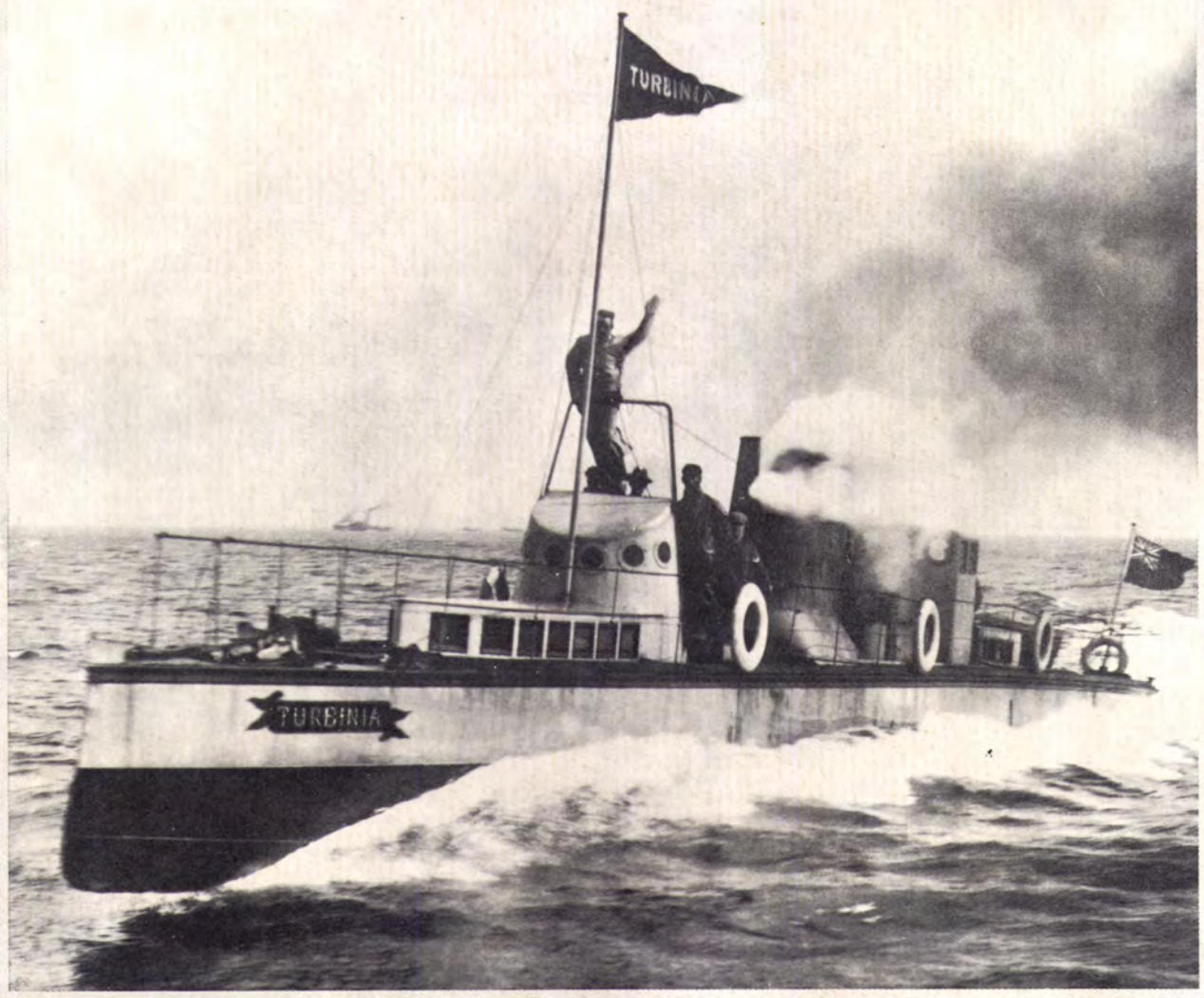
MARITIME
REPORTER
AND
ENGINEERING NEWS

Halter Delivers Another To Persian Gulf
—Offshore Vessel Backlog Totals $50 Million

(SEE PAGE 6)

JULY 1, 1974

Photograph courtesy of The Science Museum, London.



