to take over managing director-Atlantic region. He succeeds **Joseph H. Winer** who has resigned. **Van Smith,** superintendent of terminal services-San Francisco, moves to New York to assume the position of director-operations.

**John J. Manseau** continues to head the Pacific region as managing director-marketing. **Paul K. Andersen,** formerly supervisor in the San Francisco freight department, takes over as director-administration, and **Don Scellato,** operating manager-New York, transfers to Los Angeles as director-operations.

**John F. Edgar** will head the Midwest region as managing director-marketing, with offices in Chicago. **Claudia Behrens** and **Frank Ciciero** will serve as directors of administration.

As part of the Asian region reorganization, **David Freidenrich** has been named managing director-Hong Kong; **D. Peter Boyce,** director-Administration; and **Adolph B. Zetterberg** continues as director-operations (Hong Kong/Taiwan/Manila). Mr. **Freidenrich** had been serving in Hong Kong as manager-traffic and operation control, and Mr. **Boyce** as manager-finance and accounting.

In Japan/Korea, **Donald G. Moore** continues as managing director with offices in Tokyo, and **Edward J. McClafferty,** director-operations north, also assumes the position of senior operations coordinator.

In Singapore, **Raymond L. Langridge,** formerly manager-Singapore, was named managing director-marketing, succeeding **Percy M. Cotton,** who is retiring after 40 years of service with APL. **C.W. Chua** assumes the position of director-administration, and **Dieter E. Hegger,** formerly terminal manager-Singapore, becomes director-operations Singapore/Colombo-India-Pakistan/Southeast Asia.

**Francis K. Lee** will continue to serve as managing director-marketing in Manila. **Carlos E. Reyes,** chief accountant, will be director-administration for the area.



## Marianas Jetfoil Asks Title XI For Boeing Model 929 Jetfoil

A Title XI guarantee in connection with one Boeing model 929, 100-passenger Jetfoil at a cost of $4.3 million has been filed with the Maritime Administration by Marianas Jetfoil, Inc., P.O. Box 1458, Agana, Guam. The vessel, which will ultimately be used in the tourist trade, will be built by Boeing Aerospace and is scheduled for delivery in August 1975.

## American Trading Seeks Title XI Aid To Build 4 OBOs

The Maritime Administration announced that American Trading Transportation Co. of 555 Fifth Avenue, New York, N.Y., has applied for a Title XI guarantee to aid in financing the construction of four 80,000-deadweight-ton ore/bulk/oil (OBO) carriers. The applicant, a subsidiary of American Trading and Production Corp., estimates that the vessels will cost approximately $34,993,000 each, and has filed for both construction and operational differential subsidies. When completed, the vessels will be used in the carriage of crude oil from ports in the Arabian Gulf to United States ports, and of bulk coal from U.S. Atlantic ports to ports in Japan.

## Levingston To Build Semisubmersible Unit For Santa Fe Int'l

Santa Fe International Corp., Orange, Calif., has announced plans for immediate construction of a semisubmersible drilling unit designed to operate in maximum water depths of 1,500 feet.

The unit, Blue Water No. 4, will be built at Orange, Texas, by Levingston Shipbuilding Co. Delivery is scheduled for October 1974.

Santa Fe president **E.L. Shannon Jr.** said it will be an improved version of the company's Blue Water No. 3, which was worked in the North Sea the past year.

Mr. **Shannon** said it is being built in anticipation of an increased demand for rigs capable of drilling in deeper waters of the Gulf of Mexico. Initially, it will be outfitted with marine riser and blowout preventer controls to work in 600-foot water depths.

For water depths to 1,500 feet, the Blue Water No. 4 will use a combination chain/wire mooring system with eight 15-ton anchors. The entire mooring system will be carried on board the unit during field moves, eliminating the requirement for an auxiliary vessel to handle the chain and anchors.

In overall physical dimensions, the unit will be identical to the Blue Water No. 3, while design modifications will provide increased stability and improved motion characteristics.

It will be equipped with a diesel-electric rig capable of drilling to depths of 25,000 feet and will incorporate the latest design in subsea equipment.

Air-conditioned quarters will be provided for 68 persons in addition to a six-bed hospital.

The vessel is designed to conform with all regulations of the American Bureau of Shipping and other agencies governing the construction and operation of U.S.-flag vessels.

Principal dimensions and capacities of the unit include: overall length, 220 feet; overall width, 198 feet; height to deck, 83 feet; drilling draft, 40 feet; allowable deck load, 1,500 short tons; drill water storage, 5,000 barrels; fresh water (ship service), 1,200 barrels; potable water (plus distillation units), 100 barrels; liquid mud (active) 1,200 barrels; diesel fuel, 65,000 gallons, and bulk mud and cement (interchangeable), 2,400 and 4,800 cubic feet.

## ITT Mackay Marine To Supply Navigation Equipment For 3 LNGs

A contract for radio communications and navigation equipment totaling $210,000 has been awarded to ITT Mackay Marine, Raleigh, N.C., a division of International Telephone and Telegraph Corporation.

The equipment is to be supplied for three LNG vessels being built at General Dynamics Shipyard, Quincy, Mass., and will include an MRU-29B/35A SSB/CW communications console, 401A lifeboat transceiver, 222A solid-state synthesized VHF radiotelephone, and a 4005A solid-state synthesized automatic direction finder.

In addition, receiving and transmitting ship antennas and vertical main, and emergency transmitting antennas are to be supplied.

## SNAME Issues Report On Ferro-Cement In Marine Environment

Even though cement was being used to fabricate marine craft in the 19th century, very few people in the marine industry have a working knowledge of this material. In an attempt to remedy this situation, The Society of Naval Architects and Marine Engineers Technical and Research Program, through Task Group HS-6-4 (Ferro-Cement) of the hull structure committee, has culled most of the pertinent literature on ferro-cement and presented the most useful in Report R-14, "References on Ferro-Cement in the Marine Environment."

This comprehensive list of over 275 references on this subject dating from 1897 to 1972 attempts to answer many of the questions that have been raised about ferro-cement in the marine environment. The bibliographic report attempts to give references which answer questions on standards of construction, the nature and control of the material, and assurance of quality.

The references are arranged chronologically and alphabetically by author for easy reference. The majority of the articles are of a technical nature, but a few are historical looks at attempts to use cement in the marine environment. Popular articles without apparent technical merit have not been included.

This list should be of great value to individuals and firms either engaged in the construction of ferro-cement craft, or interested in the application of ferro-cement structually in the marine environment.

T&R Report R-14, "References on Ferro-Cement in the Marine Environment," was reviewed and approved for publication by the hull structure committee and is available through The Society of Naval Architects and Marine Engineers, 74 Trinity Place, New York, N.Y. 10006, at $6 per copy. Members of the Society may obtain this report at a price of $4 per copy. If payment is included with the order, the price includes postage via third class mail in the United States and as "Printed Matter" in all other countries. Shipments will be insured or sent air mail at additional cost only if requested.



## Elliott Company Appoints Cornez

Paul M. Cornez

**Paul M. Cornez** has been appointed manager of Federal and marine marketing for Elliott Company, Jeannette, Pa., division of Carrier Corporation.

In his new capacity, Mr. **Cornez** will be responsible for the administration of product marketing and contract engineering activities for all Elliott-built apparatus in the Federal and marine markets. This line of equipment includes mechanical-drive steam turbines, air compressors, strainers, ejectors and boiler and condenser tube cleaners.

## Hovermarine Names Charles L. Benard

**Charles L. Benard** has been named manager of manufacturing for Hovermarine Corporation, Pittsburgh-based producer of commercial surface effect ships. He will be responsible for all manufacturing operations at the firm's new facility in Titusville, Fla.

Mr. **Benard** comes to Hovermarine from Bell Aerospace, New Orleans, where he served in the primary test crew as First Officer of the U.S. Navy's SES 100B—a 100-ton experimental surface effect ship—during its first 225 hours of operation.

Previously, Mr. **Benard** had been associated with various companies engaged in surface effect ship activities over a period of 10 years.

## Malta Yard Wins Another Order From Single Buoy Moorings

Malta Drydocks Corporation has won an order—the second in a two-week period—from Single Buoy Moorings, Inc., of Monaco.

The order calls for the fabrication of a single point mooring buoy measuring approximately 36 feet in diameter by about 16 feet in height. Some 150 tons of steel will be involved in its construction.

An order for an identical buoy was placed with Malta Drydocks Corporation on July 4. The corporation has already delivered a temporary mooring buoy to Single Buoy Moorings, and a single buoy storage installation for the same company is nearing completion in the yard.

The orders placed with Malta Drydocks Corporation by Single Buoy Moorings to date are worth approximately $1,016,000.

## SNAME Publishes Guide For Shipboard Crane Specifications

Even with the advent of many new types of ships, such as LASH, SEABEE and roll-on/roll-off vessels, the vast majority of cargo is still transferred between the ship and the shore via cranes. In an effort to facilitate procurement and operational standardization for the crane buyer, manufacturer and the ship operator-owner, The Society of Naval Architects and Marine Engineers' Technical and Research (T&R) Program has published Bulletin 4-12, "Guide for Shipboard Crane Specifications," by Panel 0-31 (Cargo Handling) of the ship technical operations committee.

The bulletin was written to provide technical guidance for the equipment buyer in specifying particulars to suppliers, and to provide a more consistent and uniform specification which would be of assistance to the manufacturer in designing shipboard cranes. The bulletin sets forth requirements for rotating boom and traveling gantry cranes, as well as various other special cranes designed for shipboard medium and heavy-lift capacity. These cranes may be powered by diesel, diesel electric, electric-mechanical or hydraulic means.

Included as a supplement in this publication is a summary of requirements, along with worksheets to be completed by the buyer, which can be used in the ordering of shipboard crane equipment from the manufacturer. This supplement thus spells out in detail the particular requirements and capacities for the specific use or ship installation and serves as a reminder or check-off sheet to assure that details are not overlooked.

T&R Bulletin 4-12, "Guide for Shipboard Crane Specifications," was reviewed and approved for publication by the ship technical operations committee and is available through The Society of Naval Architects and Marine Engineers, 74 Trinity Place, New York, N.Y. 10006, at $14.25 per copy. Members of the Society may obtain this bulletin at a price of $9.50 per copy. If payment is included with the order, the price includes postage via third class mail in the United States and as "Printed Matter" in all other countries. Shipments will be insured or sent air mail at additional cost only if requested.

## Hisashi Matsunaga Named President Japan Line, Ltd.

**Hisashi Matsunaga** has been named president of Japan Line, Ltd., according to reports from Tokyo that followed action by the shipping company's board of directors. With some 33 years of service in a variety of ship industry positions, Mr. **Matsunaga** heads one of the world's biggest ocean trade enterprises.

At the present time, Japan Line operates 224 ships in worldwide services that include containerships, conventional dry cargoliner vessels, tankers and other ships in tramping activities. The company owns 65 of these vessels, with an aggregate deadweight tonnage of 4,327,259.

# Three questions marine people ask about nuclear power.

# And answers that show why it must be considered for every large, high-speed ship.

**1. Is there an economic justification for nuclear power?**

Absolutely. Nuclear power is economically superior to all other forms of propulsion for large ships operating at sustained high speeds.

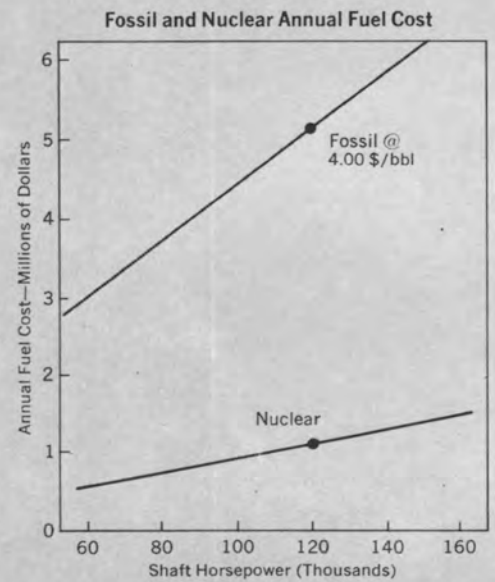
A bold statement. But one that seems to be verified by recent MARAD studies and our own projections.

Larger, faster ships are becoming an economic necessity as world trade continues to grow rapidly.

Just ten years ago, a 30,000 SHP merchant marine ship was considered high-powered. Today, over 40 ships are being built in excess of 80,000 SHP. Eight of these are rated at 120,000.

By 1990 there will be a need for about 500 ships over 100,000 SHP and about 2,500 commercial vessels over 40,000. With all this horsepower, fuel costs and fuel availability become vitally important to ship builders and operators hard-pressed by diminishing profit margins.

So, let's take a look at fuels. Nuclear fuel prices have declined over the past five years. Those of fossil fuels continue to rise. Bunker C fuel oil has doubled in price in recent years. By 1975, cost per barrel is expected to be at least $5.00 to $6.00.




Even at 1972 prices, a 120,000 SHP oil-fired ship would consume at least $100 million worth of fuel over its 20-year life span. A nuclear ship of the same size would consume only about $20 million worth. Despite the additional $19 million in capital costs that a nuclear ship presently requires over an oil-fired one, and additional operating costs of about $17 million, there are still lifetime savings of over $44 million.

In addition, five nuclear ships, with their higher speeds, can do the work of eight conventional ships. So a nuclear fleet would also cost less to build and less to operate.

There are other reasons to consider nuclear power for your next big commercial vessel.

Since nuclear fuel is produced domestically, its supply can be assured. Over half of all the fuel oil used by ships serving the United States in international trade originates overseas, where conditions may disrupt supplies and prices.

**2. Can you expect to get government support? Subsidies?**

Although there is no specific program at present to support a nuclear program, existing legislation does provide for a Construction Differential Subsidy (CDS) of U. S. built ships. From all indications, a particular nuclear ship project would be acceptable under these provisions on a case by case basis.

In addition, "first-of-a-kind" research and development expenses are covered in MARAD's advanced propulsion R&D program.

Of course, future executive and legislative action will

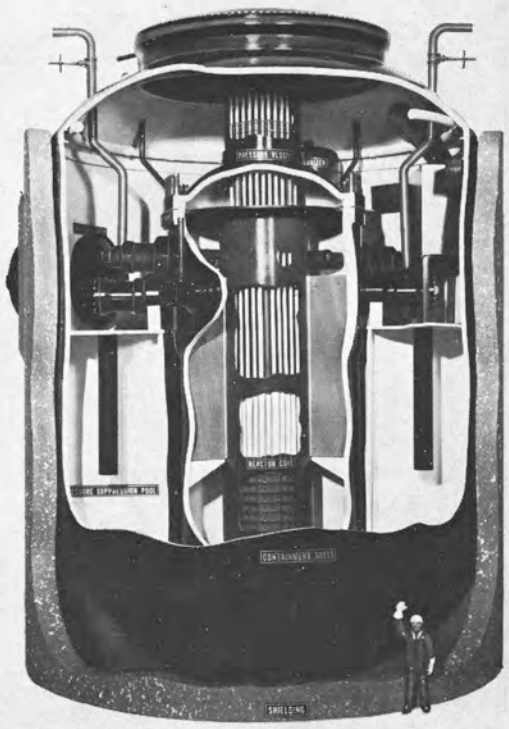
affect any current program. However, with the economic advantages of nuclear power, and the beneficial effect that domestically produced nuclear fuel has on the balance of payments, government support could be expected.

**3. Is nuclear power technically feasible?**

Definitely. Nuclear power proved itself with the N. S. Savannah. Using a Babcock & Wilcox Pressurized Water Reactor (PWR) of the spread-out design, the Savannah achieved an availability of 99.88% over almost half a million miles. An unparalleled performance in the history of mechanical marine propulsion.

Now, a second generation of nuclear reactors, designed by Babcock & Wilcox, is having similar success in the German ore carrier Otto Hahn.

This Consolidated Nuclear Steam Generator (CNSG-Mk I) is a much more compact system with flow passages within the reactor vessel itself. This eliminates the need for the external piping of the earlier models and offers significant savings



in both space and weight. Actually, in a 120,000 SHP ship, fossil-fired boilers with their fuel take up approximately 400% more space than a nuclear plant. This more productive utilization of space is further assurance of the economic feasibility of nuclear power.

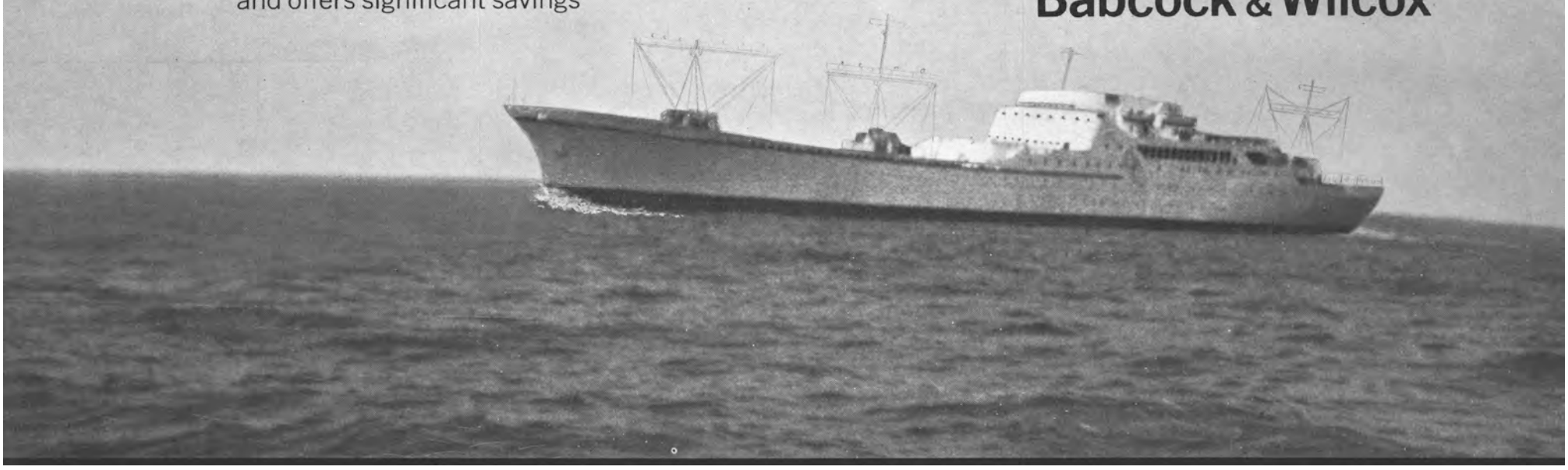
The next logical question is: "Who has the most managerial, technological and operating background to work with you in developing your own nuclear marine program?" The answer: Babcock & Wilcox.

B&W pioneered in marine nuclear propulsion with the Savannah and Otto Hahn. B&W worked with the Maritime Administration in the application of the Consolidated Nuclear Steam Generator to marine propulsion. We have a familiarity with the AEC and government. There's our experience in designing and building land based nuclear power generation systems for public utilities. Plus nearly 100 years of building steam boilers for both land and sea use.

It all adds up to a capability that should be consulted when you are thinking of designing a new, large merchant ship. We welcome the opportunity to answer any questions you may have on marine nuclear design, engineering, economics, applications and regulations.

Babcock & Wilcox, Government Marketing, Nuclear Power Generation Division, Lynchburg, Virginia 24505.

**Babcock & Wilcox**



## Colt Industries To Furnish Environmental System For Riverboat

Colt Industries' unique vacuum-operated environmental protection system will be featured aboard a new riverboat being built for Greene Line Steamers, Inc., owners and operators of the famous Delta Queen. The new vessel will be the first of a new fleet of passenger riverboats to be operated by Greene Line.

The Water and Waste Management Operation of Colt Industries, Beloit, Wis., has received a contract to supply the advanced sewage system for the 400-passenger vessel. Known as ENVIROVAC, the system requires less than one-tenth of the water used in conventional systems.

The new 365-foot excursion boat will have a crew of 110. It is expected to be in operation in 1975.

**F.J. Eubank,** vice president and general manager of the Colt operation, said: "All of the sewage from the vessel will be handled by the new ENVIROVAC collection system. This includes all of the 220 staterooms, crew quarters, and public toilets."

ENVIROVAC vacuum sewage systems can be installed in very limited equipment space. This is due to the limited water usage and smaller collection tank. Water storage capacity is also minimized.

The vacuum system operates with small electric motor driven pumps, which produce a constant vacuum of about 7½ psi. Important to marine applications is the fact that small diameter plastic piping can be installed without slopes and can be worked around obstacles, because gravity transport and grade dependence are not required. This facilitates placing piping in areas and at angles where it fits conveniently.

The new vessel will be built by Jeffboat, Inc., for the owners, Greene Line Steamers, Inc., at a cost of about $15.5 million. An official of Greene Line said the new pleasure vessel will be the largest and finest ever to operate on the Mississippi River and its tributaries.

The order for the ENVIROVAC system includes a vacuum collection tank with a 4,000 gallon capacity, two macerator units, 320 toilets, two sewage discharge pumps, vacuum equipment and all necessary controls.

The vacuum transported sewage is pumped to the large divided storage tank where it is macerated. At this point, the sludge is discharged to the oil-fired steam boilers and incinerated.



## Esso Adds Barges To Service Ships In Japanese Ports

New lube oil barges in Osaka Bay and Tokyo Bay have tripled the Esso bulk delivery capability in these areas.

The Esso Osaka Maru is a 130-ton barge with six tanks and space on deck for 100 drums. The Esso Yokohama Maru is a four-tank 100-ton barge which carries 50 drums on deck.

The two join the 65-ton Esso Kobe Maru and the 50-ton Esso Tokyo Maru, respectively. The two smaller barges have been in service since 1969.

The Esso companies are said to deliver lubricants in bulk at more than 150 ports around the world. Nearly half the company's worldwide marine lubricant deliveries are made by pumping in bulk directly into ships' tanks.

## So. Jersey Port Corp. Reports Cargo Increase

South Jersey Port Corp. has reported a 30.2 percent rise in waterborne cargo for the first six months of 1973, compared with the same interval last year.

According to **Robert I. Pettegrew**, executive director of the state-controlled agency, 413,618 tons were handled at the Beckett Street and Broadway terminals at Camden, N.J., in contrast to 317,706 tons last year. General cargo handled was 31 percent more than in the first half of 1972, while bulk cargo was up 44 percent.

## Foxboro Appoints LeCrone Manager U.S. Marine Systems Sales

Robert C. LeCrone

**Robert C. LeCrone** has been appointed manager of U.S. marine systems sales at The Foxboro Company, Foxboro, Mass. 02035. The announcement was made by **Colin I. Baxter,** vice president and U.S. general manager.

The Foxboro Company is a leading supplier of instrumentation and systems for process management and control, with manufacturing, sales, and service facilities located in principal cities around the world. The company has been very active in the recent surge toward shipboard instrumentation brought on by the demands of the larger, more complicated VLCCs (very large crude carriers) and LNG (liquefied natural gas) tankers. The marine systems sales group was formed to centralize and expand upon this already existing activity.