"What is it? Where did it come from?"

The year was 1897. The occasion, the naval review celebrating the DIAMOND JUBILEE OF QUEEN VICTORIA.

Suddenly there dashed out among the assembled ships a small craft scooting along at the then incredible speed of 34½ KNOTS.

From the astounded naval officers came cries of, "What is it? Where did it come from?"

It was the "TURBINIA," the first ship powered by turbine engines. It had been built at Wallsend on the Tyne in 1894, with engines invented by SIR CHARLES PARSONS, and taken secretly to COWES for its surprise appearance in the naval review.

The "TURBINIA" was only 100 ft. long with a 9 ft. beam, and although it was a sensation, it was some time before Parsons could persuade commercial ship owners to take an interest in his invention.

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Subsidy Sought For 390,000-Dwt Tanker

The Maritime Administration has received a request to subsidize the building of a 390,200-deadweight-ton tanker from a Delaware-chartered holding company. The vessel is to be constructed at Newport News Shipbuilding and Dry Dock Company.

The subsidy application filed by VLCC I Corporation said the 1,200-foot-long tanker, which would be chartered to Shell Oil Company under a long-term lease, would cost approximately $133.5 million.

The crude oil carrier, which would have a cruising speed of 16.1 knots, would be employed in the worldwide trade.

This brings to nearly 80 such vessels of more than 100,000 dwt for which U.S. companies are seeking subsidy to build. They are valued at some $9 billion.

Dixie Dredge Delivers Cutterhead Dredge For Lake Restoration Project

The Dixie Dredge Corporation, a subsidiary of Pott Industries, Inc., St. Louis Ship Division, has announced the delivery of a 14- inch Portable Hydraulic Cutterhead Suction Dredge to the Department of Parks and Recreations, St. Louis County, Missouri.

At present, the dredge is to be used in the reclamation of Creve Coeur Lake, a 270-acre natural oxbow lake surrounded by some 1,260 acres of park. This project is expected to take approximately 10 years, and is designed to restore the lake to its original beauty and usefulness as a recreation area.

Named Princess Me-Me-Ton-Wish, the 14-inch Portable Hydraulic cutterhead dredge was shipped by truck from Dixie's St. Louis Plant to the lake site, was erected, launched and prepared for service within 10 days after leaving the plant. The dredge is designed with the capacity of digging to depths in excess of 20 feet below the waterline and pumping to distances up to one mile.

Total overall dimensions of the dredge are 55 feet by 21 feet by 5 feet, and it has a total of 710 connected horsepower. Dredging operations began last month.

Dixie Dredge is a leading designer and builder of Portable Dredges, with manufacturing plants in St. Louis, Mo., and Miami, Fla.

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Halter Delivers Another To Persian Gulf —Offshore Vessel Backlog Totals $50 Million

ON THE COVER: The Gacship IV is powered by three Caterpillar D-343 turbocharged after-cooled engines and can reach a speed of 23 mph.

Halter Marine Services, Inc. (New Orleans, La.), the world's largest builder of offshore oil support vessels, recently delivered a 65-foot triple-screw crewboat to Gulf Agency (Dubai) Limited. The new vessel, accommodating 49 passengers, will service incoming and outgoing tanks in the Persian Gulf. Her home port is Dubai, United Arab Emirates.

The new vessel measures 64 feet 6 inches by 17 feet 6 inches, with an 8-foot 3-inch draft. The Gacship IV is powered by three Caterpillar D-343 turbocharged after-cooled engines fitted with Twin Disc MG-514 2.0:1 gears. The engines are equipped with one 2-71 20-kw generator unit.

The vessel can reach a speed of 23 mph at a continuous 1,800 rpm, and is fitted with 3-inch-diameter 174-PH stainless-steel propeller shafts. The Gacship IV is fully air-conditioned and has a complete heating system.