Mr. **LeCrone** received his B.S. degree in electrical engineering from Pennsylvania State University. He joined Foxboro in 1966 as a field sales engineer in the Charleston, W. Va., office and was promoted to senior field sales engineer two years later. In 1970, he was transferred to Foxboro, Mass., as senior industry sales engineer in the Oil and Gas Industry Division.

## 230,000-Dwt Tanker Delivered To Amoco By Astilleros Espanoles

The 230,000-dwt tanker Amoco Milford Haven, built at the Cadiz Shipyard of Astilleros Espanoles, S.A., has successfully completed her sea trials and was placed in service by her owners, Amoco Transport Company.

**Mrs. Bonnie Swearingen,** wife of the chairman of Standard Oil Co. of Indiana, served as sponsor at the vessel's launching last January.

The approximate measurements and main particulars of the tanker are as follows: length overall, 1,096 feet; molded breadth, 167 feet; molded draft, 65 feet; cargo tank capacity (100 percent) 10,011,857 cubic feet; and classification society, American Bureau.

The propulsion machinery, built at the Manises Works of Astilleros Espanoles, S.A., comprises an AESA-Burmeister Wain supercharged eight-cylinder 8K98FF main engine adapted to burn fuel oil in service and diesel oil on trials, totaling a maximum continuous output of 30,400 bhp at 103 rpm, delivering a speed of 15.3 knots.

Other equipment such as main boilers, windlasses, deck machinery, propulsion shafts, heavy forgings and castings were produced at different works of Astilleros Espanoles, S.A.

## Willem A.J. Burgers Appointed President Dixie Stevedores, Inc.

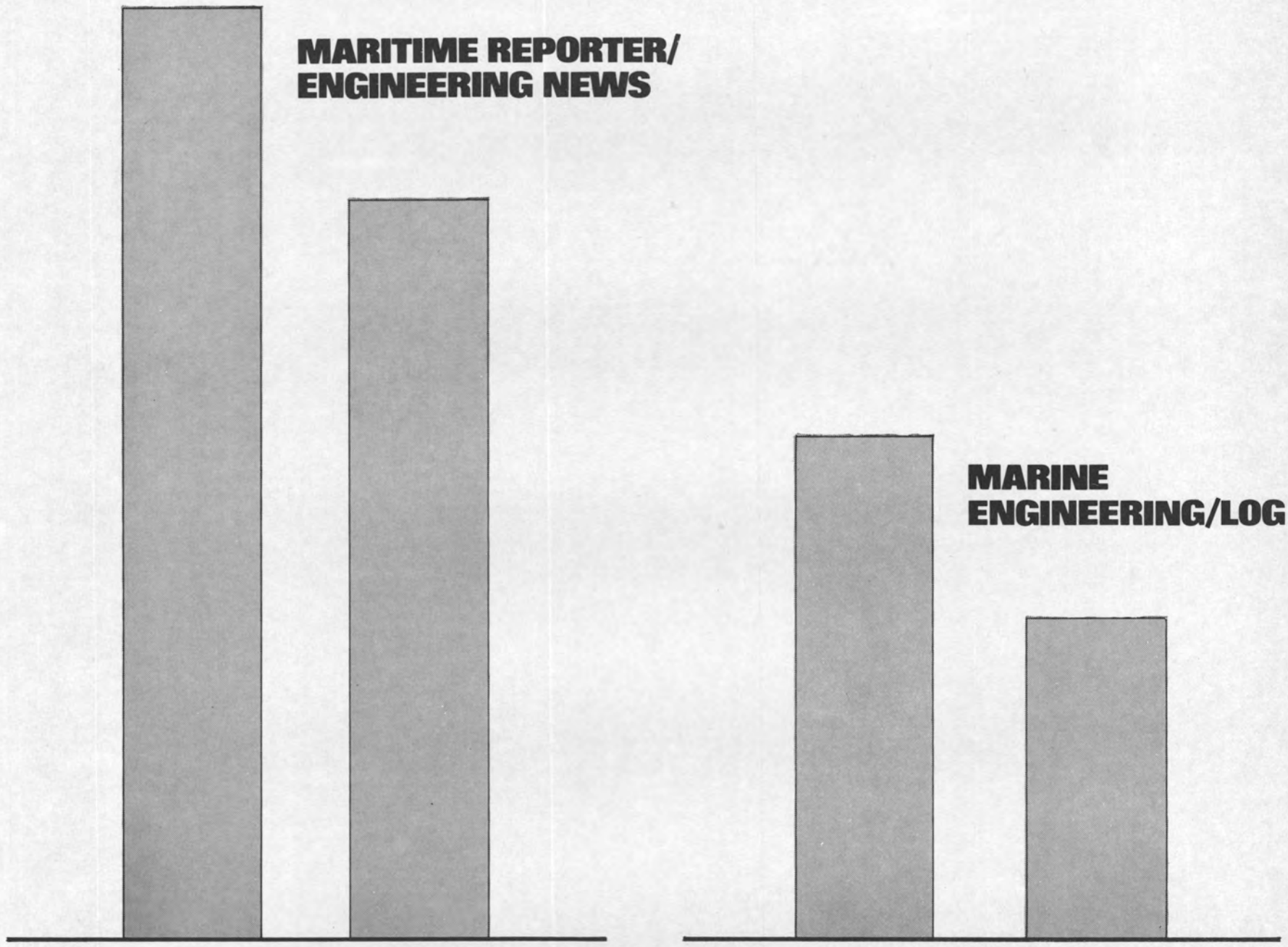
Norton, Lilly & Company, Inc. has announced the appointment of **Willem A.J. Burgers** as president of Dixie Stevedores, Inc., a subsidiary company.

Mr. **Burgers,** formerly manager of Norton Lilly offices in Boston, Mass., joined the company in March of 1951.

Mr. **Burgers** was treasurer and on the board of directors of the Boston Shipping Association; treasurer and trustee of BSA/ILA Pension Trust Fund; a member of the Foreign Commerce Club of Boston, the Traffic Club of New England, and The Propeller Club; and an associate member of the Boston Wool Trade Association.

Mr. **Burgers** will be resident in the New Orleans, La., headquarters of Dixie.

# IF YOUR MARINE CUSTOMERS ARE ALWAYS RIGHT

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**. . . shoreside men with the authority to give business to all marine advertisers**

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Directors, owners, agents, presidents, vice-presidents, managers, secretaries, treasurers, port engineers, superintendents, purchasing agents, port captains, port stewards, naval architects and engineers shoreside

**In shipbuilding & ship repair companies**

Directors, owners, presidents, vice-presidents, secretaries, treasurers, superintendents, managers, purchasing agents, naval architects, engineers and chief draftsmen

**The professional men**

Naval architects, engineers and consultants shoreside

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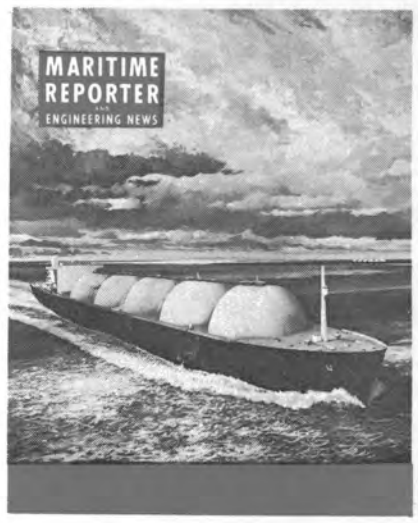
**What more could any marine advertiser ask for... than written requests... from thousands more of his own customers... for one marine magazine over all the others.**




Official circulation reports prove MARITIME REPORTER/Engineering News has a circulation to shoreside buyers (titles listed opposite) thousands larger than any other marine magazine in the entire world... and, TWICE the second magazine, Marine Engineering/Log, in the American market alone.

These buyers want MARITIME REPORTER/Engineering News and they say so... in writing.

**The total circulation of MARITIME REPORTER/Engineering News is over 97% requested ... in writing... by each individual reader.**

MARITIME REPORTER/Engineering News has five good professional editors with a combined total of over 60 years experience in marine editing. Issued twice each month, MARITIME REPORTER/Engineering News consistently publishes the latest and most important marine information FIRST... weeks before the monthlies. MARITIME REPORTER/Engineering News is first with the news... and FIRST in reader interest.

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Why advertise to only half your marine market... when you can reach thousands more shoreside buyers in the magazine they want... MARITIME REPORTER/Engineering News.

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# DIESEL GENERATOR SETS

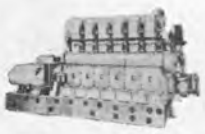
**1**

**350 KW DIESEL GENERATOR SET**

350 KW—120/240 volts DC—600 RPM—compound wound G.E. generator with switchgear. ENGINE: Ingersoll-Rand—heavy-duty type S—505 HP—10½x12—reconditioned to ABS.

**2**

**250 KW DIESEL GENERATOR SET**



ENGINE: Enterprise 12 x 15 DSG-6 — 6 cyl. — 450 RPM crank No. 50J. GENERATOR: Westinghouse 250 KW—120/240 DC—1040 amps—450 RPM. Typical serial No. 3S-10P-913. Complete with switch gear.

**3**

**EMERGENCY GENERATOR SUPERIOR 75KW 120/240 VOLT D.C. DIESEL GENERATOR SET**

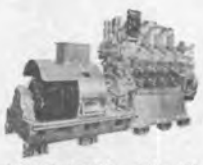
With switchgear. ENGINE: Radiator cooled Superior GBD-8—6 cylinder—1200 RPM GENERATOR: Electric Machinery Co.—120/240 volts DC—316 amps—1200 RPM—stab. shunt.

**4**

**UNUSED 10 KW SUPERIOR DIESEL GENERATOR SET**

GENERATOR: Delco 10 KW — 120 VDC — 83.3 amps—1200 RPM. ENGINE: Superior diesel—2 cyl.—4½x5¾ — 15 HP — heat exchanger cooled.

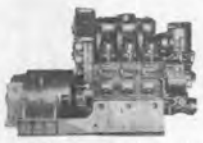
**5**



**500 KW— 120/240 VOLT DC DIESEL GENERATOR SET EQUAL TO NEW**

GENERATOR: Allis Chalmers—Compound wound. Has Class "A" insulation. Output 500 KW—120/240 volts DC—2080 amperes—720 RPM—drip-proof—self-cooling. Ambient 50°C—temperature rise 40°C. ENGINE: Model GM 8-278—2-cycle—Vee type—8½"x10½"—air starting—720 RPM. Complete with switchgear. Condition very good. Still aboard naval vessel. Has Ross shell & tube type lube oil & raw coolers—temp. control valve—shock mounts.

**6**



**300 KW DIESEL GENERATOR SET**

ENGINE: G.M. 6-278—6-cylinder—2 cycle—8¾"x10½"—750 RPM—with oil and water Ross Shell and Tube Heat Exchangers, instrument panel, pyrometer, etc. Vibro Isolators.

GENERATOR: G.E. 300 KW—120/240 volts DC—1250 amps—shunt wound—continuous overload rating 375 KW—2 hours—55° Weight of unit approximately 26,000 pounds. Complete with shock mounts. Unit 13' 2" long, 64" wide, 8' high.

# TURBO GENERATOR SETS

**7**

**400 KW WESTINGHOUSE TURBO GEN SETS FOR BETH. SPARROWS PT. HULLS 400 TO 4500; QUINCY HULLS 1600**

400 KW (500 KVA)—80% PF—1200 RPM—450/3/60. TURBINE: 585 lbs—840°TT—28½" vacuum—9018 RPM—serial 10A4462-3 & 10A4462-4. GEAR: 9018/1200 RPM. A.C. GENERATOR: 500 KVA—400 KW—450 volts—641 amps—80%PF—3 phase 60 cycle—1200 RPM—CR 40°—excitation amps 41—excitation voltage 120. Instruction book 5442. Switchgear available.

**8**

**UNUSED 300 KW—240 VOLT DC WESTINGHOUSE LOW-PRESSURE TURBO-GENERATOR SET**

GENERATOR: 300 KW—240 VDC—1250 amps—1200 RPM. GEAR: 5286/1200—frame 6x15—serial 10A-2612-4. TURBINE: Frame C-325—225 PSI—397° TF—5286 RPM—Serial 10-A-2611-4. Wt. 16,700 lbs. —complete in original factory crate.

**9**

**LOW-PRESSURE UNUSED 300 KW G.E. 120/240 VOLT DC TURBO-GENERATOR SET**

GENERATOR: 300 KW—120/240 VDC—1250 amps—1200 RPM. REDUCTION GEAR: 8.344:1 — 10012/1200 RPM—type S-182. TURBINE: DOR418N—449 H.P.—10012 RPM—working pressure 180/220 PSIG.

**10**

**WESTINGHOUSE 440/3/60 200 KW UNIT**

GENERATOR: Westinghouse 200 KW—250 KVA—450/3/60—1200 RPM—80% PF—with 40 KW—120 VDC on same shaft. GEAR: 9989/1200 RPM—double helical. TURBINE: Westinghouse — 540 PSI — superheat 322°F. Test 930 PSI 800°TT. Also operate 615 PSI—850°TT.

**11**

**1250 KW G.E. 10-STAGE TURBO GENERATOR SET**

TURBINE: 525—615 PSI—850°TT—7938 RPM—10-stage—type FSN. GEAR: Single helix—7938/3600. GENERATOR: 1250 KW—450/3/60/3600—.80 PF—type ATB with surface air cooler. Overload 25%— 2 hours—1563 KW.

## 6 EQUAL-TO-NEW LATE TYPE 500 KW SHIPS SERVICE TURBO GENERATORS

**12**

1962—DeLaval. Very little use. Completely preserved with rotors and diaphragms crated separately. TURBINE: DeLaval—585 PSI — 840°TT—6-stage—6391 RPM—class CD — Also suitable 440 lbs.—740°TT—25" vac. GEAR: 6391/1200 RPM. GENERATOR: Allis-Chalmers—450/3/60. Totally enclosed, with static exciter and voltage regulator system. Weight 17,665 lbs. Complete with latest dead front switch gear. Also available are the condensers, circulating and condenser pumps. All very up-to-date, compact construction. Turbines will easily handle 600 KW if up-grading is desired.

**13**

**AP2 VICTORY WORTHINGTON-MOORE CROCKER-WHEELER 300 KW UNIT**

TURBINE: 440 PSI—740°TT—28½" vacuum—type S4 — 5-stage — 6097 RPM — serial 7547 & 7548. GEAR: 6097/1200. GENERATOR: 300 KW—120/240 volts DC—1250 amps—compound wound—973643—999759. Armature flange 8½"; B.C. 7"—12 holes. ALSO NEW ARMATURES IN STOCK & 300 KW SHUNT ARMATURES.

**UNUSED C-4**

## CROCKER-WHEELER

**500 KW**

## GENERATOR ENDS ONLY

**120/240 VOLTS D.C.—1200 R.P.M.**

**FORMERLY USED WITH WORTHINGTON-MOORE TURBINES & GEARS**

**14**

Upgraded by U.S. Navy—rewound in glass. Generator Frame and Armature—Marine 500 KW type 3-1200—dripproof enclosure—base mount. Modified from Crocker-Wheeler generator frame 152HD — 240/120 volts DC — 2083/521 amps — 1200 RPM. Ambient temperatures 50°C. APPLICATION: For C-4-SA1; C4-SA-3; T-AP-134 vessels, using Worthington-Moore Turbine—Form S-6 and generator Form 14 x 10. No pedestal bearing.

**15**

**WESTINGHOUSE 400 KW TURBO-GEN 835 LBS — 840°TT**

Newport News Hulls 480—541 Esso ships. TURBINE: Westinghouse 835 lbs/840°TT—9018 RPM—6-stage—instruction book 1430-C1—serial 5A-7090-7 & 8. GEAR: 9018/1200 RPM. GENERATOR: Westinghouse 400 KW—440/3/60/1200 RPM—rewound field—instruction book 5442. EXCITER: 5.5 KW.

## TWO 538 KW WESTINGHOUSE T-2 AUX. GENERATORS

**(COMPLETE)**

**16**

TURBINE: 538 KW @ 5010 RPM—438 PSIG—750°TT—28½" vacuum. GEAR: 5010/1200 RPM. A.C. GENERATOR: 400 KW 450/3/60/1200—0.8 PF. DC EXCITER: 32.5 KW—120 volts (variable voltage)—shunt—4-pole—DC excitation 5 KW. ALWAYS WELL MAINTAINED BY MAJOR OIL CO.

# TURBINES & ROTORS

## MAIN PROPULSION

**17**

**BETH. CLASS—13,600 H.P.**

Sparrows Point & Quincy 1600 hulls. H.P. turbine casing only. Excellent blading & labyrinth packing.



**H.P. & L.P. COUPLINGS**

**18**

1 Set—for Beth Class 13,600 HP 4400 hulls and Quincy 1600 hulls.

## G.E. 6690 HP @ 7062 RPM HIGH PRESSURE 8-STAGE TURBINE

**19**

835 lbs—840°TT—#83341—originally built for Esso Christobol—Newport News.

# T-2 TURBINES & ROTORS

**20**

**COMPLETE WESTINGHOUSE T-2 MAIN TURBINE—UNSHROUDED 6600 HP—435 PSI—750°F 28" VACUUM—3720 RPM**

Instruction book IB-8345—type D—serial No. 5A-2124-6—unshrouded. Unit complete with all packing, stationary blading, linkage, governors, diaphragms, nozzles, etc. WILL SELL ROTOR SEPARATELY OR COMPLETE TURBINE CASING & ROTOR. Always well maintained by major oil company.

## 2 COMPLETE T-2 G.E. TURBINES

**21**

#61818 and #61834—large Lynn—all stages magnafluxed.

**ROTOR WILL INTERCHANGE WITH ELLIOTT MAIN TURBINE**

**Will Sell Rotors Separately**

**22**

**T2-SE-A1 MAIN PROPULSION ROTOR — G.E.**

Large Schenectady — serial 77418 — reconditioned Bethlehem Steel 1970—all stages magnafluxed.

**T-2 TANKER**

**UNUSED—4 UNITS AVAILABLE**

**AUX. G.E. TURBO GEN. ROTORS**

**23**

DORV — 325M — 5645 RPM — for 525 KW G.E.

# VICTORY SHIP TURBINES & ROTORS

**24**

## 8500 H.P. 8-STAGE TURBINES FOR LARGE VICTORY SHIPS

## L. P. – 3509 RPM

## H.P. – 6159 RPM

LP Serial #77943—HP Serial #77942—Interchanges Ingalls C-3—Class 442 & Sun C-4 vessels—U.S. Navy Victory "Liberty".

LP Serial #72272—HP Serial #72271—Interchanges Ingalls C-3—10 boxes of spares.

LP Serial #62042—HP Serial #62043—GEI 16263—Ridgeway Victory.

**WRITE OR PHONE FOR DETAILED INFORMATION AND PRICES**

# TON METALS CO.

**ORE ST. • BALTIMORE, MD. 21202**

539-1900 Marine Dept.: (301) 355-5050

**25** **VICTORY SHIP AP2 H.P. & L.P. TURBINES NEW — UNUSED — 6000 H.P. SETS**

G.E.—H.P. & L.P.—with throttle valve
Westinghouse—L.P.—with throttle valve
Allis-Chalmers—H.P & L.P.—with throttle valve

**26** **6000 H.P. G.E. — NORTH CAROLINA C-2**

H.P.—8-stage—serial 78040
L.P.—7-stage—serial 78043
G.E.I. 16262

**27**

**19 STAGE WESTINGHOUSE H.P. ROTOR FOR AP2 VICTORY**

Reconditioned — balanced—with ABS. Serial 4A-2079—type B — 19 stage reaction blades. Excellent — just out of shop. 13" Flange diameter with 14 bolts.

**28**

**G.E. 8500 H.P. REDUCTON GEAR FOR LARGE AP3 VICTORY & C3**

MD-48A—8500 HP—6159/3509/763/85 RPM.

**29** **ALSO 6000 H.P. VICTORY AP2 REDUCTION GEAR**

Westinghouse 4A-1640.

## PUMPS

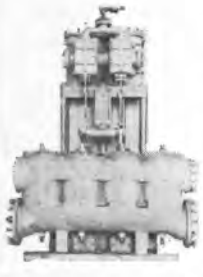
**30**

**CARGO STRIPPING PUMPS**

**BRONZE T2 TANKER STRIPPING PUMPS**

14x14x12—700 GPM at 100 lbs. Same pump available in steel for fuel oil transfer, etc.

**31**



**WORTHINGTON 16"x14"x18" VERTICAL DUPLEX STRIPPING PUMP**

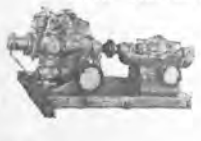
1400 GPM @ 110 PSI—suction lift 11.5 ft.—steam back pressure 15 lbs. Suction 14" — discharge 10"—steam 2½" — exhaust 4". Overall width 6'8"—overall height 9'1½" — depth 3'9½"—wt. approx. 10,000 lbs.

**32**

**UNUSED DELAVAL IMO ROTARY PUMP**

175 GPM—35 PSIG—10 HP—120 volts DC—1750 RPM—serial E-8619—frame 324 VY—76 amps—mfg. by Electro Dynamics. With magnetic control. Excellent condition.

**33** **NEW TURBINE DRIVEN FIRE AND GENERAL SERVICE PUMP**



Allis-Chalmers 6 x 5 pump, type SKH—1200 GPM—125 PSI—3500 RPM. Coppos turbine type TF-22-2½ — 3500 RPM. 273#—50° superheat.

**34**

**DAYTON-DAWD 2-STAGE FIRE AND BILGE PUMP**

Vertical 2-stage type TDV-10—20 HP—20 GPM @ 184'—3" discharge—4" suction—1775 RPM—Maumee Sun. Motor: 120 volts DC—20 HP—1775 RPM.

## BOILER FEED PUMPS

*Suitable for Navy and Merchant Vessels*

**35**

**COFFIN TYPE CG-4A FEED PUMP**

2 Available—very little use. Maximum 325 GPM—1760' head or 750 lbs Steam inlet 575 lbs. — 540°TT — exhaust 20 lbs. — speed 760 RPM.

**36** **UNUSED DD445 CLASS WORTHINGTON TURBINE-DRIVEN FEED PUMP**

Worthington — drawing SL5043—425 GPM—1675' total dynamic head—5000 RPM 3-stage — double suction. Flanged 4½" inlet—4" outlet. Powered by Sturtevant steam turbine—282 HP—590 PSI. For Fletcher DD-445 Class Destroyers.

**37**

**BUFFALO SIZE 4 FEED PUMPS**

Terry Turbine—BM—273 HP—550 RPM—exhaust 15 lbs—590 PSI—superheat 0°—425 GPM Buffalo Pump—discharge pressure 750 lbs—5"x4"—built for USN DD destroyers. DD 445 Class Fletcher.

**38**

**WORTHINGTON 3-STAGE UNUSED BOILER FEED PUMP**

PUMP: 5" Worthington—460 GPM @ 750 PSI—5000 RPM—305 HP—steam flow 8052/hr—26.4 lbs HP hr. TURBINE: Sturtevant C-22—type 21—575# dry saturated steam—15 lb. back pressure—259°F water temperature—15 lbs/inch suction pressure.

**39** **INGERSOLL-RAND BRONZE CARGO PUMP**

10GT—4500 GPM at 125 lbs.—2-stage—size 14x12.

**40** **C-25 CARGO PUMP TURBINE SPARE GEARS**

One set of gears available for Westinghouse C-25 Cargo Pump Turbine.

## MISCELLANEOUS

## DOUBLE REDUCTION GEARS for Diesel Drive

**41**

**3200 HP DOUBLE INPUT SINGLE OUTPUT DIESEL REDUCTION GEARS 20 DEGREE OFFSET**

Farrell-Birmingham — 3200 SHP. REDUCTION GEAR: 1.81:1—handles two 1600 HP diesels @ 720 RPM. With hydraulic couplings & Fawick clutch. Port and starboard. Gear output 400 RPM. Suitable for dredge pumps. Non-reversing. OK for 38D8-⅛ engine.

**42** **2:67:1 RATIO DOUBLE IN-LINE GEARS**

Farrell-Birmingham 3200 HP non-reversing — from seaplane tenders. Ratio 1.867:1. Complete with hydraulic couplings, etc. Will handle two 38D8-⅛ FM diesels. Has Fawick clutch.

**43** **2100 HP DOUBLE INPUT SINGLE OUTPUT GEARS—3:435:1 RATIO**

Farrell-Birmingham — heavy duty — originally built for 2 heavy-duty direct-reversing engines —300 RPM—1050 HP each. Ratio 3.435:1.

**44** **SINGLE ENGINE REDUCTION GEAR**

Farrell-Birmingham — non-reversing—1600 HP at 2.4909:1. With hydraulic couplings.

**45** **ANCHOR WINDLASS**

Hyde 2-11/16" — 12x14 — 100 PSI — steam — 54,100 lbs.

**46**

**SHARPLESS LUBE & DIESEL OIL PURIFIERS**

Type M-34-W22-UM—15,000 RPM. BOWL MOTOR: 2 HP—230 volts DC—8.5 amps—3450 RPM—250 to 300 GPH. Originally built for C-1-A diesel vessels.

**47**

**UNUSED 1135 SQ. FT. C.H. WHEELER CONDENSER**

20" Ex. inlet—⅝" CU-NI tubes—with or without air ejector.

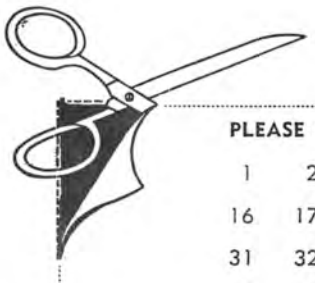
**48**

**UNUSED 70 HP McKIERNAN-TERRY WINDLASSES**

Chain and two 10640 lb anchor & 30 fathoms chain @ 30 FPM. 70 HP—230 volts—shunt DC motors—233 amps—550 RPM—55°C rise. Wildcat centers 47½". Base 9'5" wide x 11' long. Weight 36,000 lbs.

**INQUIRE FOR ALL OTHER ITEMS**

Forced draft blowers, reduction gear parts, bilge and ballast pumps, main circulators, general service pumps, F.O. transfer pumps, lube oil service, standby feed pumps, condensate pumps, aux. circulating pumps, feed water heaters, wash water pumps, etc.



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## Robert W. Cleveland Jr. Named President, H.O. Penn Machinery

Robert W. Cleveland Jr.

Robert W. Cleveland

**Robert W. Cleveland Jr.** has been installed president of H.O. Penn Machinery Co., Inc. and Pennco Industrial in an announcement by **Robert W. Cleveland,** chairman. The company is the dealer for Caterpillar diesel marine engines and power units, ship service sets and Towmotor lift trucks in southern New York State and Connecticut.

Mr. **Cleveland Jr.**, who joined H.O. Penn in 1965, has been vice president-marketing for the past two and one-half years. Prior to assuming that post, he had been sales manager of the company's Connecticut operations and had previously been sales manager for parts. He began his career in construction equipment with the Cleveland Brothers Equipment Co. of Harrisburg, Pa. He is a graduate of Colgate University.

## Pickands Mather And Beth Steel Join To Build Ore Pelletizing Complex

Bethlehem Steel Corporation, the nation's second largest steel producer, and Pickands Mather & Co., a subsidiary of Moore and McCormack Co., Inc., have decided to proceed with construction of a new large-scale iron ore pelletizing complex at Hibbing, Minn. The decision was announced in St. Paul at a press conference called by Governor **Wendell R. Anderson** at a meeting with officials of Bethlehem and Pickands Mather, which will participate in the project as manager as well as part owner.

Annual production capacity of the mining, concentrating and pelletizing complex is now planned for 5.4 million gross tons. The total investment will be over $150 million. It is anticipated the property will provide 800 to 1,000 new jobs when in full operation.

## Propulsion Systems To Supply C-P Propellers For Six Vessels Building At Todd Seattle Yard

The Seattle Division of Todd Shipyards Corporation has contracted with Propulsion Systems, Inc., Port Washington, N.Y., for Liaaen Controllable Pitch Propeller Systems for six twin-screw 220-foot tug/supply vessels being built for Allseas, Inc. of Panama. An option for six additional vessels is contemplated.

Under the contract arrangement, Propulsion Systems, Inc. will supply Liaaen Controllable Pitch Propellers, shafting and main propusion controls. Each propeller has four blades, stainless steel 10-foot diameter, built to American Bureau of Shipping Ice Class 1C Rules and is capable of transmitting 3,500 shp at 228 rpm. The vessels will be powered by GM Electro-Motive Division diesel engines, through Falk reduction gears.

Propulsion Systems, Inc. is the exclusive licensee for sales, manufacture, and service of Liaaen equipment in the United States and specializes in main propulsion, steering and side thruster systems for vessels of all sizes and types.

## Third Marshaling Contract For Mammoth LNG Project Goes To Port Of Galveston

Galveston has been chosen as the export packing and shipping port for another large liquefied natural gas project.

Chemical Construction Corporation, New York, a subsidiary of Aerojet-General Corporation, will be the major U.S. contractor for the plant to be constructed at Arzew, a port in Western Algeria, through its subsidiary Chemico (Africa), and will provide engineering and procurement as well as construction services for its client Sonatrach, the Algerian State Oil Company.

Movement of materials to Galveston for packing and loading on ships will begin in 60 to 90 days and should continue for nearly four years, **C.S. Devoy,** Galveston Port Director, has been advised by Chemico officials.

"We are pleased to welcome a new customer and project to the port, and this business will provide more work on the wharves as well as assuring the loading of many ships that will lift project cargoes under the project," Mr. **Devoy** said.

The contract marks the third major LNG project to be staged at Galveston. Since the unique concept of combining the services of the port and the packer was begun in Galveston in 1967, more than 200 project ships have been loaded there. The Port of Galveston Pier Point Packers Division performs all necessary packing, processing and export preparations for these projects.

## Fisher Controls Offers New Electro-Hydraulic Actuator

Fisher Controls Company offers a new series of electro-hydraulic actuators designed specifically for high-speed high-thrust control valve applications. Designated Series 320, these actuators operate on all standard milliampere input signal ranges, provide thrusts up to 10,300 pounds, and can stroke fully in one direction (8⅛-inch travel) within three seconds. Features include easy start-up and maintenance (no severe filtration requirements), easy calibration (transducer directly accepts input signal), and quick field conversion from direct to reverse acting without additional parts. For additional information, contact Fisher Controls Company, Box 190, Marshalltown, Iowa 50158.

**LIKE THE PROVERBIAL SHIP IN A BOTTLE:** Hovermarine Corporation, Pittsburgh-based manufacturer of commercial surface effect ships, has begun construction of a 60-passenger HM.2 Hoverferry at the company's newest—but as yet unfinished—manufacturing facility in Titusville, Fla. To keep construction on schedule, one of the Titusville factory buildings, in effect, is being built around the vessel. The hull of an existing HM.2, which had been shipped from England (pictured above), is serving as a mold for the new craft. Scheduled for completion in January 1974, the high-speed fiberglass hoverferry will be the first commercial surface effect ship ever manufactured in the United States. HM.2s in service in nine foreign countries have been constructed by Hovermarine's subsidiary, Hovermarine Transport Ltd., in Southampton, England.

## Mitsubishi To Build Cities Service Tanker

Cities Service Company, New York, N.Y., has announced that its subsidiary, Grand Bassa Tankers, Inc., has signed a contract for the construction of a 262,000-deadweight-ton tanker, with a capacity of approximately 1.8 million barrels.

The vessel will be constructed by Mitsubishi Heavy Industries, Ltd., at Nagasaki, Japan. The contract calls for delivery in early 1976.

It will be a sister ship to two other vessels that Mitsubishi is building for Cities Service. The latter vessels are scheduled for delivery in mid-1974 and early 1975.

## Port Of New York Favored For East Coast-Soviet Cargo

Officials of the Port Authority of New York and New Jersey, at a recent meeting, reported that the Port of New York will be favored with the preponderance of general cargo expected to move from the Eastern United States to the Soviet Union in the years ahead.

Port Authority commissioner **Andrew C. Axtell,** marine terminals director **A. Lyle King** and **Gerard Gorman**, general manager of the Authority's trade development section, attended the recent press conference in New York, during which it was predicted that 75 percent of the Eastbound general cargo freight will be directed through the bi-state harbor area.

A recent trade mission for the port unit, which met with leading Russian trade and transportation officials in Moscow and Leningrad, was headed by Mr. **Axtell** and Mr. **King.** As a result of the U.S.-Russian Trade Agreement reached last fall, the mission was dispatched to the Soviet Union. The State Department estimates that the agreement will stimulate a trade flow between the two nations of about $5 billion per year by 1980.

A state-operated Russian shipping organization began monthly sailings from the U.S. East Coast to the Baltic in February—the start of what is expected to be an enormous movement of East Coast cargo.

The steamship company, Baltatlantic line, is scheduled to begin weekly operations on the U.S. North Atlantic-Baltic route next month. Russia also maintains general cargo operations to and from Gulf ports and the Soviet Union, from the Great Lakes to the Baltic and Black Seas as well as a trans-Pacific service.

The Port Authority officials acknowledged that predictions as to the amount of Russian cargo to be channeled through New York harbor are based mainly on the Russian reaction to the facilities offered by the port.

A big "plus," they said, was the 500-ton floating crane available in New York, along with the direct highway and rail ties New York has with interior points east of the Mississippi, which normally utilize North Atlantic ports.

Much of the U.S.-Russian cargo movement is expected to be heavy machinery, knocked-down manufacturing plants and other types of shipments which require the use of a heavy-lift crane, it was pointed out.

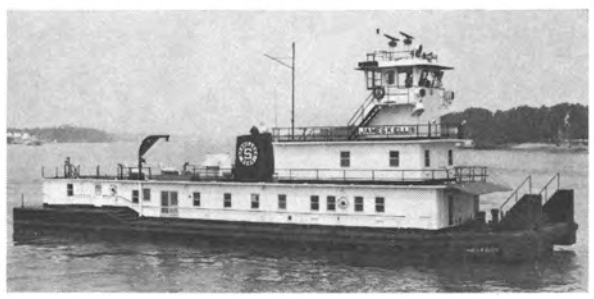
The four Russian-flag vessels which have called in New York thus far this year have utilized the Port Authority's Pier 7 Brooklyn facility.

The port agency officials indicated that the Russian shipping officials have been impressed with the cooperation and productivity of the longshore labor force at the terminal.

While Russia's trans-Pacific general cargo services are employing cellular containerships, the port agency spokesmen said there is no immediate indication that this type of ship will soon be introduced in the Soviet-flag trans-Atlantic operations, which are maintained by break-bulk tonnage.

# "If it does what you say it'll do, we'll buy another."

## HERE'S O.F. SHEARER'S 2ND HYDRODYNE



In 1970, Captains Oliver and Bert Shearer, of O. F. Shearer and Sons, purchased their first Hydrodyne towboat, the M/V Winchester, from St. Louis Ship. The new 2650 HP, M/V James K. Ellis is a duplicate of the Winchester. It is the result of the Shearers' offer to buy another HYDRODYNE "if the Winchester does what you say it'll do." *It did*. And the Shearers just took delivery on Hydrodyne No. 2. St. Louis Ship's exclusive Hydrodyne concept provides maximum operating efficiency, improved handling ability, and greater thrust, regardless of towboat size. We invite you to contact us about your individual requirements. For complete information, call America's largest inland shipbuilding and repair firm, at (314) 638-4000.

**ST. LOUIS SHIP**
DIVISION OF POTT INDUSTRIES INC.
611 EAST MARCEAU STREET, ST. LOUIS, MO. 63111

New York, Chicago, Kansas City, New Orleans, Memphis, Minneapolis, Houston and Mobile.

## Strommen Staal Receives Federation Design Award For Nozzle Propellers

The Norwegian company A/S Strommen Staal, P.O. Box 98 N 2011, Strommen, Norway, has been awarded the Federation of Norwegian Engineering Industries' Design Prize for 1973. When the judges made the public announcement concerning the award, they mentioned among other things, the following:

"The nozzle propeller propulsion unit is the only one of this size, and S/S Strommen Staal should be honored for having had the courage to carry out the idea of using the nozzle propeller system on larger ships.

"It is hoped that the successful result with the nozzle propeller will lead to further development and an integrated solution of the entire stern part, which includes both propulsion and steering."

The first nozzle propeller was delivered in 1970 to the T/T Golar Nichu, a turbine tanker of 215,000 deadweight tons being built for Gotaas-Larsen, Inc., New York. The Golar Nichu has now been in service for 2½ years. She has two identical sister ships with conventional propellers. This has enabled Strommen Staal to carry out thorough tests on the nozzle propeller, and the results are very satisfactory.

The nozzles are now built in Japan under license to Kawasaki Heavy Industries Shipyard, and a license agreement is also in effect in Spain with Astilleros Espanoles. A total of 22 nozzle propellers have been constructed or are on order for ships ranging from 130,000 deadweight tons to 358,000 deadweight tons.

Strommen Staal is one of the world's leading specialists in stern construction. In 1903, the company became the first in Scandinavia to obtain Lloyd's Register of Shipping approval as a supplier of steel castings to the shipbuilding industry. Today, the company delivers stern equipment to approximately 30 percent of all newbuildings over 100,000 deadweight tons in the Western Hemisphere.

Production is constantly expanding, with an annual output of steel castings of about 15,000 tons. The firm's main products include stern frames, rudders, rudder stocks, rudder shafts, chocks, engine components, steering gear, large welded constructions, several types of propellers —and nozzle propellers.



## Halter Delivers Crewboat For Offshore Nigeria Operation

Designed and built by Halter to Lloyd's Class 100-A Nigerian Service classification, the new crewboat can accommodate 32 passengers.

Halter Marine Services, Inc., New Orleans, La., one of the world's largest builders of offshore support vessels for the oil and gas industry worldwide, has delivered a new 78-foot offshore crewboat to Tidewater Marine Services, New Orleans. The new crewboat, with overall dimensions of 78 feet by 18 feet 6 inches, and a 4-foot 9-inch draft, has been placed into operation by its owner in Lagos, Nigeria, servicing oil rigs.

The boat is powered by two General Motors V-1271NT turbocharged diesel engines and is equipped with two General Motors 2-71-20 KW generator units, Decca radar, and RF Communications VHF radio. The vessel is air-conditioned in the passenger lounge, two double staterooms, and the wheelhouse.

Halter Marine Services has a current backlog of approximately $60 million in contracts to build offshore crewboats, supply, anchor-handling, and towing vessels for the oil and gas industry. The company's production comes from three fully equipped shipyards in New Orleans and Lockport, La., and Moss Point, Miss. Three special-type vessels presently under construction include a 15,000-horsepower tug, the most powerful ever built in the United States, and two 174-foot oceanographic research ships. One research vessel will be used by Texas A&M University; the other will be used by the University of Hawaii's Oceanographic Institute in Honolulu.

**GULF AWARD:** The Gulf Oil Foundation recently presented a check to the department of naval architecture and marine engineering, University of Michigan, for the fellowship support for graduate students. Pictured on the occasion of the presentation of the check to the department are, left to right: **Charles A. Gallup,** Gulf Oil distributor of Ann Arbor; **Frank T. Odom,** marketing manager, Gulf Oil of Detroit; Prof. **R.B. Couch,** department of naval architecture and marine engineering, University of Michigan, and **Dave Ragone,** engineering dean, University of Michigan.

## Nelson Log Bronc Delivers New Type Clearing Vessel For Harbor Cleaning/Maintenance

**Jack L. Wilskey,** president of Nelson Log Bronc Co., P.O. Box 692, Coos Bay, Ore., has announced that the firm's new ecology oriented debris-clearing vessel, trade-named the "Logster," has been working successfully for the Weyerhaeuser Co., one of the nation's leading wood products companies.

The vessel represents more than two years of research into the field of harbor utility vessels, and is believed to be the first and most advanced vessel of this type available as a stock-manufactured product.

The forward throat area of the vessel incorporates a wide-angle debris deflector leading into a conveyor. The throat area can also incorporate an oil skimmer attachment.

For 20 years, the firm has specialized in designing and building several different types of steel craft for the logging industry, the most noteworthy of which is called the Log Bronc®, featuring a bow propulsion unit which swivels 360 degrees. More than 400 units of this type have been built by the firm to assist in the sorting and towing of logs and log rafts throughout the world.

The Logster is particularly oriented to the wood products industry, debris contractors, or port authorities. The versatile craft can be used for harbor maintenance projects the year round. Due to its unusual hull shape, the vessel features extremely high stability and load carrying capabilities for its overall size.

The vessel incorporates many other features not previously found in debris-clearing vessels.

Power for the vessel and its machinery is provided by twin propulsion units similar to that used on the Log Bronc, each consisting of a Detroit Diesel marine engine (100 hp), driving a Hydro-Drive Model U 360/100 Swivel Strut Drive Unit, and a hydraulic pump system for deck machinery. Full hydraulic steering is utilized to rotate each propeller independently a full 360 degrees within three seconds. With the propulsion units located in the aft end of each sponson, the vessel can be maneuvered in any direction, including sideways against a current.

The hydraulic crane loader can lift sunken or floating objects from the throat area or from alongside the vessel and place the material on the aft deck.

The vessel is constructed in three individual modules and transported by truck to the site of the user. This feature is particularly useful to the many inland reservoirs, lakes, and rivers which have not previously had equipment of this type available.

Deck machinery consists of an articulated hydraulic crane loader with winch, grapples and grapple basket, 25-foot boom with a lifting capacity of 14,000 pounds at 8-feet outreach. The loader can lift sunken or floating objects from the throat area or from alongside the vessel and deposit the material on the aft deck. Optional equipment for the loader consists of twin-controlled fire nozzles, linemans bucket for bridge and cable crossing maintenance, and a hydraulic-operated shear that can be lowered below the water approximately 16 feet to shear old piling at the mud line. The controls for the crane are located in the deckhouse.

The forward throat area of the vessel incorporates a wide-angle debris deflector leading into a conveyor. This allows the vessel to move through the water at 1-3 knots while collecting debris, and depositing it in containers on deck ready for unloading.

The throat area can also incorporate an oil skimmer attachment. All accessories are powered by the hydraulic system driven by the propulsion engines. The loader can be used to lift the required components aboard in a very few minutes.

The versatility of this craft enables the port authorities to invest their money in a piece of equipment that can be used the year round. Then, in the event that an oil spill occurs within the range of this vessel, it can be transformed into an efficient oil recovery platform.

Basic equipment includes the steel hull, twin swivel drive, propulsion units, operators control cab, and the deck-mounted crane, with basic hydraulic system.

Accessories include: log grapples, 40 inches; debris shovel, ⅓ yard; piling shears, 16-inch diameter; hoist winch, 7,000-pound hoist; debris conveyor, 48-inches wide; debris deflectors, with self-dumping containers; oil skimmer and attachment with tank, and fire pump with boom-mounted nozzles.

As can be seen from the above list of optional equipment, the vessel can be equipped to perform many of the functions associated with clearing and maintaining any harbor.

The designers believe that with all of the options available with this equipment, many areas of our rivers and harbors can now be maintained economically and prevent further abuse of these areas.

## Ocean Resources Engineering Appoints H.B. Spiller Vice-Pres.

**Joe W. Key,** president of Ocean Resources Engineering, Inc., a Houston, Texas, consulting engineering firm involved in the design, inspection and construction management of offshore facilities and equipment, has announced the appointment of **H.B. Spiller** as vice president and manager of terminal design.

Mr. **Spiller,** formerly manager of Sun Oil's International Office in Houston, will continue as the Houston engineering representative for Oreco, Inc. of Lafayette, La.

## SNAME Publishes Translation Of German Paper On Bow Bulbs

The use of bulbous bows on ships in particular trades is common practice today, but the reasons for their use is usually not well understood. Members of Panel H-5 (Analytical Ship Wave Relations) of The Society of Naval Architects and Marine Engineers' Technical and Research (T&R) Program noted an unusually complete German paper by **E. Eckert** and **S.D. Sharma** on this subject, which clearly and simply explains the mechanism by which the bulbous bow reduces drag on full-form tankers in ballast condition. Inasmuch as it was believed that a wider audience was justified, SNAME has published a translation in English of the original German work as T&R Bulletin 1-33, "Bow Bulbs for Slow, Full-Form Ships."

The bulletin compares the results of a number of model tests conducted to determine an average reduction in resistance due to the addition of a bow bulb with full-scale operational powering data on a number of ships collected prior to their drydocking for the addition of a bow bulb, and similar data collected from the ships after their conversion. In addition, parameters for effective bow bulk design are indicated, as well as data on their sensitivity to weather conditions and their overall economic significance.

The second part of the paper describes a series of experiments conducted on a tanker model to identify and clarify the physical mechanism by which the addition of a bow bulb reduces the resistance of slow, full-form ships. Included are results of measurements of resistance, viscous wake and wave pattern as well as flow observations by means of film and underwater television.

T&R Bulletin 1-33, "Bow Bulbs for Slow, Full-Form Ships," was prepared for Panel H-5 (Analytical Ship Wave Relations) and approved by the hydrodynamics committee of the Society's T&R Program. The bulletin is available through The Society of Naval Architects and Marine Engineers, 74 Trinity Place, New York, N.Y. 10006, at a price of $9 per copy. Members of the Society may obtain the bulletin for $6 per copy. This price includes postage via third class mail in the United States and as "Printed Matter" in all other countries. Shipments will be insured and sent via air mail at extra cost only if requested.