Halter Marine Services has a current backlog of more than $50 million in contracts to build offshore crewboats, supply, anchor handling, and towing ships for the oil and gas industry worldwide. The company's production comes from four fully equipped shipyards in New Orleans, Lockport, and Pierre Part, La., and Moss Point, Miss. The Lockport division yard recently completed construction on the first Halter Marine Hustler-class vessel, a river towboat specially designed for work on the changing rivers.

Fidel Castro Orders Three Coastal Tankers From Canadian Yard

A $30-million contract to build three 10,000-ton coastal tankers for Cuba has been signed by the Canadian Government. The ships will be built by Marine Industries, Ltd. of Montreal, and will be delivered in 1977 and 1978.

The company insisted on including an inflation clause in the contract, and Cuba agreed.

The Cuba deal is the latest chapter in Canada's shipbuilding success story, and the bonanza is largely because of Government actions to encourage export sales. The Federal Government offers a 17 percent incentive grant to companies with export ship sales, and the Canadian Export Development Corporation allows low-interest loans to customer countries for up to 80 percent of the balance.

In three years, the program has increased Canadian ship exports dramatically, with sales to Greece, France, Britain, and the United States.

There is speculation that Cuban Premier **Fidel Castro** is purchasing tankers for possible oil shipments from Venezuela. Currently, Cuba receives 100,000 barrels of oil daily from the Soviet Union to cover virtually all her needs.

Todd-CEA To Automate Burners Of Ten Gulf Oil Tankers

Todd-CEA, New York, N.Y. has been awarded a contract to automate the burners of 10 tankers in Gulf Oil's U.S. fleet. The modernization program will enable the ships to operate with unattended fire rooms. Burners will be monitored by the watch engineer from a remote control panel at the throttle station.

In each instance, existing mechanical-atomizing burners will be replaced by steam-atomizing burners and the existing electric combustion control system will be replaced with a pneumatic control system. The pneumatic systems will also include new two-element feedwater controls that will respond to drum level and steam flow.

Fluctuations in boiler loads are presently met by manually shutting down and starting up the mechanical-atomizing burners. In the future, load changes will be met by automatic regulations of oil flow to wide-range steam-atomizing burners. Controls and a control panel will be located in the fire room. Burners will be ignited from the fire room console, and from then on will be monitored from the throttle station panel.

Six ships were built by Bethlehem and four are jumboized T-2 tankers. The Bethlehem ships presently have six burners each, three per boiler, and the T-2 tankers have four burners per boiler. Following conversion, all ships will have two burners per boiler.

The new burner management systems will incorporate alarms and indicator lights to alert the watch engineer in event of abnormal operating conditions. The systems meet Coast Guard and ABS requirements for unattended boiler rooms.

Swedish Firm Receives $26-Million Steel Order From Finnish Yard

An order worth $26 million has been placed with Scandia Plate AB of Oxelosund, Sweden, for supplying heavy steel plate to the Finnish shipbuilders Oy Wartsila AB. The plate will be delivered in 1976 and 1977 for use in five seagoing LPG tankers. The steel is a grade developed especially for containing liquefied petroleum gas and other potentially hazardous products transported or stored at low temperatures.

The five tankers, each having a capacity of 75,000 cubic meters of liquefied gas, will be built at a new yard to be constructed near Turku in Finland. They will be operated by the Norwegian shipping company Fearnley & Eger.

The steel plate will be manufactured at Oxelosund Iron Works (owned by the Granges Group) and Domnarvet Iron Works (Stora Kopparberg Group). Scandia Plate AB is their joint exporting company.

It is a fully killed, normalized steel plate with a maximum carbon content of 0.12 percent. It can readily be welded to other weldable steels, and its extreme purity permits highly automated welding techniques to be used.

The plate is approved by Lloyd's Register of Shipping, the American Bureau of Shipping, and Det norske Veritas.

Michigan Wheel Acquires Interest In Austral Propeller Co.

As part of its continuing emphasis on worldwide expansion, Dana Corporation's "seagoing" subsidiary, Michigan Wheel Corporation of Grand Rapids, Mich., has acquired a substantial equity interest in Austral Propeller Company Pty. Ltd. of Peakhurst, New South Wales, Australia.

Announcement of the acquisition, to be known as Austral Michigan Propeller Company Pty, Ltd., was made by **Kevin C. Vincent,** managing director of Austral, and **H.L. VanderMey,** president of Michigan Wheel.

Austral is the leading manufacturer of machined pitch propellers for outboard, inboard, and marine outdrive units in Australia. Michigan Wheel Corporation is a leading supplier of marine and industrial propellers to the North American and international markets.

Falk Corp. Appoints Vonier Sales Manager

William H. Vonier

William H. Vonier has been appointed sales manager for The Falk Corporation, Milwaukee, Wis. The appointment, effective immediately, was announced by **S.G. Falk,** senior vice president-marketing and sales.

Mr. **Vonier** was most recently assistant sales manager. In his new post, he succeeds **Don R. O'Hare,** recently elected president of Falk.

A graduate of the United States Naval Academy, Mr. **Vonier** joined Falk in 1955 after completing his Naval service. Upon completion of a sales training program, he was assigned to the Cleveland office. In 1960, he went to Falk's Milwaukee headquarters as coupling sales manager. He returned to the field in 1964 as Atlanta district manager.

He returned again to Milwaukee in 1969 as Eastern regional manager, and was made assistant sales manager in June 1973.

As sales manager, Mr. **Vonier** will be responsible for all field office operations, merchandising and customer service, Mr. **Falk** said.

The Falk Corporation, Milwaukee-based subsidiary of Sundstrand Corporation, is a leading manufacturer of industrial gear drives and shaft couplings.

William Weaver Named ODECO Vice President

The promotion of **William B. Weaver** to vice president of Ocean Drilling & Exploration Company, New Orleans, La., was recently announced by **Alden J. Laborde,** ODECO's president.

Mr. **Laborde** said Mr. **Weaver** will be responsible for ODECO's worldwide customer relations activities.

Mr. **Weaver** joined ODECO in 1969 as manager of drilling engineering, following 17 years as a drilling operations engineer for Humble Oil. He was promoted to manager of drilling engineering and customer relations for ODECO in 1972.

A native Oklahoman, Mr. **Weaver** is a petroleum engineering gradate of Oklahoma A. & M. He is a member of AIME, IADC, and the Petroleum Club of New Orleans.

The Tougher The Going The More You Can Depend On New Bedford Rope

That's why the M/V North Seahorse, recently put into operation by the Levy Boat Service, Inc., is outfitted with 100% nylon stretch lines from New Bedford Cordage Company.

She'll be towing rigs in all kinds of weather in the North Sea, where you know it gets rough enough to test the stamina of men and equipment — hour after hour, day after day — straining every fiber of the tow lines or tie-up lines.

But, New Bedford Rope has met the grueling test of the sea and time since 1830 — around the world. So before the going gets tough, outfit your ships with the proven rope.

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Santa Fe Int'l Awards Oil Rig Contract To Tacoma Boatbuilding

Santa Fe International of Orange, Calif., has awarded a $10.5-million contract for an offshore oil-drill rig to Tacoma Boatbuilding Co. The contract, which puts the company's construction backlog at a record $31 million, contains an option, to be exercised within 10 months, for Tacoma Boat to build an even bigger offshore platform.

The contract will immediately add 220 workers to the Tacoma yard's 400, and makes the company the Pacific Northwest's first builder of an offshore oil-drill rig.

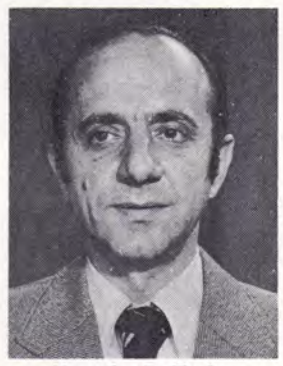
President of the construction firm, **Frank Lynott,** said another $15 million to $20 million in vessel construction contracts are expected within 90 days. He also said that the company will continue to produce its line of tuna vessels and military boats while diversifying into the oil-rig business.