## U.S. Navy Orders 24 Fiberglass Gigs From Uniflite Inc.

Uniflite Inc., Bellingham, Wash., has announced receipt of an $801,-144 contract for the construction of 24 personnel boats for the U.S. Navy.

**John L. Thomas,** president of Uniflite, said delivery of the redesigned 26-foot boats will begin in January 1974. He said this contract boosts Uniflite's backlog of Federal Government work to more than $4 million. Completion of this contract will bring to 144 the number of 26-foot personnel boats Uniflite has supplied the Navy.

Uniflite redesigned the hull form to provide better stability and seakeeping characteristics and a reduction in cost through use of modern fiberglass boatbuilding techniques.

Mr. **Thomas** said one prototype of the boat has been built to the new design and was delivered earlier this year. He pointed out that most of the boats in this new contract are earmarked for the Navy's new DD-963 class of destroyers currently being built in Mississippi.

**Seabury McGown,** Uniflite's chief engineer, said the personnel boat is used as a "captain's gig" and is capable of 21 knots with a full load of 14 passengers and two crew. He said the boat is powered by a single 250-hp engine and has a range of 100 miles at full load and power. The beam is just over 10 feet, and it has a hoist weight of 10,500 pounds and a full-load displacement of 12,500 pounds.

Uniflite is a Bellingham-based manufacturer of fiberglass boats and yachts. The company has a branch plant in Swansboro, N.C.

## Employment Promotion Service Initiated By Personnel Services Inc.

**Ray Agent,** president of Personnel Services Inc., 823 West Street, Wilmington, Del. 19801, a professional employment placement service specializing in employment referral for the shoreside marine industry, announced the inauguration of a new program designed to help employment seekers who don't want to be represented by an employment agency and yet need assistance in presenting their qualifications in an effective way to prospective employers.

This "Employment Promotion Service" includes complete resume preparation, composition of an individualized cover letter and mailing to the appropriate executive in companies that normally utilize the individual's particular background. The cost is kept at a nominal amount to encourage participation by those who are just starting their careers, as well as being practical for the experienced professional. Each promotion campaign is tailored to the person's specific situation, and personal considerations, such as size, type and location of the companies are given priority.

Mr. **Agent** explained that although a person is highly capable in his profession, it doesn't always follow that he has expertise in the art of finding a suitable position. This program provides that expertise which is usually made available to top management personnel by consulting firms. The program also permits the individual to utilize the resources of a professional employment placement service without the concern of having to pay a placement fee.

## New Welding Booklet Available From Arcair

The Arcair Company, Lancaster, Ohio, recently announced the availability of a new brochure describing the company's N-5 Automatic Metal Cutting Torch.

Fast and economical, the N-5 produces grooves from ¼" to ¾" in a single pass at speeds of 60 to 20 I.P.M. respectively and is ideal for set up with automatic welding equipment . . . preparing "U" joint in one direction and automatically welds on the return.

A copy of the brochure on the N-5 Torch can be obtained by contacting the Arcair Company, P.O. Box 407, North Memorial Drive, Lancaster, Ohio 43130.

## NYK Line Names Miura Gen. Manager, London

NYK Line (Nippon Yusen Kaisha) announced it has appointed **Takashi Miura** as general manager of its London branch office. Mr. **Miura** who succeeds **Y. Yamanaka** at the London post, has been serving NYK as general manager of its business division No. 1 (liner service). Mr. **Yamanaka,** the former London branch general manager, has been named executive managing director of NYK's head office.

## Seatrain Lines Appoints Capt. Jack M. Park

Capt. **Jack M. Park,** USN (ret.), has been appointed to the newly created post of general manager of operations cost control by Seatrain Lines, California, according to **Frank D. Troxel,** president, at Oakland.

Prior to his retirement from the Navy, Captain **Park** had been commanding officer of the Military Overseas Terminal-Bay Area.

## Cummins Engine Co. Names George Hollins

George Hollins

**George Hollins,** formerly executive director-service, has been named head of a new Cummins Engine Company department created to give the customer better representation within the firm by consolidating several quality assurance and service functions. His new title, effective immediately, is vice president-product performance.

A graduate of Northwestern University in mechanical engineering, Mr. **Hollins** originally joined Cummins in 1946. For 20 years, he worked in a variety of design and engineering positions for the world's largest independent producer of heavy-duty diesel engines. He was director-engineering services when he left Cummins in 1966 to become manager-product engineering of the Allis Chalmers Engine Division, where he was subsequently promoted to general manager. In February 1972, he returned to Cummins in Columbus, Ind., as executive director-service.

Cummins's new product performance department incorporates advanced quality engineering, certification testing, tech service, customer relations, and warranty and service practices.

## Virginia Port Authority Appoints Willard Forbes

The Virginia Port Authority announced that **Willard G. Forbes,** vice president of Associated Naval Architects Inc. of Portsmouth, has been appointed by Governor **Linwood Holton** to the authority's board of commissioners. The appointment is for a three-year term ending June 30, 1976. He can be reappointed for a six-year term.

## Union Mechling Moves N.O. Sales Office

Union Mechling Corporation has announced that its New Orleans, La., sales office is now located in Suite 802 of the International Trade Mart.

Staffing the office will be **Peter M. Mitchell Jr.,** Southern sales manager; **Robert D. Wilson,** assistant manager-sales, and **James J. McGinnis,** sales representative. **Thomas Stahl** and **Harry Baker** will be in charge of operations and dispatching.

Union Mechling, a subsidiary of Dravo Corporation, Pittsburgh, Pa., provides barge transportation services on the Mississippi River System and Gulf Intracoastal Waterway and to Tampa, Fla.

## Alcoa Subsidiary Ocean Search Inc. Names Scholley VP

Ocean Search, Inc., Washington, D.C., has named **George G. Scholley** vice president, with responsibility for diversifying company operations.

Ocean Search, Inc., a Washington-based subsidiary of Aluminum Company of America, owns and operates Alcoa Seaprobe—a deep-ocean search and recovery vessel—and has a worldwide salvage contract with the U.S. Navy.

Mr. **Scholley** goes to Washington from Pittsburgh, where he has been manager of Alcoa's advanced projects division.

He joined Alcoa in 1953, after graduation from Duke University, and has had various sales assignments.

He also is a director of Ocean Search, Inc. and is a member of the Marine Technology Society, Society of Small Craft Designers and The Society of Naval Architects and Marine Engineers.

## Avondale Begins Construction On First Of Three LASH Ships For Central Gulf Under Contract Totaling $82.5 Million


Taking part in keel-laying ceremonies are (from left) **Edwin Hartzman,** Avondale president; **Jerome L. Goldman,** LASH designer and president of the naval architectural firm of Friede & Goldman, Inc.; **Erik F. Johnsen,** president of Central Gulf Lines, Inc., and **Frank X. McNerney,** Central Region Director of the U.S. Maritime Administration.

Keel-laying ceremonies in New Orleans, La., on July 18 marked the beginning of an $82.5-million contract for three U.S.-flag LASH vessels for Central Gulf Lines, Inc., the New Orleans-headquartered shipowner and operator that pioneered LASH operations, beginning with the world's first LASH vessel in 1969.

The keel-laying for the 893-foot-long S/S Green Valley, first of the three new ships, took place at Avondale Shipyards, contractor for the new Central Gulf ships. The Green Valley is scheduled for delivery in August of 1974, with the other two vessels to follow at 75-day intervals.

**Erik F. Johnsen,** Central Gulf president, said a group of more than 400 LASH barges to serve the three ocean carriers are being built by Union Tank Car Company at its East Chicago, Ind., plant. Central Gulf and Union Tank Car Company are affiliates of Trans Union Corporation.

He said Central Gulf plans to operate the Green Valley and its sister ships—to be named Green Harbour and Green Island—between United States Gulf and East Coast ports and the Middle East, Indian sub-continent, Southeast Asia and the Far East. All are designed to carry 89 LASH barges.

Central Gulf ordered the new ships under the Merchant Marine Act of 1970. The United States Government will contribute a portion of the construction cost, but the company will not receive any operating funds from the Government, Mr. **Johnsen** said.

Principal characteristics of the three new Central Gulf LASH ships are identical and include an overall length of 893 feet, beam of 100 feet, molded depth of 60 feet at the side, design draft of 38 feet, shaft horsepower of 32,000, speed of 22 knots, and a deadweight of 40,400 tons at 38 feet.

Central Gulf pioneered LASH operations in 1969 with the world's first LASH ship, the Acadia Forest, followed in 1970 by a sister ship, the Atlantic Forest. The company operates the two LASH vessels under long-term charter in an express fortnightly service between New Orleans and other U.S. Gulf ports, the United Kingdom and Continental Europe.

Central Gulf maintains headquarters in New Orleans, with principal offices in New York, Houston, and Memphis, and a network of agency affiliates in major United States and overseas trading centers.

The Central Gulf LASH vessels were designed by Friede & Goldman, Inc., naval architects and marine engineers of New Orleans.

## Saudi Arabian/Marcona Steel Project Advanced

Marcona Corporation, San Francisco, Calif., and Petromin, the Saudi Arabian Government Development Corporation, have agreed to proceed with the final stage of a joint feasibility study aimed at construction and operation of a major steel mill in Saudi Arabia.

At a recent meeting in Jeddah, Saudi Arabia, Marcona president **C.W. Robinson** and senior vice president **K.E. Merklin,** and **W.E. Jameson,** executive vice president of Gilmore Steel Corp., presented the first stage project report to the directors of Petromin, which Shaykh **Ahmed Vaki Yamani,** Minister of Petroleum and Mineral Resources, serves as chairman.

The report established the economic feasibility of locating a major steel mill on the Arabian Gulf Coast of Saudi Arabia, utilizing natural gas which is now being flared in conjunction with oil production. This contemplates the transport of iron ore concentrate from Brazil to be delivered in slurry form for pelletizing and direct reduction based on the use of surplus gas. The metalized pellets will be converted to steel in electric furnaces and a continuous casting facility, with all of the power to be generated from surplus gas.

Marcona considers that this plant would not only be highly competitive in terms of production costs but would also be the first steel mill in the world to actually reduce overall atmospheric pollution.

The initial plant capacity has been set at one million tons per year, primarily consisting of finished products for the Arabian Gulf market. This would include spiral weld pipe to meet the expanding requirements for petroleum pipeline construction in the area, with additional products in the form of bar and plate. Further expansion is contemplated as required to meet the accelerated demand for semi-finished steel products, primarily in European and Japanese markets.

A joint venture company will be established to conduct the final detailed engineering program over the next nine months. This company will be 50 percent owned by Petromin, with the balance to be held by The Marcona Group, which will include Gilmore Steel Corporation and possibly other European and Japanese steel mill interests.

Marcona, an integrated mining, shipping and resource development firm, with headquarters located in San Francisco, is primarily owned by Cyprus Mines Corporation and Utah International Inc.

## Dover/Norris Division Announces Changes

**Homer Hill**

**U.J. Breece**

**D.P. Hagaman**

The Norris Division of Dover Corporation, Tulsa, Okla., has announced a reorganization of responsibilities within its Pumps and General Products Group.

**Homer Hill,** former sales manager of the southern region for Norris, has been promoted to general sales manager. His replacement has not been named. **U.J. Breece** will continue as sales manager for the northern region.

Mr. **Hill** has been with Norris Division for 25 years. A native of Tulsa, he began his career with Norris in warehouse operations. He was division manager for the Oklahoma and Kansas area for 10 years before heading the southern region.

**D.P. Hagaman,** vice president, has been assigned the responsibility for sales administration, including internal and export sales and special assignments. He has been with the firm for 36 years.

Norris, a division of Dover Corporation, is a manufacturer and marketer of sucker rods, butterfly and control valves, pumps and fittings for oil, gas, marine, and industrial application.


**TANKER DAIKO MARU DELIVERED BY HITACHI:** On July 14, the Daiko Maru, a 181,775-dwt tanker built at Hitachi Zosen's Innoshima Shipyard, was delivered to her owner, The Sanko Steamship Co., Ltd. The Daiko Maru, the first example of an 180-type tanker that Hitachi has developed as a standard economical vessel, is equipped with an inert gas system. To protect from corrosion, the inside of cargo oil tanks are coated with tar epoxy paint, and cargo oil pipes in tanks are made of cast steel that is anticorrosive. The engine room is fully automated, making unmanned operation possible for a period of more than 24 hours. The approximate measurements and principal particulars of the vessel are: length (between perpendiculars), 991 feet; breadth (molded), 145 feet, and depth (molded), 80 feet. The new tanker is powered by a Hitachi B&W 12K84EF-type diesel engine with a maximum output of 30,900 hp, producing a trial speed of 17.06 knots. The maiden voyage will be to the Persian Gulf.

## House Approves TAPS —41 Tankers Needed

A bill to license the construction of the Trans-Alaskan Pipeline System (TAPS) and to shield the project from further challenges by environmentalists was passed by the House of Representatives on August 2.

After eight hours of debate, the controversial bill, similar to one passed by the Senate, cleared the House by a vote of 356 to 60.

The $3.5 billion, 789-mile pipeline is expected to carry two million barrels of crude oil daily from Alaska's North Slope oilfields to the ice-free port of Valdez, on Alaska's southern shore, for tanker shipment to West Coast ports.

In late 1971, the Bureau of Domestic Commerce, Department of Commerce, estimated that the total number of ships by size for Valdez/West Coast services would be as follows: eight 250,000-dwt tankers; sixteen 120,000-dwt tankers; one 90,000-dwt tanker; two 80,000-dwt tankers; four 75,000-dwt tankers; six 70,000-dwt tankers; two 60,000-dwt tankers, and two 45,000-dwt tankers, adding up to a total of 41.

The Commerce Department Report on "Economic Effects of Opening the Oil Reserves of Alaska Through the Trans-Alaska Pipeline System," further indicated that eight of the above 41 tankers will come from the existing fleet "and the remaining 33 will be built in U.S. shipyards."

## Lloyd's Register Reports Record High For Ships On Order

Apart from the People's Republic of China, Rumania and Russia for which information is not available, at the end of June there were under construction in the world 2,102 merchant ships totaling 26,550,507 gross tons, according to Lloyd's Register of Shipping. This is 13,865,759 tons more than last quarter, and is the highest figure ever recorded.

When the ships which are on order but have not been commenced are included, the world order book surpassed 100-million gross tons, and the mammoth figure of 105,316,423 tons is 6,133,597 tons more than the last quarter.

As forecast, last quarter's rate of contracting has not been maintained. Nevertheless, tonnage ordered during the first six months of 1973 is already higher for any entire year, with the exception of 1970.

Japan, Britain and Spain show substantial increases to their order books, while most of the other major shipbuilding countries have more modest increases. Japan's share of the order book now stands at almost 44 percent.

The United States total order book is 3,202,930 gross tons, an increase of 98,473 tons over the March quarter.

Of the ships under construction throughout the world at the end of June, 8,417,200 gross tons were being built under the supervision of Surveyors to Lloyd's Register.

## American Bureau Signs Agreements With USSR Register Of Shipping

The American Bureau of Shipping and the USSR Register of Shipping have concluded agreements for reciprocal representation for survey of existing vessels and for survey during construction or conversion of vessels in ocean service classed with either society. Representatives of ABS and the USSR society signed the agreements in Leningrad on May 24, 1973.

An agreement for reciprocal representation for survey of ship steel plates and shapes has been in effect between ABS and the USSR society since February 1972.

## T.J. Stevenson & Co. Appoints Lance Miller

T.J. Stevenson & Co., Inc., New York-based steamship agents, announced it has appointed **Lance A. Miller** as its Gulf manager. Mr. **Miller,** who will be based at the World Trade Center in Houston, Texas, formerly served at Seoul, Korea, as special representative providing liaison between the Stevenson organization and its principals, Korea Shipping Corp.

## World-Wide Marine Appoints Paul Lee Executive Vice Pres.

**Y.K. Pao,** governing director of World-Wide, (Shipping) Ltd. of Hong Kong, and president of World-Wide Marine, Inc., New York, has announced the appointment of **Paul Lee,** formerly vice president, to the position of executive vice president of World-Wide Marine.

Mr. **Lee** graduated from the National Fuh Tan University in Shanghai, China, having majored in economics and received a master's degree in business administration from Fordham University in New York.

Mr. **Lee** is a director of World-Wide, (Shipping) Ltd. and served in Hong Kong for seven years, primarily in charge of their finance division, before coming to New York in 1963 to open the agency offices of World-Wide Marine.

## Insley Of Crisfield Delivers Towboat To Cottrell Eng'r'g.


In addition to pushing, the Falcon performs exceptionally well as a dredge or yard tender.

A new twin-screw towboat has been delivered to Cottrell Engineering Corporation by designer-builder N.E. Insley, Inc. of Crisfield, Md.

The Falcon is 40 feet long, 12 feet wide and 5 feet deep. One-quarter-inch steel plate was used in construction of the hull, bulkheads and bulwark. Frames consist of 4 by 3 by ¼ angle on 24-inch centers.

Two 38-inch-diameter four-blade propellers are turned by twin Detroit Diesel 6-71 Model engines. The vessel is equipped with a hynautic hydraulic steering system.

The engine compartment provides full headroom and easy access to both engines. The compartment may be reached by ladder from the pilothouse, as well as by the aft deck stairway.

The electrical, hydraulic and mechanical assemblies chosen for installation on the Falcon are durable and free of unnecessary complications. The use of these systems should significantly reduce maintenance and repair time according to **N. Edward Insley,** shipyard president.

The pilothouse affords excellent visibility through two fixed and eight double-hung windows. A storage locker is located under the full length seat/bunk.

An unusual amount of usable deck space causes the boat to be imminently suitable for employment as a utility vessel on a wide variety of marine construction projects.

Additional information may be obtained by writing **Jack Hoyle,** at N.E. Insley, Inc., P.O. Box 11, Crisfield, Md. 21817.

**GE ENGINEERS CITED:** Two General Electric marine application engineers from Schenectady, N.Y., have been cited by the company's Marine & Defense Facilities Sales Operation (M&DFSO) in connection with the filing of a patent application on an electric propulsion system and control for two double-ended 440-foot auto ferryboats used on Puget Sound. Left to right are: **J.F. Nace,** manager, Marine & Defense Facilities Application Engineering and Sales; **John A. Beverly** and **Richard L. Koch,** the two inventors holding an illustration of the ship, and **Edward F. Eaton,** manager, Marine Application Engineering and Sales for M&DFSO. The two ships, built by the Seattle Division of Todd Shipyards Corporation for the Washington State Highway Commission, are propelled by GE electric drive equipment made in Schenectady by the Large DC Motor Section and Large AC Motor and Generator Dept.

## Four Executive Promotions Announced By ACT/PACE

Capt. William F. Wilson

John E. Dann

Four executive level promotions were recently announced by Associated Container Transportation/PACE Line in keeping with the demands of the growing trade between North America and Australia/New Zealand.

"The four men named to fill the various positions represent more than a century of combined experience in the steamship industry, most of it in the Australasian trade," according to **Michael B. Northen,** president of ACT/PACE in North America, who made the announcement.

Thomas G. Johnson

V.R. Vincent

They are Capt. **William F. Wilson,** who was appointed vice president-marine operations; **John E. Dann,** assistant vice president-marketing and sales; **Thomas G. Johnson,** assistant vice president-commercial, and **V.R. (Pete) Vincent,** assistant vice president-container services.

"These steamship veterans have proven their expertise in their fields," said Mr. **Northen.** "We acknowledge their contributions toward the success of ACT/PACE during its most important years of growth." The company operates a trade route linking North America with Australia/New Zealand with a new generation of containerships providing fortnightly service.

Captain **Wilson,** who in June entered his 45th year in the industry, is a native of England. In 1929, he went to sea with Ellerman Lines, a partner in the ACT/PACE consortium. In 1946, he was assigned by the company to Calcutta, India, where he was marine superintendent for 10 years before assuming the same duties for Ellerman in the United States, prior to the formation of the ACT/PACE consortium.

Captain **Wilson** has been with ACT since 1969, coming aboard as technical development manager and later as marine operations manager. While at sea during World War II, he was awarded the M.B.E.—Member of the British Empire.

Mr. **Dann** was foreign freight forwarder for nearly 20 years with Wedemann and Godknecht Inc., before joining ACT four years ago as manager of documentation. He was North American marketing manager, overseeing sales and marketing in the United States and Canada, including agents, at the time of his promotion to assistant vice president.

Mr. **Johnson** worked for 27 years for Norton, Lilly and Co., where he was traffic manager handling outward and inward in the Australia/New Zealand trade, including the American and Australian Line and the Port Line, both now partners in ACT/PACE. He came to ACT three years ago as manager of conference, rates, tariffs, and claims, with considerable experience in evaluating shipper rates and requests and progressive tariff construction.

Mr. **Vincent** joined the Cunard Steamship Co. in London in 1946, and 20 years later was assigned to container service development in New York. After several years at Atlantic Container Line as assistant to the president, Mr. **Vincent** came to ACT four years ago as manager of container services, and is largely responsible for ensuring the availability of equipment to shippers.

## Modular Systems Awarded $400,000 For Combustion Control Simulators For Navy

Modular Systems, Parsippany, N.J., a division of Warren Pumps/Houdaille, announced the recent award of a $400,000 contract from the U.S. Navy to manufacture 12 combustion control simulators for instructional use at Naval training facilities.

Each unit consists of an instructor console and a trainee console. The trainee console is virtually a duplicate of existing U.S. Navy shipboard units in external appearance, while the instructor console is used to simulate conditions which are likely to be encountered in actual shipboard situations.

Modular Systems is a manufacturer of a wide range of packaged fluid systems for marine and industrial use, including fuel oil, lube oil, water, hydraulic and pneumatic systems.

## Bell Aerospace Team Plans World's First Oceangoing Surface Effect Ship For Navy

The Bell Aerospace Division of Textron, New Orleans, La., has disclosed its proposed plans to design and build the world's first oceangoing surface effect ship (SES) for the United States Navy.

Bell Aerospace president **William G. Gisel** said his company has been working with Avondale Shipyards, Inc. of New Orleans, and the British Hovercraft Corporation (BHC) of East Cowes, England, and that they will perform important roles in the project to develop the high-speed 2,000-ton SES.

Avondale and BHC join an outstanding team of major subcontractors which have been associated with Bell Aerospace since the initiation of the preliminary design study last November. They are the Autonetics Division of Rockwell International of Anaheim, Calif. (with Collins Radio Company of Cedar Rapids, Iowa), combat system integration; Gibbs & Cox, Inc. of New York City, naval architecture; and Hydronautics Inc. of Laurel, Md., hydrodynamic design and waterjet inlet studies.

In addition, Bell is receiving technical assistance in the area of waterjet propulsion from the Rocketdyne Division of Rockwell International, Canoga Park, Calif., and the Aerojet Liquid Rocket Division of Aerojet-General Corporation, Sacramento, Calif.

Avondale, one of the nation's leading military and commercial shipbuilders, will be designated by Bell in its proposal to the Navy as an exclusive subcontractor for major fabrication work.