One of the world's largest drilling companies, Santa Fe operates 44 land and 15 marine rigs and has six other platforms under construction.

Named Mariner III, the rig is designed to drill in water 600 feet deep and is identical to another in use off Trinidad. It is 270 feet long, 106 feet wide, and has accommodations for 80 workers. The steel in it will weigh six million pounds —equivalent to four medium-size ships. Eight anchors, each weighing 30,000 pounds, will moor the platform at its four corners.

The cost of machinery and other equipment, to be procured by Santa Fe for about $7 million, is not included in the $10,565,000 contract.

Carboline Elects Hercules D. Tarlas Exec. Vice President



Hercules D. Tarlas

Stanley L. Lopata, president of Carboline Company, St. Louis, Mo., has announced the election of **Hercules D. Tarlas** to the position of executive vice president and chief operating officer of the company. Mr. **Lopata** will remain chief executive officer and president.

A native of Greece, Mr. **Tarlas** graduated from Washington University, St. Louis, in 1955 with a B.S. degree in chemical engineering.

His career with Carboline Company started as a part-time employee while a senior in college, and upon graduation he worked in the company laboratory as development engineer. His next assignment was with the technical service department. In 1960, he was made manager of the department.

In 1961, Mr. **Tarlas** was named vice president and technical director, and five years later was placed in charge of manufacturing. In 1971, he assumed the position of general manager of international operations.

When the company acquired the Admiral Paint Company, Lake Charles, La., Mr. **Tarlas** took over the additional responsibilities of president of the Admiral subsidiary.

He is a member of the American Institute of Chemical Engineers, National Association of Corrosion Engineers, and has served on a number of technical committees, including Task Group chairman.

Carboline Company, international in scope, markets a wide-range of products including protective coatings, waterproofing membranes, roof coatings, fireproofing coatings, industrial finishes, paints and adhesives. Headquarter offices are located at 350 Hanley Industrial Court, St. Louis, Mo. 63144.

Sperry Vickers Names McCormick Manager Marine And Ordnance

Jerry D. McCormick

Jerry D. McCormick has been named manager of marine and ordnance for Sperry Vickers Aerospace-Ordnance-Marine Division.

In his new position, Mr. **McCormick** will have basic management and supervisory responsibilities for manufacturing and marketing the division's marine and ordnance products at Sperry Vickers' Jackson, Miss., manufacturing and administrative facility.

A seven-year Sperry Vickers employee, Mr. **McCormick** has served in a number of key positions, including manager of industrial engineering at the company's Tulsa Division, as general plant superintendent at its Joplin, Mo., manufacturing facility, and most recently as materials manager at the Tulsa Division.

He is a member of the American Institute of Industrial Engineers, has served on the board of directors of the National Management Association, and is a member of the Society of Manufacturing Engineers. Mr. **McCormick** has a B.S. degree in industrial engineering from the University of Arkansas.

86.9% Rise In Profits Estimated By Lykes

The Lykes-Youngstown Corporation's estimated earnings for the first half of this year should reach $40 million after taxes, **J.T. Lykes Jr.**, chairman, announced. The rise would come to 86.9 percent above the $21.4-million net income shown in the corresponding six months of 1973.

The company includes the Youngstown Sheet and Tube steel producer and Lykes Bros. Steamship Company, the largest American-flag fleet of dry-cargo common carriers engaged in international commerce.

At the same time, directors of the New Orleans, La.-based company voted to clear up three of the six quarterly dividend arrears on its preferred issues. Declarations were $2.50 a share on the $2.50 Series A preferred and $4 a share on the $4 Series preferred, payable July 15 to shareholders of record June 21. These payments include the regular quarterly payment with the arrears. The last dividend on the common stock was 15 cents on September 10, 1970.

Design Contract For Galveston-Bolivar Ferry To Coast Engineering

Coast Engineering Company, naval architects, Norfolk, Va., have been commissioned by the Texas Highway Department, Austin, Texas, to design a new 70-car 500-passenger diesel-driven passenger/vehicle ferry for the Galveston-Bolivar Ferries. The vessel will be approximately 250 feet long, have a breadth of 63 feet and a draft of 8 feet. The designed speed will be 12 knots.