British Hovercraft, international pioneer and leader in the development of air-cushion vehicles, will contribute its technological expertise in flexible seal design and other engineering tasks.

British Hovercraft developed the 190-ton SR.N4 Hovercraft, five of which have been in daily passenger service on the English Channel for the last 4½ years. The SR.N4 seals are similar in geometry and approximately one-half scale of those which will contain the air cushion of the 2,000-ton surface effect ship.

Textron's Bell Aerospace Division is one of four companies conducting preliminary design studies for the development of a 2,000-ton operational prototype SES under contract to the Naval Material Command's Surface Effect Ships Project Office (PM-17).

**John J. Kelly,** vice president and general manager of Bell Aerospace New Orleans Operations, said the development of the 2,000-ton SES will represent "a major step forward in mobility and tactics for the U.S. Navy."

However, Mr. **Kelly** said, there are distinct differences between the large surface effect ship and conventional displacement ships. The most obvious ones, he explained, are that the SES will feature all-aluminum construction, a highly efficient structural hull design, and a high-powered high-speed propulsion system.

"Therefore," he continued, "Bell plans to balance the need for new techniques to meet the special design and performance requirements of the SES with a recognition of the proven success of standard shipyard practices."

Bell Aerospace, which has had 15 years of experience in the design, development, production and test of air-cushion/surface-effect vehicles in the United States and Canada, will devote its efforts to the total ship design and to the fabrication and installation of those systems and components which are peculiar to surface effect ships, such as the aluminum hull structure, the propulsion system and the air-cushion/flexible-seals system.

This work will be performed at the New Orleans Michoud Assembly Facility, where the National Aeronautics and Space Administration has allocated environmentally controlled manufacturing space to Bell for work on the Navy SES project. This facility was specifically designed for the fabrication of high-integrity welded aluminum structures.

Avondale Shipyards, which has turned out almost 400 military ships and amphibious craft, as well as countless numbers of commercial vessels, ranging from oceangoing tugboats to supertankers, will contribute its established and proven shipbuilding techniques to the outfitting of the Bell-built hull structure and the fabrication, installation and furnishing of the deckhouse.

**Edwin Hartzman,** president of Avondale, a subsidiary of the Ogden Corporation, expressed his enthusiasm in working on the SES project.

"We at Avondale are honored in working with this excellent team, and in putting our skills to work on this concept. Together with Bell and the other members of the team, Avondale will use its production skills and technical knowledge to bring the world's first oceangoing surface effect ship into reality for the U.S. Navy."

## Peterson Delivers First In New Line Of 58-Footers

The Kimber is powered by a Detroit Diesel Model 12V71N delivering 350 continuous horsepower through a Twin Disc Model 514 reverse-reduction gear.

Peterson Boatbuilding Company has announced completion of trials and delivery of the first in their new line of 58-footers, the F/V Kimber, designed by naval architect **B.F. Jensen.** The boat was constructed at the Peterson facility on Taylor Way and outfitted at the firm's headquarters plant at 223 East F Street, Tacoma, Wash. 98421.

Owner and captain of the new boat is **Jeff Pfundt** of Petersburg, Alaska. He will fish crab, salmon, and herring for Petersburg Fisheries.

Immediately on completion of trials, the Kimber took on fuel and supplies and departed Tacoma for Petersburg. Reports coming in are most gratifying to Peterson Boat, and her working speed of 10 knots should make her a real contender on the fishing grounds.

Propulsion is by a Detroit Diesel Model 12V71N delivering its 350 continuous horsepower through a Twin Disc Model 514 reverse-reduction gear. This combination drives a 56 by 44 three-blade Olympic propeller. Engine controls are Mathers single lever, two station.

A Twin Disc Model SL-211 power take-off is fitted forward on the main engine to provide a source of power for hydraulically operated deck machinery.

Auxiliary power is supplied by a Detroit Diesel 3-71 Model 3055C driving a 30-kw Delco AC generator.

All Detroit Diesel equipment was supplied by Courtwright Diesel and Machine Company of Tacoma.

The Kimber is fitted with a Sperry Rand hydraulic steering system with two jog stations and rudder angle indicator.

Deck machinery includes both a power block and pot puller by MARCO, Northern Line combination fishing winch and Bevis anchor winch. All deck machinery is hydraulically operated. The system was designed by Charles M. Bevis & Associates.

The hold is fully insulated and fitted for fishing salmon, crab, bottom fish or tuna. The crab pump is a 5 by 4 Deming.

Hold refrigeration was furnished by Anderson Refrigeration of Seattle. It included a 7½-ton type RA St. Regis compressor driven by a Lincoln Electric motor.

The Kimber's suit of electronics includes the following: Decca Marine radar, Super 101; Northwest Instrument Model NW-4 single side band radio; Messenger Model 242-153 citizens' band transceiver; Morrow S120A Fathometer, and Simrad Model EX38D Fathometer.

## Mangone-Built Offshore Vessel Launched For Norwegian Firm

The Tender Tarpon, pictured during her launching, is tentatively scheduled for operation in the North Sea.

Mangone Shipbuilding Company in Houston, Texas, recently launched the 185-foot Tender Tarpon, an offshore vessel under construction for Wilhelmsen Offshore Services.

One of six vessels contracted for by the Norwegian firm, the vessel is scheduled for completion this month. A sister ship to three vessels delivered to Wilhelmsen by Mangone since last fall, the Tender Tarpon will be powered by two GM Electro-Motive Division 16-645-E5 turbocharged engines providing a total of 5,800 horsepower.

The Mangone-built vessel has a beam of 38 feet and a depth of 16 feet. It has 120 feet of deck space. The Tender Tarpon will cruise at 14.5 knots and has a cruising range of 10,000 miles. It has sleeping accommodations for 13, as well as accommodations for 12 additional crew members below deck.

The vessel is equipped with a 48-inch-diameter bow thruster driven by a 300-hp GM 8V-71. The Tender Tarpon and the two remaining vessels still under construction for Wilhelmsen will all be equipped with Kort nozzles.

**Don Godeau**, vice president and general manager of Mangone Shipbuilding, said the vessel will probably work in the North Sea, which is the original destination for all the Wilhelmsen ships. The Tender Tarpon is almost identical to the Tender Tuna, whose maiden voyage last December turned into a 25,000-nautical-mile trip in which the smaller vessel towed another Wilhelmsen ship, the 625-foot cargoliner Talisman, from the Panama Canal to Sydney, Australia.

Mr. **Godeau** explained that the ships for Wilhelmsen are among a number under construction for foreign firms. Mangone has already built vessels for another Norwegian firm and now has contracts with a third Norwegian company. In addition, the shipbuilding company is constructing vessels to work in Brazil, as well as in Indonesia.

## U.S. Export-Import Bank Aids Korean Shipyard

The U.S. Export-Import Bank and **Ryun Namkoong**, president of the Korea Shipbuilding and Engineering Corp. (KSEC), have signed loan agreements to support a $72-million sale of U.S. equipment materials and services to expand KSEC's shipyard and repair facilities in Korea.

Eximbank's board of directors authorized a direct loan of $32.4 million to finance 45 percent of the U.S. costs and a financial guarantee of a loan of $32.4 million from Morgan Guaranty Trust Co. of New York, to finance another 45 percent of the costs.

The project consists of the design, construction and equipping of a new shipyard and repair facility for larger merchant ships and fishing vessels on Koje-Do Island, some 25 miles southwest of Pusan where its existing facilities are located. Total cost of the project is estimated at some $102.8 million.

**FIRST FOR HONDURAS:** The modern and fully automated combination ship Morazan (shown above) is the first cargo ship to fly the national flag of Honduras. Named after the liberator of Honduras, the Morazan was officially greeted in Porto Cortez by the president and first lady of Honduras on its maiden voyage from Gijon, Spain, where it was built. The vessel was presented to the president of Honduras by **Joe Teitelbaum,** president of Eagle Inc., Miami, Fla., co-owners of Conasa Line with the Honduran Government. Captained by Honduran **Arturo Fernandez** and crewed by graduates from the Honduran Merchant Marine Academy, the new vessel will operate from Miami in two-way cargo trade between the Republic of Honduras and the United States. Designed to carry 143 dry or refrigerated containers, the Morazan can carry more than 2,000 tons of high dollar value general cargo plus 160 tons of edible oil.

## Potable Water Aboard Ship Made Pollution-Free Using Bull & Roberts U-V Purifier

Water can now be made pollution-free at an operating cost of approximately 5 cents per 100,000 gallons by an ultra-violet water purifier being marketed by Bull & Roberts, Inc., Murray Hill, N.J.

Water that is safe today may be polluted tomorrow. It may be clear without being pure, look good but be contaminated. Germs and viruses in water can cause polio, infectious hepatitis or jaundice, dysentery, typhoid or cholera.

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For additional information, contact **B.W. Seile** at Bull & Roberts, Inc., 785 Central Avenue, Murray Hill, N.J. 07974.

## Delta Iron Elects Arceneaux And Olivier

The elections of **Ralph A. Arceneaux** as vice president and general manager, and **Christian L. Olivier III** as vice president, Shipyard Division, has been announced by **R.H. Marmande,** president of the Delta Iron Works Division of Chromalloy American Corporation, Houma, La.

Mr. **Arceneaux** joined Delta in 1968 as Shipyard Division manager. His prior experience includes 17 years with two major shipyards in the Morgan City, La., area. In 1970, Mr. **Arceneaux** was named vice president of the Shipyard Division, a position he held until given his new assignment. He is a civil engineering graduate of Indiana Institute of Technology and is a member of The Society of Naval Architects and Marine Engineers. In his new position, Mr. **Arceneaux** will manage and coordinate all operational aspects of Delta Iron.

Mr. **Olivier** joined Delta in 1968 as an engineering estimator in the Shipyard Division. Prior to that, he was with the Boeing Company as a design engineer for six years. A native of Houma, La., Mr. **Olivier** received a degree in mechanical engineering from the University of Southwestern Louisiana.

## Norton, Lilly & Co. Appoints Joseph Gill

Norton, Lilly & Company, Inc. has announced the appointment of **Joseph M. Gill** as manager of their Boston, Mass., office.

Mr. **Gill** replaces **W. Burgers,** who assumed the presidency of their subsidiary company, Dixie Stevedores, Inc., in New Orleans, La.

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**NICOLAI JOFFE CORPORATION**
**MACHINERY DIVISION**

## 1500 KW GENERAL ELECTRIC TURBO GENERATOR SETS

**TURBINE:** 420/618 PSI 825/850° Total Temperature Type FN4-FN30 11 Stage 8145 RPM GEI-19320

**GEAR:** Type S195A 8145/1200 RPM

**GENERATOR:** 1500 KW 450 V 3 Ph 60 Cy .8 PF 1200 RPM Continuous 2340 KVA 2 Hrs Type ATI-HL

Four Units Available, Complete with Board, Condensers, Air Ejector and Condenser and Condensate Pumps. Removed from Cruiser ROANOKE. In Like New Condition.

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**FOR SALE**

One pair of Enterprise DMM-363 diesel engines, 500 continuous HP at 950 RPM, complete with snow-nabsted SN-3786 2.59 to 1 ratio reverse reduction gears and many spare parts. These units are presently operating on schedule in an offshore supply vessel on Louisiana Gulf Coast. Units can be inspected anytime by appointment and should be available by mid-August. Write for additional details, specifications, photos, or an inspection appointment.

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## FOR SALE — AIR COMPRESSORS

1 Each CHICAGO PNEUMATIC Type YCM, 11½ x 7 x 7, 501 CFM @ 100#, 75 HP, 220/440 Volt Motor

2 Each WORTHINGTON Model 80, 7½ x 7½ x 6 x 5, Air Cooled, 369 CFM @ 125#, 100 HP, 220/440 Volt Motor

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120′ x 26′ x 8′ $600,000.00

E. **3 COVERED AND 3 DECK BARGES**—Built 1954
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The Cadillac of radars, for ships, tugs, yachts, any type vessel. Installation materials included. Nothing else to buy. Parts available. Financing or leasing. $3000 price includes $1000 worth waveguide, accessories, and extras.

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## TWO(2)500KW DIESEL GENERATORS

★ ***ENGINES***
General Motors, Model 12-278A, Marine, 720 RPM

★ ***GENERATORS***
General Electric, 500 KW, 440/3/60, Type ATI

Units are removals from ex-Navy Light Cruiser "Worcester". Units were standby auxiliaries, and are very clean and in good condition.

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**Also Electric**

2 Almon A. Johnson Towing Engines Model 232 wire rope included at $19,000.00 each

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**MAIN PROPULSION FOR C4, C3, C2, C1, T2, & VICTORY**

| | |
|---|---|
| General Electric High and Low Pressure | 8500 HP |
| Westinghouse High & Low Pressure Turbine & Type H & Type C Gears | 8500 HP |
| Allis Chalmers Low Pressure | 6000 HP |
| De Laval Reduction Gear Components | 6000 HP |
| General Electric T-2 Diaphragms | 6000 HP |
| General Electric High & Low Pressure | 6000 HP |
| Westinghouse High Pressure | 6000 HP |
| Westinghouse and Allis Chalmers High & Low Pressure | 4400 HP |

**AUXILIARY TURBO-GENERATORS**

| | |
|---|---|
| General Electric FN4-FN30 | 1500 KW |
| General Electric FN3-FN20 10030 RPM | 600 KW |
| Westinghouse 5015 RPM | 538 KW |
| General Electric DORV 325 | 525 KW |
| Allis Chalmers (G.E. Design) 5645 RPM | 500 KW |
| General Electric DORV 618N 10059 RPM | 400 KW |
| Worthington 6097 RPM | 400 KW |
| Allis Chalmers 8000 RPM | 300 KW |
| Allis Chalmers 5645 RPM | 300 KW |
| De Laval 5692 RPM | 300 KW |
| General Electric DORV 325 5636 RPM | 300 KW |
| Joshua Hendy (Terry Design) HM-5 5965 RPM | 300 KW |
| Westinghouse Non-Recessed | 300 KW |
| Westinghouse Recessed | 300 KW |
| Worthington 6097 RPM | 300 KW |
| General Electric DS 60-25 5660 RPM | 250 KW |
| Westinghouse 5015 RPM | 250 KW |
| General Electric DORV 518N 10012 RPM | 240 KW |
| Worthington 6510 RPM | 150 KW |
| Westinghouse 7283 RPM | 60 KW |

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**Most Anything in Marine Supplies**
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**FACTORY RECONDITIONED**
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**Anchors** (1500)
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(250) **Pumps**
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(10) **Gangways**
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**Rewound — with A.B.S. — ex-Pioneer Valley.**

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# ZIDELL EXPLORATIONS, INC.

**Contact: Ralph Ingram**
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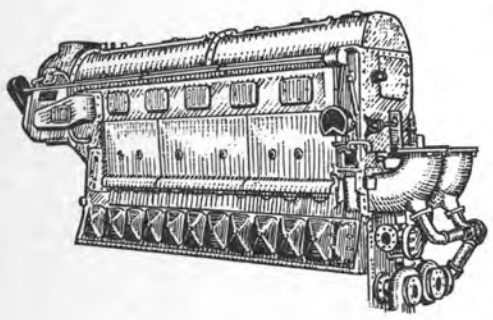
# *Marine Equipment*

# VALUES 3 BIG PAGES PACKED FULL!

## MARINE DIESEL ENGINES

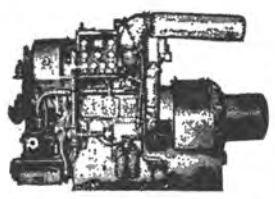


**MATCHED PAIR . . .** FAIRBANKS MORSE MODEL 38D8-1/8—1 Port; 1 Starboard. Used condition, 1800 HP, 800 RPM, 2 cycle, 8½" bore, 10" stroke, Air Start. Complete with Westinghouse Reduction Gears, 2.216:1 ratio—with Hydraulic Coupling.

3—COOPER-BESSEMER DIESEL ENGINES, Model LS-8-DR, 1300 HP, 277 RPM, direct reversing, turbo charged.

2—SUPERIOR DIESEL ENGINES, Model VDSS, 1160 HP, 325 RPM.

## MARINE DIESEL GENERATORS



2—DE LAVERGNE, Marine, 560 HP, 514 RPM, Serials #2180 and #2181, with Electric Machinery Generators, 375 KW, 450/3/60.

6—SUPERIOR Diesel Engines, Model GBD-8, Marine, 150 HP, 1200 RPM, 8 cylinder, with Delco Generators, 100 KW, 120/240 DC.

HERCULES, DOOC, 10 KW, 120 DC.

CATERPILLAR, D3400, 15 KW, 120/240 DC.

BUDA, 4 cylinder, 15 KW, 120/240 DC.

HERCULES, DJXC, 25 KW, 120 DC.

CUMMINS, WA255, 30 KW, 120 DC.

P&H, 387C-18, 45/56 KVA, 120/208/3/60.

BUDA, 6DH909, 40 KW, 120 DC.

1—GENERAL MOTORS, Model 3-268A, Marine, 150 BHP, 1200 RPM, 3 cylinder, with 100 KW Generator, 120/240 DC.

4—GENERAL MOTORS, Model 3-268A, 150 HP, 1200 RPM, 3 cylinders, with 100 KW Generators, 450/3/60.

BUDA, 6 DHG691, 60 KW, 120 DC.

GENERAL MOTORS, 6067, 60 KW, 450/3/60.

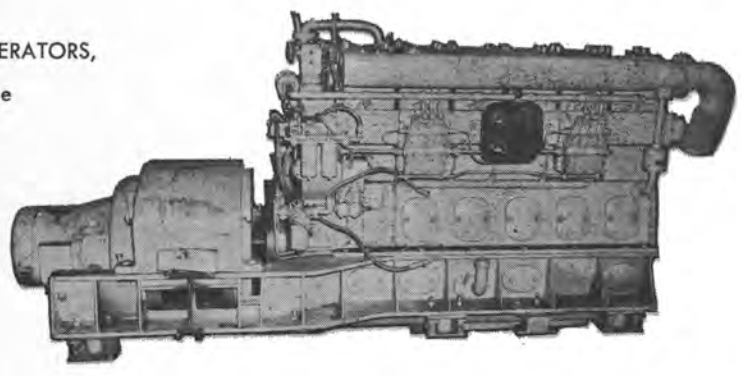
BUDA 6DC844, 75 KW, 125-250 DC.

CATERPILLAR, D17000, 75 KW, 120/240 DC.

LORIMER, F5SS, 75KW, 120/240 DC.

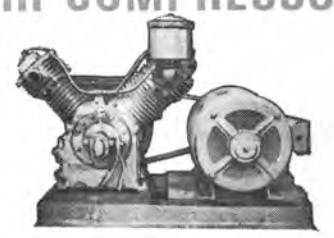
CATERPILLAR, D17000, 85 KW, 220/3/60.

For TURBINE GENERATORS,
See Following Page



**4—COOPER-BESSEMER, Marine**
Model FSN6, 6 cylinders, 375 HP, 900 RPM, with General Electric Generators, 250 KW, 440/3/60.

## AIR COMPRESSORS



2—SULLIVAN, Size WL60, Model A-UB-8, 100 PSI, 2 stage, with 30 HP G.E. Motors, 440/3/60.

2—GARDNER-DENVER, 150 CFM, 125 PSI, Class WB, Size 7x5¾x5, with Diehl Motors, 45 HP, 230 Volts DC, 870 RPM, 167 Amperes.

1—INGERSOLL-RAND, Size 5x5x4x4, 50 CFM, 150 PSI, with G.E. Motor, 20 HP, 440/3/60.

2—INGERSOLL-RAND, Size 4x1½x3½, 10 CFM, 600 PSI, with Diehl Motor, 7½ HP, 120 Volts DC.

2—WESTINGHOUSE Air Brake Steam, Size 11 x 11 x 12, approximately 60 CFM at 100 PSI.

1—INGERSOLL-RAND, Model 40B, 155 CFM, 110 PSI, 870 RPM, with 40 HP Motor, 230 DC.

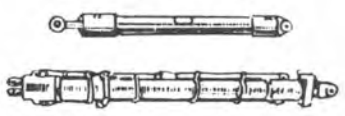
1—WORTHINGTON, 20 CFH, 3000 PSI, 4 stage, 585 RPM, with Worthington Steam Turbine, 47 HP, 5502 RPM.

## HEAT EXCHANGERS

3—ROSS Lube Oil Coolers, size 1005.5.

2—ROSS Fresh Water Coolers, size 1206.

## HYDRAULIC CYLINDERS



| Bore | Overall Stroke | Rod Diameter | retracted length | Action |
|---|---|---|---|---|
| 10" | 12" | 3.75" | 45½" | double |
| 10" | 26" | 3.75" | 58½" | single |
| 2" | 8" | 1½" | 20" | double |
| 2.5" | 15" | 1.12" | 25½" | double |
| 3" | 8" | 1.37" | 1-5½" | double |
| 6" | 8' | 4" | 144" | double |

## SPERRY GYRO COMPASSES

SPERRY MARK 14, Model 1 Gyro Compasses, used, good, complete with Master Compass, with Binnacle, Amplifier panel, control panel, carbon pile voltage regulator, motor generator set, alarm panel, and repeaters with mounts.

## AXIAL FLOW FANS

**Rebuilt Guaranteed LaDel, STURTEVANT etc.**

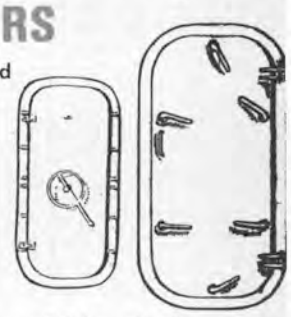
In 440 AC, in 115 DC, and in 230 DC, and i nsizes 1 HP through 20 HP. Completely reconditioned.

EXAMPLE LISTING:

| | | |
|---|---|---|
| Size A¼ | Size A3 | Size A8 |
| Size A½ | Size A4 | Size A10 |
| Size A1 | Size A5 | Size A12 |
| Size A2 | Size A6 | Size A16 |

## Steel Watertight DOORS

Used, Good Condition, Trimmed Frames.



Many sizes available, priced reasonable. Some Typical Prices shown below. Please Inquire for other sizes.

26"x48"-4 Dogs-**$60.00 ea.**
26"x57"-6 Dogs-**$80.00 ea.**
26"x60"-4 Dogs, 6 Dogs-**$86.00 ea.**
26"x66"-6 Dogs, 8 Dogs-**$100.00 ea.**
26"x66"-Q.A. Type-**$175.00 ea.**

## REDUCTION GEARS

DE LAVAL Reduction Gear from S/S Texas a C3M ship, Type Double Reduction, 8500 HP size, HP Pinion 5015 RPM, LP Pinion 3461 RPM, low speed gear, 85 RPM.

WESTINGHOUSE Reduction Gear from S/S Montrose, an AP3 ship, size 8500 HP, Gear RPM 85, HP Pinion 5238 RPM, LP Pinion 4422 RPM.