Plans and specifications for the vessel will be completed about October 1, 1974, according to **Harry W. Keeling Jr.**, president of the firm. The design will be under the personal supervision of **John C. Chivvis Jr.**, vice president, engineering.

This firm was consultant and naval architects for the recently delivered ferry Delaware, a 320-foot vessel for the Cape May-Lewes Ferries. This ship will replace the present steam ferry of the same name, which was formerly operated on the Little Creek-Kiptopeake run. Two additional sister ships now under construction will replace the remaining old steam ferries this fall.

Todd Signs $155 Million In Tanker Contracts—Backlog Nears Half-Billion-Dollar Mark

Todd Shipyards Corporation has announced that it had been awarded contracts for the construction of four 89,700-deadweight-ton tankers totaling approximately $155 million. Three of these vessels will be built for Hawaiian International Shipping Corp. of Honolulu, a wholly owned subsidiary of Pacific Resources, Inc., under Title V of the Merchant Marine Act of 1936, as amended, with a construction differential subsidy of 33.66 percent. The fourth vessel will be built for United States Lines under Title XI of the Act.

The Hawaiian International contracts were signed in Washington by **Lowell E. Mee,** vice president-secretary-treasurer; **J.T. Gilbride,** president of Todd, and **Robert J. Blackwell,** Assistant Secretary of Commerce for Maritime Affairs. The United States Lines contract was signed by **Nicholas Bachko,** senior vice president of that company, and Mr. **Gilbride.**

The vessels, to be built at Todd's Los Angeles Division, will be 894 feet long, with a beam of 105 feet 9 inches and a draft of 49 feet. They are of the San Clemente-class powered by steam with a shp of 24,500. Delivery of the first vessel will be in October 1978, and deliveries will be completed by November 1979.

With these awards, Todd Shipyards Corporation's backlog nears the half-billion-dollar mark. Construction work at its Los Angeles, Seattle, Houston and Galveston plants includes tankers of 89,700, 35,000, and 25,000 deadweight tons, phosphate rock barges, drillships, tug/supply vessels, ferryboats, tank barges and towboats.

Fruehauf Corporation Elects Rowan Chief Executive Officer; Grace Remains Board Chairman

Robert D. Rowan

William E. Grace

At its annual shareholder meeting held recently at the Pontchartrain Hotel, Detroit, Mich., the board of directors of Fruehauf Corporation announced the election of president **Robert D. Rowan** as chief executive officer, succeeding **William E. Grace,** who will remain as chairman of the board.

Mr. **Rowan,** who was elected president and chief operating officer in 1972, joined Fruehauf as controller in 1955, after spending five years with Touche Ross & Company as audit supervisor. He was elected corporate vice president-controller in 1963, vice president-finance in 1965, executive vice president-finance in 1969, and a director of the company in 1970.

Mr. **Grace,** who will continue as a member of the executive committee of the board and the firm's Policy Council, has been chief executive officer since 1958. He was elected president the same year, and moved up to chairman of the board in 1972.

B&W Moves Headquarters For Industrial And Marine Division

The Industrial & Marine Division of The Babcock & Wilcox Company will consolidate headquarters and engineering office in a new 100,000-square-foot office building being constructed in North Canton, Ohio.

The division's engineering office in Coventry Township, Ohio, will move to the new facility in August 1974. The remainder of the division is scheduled to move by October 1, 1974.

The division offices are currently located at B&W's Power Generation Group headquarters in Barberton, Ohio. Besides the engineering office in Coventry, the division maintains a 400,000-square-foot manufacturing facility in Wilmington, N.C.

According to I&M general manager **Thomas M. Campbell Jr.,** "The purpose of the move is to bring all division office functions into one building for more effective operations and to permit expansion for future growth of the division."

Barberton office space vacated by the I&M Division will permit expansion of other B&W divisions located there.