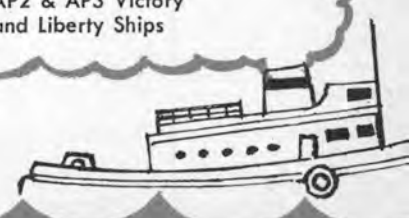
FARREL-BIRMINGHAM, as orig. used on two 1375 HP electric motors in submarine, 2 pinions, single output gear, pinion RPM 1302, Gear RPM 280; ratio 4.65:1.

WESTINGHOUSE, as orig. used on two 1362 HP electric motors in submarine, 2 pinions, single gear.

FALK Reduction Gears—Port & Starboard, Interchangeable with T-3 Tanker Gears, Falk No. 148-300. Also interchangeable with Falk Gears on AO51 Class Tankers (14 ships). Also on AO97 to AO100 Tankers.

## PROPELLER SHAFTS

From C3M Vessel
From C3-S1-A3 Vessel,
C2-S-B1 Vessel (Moore Built,
AP2 & AP3 Victory
and Liberty Ships



*Fast Service*
**on any and all inquiries**

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## CAPSTAN WINDLASSES

Model CWP-3, Vertical 24" Planetary Capstan Windlasses, Single Wildcat — using 1¼" Anchor Chain, Single Gypsy with 20 HP motor, 230 volts DC, complete with Contactor Panel, Master Switch, and Resistors.

3—HESSE-ERSTED VERTICAL, Single Wildcat—for 1⅜" Anchor Chain, single gypsy, with 35 HP General Electric Motor, 230 Volts DC, complete with Controller equipment.

HYDE, VERTICAL, Single Wildcat, for 1⅛" Anchor Chain, single gypsy, with 20/5 HP Motor, 440/3/60.

## ANCHOR WINDLASSES

1—LIDGERWOOD horizontal Anchor Windlass, double wildcat—for 2 1/16" Chain, double gypsy, with 50 motors, 230 volts, DC, complete with controls.

1—HORIZONTAL, of German Mfg., double wildcat—for use with 3" anchor chain, double gypsy with 230 VDC motor, complete with electrical control equipment.

AMERICAN ENGINEERING, horizontal, double 2⅛" Chain, 65 HP, 230 DC, complete.

4—AMERICAN HOIST AND DERRICK COMPANY, horizontal, double wildcat—for 2¼" chain double gypsy, 70 HP, 230 Volts DC, with electric controls.

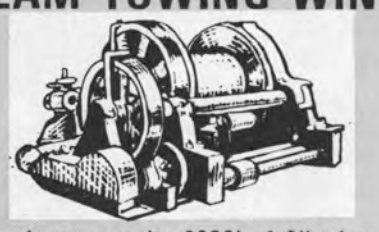
3—HESSE-ERSTED, horizontal, double wildcat, 2⅛" chain, 60 HP, 230 DC.

1—HYDE HORIZONTAL ANCHOR WINDLASS double wildcat—for use with 2⅛" Anchor Chain, and with General Motors Electric Motor, 60 HP, 230 volts DC, 560/1700 RPM, Type CDM 18831 AE. Complete with Contractor Panel, Resistors, and Master Switch.

## ANCHOR WINCHES

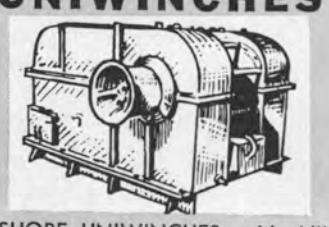
**1—JAEGER,** single drum—capacity approximately 900' of 1½" wire rope, double gypsy, with 35 HP Motors, 230 Volts DC, complete with electricals.

## STEAM TOWING WINCH



Single drum, capacity 2000' of 2" wire rope, cylinder size 9" bore by 10" stroke.

## UNIWINCHES



LAKESHORE UNIWINCHES, with Allis-Chalmers Motors, 50 HP, 230 Volts DC, complete with Control Equipment.

Single speed, double drum, 7450 # at 220 FPM.

Single speed, single drum, 7450 # at 220 FPM.

## CARGO HOISTER BLOCKS

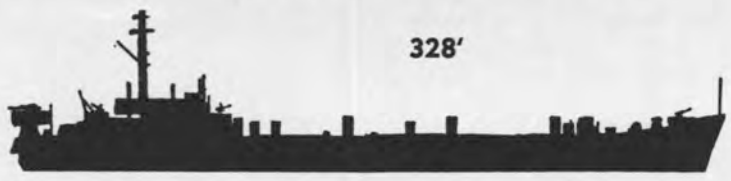
5 ton rated, Steel, as removed from surplus ships. Manufactured by: Young, Draper, etc., 12" & 14" sizes.

**$34.50 ea.**

$39.50 each with pull test certificates

## 1 — L.S.T. TYPE VESSEL HULL

### For Immediate Sale




Steel Hull, 328' overall, 50' extreme beam, maximum draft 14', approximate displacement 1780 tons. To be sold stripped of all machinery and deck house. Located in Portland, Oregon.

## SUBMARINE DIESEL GENERATOR ENGINES

(Without Generators)

2—GENERAL MOTORS, Model 16-278A, 1600 HP, 750 RPM.

2—FAIRBANKS-MORSE, Model 38D8-1/8, 16 cylinder, O.P., 1600 HP, 720 RPM.

## STERN ANCHOR WINCHES

2—ALMON A. JOHNSON Stern Anchor Winches as removed from L.S.T. Vessels, line pull rating 100,000 pounds at 10 FPM in low gear, complete with Contractor Panels, Resistors, and Master Switches.

## Zidell is your "HOT-LINE" to ALL Marine Equipment needs!

**If it isn't shown here, please write or phone!**

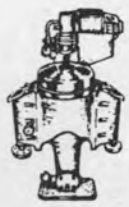
## CENTRIFUGES

**SHARPLES AND DE LAVAL**

150 GPH—440 AC
—230 DC

350 GPH—230 DC

600 GPH—230 DC



## Marine Synchronous Motors

8—General Electric, 6000 HP, 2700 Volts, 3 phase, 93⅓ cycles, Type 28, 400 RPM, continuous duty, Typical Serial #5985657.

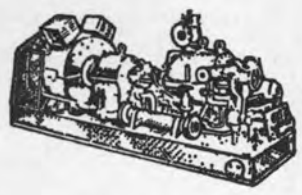
## TURBINE GENERATORS

2—DE LAVAL, 360 HP, 440 PSI, 740°F, with Crocker-Wheeler Generators, 250 KW, 240/120 DC, 1200 RPM.

1—WORTHINGTON, 225 PSI, 397°F, 6510 RPM, with Westinghouse Generator, 150 KW, 120 DC, 1250 Amperes.

6—WESTINGHOUSE, 200 PSI, with Westinghouse Generators, 60 KW, 120 DC.

4—ALLIS-CHALMERS, 440 PSI, 740° F, with Allis-Chalmers Generators, 300 KW, 240/240 DC.



1—GENERAL ELECTRIC, 525 PSI, with G.E. Generator, 250 KW, 440/3/60.

1—GENERAL ELECTRIC, with G.E. Generator, 350 KW, 440/3/60.

GENERAL ELECTRIC, Type ATB-2, 1563 KVA, 1250 KW, 450/3/60.

ALLIS-CHALMERS, 440 PSI, 740°F, 300 KW, 120/240/DC

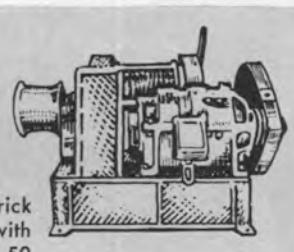
TERRY, TM5, 440 PSI, 740°F, 300 KW, 120/240 DC.

JOSHUA HENDY, 300 PSI, 550°F, with Westinghouse Generator, 300 KW, 120/240 DC.

WORTHINGTON, Form S4, 440 PSI, 740°F to a Westinghouse Generator, 250 KW, 440/3/60, and to a 90 KW, 120 DC.

DELAVAL, 450 PSI, 750°F, 300 KW, 120/240 DC.

## CARGO WINCHES



American Hoist and Derrick Company Winches with Westinghouse Motors, 50 HP, 230 Volts DC, complete with Contractor Panels, Master Switches, and Resistors.

**Single Speed, Single Drum**

## UNIT WINCHES

**American Hoist and Derrick Company**

U3H—SINGLE DRUM, Single speed (4)
Line Pull: 7450# — 223 FPM,
6360# — 237 FPM,
3720# — 287 FPM.

U6H—DOUBLE DRUM, Single speed (2)
Line Pull: 7450# — 223 FPM,
6360# — 237 FPM,
3720# — 287 FPM.

Motor: Westinghouse, 50 HP, 230 Volts DC, 1900 RPM, Model 288212, 183 Amperes, compound wound, Frame 9 UW, horizontal.

Unit Winches complete with Contactor Panels, Resistors, Master Switches.

# TERRIFIC INVENTORY... AC & DC

# Marine Pumps

## CENTRIFUGAL

### DC – HORIZONTAL

1—ALLIS-CHALMERS, 40 GPM, 30.2 ft. hd., with Allis-Chalmers Motor, 5 HP, 230 DC, 575/1150/RPM.

1—WORTHINGTON, Size 3UB1, 400 GPM, 280' head, with Westinghouse Motor, 50 HP, 230 DC.

1—WESTCO, 100 GPM, 100 PSI, 2" suction, 3" discharge, Imperial Motor, 10 HP, 120 DC.

2—WORTHINGTON, Size 8L1, 2100 GPM, 138.5 TDM, with Westinghouse Motors, 100 HP, 230 DC.

1—WARREN, Size 8DM11½, 1175 GPM, 11.1 PSI, with Reliance Motor, 10 HP 230 Volts DC.

1—WORTHINGTON, 3½" suction, 3" discharge, 150 GPM, 23.8 PSI, with Diehl Motor, 3.47 HP, 230 DC, 1750/3500 RPM.

3—GOULDS, 250 GPM, 100 PSI, Figure 3380, 4"x3", with 30 HP Motors, 230 DC.

4—WORTHINGTON, Size 8L1, 2100 GPM, 138.5 TDM, 100 HP, 230 DC.

4—WORTHINGTON, Size 12LA1, 4000 GPM, 67.3 TDM, 100 HP, 230 DC.

5—WORTHINGTON, Size 4L1, 400 GPM, 83' head, 15 HP, 230 DC.

2—ALLIS-CHALMERS, Type 5G, Size 5x5, 650 GPM, 29' head, 7½ HP, 230 DC.

2—ALLIS-CHALMERS, Type SS-L, Size 4x2, 45 GPM, 2 HP, 230 DC.

### AC – HORIZONTAL

2—WARREN, 60 GPM, 50 PSI, 1.87 HP, 440/3/60, 3500 RPM.

1—WARREN, 17 GPM, 110 PSI, 3½ HP, 440/3/60, 3500 RPM.

1—WARREN, 600 GPM, 50 PSI, 8¼ HP, 440/3/60, 1135 RPM.

1—GARDNER-DENVER, 750 GPM, 360' head, 6" suction, 5" discharge, 3500 RPM, with G.E. Motor, 100 HP, 440/3/60.

1—WARREN, Size 3-SED-8, 150 GPM, 26.2' hd., with Westinghouse Motor, 3.96 HP, 440/3/60.

4—WORTHINGTON, 200 GPM, 100 PSI, 3½" suction, 3" discharge, Size 2UB1, with Wagner Motor, 25 HP, 440/3/60.

1—GARDNER-DENVER, 5" suction, 3" discharge, 350 GPM, 336' head, 50 HP, 440/3/60, 3500 RPM.

1—CARVER, 400 GPM, 100 PSI, 3½" suction, 2½" discharge, 3500 RPM, 35.7 HP, 440/3/60.

2—WORTHINGTON, 875 GPM, 10 PSI, 1160/860 RPM, with Westinghouse Motor, 4.45 HP/7.92 HP, 440/3/60.

3—WORTHINGTON, 6" x 6", 550 GPM, 25' head, 6 HP, 440/3/60, 1750 RPM.

2—BUFFALO, 250 GPM, 100 PSI, Class CCS, Size 4 x 3½", with Westinghouse Motors, 25 HP, 440/3/60.

*(Continued)*

### AC – HORIZONTAL

1—GOULDS, 2000 CFM, 470' head, Size 8x10, 350 HP, 2300/3/60.
3—ALLIS-CHALMERS, 35 GPM, 100' head, Size 2x1½, 3 HP, 440/3/60.

### DC – VERTICAL

1—AURORA, 4" x 3", with G.E. Motor, 25/40 HP, 230 DC, 1310/1750 RPM.

1—INGERSOLL-RAND, Size 8VCM, 8" suction, 8" discharge, with Westinghouse Motor, 15 HP, 230 DC, 850/1210 RPM.

1—INGERSOLL-RAND, 4" suction, 3" discharge, with Westinghouse Motor, 15 HP, 230 DC, 1310/1750 RPM.

1—WARREN, 6" suction, 3" discharge, with G.E. Motor, 5 HP, 440/3/60, 1725 RPM.

1—DAYTON-DOWD, 5" suction, 4" discharge, with Century Motor, 15 HP, 230 DC, 1310/1750 RPM.

2—ALLIS-CHALMERS, 170 GPM, 208' head, Type CF2V, 6" suction, 3½" discharge, 20 HP, 230 DC.

2—ALLIS-CHALMERS, 30 GPM, 208' hd, Type CF2V, 2½" suction, 1½" discharge, 7½ HP, 230 DC.

1—ALLIS-CHALMERS, 12,500 GPM, 10.4 PSI, Type LS-V, Size 20" x 20", 100 HP, 230 DC.

1—ALLIS-CHALMERS, 2520 GPM, 14.4 PSI, Size SE-V, 12" x 12", 30 HP, 230 DC.

2—ALLIS-CHALMERS, 600 GPM, 30 PSI, Type SGV, 5" x 5", 20 HP, 230 DC.

1—ALLIS-CHALMERS, 450 GPM, 120 PSI, 4" x 3", 50 HP, 230 DC.

3—GARDNER-DENVER, 1500 GPM, 56' head, 8" suction, 6" discharge, with 30 HP Motors, 230 DC.

1—WORTHINGTON, Type 20 LAS1, 13,000 GPM, 11:5 PSI, 100 HP, 230 DC.

2—DELAVAL, 80 GPM, 75 PSI, 5/10 HP, 230 DC.

1—WORTHINGTON FIRE & BUTTERWORTH, Size 3 UBS, 400 GPM, 300 PSI, 75 HP, 230 DC.

4—ALLIS-CHALMERS, Type SGV, 600 GPM, 30 PSI, 20 HP, 230 DC.

### AC – VERTICAL

1—DE LAVAL, 155 GPM, 59.9 PSI, 440/3/60.

1—WARREN, 17 GPM, 55 PSI, with Westinghouse Motor, 4.26 HP, 440/3/60.

1—INGERSOLL-RAND, Size 2VHMA, 65 GPM, 75 PSI, 440/3/60.

1—BUFFALO, Size 6, 875 GPM, 10 PSI, 6.3 HP, 440/3/60.

2—WORTHINGTON, 275 GPM, 56.6 PSI, 22.9 HP, 440/3/60.

3—DAYTON-DOWD, 1160 GPM, 15 PSI, 10 HP, 440/3/60.

3—ALLIS-CHALMERS, 68 GPM, 114' head, 7½ HP, 440/3/60.

## ROTARY PUMPS

### DC – HORIZONTAL

3—NATIONAL TRANSIT, 50 GPM, 50 PSI, 3x2½, with G.E. Motor, 3 HP, 230 DC.

### DC – VERTICAL

1—WORTHINGTON, Size 4GRVS, with Westinghouse Motor, 15 HP, 230 Volts DC, 1310/1750 RPM.

2—QUIMBY, Size 4D, 225 GPM, 50 PSI, 15 HP, 230 DC, 540/740 RPM.

2—QUIMBY, Size 5, 6 x5, 400 GPM, 48 PSI, 25 HP, 230 DC.

2—QUIMBY, Size 6, 500 GPM, 70 PSI, 40 HP, 230 DC.

1—QUIMBY, Size 2½, 17 GPM, 405 PSI, 7½ HP, 230 DC.

2—QUIMBY, Size 5, 400 GPM, 60 PSI, 30 HP, 230 DC.

2—WORTHINGTON, Type 3GRVS, 90 GPM, 75 PSI, 7½ HP, 230 DC.

### Rotary, AC – Vertical

2—NORTHERN, Size 7020, 10 GPM, 350 PSI, 200 RPM, 3.65 HP, 440/3/60, 1720 RPM.

2—BLACKMER, Size IN5INV, 50 GPM, 50 PSI, geared, 2 HP, 440/3/60.

## HYDRAULIC PUMPS

WATERBURY, some Model A, some Model B, piston type Pumps, Size 2, Size 5, Size 10, Size 20, Size 50.

## BOILER FEED PUMPS-STEAM

Size 11 x 7 x 18 vert. simplex

Size 11 x 7 x 24 vert. simplex

Size 12 x 8 x 24 vert. simplex

Size 12 x 8½ x 12 vert. simplex

Size 14 x 9 x 24 vert. simplex

## TURBINE DRIVEN FIRE PUMPS

4—INGERSOLL-RAND, 1200 GPM, 98 PSI, Size 5UV, with Elliott Turbines, 84.3 HP, 3550 RPM, 1 stage, impulse type.

## FAIRLEADS

**Designed and Manufactured by ZIDELL EXPLORATIONS, INC.**

To Give You These Features:

One size fairlead with universal type sheave to accommodate wire rope sizes 1" up to and including 2".

Self Aligning, Swivel Type Head.

Dependable and Ruggedly built to perform consistently year after year with minimum maintenance.

**Model Design**
**$1350 each**

*PRICES ARE F.O.B. PORTLAND, ORE.*

## FIRE PUMPS

2—BUDA, Model 6-LD-468, Diesel Engines, 6 cylinders, 100 BHP, Marine, Gardner-Denver. centrifugal Pumps, Bronze, horizontally split case, 1000 GPM, 280' head, 6" suction and 5" discharge.

## CLYDE 17-DE-90 WHIRLEY CRANE

LIFTING RATE: 25 tons at 50 Ft. Radius at 50 to 60 FPM.

BOOM: 80' to headblock (with 10' whip)

WHIP: 10 tons at 125 FPM—2 part line

TRACK CENTERS: 20'—Engine: Cummins HBIS 601, 180 HP supercharged, elec. start

MOTORS: Each leg (4 tot.) 7½ HP, 230 DC.

POWER: Diesel electric (DC)

## FORGED STEEL LINE SHAFTING

1000 Tons of miscellaneous line shafting — Call on your requirements.

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**Machinery & Equipment**

From: AP2 & AP3 VESSELS
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AND LIBERTY SHIPS

## Marine Generators

8—General Electric, 4600 KW, 2700 Volts, 93.3 cycles, 3 phase, Form HL, Arm. Amps 984.

## ANCHOR CHAIN

Used, good, with or without test certificate . . . . . .

1-3/8" size
1-1/2" size
2-1/16" size
2-1/4" size
2-5/8" size
2-3/4" size
3-3/8" size

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**Cargo Tank Venting Valves. Bronze—#100 2½" iron pipe size screwed.**

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## FUEL OIL OR LUBE OIL PURIFIER

DeLaval—600 G.P.M.—type B-1529C-60—with 3 H.P. 440/3/60 Motor. Mfg. by German DeLaval. Spare parts available.

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(MEET PANAMA REGULATIONS)

With extended legs for welding to deck. IMMEDIATE DELIVERY FROM STOCK.

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# M.G. SETS

## APPROX. ½ KW 110/1/60 M.G. SET NEW—UNUSED

INPUT: 115 VDC—6.1 amps—3600 RPM. AC OUTPUT: 425 watts—4.55 amps—110/1/60. Ball bearing. 13⅞" long—7 9/16" wide—10½" high. Has radio noise supression filter. Net wt. 58 lbs—83 lbs packed for shipping.

**$89.50 EACH**

## UNUSED—10 KW—120/1/60 M.G. SET

**INPUT:** Motor 25 HP — 120 VDC — 156 amps — 1800 RPM —flange-coupled to output generator.

**OUTPUT:** 10 KW generator — 120 volts 60 cycle single phase —108 amps — 0.80 PF — with direct-connected 125 volt 8 amp exciter. Motor starter by Cutler-Hammer. AC generator has voltmeter and ammeter. Bassler voltage regulator.

## RECONDITIONED CONTINENTAL 2 KW—220 D.C. TO 120/1/60 A.C.

**INPUT:** 5 HP—230 VDC—20 amps. **OUTPUT:** 2.5 KVA —2 KW—120/1/60 AC—0.8 PF—1800 RPM—21 amps. With controls. 38" long—15" wide—480 lbs.

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## 8" x 8" WATEROUS HEAVY DUTY ROTARY CARGO PUMP

Mfg. Waterous Co.—730 GPM—pump speed 232 RPM—reduction ratio 900/232—8" suction—type P-1256—80 PSI pressure—60 HP—herring-bone reduction gear—8" discharge.

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## Berger-Type Deck-Mounted FAIRLEADS

**For 1" wire rope—12" diameter sheave—steel frame—self-aligning — 180° swing. Formerly in Naval use on LCT.**

**$745 EACH**

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## SELF-PRIMING 6" GASOLINE DRIVEN PUMPS

**Frame mounted steel pumps—6" suction—6" discharge. Carver Pump Co. Model 6113—driven by 4-cylinder LeRoi gasoline engine model D-201P36. Capacity about 1400 GPM at 75'—1000 GPM at 135'. U.S. Navy surplus—in good running condition.**

**$1375.00 each**

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## UNUSED 2" BRONZE STRAINERS (DUPLEX)

Flanged—mfg by Derbyshire Machine & Tool Co. Flange has 6 holes 9/16".

**$299.00**

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**1000 GPM—125 LB**

## BRONZE FAIRBANKS-MORSE FIRE & GENERAL SERVICE PUMP

**PUMP: Mfg by Fairbanks-Morse.. Horizontally split case — 1000 GPM—281' head — 3545 RPM. Suction pressure flooded—6" suction—5" discharge. Steelflex coupling. MOTOR: Fairbanks-Morse—440/3/60—squirrel cage—3600 RPM—class A insulation. Type KZK—continuous duty—dripproof—ambient temp. 50°C. Complete with Cutler-Hammer controller (reduced voltage magnetic starter). DIMENSIONS: 5' 5" OAL—23" OAW—2' 11" OAH. UNIT HAS HAD VERY LITTLE USE.**

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## UNUSED ALLIS-CHALMERS FIRE & GENERAL SERVICE PUMPS

200 GPM — 180' head — 2½"x2"—bronze—flange connections. MOTOR: 20 HP—115 volts DC—2400 RPM—153 amps.

**THE BOSTON METALS COMPANY**

**313 E. Baltimore St. Baltimore Md. 21202**
**539-1900 (301) 355-5050**

**Attention: Offshore Contractors, Dredgers!**

## 1200 KW—525 Volt DC DIESEL SET

**Completely Self-Contained on Railroad Flat Car—Ex-Navy Emergency Unit**

GENERATOR: Allis-Chalmers — 525 VDC — 2290 amps—750 RPM—self-ventilating—horizontally split casing. DIESEL: G.M. 16-278A—8¾ x 10½—1700 BHP—720 RPM. Unit includes control panel & switches—excitation sets—aux. lighting generator driven by GM 2-71 2-cyl. 4½ x 5 engine at 1200 RPM. Generator is 120 VDC. Also included are silencers and mufflers.

**ALL MOUNTED ON FLATCAR WITH STANDARD TRUCKS AND WHEELS—56½" GAUGE**

Has air, water and oil tanks — starting air compressor—all on same car and interconnected. Entire unit was fabricated by Navy for Navy Yard use. Total weight 120,000 lbs. Shipping Dimensions: 40' long—9'4" wide—15' high. Car has steel wheels and can be certified to go over the road. **UNIT CAN BE EASILY REMOVED FROM FLATCAR AND PLACED ON VESSEL.**

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## NEW WATERTIGHT DOORS

**6-Dog right and left hand hinged steel doors—with frames. Built and tested to A.B.S. spe-specifications.**

| SIZE | NET WT. |
|---|---|
| 26"x48" | 250 lbs. |
| 26"x60" | 300 lbs. |
| 26"x66" | 320 lbs. |
| 30"x60" | 330 lbs. |

EACH DOOR

**IMMEDIATE DELIVERY**

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## 100,000 lb. Almon Johnson Series 232 Constant Tension Mooring Winches

5 Available. In very good condition. Series 232 mooring & anchoring winches—automatic self-tensioning. Wide range from 100,000 lb line pull at 10 FPM to 26,000 lbs at 400 FPM. Gypsy line pull 12,000 lbs at 125 FPM. Drum declutchable through spiral jaw clutch for free spooling. Driven by 50 HP—230 VDC motors—Westinghouse CK—575 RPM—½ hour—75°C rise—stab. shunt—181 amps—max. RPM 1900. Cutler-Hammer brake—18"—type NM. Complete with magnetic control panel, resistor banks & remote control pedestal—mounted master switch. **Can spool up to 2000' 1¼" wire.**

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# NATIONAL METAL'S CURRENT T-2 INVENTORY

**MANY OTHER ITEMS NOT LISTED • ALL ITEMS FURNISHED WITH A.B.S. OR LLOYDS'**

## TURBOGENERATORS

### 525 KW GENERAL ELECTRIC AUXILIARY TURBOGENERATOR UNIT

Complete with L.O. Cooler. **Turbine:** General Electric 525 KW, Type DORV-325M, 5645 RPM. **Reduction Gear:** General Electric Type S-162-D, 5645/1200 RPM, single helical. **Generators::** General Electric. (1) Type ABT, 3 phase, 400 KW, 450 VAC, 1200 RPM. (2) Type MPC, 75 KW, 110 VDC, 1200 RPM, Exciter. (3) Type MPLI, 55 KW, 120 VDC, 1200 RPM, Generator. (4) Auxiliary DC generators.

### 538 KW WESTINGHOUSE TURBOGENERATOR UNIT

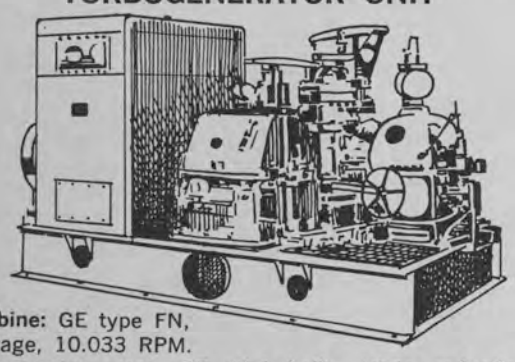
Complete with L.O. Coolers and exciters. **Turbine:** Westinghouse 538 KW, 5010 RPM. Inlet pressure 435 psi. Temp. 750 degrees F.TT. Exhaust pressure 28½ hg vac. **Generators:** (1) 400 KW, 450 VAC, 3 pole, 60 cycle, PF 80%, 1200 RPM, ship's service. (2) 32.5 KW, 125 VDC, 1200 RPM, variable voltage exciter. (3) 110 KW, 125 VDC, 1200 RPM, constant voltage generator. (4) 5 KW, 125 VDC, 1200 RPM, ship's service Generator-Exciter. **Reduction Gear:** Ratio 5010/1200 RPM.

### 535 KW GENERAL ELECTRIC TURBOGENERATOR UNIT

Complete with L.O. Coolers and exciters. **Turbine:** General Electric Mfg. drawing P-8453535, 3 stages, type DORV-325, 5645 RPM, rating 535 KW, inlet pressure 590 lbs., Superheat 325 degrees F., exhaust pressure 1¾ ABS. **Reduction Gear:** General Electric, type S-162-D, Class, 535 KW, Mfg. dwg, T-8453535, 5645/1250 RPM. **Generator:** General Electric, Dwg, T-8453535, type ATB-976, KNA 500, 450 volts AC, 3 phase, 60 cycle, 400 KW, 642 amps, 1200 RPM, PF .8, Frame 976, Exciter 120 volts DC. Control panel: General Electric, Dwg. 6367270, Type XF-100492, 6 circuits, 450 volts AC.

## ★★ ALSO AVAILABLE!! ★★

### 600 KW GENERAL ELECTRIC TURBOGENERATOR UNIT



**Turbine:** GE type FN, 6-stage, 10.033 RPM.

**Reduction gear:** GE triple-helix, triple reduction, 10033/1200 RPM. **Generator:** GE type ATI, 600 KW, 6-pole, 0.8 pf, 450 VAC, 3 phase, 60 cycle, 1200 RPM. **Exciter:** GE type MPLI, 7.5 KW, 120 VDC, direct connected. **Air cooler:** Surface type, for generator, complete with control panel.

### MAIN MOTOR FOR T2

Gen. Elect. #5690714 Type TSM-80, 6000 HP, 90 RPM, form H.L., 2300 Volts, Amps. arm. 1160, P.F. 1.0, KVA 4625 Phase 3 cycle 60, Exciter volts 120, amps field 390 contin. @ 60°C. rise.

### 5400 KW MAIN GENERATOR

General Electric, S/N 79938, Marks 6937958 G-4, 5F-1690-2, 164-M.

## PUMP UNITS

### CARGO STRIPPING PUMP

(Steam) Worthington, vertical duplex, double acting, size 14″ x 14″ x 12″, speed 46 ft./min., 700 GPM, 150 psi operating pressure.

### MAIN FEED PUMP

**Pump:** Coffin Turbo Pump Co., single stage, centrifugal, size CG-12A, 6980/7030 RPM, 240/280 GPM, 254/280 HP, 6″ x 3″, 750 psi @ 1760 ft. head, complete with turbine.

### MAIN FEED PUMP

Coffin, turbine drive, Type F, 7200 RPM, 200 GPM, 150 HP, 150 psi w 1329 ft. head.

### MAIN CIRCULATING PUMP

**Pump:** Ingersoll Rand, type 24 VCM, single stage, double suction centrifugal, 585 RPM, 16,500 GPM against TDH 25 ft. @ 30 psi, 26″ x 24″. **Motor:** General Electric, Model 5K633AP1, Frame N-6336-B, 585 RPM, 440 volts AC, 191 amps, 3 phase, 60 cycle, complete with controller.

### MAIN CIRCULATING PUMP

**Pump:** Ingersoll Rand, type 24 VCM, size 24″, 585 RPM, 14,000 GPM @ 25 ft. TDH, 26″ x 24″, operating pressure 15 psi. **Motor:** Westinghouse, Model CS, Frame 876C, 125 HP, 585 RPM, 440 volts AC, 159 amps, 3 phase, 60 cycle, complete with controller.

### MAIN CARGO PUMP UNIT

**Pump:** Ingersoll Rand, type 2 stage horizontal, size 6-GTM, 1750 RPM, 2000 GPM, 12″ x 12″, 100 psi @ 280 ft. head. With motor.

### FUEL AND LUBE OIL PUMP

**Pump:** Quimby, size 2½ head screw, 1200/600 RPM, 15 GPM @ 325 psi disch. press. **Motor:** General Electric, Model 5KF364PP1, Frame 364, 7.5/3.75 HP, 1160/580 RPM, 440 volts AC, 10/9.7 amps, 3 phase, 60 cycle, complete with controller.

### LUBE OIL SERVICE PUMP

**Pump:** Quimby, Type vertical rotex, size 4-B, 1150 RPM, 175 GPM @ 60 psi with 20 ft. head, 6″ x 5″. **Motor:** General Electric, Model 5KF365AJX1, Frame 365, 5 HP, 1170 RPM, 440 volts AC, 20 amps, 3 phase, 60 cycle, complete with controller.

### MAIN CONDENSATE PUMP

**Pump:** Ingersoll Rand, size 2VHM, 1760 RPM, 180 GPM @ TDH 165 ft., 5″ x 2″, disch. press. 67 psi. **Motor:** General Electric, Model 5KF365AJN-1, Frame 365V, 20 HP, 1765 RPM, 440 volts AC, 3 phase, 60 cycle, 25.5 amps, with controller.

## AIR COMPRESSORS

### COMBUSTION CONTROL AIR COMPRESSOR UNIT

**Compressor:** Ingersoll Rand, type 30, Model 253 x 5, 20 CFM at 100 psi, 600 RPM. **Motor:** General Electric, Model 5KG254B2782, Frame 254, Type K, 440 volts, AC, 7.5 amps, 3 phase, 60 cycles, 5 HP, 1723 RPM, complete with controller and switch.

### SHIP SERVICE AIR COMPRESSOR UNIT

**Compressor:** Ingersoll Rand, Type 30, Model 5 x 5 x 4, 545 CFM at 100 psi, 750 RPM. With motor and base.

## VALVES

**Gate:** 10″, 12″, 14″, 16″, 20″ and 24″
**Angle:** 12″, 14″ and 18″ **Crossover:** 16″
**High suction:** 26″ **Low suction:** 26″

## TURBINE ROTORS

### 5400 KW GENERAL ELECTRIC TURBINE ROTOR

ABS, 6275-31, AB-142-WD-8-10-44, 1701461 T8604259, 6275-31 67-KU-102032, A853BY 21 Jan. 1967.

### 525 KW GENERAL ELECTRIC TURBINE ROTOR

S/N 60137, ABS 71-LA-12430-624 A624 B, Reconditioned April 21, 1971.

### 5400 KW WESTINGHOUSE TURBINE ROTOR

ABS report 66KU11942 A853B, 6 Sept., 1966, Marks: 6275-45. AB-142 WD9-30-44, 170-1467, 8604259-1, 6275-45.

### 5400 KW WESTINGHOUSE MAIN TURBINE (Profile type):

### 5400 KW ELLIOTT TURBINE ROTOR

ABS, 67-LA9644-830, AB-JCB-3-31-67, 9013039-9230P1, 66-KU-11895, A853 1071941, AB142 WDG-4-45.

## MISCELLANEOUS T-2 EQUIPMENT

### MAIN AIR EJECTOR

Main air ejector, Graham Mfg. Co., type 2 stage twin, size 163B, capacity, 65 PPH of air (220 GPM cont. @ 79°F.), oper. press. 150 PPH.

### MAIN CONDENSER END

Graham (waterbox).

### MAIN CONDENSER END

Westinghouse (waterbox).

### MAIN CONDENSER END

Westinghouse (return head).

### AUXILIARY CONDENSER END

Graham (waterbox and return head), surface condenser, size 1500 sq. ft., S/N 2915, Design press Shell 15-Tubes 25, Test press Shell 30-Tubes 50.

### TAIL SHAFTS

ABS 59-S1768-AB810
Reconditioned, ABS 70-LA-11901-946

### RUDDER WITH STOCK (complete)

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Waukesha Bearings Corp., P.O. Box 798, Waukesha, Wis. 53186

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Combustion Engineering, Inc., Windsor, Connecticut 06095

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Murray & Tregurtha, Inc., 2 Hancock St., Quincy, Mass. 02171

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Independent Petroleum Supply Co., 1345 Ave. of Americas, New York, N.Y. 10019
The West Indies Oil Co., Ltd., St. John's Antigua, W. I.

**CARGO HANDLING EQUIPMENT**
MacGregor International Organization, 49 Gray's Inn Road, London W.C.I., England

**CATHODIC PROTECTION**
Engelhard Industries, 430 Mountain Ave., Murray Hill, N.J. 07974

**CLUTCHES, GEARS & BRAKES**
Wichita Clutch Co., Inc., Wichita Falls, Texas 76307

**COATINGS—Protective**
Ameron Corrosion Control Div., Brea, Calif. 92621
Carboline Co., 328 Hanley Industrial Court, St. Louis, Mo. 63144
EGD Spee-Flo Co., 4631 Winfield Rd., Houston, Texas 77039
International Paint Co., Inc., 21 West Street, New York, N.Y. 10006
Patterson-Sargent, P.O. Box 494, New Brunswick, N. J.
Philadelphia Resins Corp., 20 Commerce Dr., Montgomery, Pa. 18936

**CONTAINERS—CONTAINER HANDLING SYSTEMS**
Ameron Corrosion Control Div., Brea, Calif. 92621
Lighter Aboard Ship, Inc., 225 Baronne St., New Oreans, La. 70112
Paceco, Div. Fruehauf Corp., 2350 Blanding Ave., Alameda, Calif. 94501
RPC Division, Midland-Ross Corp., P.O. Box 490, Roxboro, N.C. 27573

**CONTAINER LASHINGS & COMPONENTS**
American Engineered Products, P.O. Box 74 Nichol Ave., McKees Rock, Pa. 15136
W. W. Patterson Co., 830 Brocket St., Pittsburgh, Pa. 15233

**CONTROL SYSTEMS**
Frederick Cowan & Co., Inc., 120 Terminal Drive, Plainview, L.I. New York 11803
Galbraith-Pilot Marine Corp., 600 Fourth Ave., Brooklyn, N.Y. 11215
Henschel Corporation, 14 Cedar St., Amesbury, Mass. 01913
Sperry Marine Systems Div., Charlottesville, Va., 22901, Division of Sperry Rand Corp.
WABCO Fluid Power Division, 1953 Mercer Road, Lexington, Kentucky 40505

**CORROSION CONTROL**
Ameron Corrosion Control Div., Brea, Calif. 92621
Carboline Co., 328 Hanley Industrial Court, St. Louis, Mo. 63144

**CRANES—HOISTS—DERRICKS—WHIRLEYS**
ASEA Marine, Rep. in U.S.A. by Stal-Laval, Inc., 400 Executive Blvd., Elmsford, N.Y. 10523
Houston Systems Mfg. Co., P.O. Box 14551, Houston, Texas 77021
M.A.N. Maschinenfabrik Augsburg-Nurnberg AG, Werk Augsburg, West Germany
Paceco, Div. Fruehauf Corp., 2350 Blanding Ave., Alameda, Calif. 94501

**CRANE LOAD INDICATORS**
W.C. Dillon & Co., 14620 Keswick St., Van Nuys, Calif. 91407
Mark Products, Inc., 10507 Kinghurst Dr., Houston, Texas 77072
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass. 02173

**DECK COVERS (METAL)**
Marine Moisture Control Co., 449 Sheridan Blvd., Inwood, N.Y. 11696
Mechanical Marine Co., 900 Fairmount Ave., Elizabeth, N.J. 07027

**DECK MACHINERY**
Appleton Machine Co., P.O. Box 2265, Iron Mountain, Mich. 49801.
ASEA Marine, Rep. in U.S.A. by Stal-Laval, Inc., 400 Executive Blvd., Elmsford, N.Y. 10523
Markey Machinery Co., Inc., 79 S. Horton St., Seattle, Wash. 98134
A. G. Weser, Seebeckwerft, 2850 Bremerhaven 1, Germany

**DIESEL ACCESSORIES**
A.G. Schoonmaker, Box 757, Sausalito, Calif. 95965

**DIESEL ENGINES**
Bruce GM Diesel, Inc., 180 Route #17 S. at Interstate 80, Lodi, N.J. 07644
Caterpillar Tractor Co., Industrial Div., 100 N.E. Adams St., Peoria, Ill. 61602
Colt Industries Inc., Power Systems Div., Beloit, Wisc. 53511
De Laval Turbine Inc., Engine & Compressor Div., 550 85th Ave., Oakland, Calif. 94621
Electro-Motive Division General Motors, La Grange, Illinois 60525
M.A.N. Maschinenfabrik Augsburg-Nurnberg AG, Werk Augsburg, West Germany.
H.O. Penn Machinery Co., Inc., 1561 Stewart Ave., Westbury, N.Y. 11590
Sulzer Brothers, Ltd., Winterthur, Switzerland
Waukesha Motor Co., 1000 W. St. Paul Ave., Waukesha, Wis. 53186

**DIESEL ENGINE MUFFLERS**
Marine Products & Engrg. Co., 20 Vesey St., New York, N.Y. 10007

**DOCK BUILDERS**
GHH Sterkrade Ferrostaal Overseas Corp., 17 Battery Place, New York, N.Y. 10004

**DOORS—Watertight—Bulkhead**
Overbeke-Kain Co., 20905 Aurora Rd., Cleveland, Ohio 44146
Walz & Krenzer, Inc., 20 Vesey St., New York, N.Y. 10007

**ELECTRICAL EQUIPMENT**
AMP Special Industries, P.O. Box 1776, Paoli, Pa. 19301
Arnessen Electric Co., Inc., 335 Bond St., Brooklyn, N.Y.
Galbraith-Pilot Marine Corp., 166 National Rd., Edison, N.J. 08817
Harvard Murlin Div., P.O. Box 302, Quakertown, Pa. 18951
Merrin Electric, 162 Chambers St., New York, N.Y. 10007
Oceanic Electrical Mfg. Co., Inc., 159 Perry Street, N.Y. 10014

**EVAPORATORS**
Bethlehem Steel Corp., Shipbuilding, 25 B'way, N.Y., N.Y. 10004
Riley-Beaird, Inc., Maxim Evaporator Profit Center, P.O. Box 1115, Shreveport, Louisiana 71130

**FAIRLEADS**
Appleton Machine Co., P.O. Box 2265, Iron Mountain, Mich. 49801.

**FENDERING SYSTEMS—Dock & Vessel**
BJ Marine Products, subsidiary of Borg-Warner, P.O. Box 2709, Terminal Annex, Los Angeles, Calif. 90054
Hughes Bros., Inc., 17 Battery Place, New York, N.Y. 10004

**FITTINGS & HARDWARE**
AMP Special Industries, P.O. Box 1776, Paoli, Pa. 19301
Robvon Backing Ring Co., 675 Garden St., Elizabeth, N.J. 07207

**FLOATING EQUIPMENT—Steel—Aluminum Pontoons**
Dravo Corporation, Neville Island, Pittsburgh 25, Pa.

**GAS ALARM SYSTEMS**
Riken Keiki Fine Instrument Co., Ltd., 2-7-6 Azusawa Itabashi-ku, Tokyo, Japan

**HEATERS & COOLERS**
Way-Wolff Associates, Inc., 45-10 Vernon Blvd., Long Island City, N.Y. 11101

**INSULATION—Marine**
Bailey Carpenter & Insulation Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231

**LIGHTS—Emergency, Search & Navigation**
Snelson Oilfield Lighting Co., P.O. Box 1284, Fort Worth, Texas 76101

**LNG SHIP DESIGN AND LICENSING**
PDM/GAZ Transport, 919 Third Ave., New York, N.Y. 10022

**LNG TANKAGE**
Gazocean U.S.A. Inc., 125 High St., Boston, Mass. 02110
LGA—Liquid Gas Anlagen Union GmbH, c/o Ferrostaal Overseas Corp., 17 Battery Place, New York, N.Y. 10004
Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. 15225

**LININGS**
Ameron Corrosion Control Div., Brea, Calif. 92621
Carboline Co., 328 Hanley Industrial Court, St. Louis, Mo. 63144

**MARINE BLOCKS & RIGGING**
Crosby Group, Box 3128, Tulsa, Okla. 74101

**MARINE DRIVES—GEARS**
Hoffert-Lowe, Inc., 108 Ridge Road, North Arlington, N.J. 07032
Philadelphia Gear Corp., Schuylkill Expressway, King of Prussia, Pa. 19406

**MARINE EQUIPMENT**
Comet Marine Supply Corp., 157 Perry St., New York, N.Y. 10014
Homelite Corporation, 70 Riverdale Ave., Port Chester, N.Y. 10573
ITT Henze Service, P.O. Box 1745, Mobile, Ala. 36610
Kearfott Marine Products, 780 South 3rd Ave., Mt. Vernon, N.Y. 10550
Nicolai Joffe Corp., P.O. Box 2445, 445 Littlefield Ave., So. San Francisco, Calif. 94080
Merrin Electric, 162 Chambers St., New York, N.Y. 10007
Metritape, Inc., 77 Commonwealth Ave., West Concord, Mass. 01742
Stow Mfg. Co., 225 Shear St., Binghamton, N.Y. 13902
Vokes Filter Div., (Cardwell Machine Co.), Cardwell and Castlewood Rd., Richmond, Va. 23221
Waukesha Bearings Corp., P.O. Box 798, Waukesha, Wis. 53186

**MARINE FURNITURE**
Bailey Joiner Co., 115 King Street, Brooklyn, N.Y. 11231

**MARINE INSURANCE**
Adams & Porter, 1819 St. James Place, Houston, Texas 77027
Midland Insurance Co., One State St. Plaza, New York, N.Y. 10004
R.B. Jones Corp., 301 West 11th St., Kansas City, Mo. 64105

**MARINE PROPULSION**
Babcock & Wilcox Co., 161 East 42nd Street, New York, N.Y. 10017
Combustion Engineering, Inc., Windsor, Connecticut 06095
Jacuzzi Bros., Inc., 11511 New Benton Highway, Little Rock, Ark. 72204
Murray & Tregurtha, Inc., 2 Hancock St., Quincy, Mass. 02171
Port Electric Turbine Div., 155-157 Perry St., New York, N.Y. 10014
Stal-Laval, Inc., 400 Executive Blvd., Elmsford, N.Y. 10523
Tech Systems, Inc., 405 Watertown Rd., Thomaston, Conn. 06787
Turbo Power & Marine Systems, Subsidiary of United Aircraft Corp., 1690 New Britain Ave., Farmington, Conn. 06032

**MARINE SURVEYORS**
Schmahl and Schmahl, Inc., 1209 S.E. Third Ave., Fort Lauderdale, Fla. 33316

**MARITIME FINANCING—Leasing**
General Electric Credit Corp., 4 Corporate Drive, White Plains, N.Y. 10604
Rhode Island Hospital Trust National Bank, 15 Westminster Street, Providence, R.I. 02903

**NAVAL ARCHITECTS AND MARINE ENGINEERS**
J. L. Bludworth, 4030 Wynne St., Houston, Texas
Breit Engrg. Inc., 441 Gravier St., New Orleans, La. 70130
James G. Bronson Associates, 166 Altamont Ave., Tarrytown, N.Y. 10591
Childs Engineering Corp., Box 333, Medfield, Mass. 02052
Coast Engineering Co., 711 W. 21st St., Norfolk, Va. 23517
Crandall Dry Dock Engrs., Inc., 238 Main St., Cambridge, Mass. 02142
Francis B. Crocco, Inc., Box 1411, San Juan, Puerto Rico
C.R. Cushing & Co., Inc., One World Trade Center, New York, N.Y. 10048
Arthur D. Darden, Inc., 1040 International Trade Mart, New Orleans, La. 70130
Design Associates, Inc., 3308 Tulane Ave., New Orleans, La. 70119
Designers & Planners, Inc., 114 Fifth Ave., New York, N.Y. 10011
M. Mack Earle, 103 Mellor Ave., Baltimore, Md. 21228
Christopher J. Foster, 14 Vanderventer Ave., Port Washington, N.Y. 11050
Friede and Goldman, Inc., 225 Baronne St., New Orleans, La. 70112
Gibbs & Cox, Inc., 40 Rector Street, New York, N.Y. 10006
John W. Gilbert Associates, Inc., 58 Commercial Wharf, Boston, Mass. 02110
Morris Gurainick, Associates, Inc., 583 Market St., San Francisco, Calif. 94105
J. J. Henry Co., Inc., 90 West St., New York, 10006
Hydranautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, Calif. 93017
C.T. Ilariucci & Associates, Tourism Pier #3, San Juan, P.R. 00902
Jantzen Engineering Co., 15 Charles Plaza, Baltimore, Md. 21201
James S. Krogen, 2500 S. Dixie Hwy., Miami, Fla. 33133
Littleton Research and Engrg. Corp., 95 Russell St., Littleton, Mass. 01460
Robert H. Macy, P.O. Box 758, Pascagoula, Miss. 39567
Marine Consultants & Designers, Inc., 308 Investment Insurance Bldg., Corner E. 6th St. & Rockwell Ave., Cleveland, Ohio 44114
Marine Design Inc., 1180 Ave. of Americas, N.Y., N.Y. 10036
Marine Design Associates, P.O. Box 2674, Palm Beach, Florida
Rudolph F. Matzer & Associates, Inc., 13891 Atlantic Blvd., Jacksonville, Fla. 32225
John J. McMullen Associates, Inc., 1 World Trade Center, New York, N.Y. 10048
George E. Meese, 194 Acton Rd., Annapolis, Md. 21403
Metritape, Inc., 77 Commonwealth Ave., West Concord, Mass. 01742
Robert Moore Corp., 350 Main St., Port Washington, N.Y. 11050
Nickum & Spaulding Associates, Inc., 71 Columbia St., Seattle, Wash. 98104
Ocean-Oil International Engrg. Corp., P.O. Box 6173, New Orleans, La. 70114
Pearlson Engineering Co., Inc., 8970 S.W. 87th Ct., Miami, Florida 33156
S.L. Petchul, Inc., 8-D So. New River Drive East, Ft. Lauderdale, Fla. 33301
Potter & McArthur, Inc., 253 Northern Ave., Boston, Mass.
M. Rosenblatt & Son, Inc., 350 Broadway, New York, N.Y. 10013 and 657 Mission St., San Francisco, Calif.
George G. Sharp, Inc., 100 Church St., New York, N.Y. 10007
T. W. Spaetgens, 156 West 8th Ave., Vancouver 10, Canada
R. A. Stearn, Inc., 100 Iowa St., Sturgeon Bay, Wisc. 54235
Richard R. Taubler, 50 Court St., Brooklyn, N.Y. 11201
H. M. Tiedemann & Co., Inc., 74 Trinity Pl., New York, N.Y. 10006
Whitman, Requardt & Associates, 1304 St. Paul St., Baltimore, Md. 21202
Yankee Shipwrights, P.O. Box 35251, Minneapolis, Minn. 55435

**NAVIGATION & COMMUNICATIONS EQUIPMENT**
American Hydromath Co., 55 Brixton Rd., Garden City, N.Y. 11530
Edo Western Corporation, 2645 South 2nd West, Salt Lake City, Utah 84115
Electro-Nav, Inc., 501 Fifth Ave., New York, N.Y. 10017
F&M Systems Co., P.O. Box 20778, 2525 Walnut Hill Lane, Dallas, Texas 75220
Henschel Corp., 14 Cedar St., Amesbury, Mass. 01913
Hose McCann Telephone Co., Inc., 524 W. 23rd St., N.Y. 10011
ITT Decca Marine, Inc., 386 Park Ave. South, New York, N.Y. 10016
ITT Mackay Marine, 2912 Wake Forest Road, Raleigh, N.C. 27611
Lorain Electronics Corp., 2307 Leavitt Road, Lorain, Ohio 44052
Magnavox Navigation Systems, 2829 Maricopa St., Torrance, Cal. 90503

Radiomarine Corp., 20 Bridge Avenue, Red Bank, N.J. 07701
Raytheon Co. Marine Products, 676 Island Pond Rd., Manchester, N.H. 03103
Raytheon Co., Submarine Signal Div., P.O. Box 360, Portsmouth, R.I. 02871
Sperry Marine Systems Div., Charlottesville, Va. 22901, Division of Sperry Rand Corp.
Standard Communications Corp., 639 N. Marine Ave., Wilmington, Calif. 90744
Teledyne Hastings Raydist, P.O. Box 1275, Hampton, Va. 23361
Tracor, Inc., 6500 Tracor Lane, Austin, Texas 78721
The Waterways Co., 3512 Metairie Hts. Rd., New Orleans, La. 70002

**GILS—Marine—Additives**
Exxon Company, U.S.A., P.O. Box 2180, Houston, Texas 77001
Exxon International Company, 1251 Avenue of the Americas, New York, N.Y. 10020
Gulf Oil Trading Co., 1290 Ave. of Americas, New York, N.Y. 10019
Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002
Texaco, Inc., 135 E. 42nd St., New York, N.Y. 10017

**PAINT—Marine—Protective Coatings**
Ameron Corrosion Control Div., Brea, Calif. 92621
Carboline Co., 328 Hanley Industrial Court, St. Louis, Mo. 63144
International Paint Co., 21 West St., New York, N.Y. 10006
Patterson-Sargent, P.O. Box 494, New Brunswick, N. J.
Transocean Marine Paint Association, P.O. Box 456, Delftseplain 37, Rotterdam, Holland

**PETROLEUM SUPPLIES**
Independent Petroleum Supply Co., 1345 Ave. of Americas, New York, N.Y. 10019
Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002
Texaco, Inc., 135 E. 42nd St., New York, N.Y. 10017
The West Indies Oil Co., Ltd., St. John's, Antigua, W. I.

**PIPE—Cargo Oil**
Kubota, Ltd., 22, Funade-cho 2-chome, Naniwa-Ku, Osaka, Japan

**PLASTICS—Marine Applications**
Ameron Corrosion Control Div., Brea, Calif. 92621
Hubeva Marine Plastics, Inc., 390 Hamilton Ave., Bklyn, N.Y. 11231
Philadelphia Resins Co., 20 Commerce Dr., Montgomeryville, Pa. 18936

**PORTS**
Port of Galveston, P.O. Box 328, Galveston, Texas
Jacksonville Port Authority, 2701 Tallyrand Ave., Jacksonville, Fla.

**PROPELLERS: NEW AND RECONDITIONED**
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans La. 70150
Coolidge Propellers, 1601 Fairview Ave. East, Seattle, Wash. 98102
Escher Wyss Gmbh, P.O. Box 798, Ravensburg, Germany
Federal Propellers, 1501 Buchanan Ave. S.W., Grand Rapids, Mich. 49502

**PUMPS**
Colt Industries, Inc., Fairbanks Morse Pump & Electric Div., 3601 Kansas Ave., Kansas City, Kansas 66110
Goulds Pumps, Seneca Falls, N.Y. 13148
Houttuin-Pompen N. V. Sophialaan 4, Utrecht, Holland
Jacuzzi Bros., Inc., 11511 New Benton Highway, Little Rock, Arkansas 72204

**RATCHETS**
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Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231

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Du Pont Co., Room 31H1, Wilmington, Delaware 19898
Jackson Rope Corp., 9th & Oley, Reading, Pa. 19604
Wall Rope Works, Inc., Beverly, N. J. 08010

**RUDDER ANGLE INDICATORS**
Galbraith-Pilot Marine Corp., 600 Fourth Ave., Brooklyn, N.Y. 11215
Henschel Corp., 14 Cedar St., Amesbury, Mass. 01913
Hose McCann Telephone Co., Inc., 524 W. 23rd St., N.Y. 10011
Sperry Marine Systems Div., Charlottesville, Va., 22901, Division of Sperry Rand Corp.

**SANDBLASTING EQUIPMENT**
Pauli & Griffin Co., 826 Folsom St., San Francisco, Calif. 94107

**SCAFFOLD BOARDS**
Howmet Corporaton, Southern Extrusions Division, P.O. Box 40, Magnolia, Arkansas 71753

**SEWAGE DISPOSAL**
Babcock & Wilcox Co., 161 East 42nd Street, New York, N.Y. 10017
Jered Industries, Inc., 1300 S. Coolidge Rd., Birmingham, Mich. 48008
Koehler-Dayton, Inc., P.O. Box 309, New Britain, Conn. 06050
LaMere Industries, Inc., 277 N. Main Street, Walworth, Wis. 53184

**SHAFT REVOLUTION INDICATOR EQUIP.**
Henschel Corp., 14 Cedar St., Amesbury, Mass. 01913

**SHIPBOARD VENTILATION**
Coppus Engineering Corp., P.O. Box 457, Worcester, Mass. 01613
TANK S.A.P.P. Inc., 330 Madison Avenue, New York, N.Y. 10017 and 1020 Springfield Avenue, Mountainside, N.J. 07092

**SHIPBREAKING—Salvage**
The Boston Metals Co., 313 E. Baltimore St., Baltimore, Md. 21202
National Metal & Steel Corp., 1251 New Dock St., Terminal Island, Cal. 90731
Zidell Explorations, Inc., 3121 S. W. Moody St., Portland, Ore. 97201

**SHIP BROKERS**
Agemar, P.O. Box 1465, Maracaibo, Venezuela
Hughes Bros., Inc., 17 Battery Pl., New York, N.Y. 10004
Mowbray's Tug and Barge Sales Corp., 21 West St., N.Y., N.Y. 10006
Oaksmith Boat Sales, Inc., Fisherman's Terminal, Seattle, Wash. 98119

**SHIPBUILDING STEEL**
Armco Steel Corp., 703 Curtis St., Middletown, Ohio 45042
Bethlehem Steel Corp., 25 Broadway, New York, N.Y. 10004
Huntington Alloy Products, Div. International Nickel Co., Inc., Huntington, W. Va. 25720
International Nickel Co., 1 New York Plaza, New York, N.Y. 10004

**SHIPBUILDING—Repairs, Maintenance, Drydocking**
Astilleros Espanoles, S.A. Zurbano, 70, Madrid 10, Spain
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans La. 70150
Beliard, Crighton & Cie, P.O. Box 2074, Route des Docks, 59, Dunkirk, France
Beliard Murdoch S. A., Kattendijkdok Westkaai 21, Antwerp, Belgium
Bertram Marine, Division of Whittaker, 3663 N.W. 21 Street, Miami, Fla. 33142.
Bethlehem Steel Corp., Shipbuilding, 25 Broadway, N.Y., N.Y. 10004
Bludworth Shipyard, Inc., Box 5426, Cypress St., Brady Island, Houston, Texas 77012
Carrington Slipways Pty. Ltd., Tomago, N.S.W. 2322, Australia
Conrad Industries, P.O. Box 790, Morgan City, La. 70380
Curacao Drydock, Inc., P.O. Box 153, Willemstad, Curacao, N.A.
Devcon Corporation, Endicott Street, Danvers, Mass. 01923
Dillingham Shipyard, Pier 41, P.O. Box 3288, Honolulu, Hawaii 96801
Dravo Corporation, Neville Island, Pittsburgh 25, Pa.
Empresa Nacional Bazon, 65 Castellana, Madrid 1, Spain
Equipment Systems, Inc., A Microdot Co., P.O. Box 95, Port Deposit, Md. 21904
Equitable Equipment Co., Inc., P.O. Box 8001, New Orleans, La. 70122
General Dynamics, Electric Boat Division, 99M Eastern Point Road, Groton, Conn. 06340
General Dynamics, Quincy Division, Quincy, Mass. 02169
Halter Marine Services, Inc., Route 6, Box 287H, New Orleans, La. 70126
Havre de Grace, Havre de Grace, Md.
Hillman Barge & Construction Co., Grant Bldg., Pittsburgh 19, Pa.
Hongkong & Whampoa Dock Co. Ltd., Kowloon Docks, Hong Kong
Jacksonville Shipyards, 644 E. Bay St., Jacksonville, Fla. 32203
Jeffboat, Inc., Jeffersonville, Ind. 47130
Kawasaki Dockyard Co., 8 Kaigon-dori, Ikuta-ku, Kobe, Japan
Kelso Marine, Inc., P.O. Box 268, Galveston, Texas 77550
Keppel Shipyard (Private) Ltd., P.O. Box 2169, Singapore
Kockums Mekaniska Verkstads AB, Malmo 1, Sweden
Litton Industries, 9920 W. Jefferson Blvd., Culver City, Calif. 90230
Lockheed Shipbuilding and Construction Co., 2929 16th Avenue, S.W., Seattle, Wash. 98134
Marathon Manufacturing Company
Marathon LeTourneau Offshore Company, 1700 Marathon Building, 600 Jefferson, Houston, Texas 77002
Marathon LeTourneau Gulf Marine Division, P.O. Box 3189, Brownsville, Texas 78520
Marathon LeTourneau Marine Division, LeTourneau Rural Station, Vicksburg, Mississippi 39180
Marathon LeTourneau Offshore Pte., Ltd., P.O. Box 83, Taman Jurong Post Office, Singapore 22, Singapore
Marathon Shipbuilding Company, P.O. Box 870, Vicksburg, Miss. 39180
Marathon Shipbuilding Company (U.K.) Ltd., Clydebank Bunbartonshire, G81-1YB, Scotland
Marine & Rail Equipment Division/FMC Corp., 4700 N.W. Front Ave., Portland, Oregon 97208
Maryland Shipbuilding & Drydock, P.O. Box 537, Baltimore, Md. 21203
Matton Shipyard Co., Inc., P.O. Box 428, Cohoes, New York 12047
Mitsui Shipbuilding & Engrg. Co. Ltd., 6-4, Tsukiji 5-chome, Chuo-ku, Tokyo, Japan
Mitsubishi Heavy Industries, Ltd., 5-1 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan
Monark Boat Co., P.O. Box 210, Monticello, Ark. 71655
National Steel & Shipbuilding Corp., San Diego, Calif. 92112
Newport News Shipbuilding and Dry Dock Co., Newport News, Va.
Newport Ship Yard, Inc., 379 Thames St., Newport, R.I. 02840.
Northwest Marine Iron Works., P.O. Box 3109, Swan Island, Portland, Oregon 97208
O.A.R.N. (officine Allestimento e Riparazioni Navi) Genoa, Italy
Odense Steel Shipyard Ltd., P.O. Box 176, DK-5100 Odense, Denmark
Paceco, Div. Fruehauf Corp., 2350 Blanding Ave., Alameda, Calif. 94501
Pearlson Engineering Co., P.O. Box 8, Kendall Branch, Miami, Fla. 33156
Perth Amboy Dry Dock Co., Perth Amboy, N.J. 08862
St. Louis Shipbuilding—Federal Barge, Inc., 611 East Marceau, St. Louis, Mo. 63111
Sasebo Heavy Industries Co., Ltd., New Ohtemachi Bldg., Chiyoda-ku, Tokyo, Japan
Savannah Machine & Shipyard Co., P.O. Box 787, Savannah, Ga. 31402
Sembawang Shipyard (Pte) Ltd., P.O. Box 3, Sembawang, P.O. Singapore, 27
Slocum Iron Works, Inc., P.O. Box 2506, 1752 Telegraph Road, Mobile, Ala. 36601
Sumitomo Shipbuilding & Machy. Co., Ltd. 2-1 Ohtemachi 2-chome, Chiyoda-ku, Tokyo, Japan
Swedish Shipbuilding Association, Fack S-402 70, Gothenburg 8, Sweden
Todd Shipyards Corp., 1 State St. Plaza, New York, N.Y. 10004
Tracor/Mas, Inc., P.O. Box 13107, Port Everglades, Fla. 33316
Vancouver Shipyards Co., Ltd., 50 Pemberton Ave., North Vancouver, B. C., Canada

**SHIP MODEL BASIN**
Hydronautics, Incorporated, Laurel, Maryland 20810

**SHIP ROUTING**
Weather Routing, Inc., 90 Broad Street, New York, N.Y. 10004

**SHIP STABILIZERS**
Jered Industries, Inc., 1300 S. Coolidge Rd., Birmingham, Mich. 48008
John J. McMullen Associates, Inc., 1 World Trade Center, New York, N.Y. 10048
Sperry Marine Systems Div., Charlottesville, Va. 22901, Division of Sperry Rand Corp.

**STEAM GENERATING EQUIPMENT**
Babcock & Wilcox Co., 161 East 42nd Street, New York, N.Y. 10017
Combustion Engineering, Inc., Windsor, Connecticut 06095

**STEERING SYSTEMS**
Wm. E. Hough Co., 1125 P N.W. 45th St., Seattle, Wash. 98107

**SWITCHBOARDS**
Hose McCann Telephone Co., Inc., 524 West 23 St., N.Y., N.Y. 10011

**TOWING—Vessel Chartering, Lighterage, Salvage, etc.**
Bay-Houston Towing Co., 805 World Trade Bldg., Houston, Texas 77002
Curtis Bay Towing Co., Mercantile Bldg., Baltimore, Md. 21202
Henry Gillen's Sons Lighterage, West End Ave., Oyster Bay, N.Y. 11771
James Hughes, Inc., 17 Battery Pl., New York, N.Y. 10004
Interstate Oil Transport Co., 214 Transportation Center, Six Penn Center Plaza, Philadelphia, Pa. 19103
McAllister Bros., Inc., 17 Battery Pl., New York, N.Y. 10004
McDonough Marine Service, P.O. Box 26206, New Orleans, La.
Moran Towing & Transportation Co., Inc., One World Trade Center, Suite 5335, New York, N.Y. 10048
Puerto Rico Lighterage Co., P.O. Box 1072, San Juan, P.R. 00902
State Boat Corporation, 3701 Kirby Drive, Houston, Texas 77006
Suderman & Young Towing Co., 329 World Trade Center, Houston, Texas 77002
Turecamo Coastal and Harbor Towing Corp., 1752 Shore Parkway, Brooklyn, N.Y. 11214

**VALVES AND FITTINGS—Hydraulic—Safety Flanges**
Dover Corp. / Norris Division, P.O. Box 1739, Tulsa, Okla. 74101.
Hubeva Marine Plastics-Lining, 435 Hamilton Ave., Brooklyn, N.Y. 11231
Marine Moisture Control Co., 449 Sheridan Blvd., Inwood, N.Y. 11696
Mechanical Marine Co., 900 Fairmount Ave., Elizabeth, N.J. 07027

**WIRE ROPE**
Armco Steel Corp., 703 Curtis St., Middletown, Ohio 45042
Bethlehem Steel Corp., Bethlehem, Pa. 18016

**ZINC**
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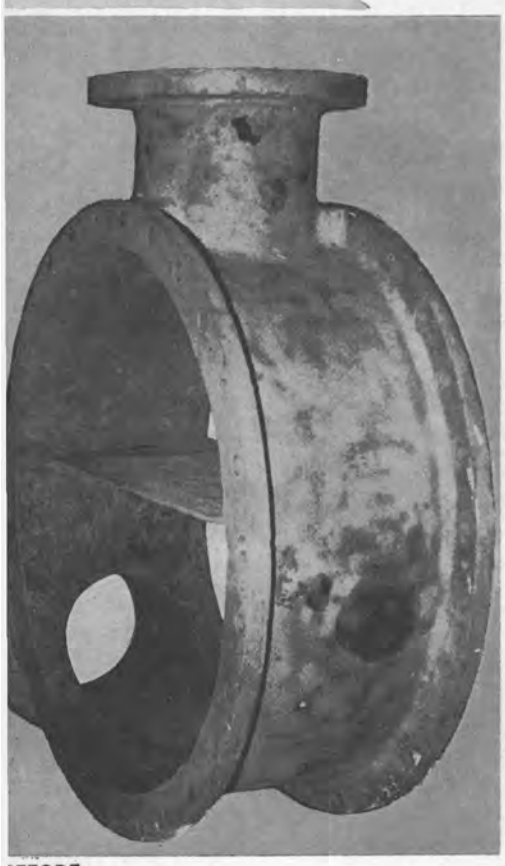
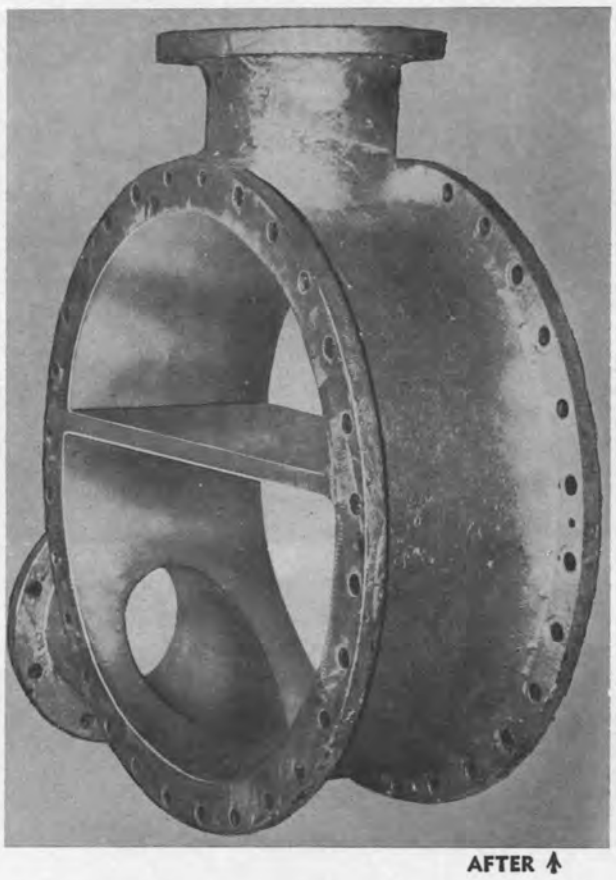


BEFORE



AFTER

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SEND FOR LIST OF CONTENTS AND LITERATURE

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