B&W's I&M Division supplies field-erected and shop-assembled boilers for industrial and specialized applications and for U.S. Navy and merchant marine ships. Included in its product line are chemical recovery and air and water quality control equipment for the pulp and paper industry; oxygen converter hoods and pulverized coal injection systems for the steel industry; power generation and process steam systems for the petrochemical industry, and solid and liquid waste incinerator systems for industrial and municipal applications.

Moran Tug/Barge Operations help meet critical transportation needs

Barge "Rhode Island," 64,000 barrel capacity, under tow of tug, "Eugenia Moran," 3160 horsepower.

Keeping pace with the ever-increasing requirement for petroleum products, Moran has helped maintain a steady, safe flow of fuels vital to our nation's health, comfort, and economy. Through the year millions of barrels are moved to refineries, distributors, and consumers along the Atlantic seaboard and inland waterways. More than a century of experience enables Moran tugs and barges to effect the greatest possible economy and efficiency.

Moran Towing & Transportation Co., Inc.

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Lily Reed Honored At Maritime Day Ceremonies

Lily W. Reed, founder-organizer and donor for the observance of the first National Maritime Day program held in the Port of New York in 1925, was the guest of honor at the 1974 Maritime Day Activities and received a warm welcome from **James P. McAllister** (left) honorary chairman for World Trade Week Committee, and Capt. **Robert E. Hart** (right), chairman of the 1974 Maritime Day.

The 1974 Maritime Day program, sponsored annually as part of New York & New Jersey World Trade Week by the maritime industry, was held at the South Street Seaport Museum located on the East River in New York City.

The program featured a "Pre-Bicentennial" format, highlighting the United States Merchant Marine Academy Regimental Band from Kings Point. The program, directed by Lt. Comdr. **Kenneth R. Force,** USMS, spotlighted the "Merchant Marine Thru the Years," with color guards in special design uniforms of the day.

Organizations sponsoring this year's program included The Council of American Master Mariners; The Robert L. Hague Post #1242; The Maritime Association of the Port of New York; The Rudder Club, Inc.; The South Street Seaport Museum, and The Propeller Club, Port of New York. A special part of the program was the presentation of the American Seamanship Award and Trophy to a New York fire-fighting boat and crew as presented by the Eastern Director of the Maritime Administration, Capt. **Thomas A. King.**

Captain **Hart,** president of Marine Index Bureau, Inc., was chairman of the 1974 Maritime Day program, and Mr. **McAllister,** president of McAllister Bros., Inc., was honorary chairman of the New York & New Jersey World Trade Week Committee for the Maritime Industry.

Upon conclusion of the midday ceremonies held at Pier 16 at the Seaport, a reception and buffet luncheon was held aboard the Seaport's flagship Robert Fulton. At the luncheon, a special recognition award was presented by the president of the South Street Seaport Museum, **Peter Stanford,** to **George W. Rogers,** chairman of the Rogers Construction Co.

Port Of Duluth To Be First Containerized Great Lakes Port

The Port of Duluth will be the first Great Lakes port to offer shippers a specialized container handling facility complete with a Paceco Portainer® and a new container marshaling area.

The crane built by Paceco, Alameda, Calif., a division of Fruehauf Corporation, is a 30-long-ton capacity Economy Portainer, which has been especially designed for Great Lakes and other ports. It has an 84-foot outreach, 22-foot backreach, and rides on rails 52 feet 5 inches between centers.

Equipped with a Quick Change Headblock, the crane can use either a telescopic spreader for 20-foot, 35-foot, or 40-foot long ANSI containers, or can be changed in minutes to a cargo beam with swivel hook to handle palletized cargo or general cargo, including steel bundles. Because of the Portainer's controlled straight-line operation, it will handle general cargo faster than conventional equipment.

The new crane will be installed at the Seaway Port Authority of Duluth's Clure Public Marine Terminal adjoining the container marshaling area.

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What's our secret?

Well, there's stainless — and there's Coolidge stainless.

We use all electric furnaces to get an alloy that's cleaner, stronger. A steel that can really take it under water. Plus a totally modern scientific manufacturing process that turns out the best stainless steel propellers in the business.

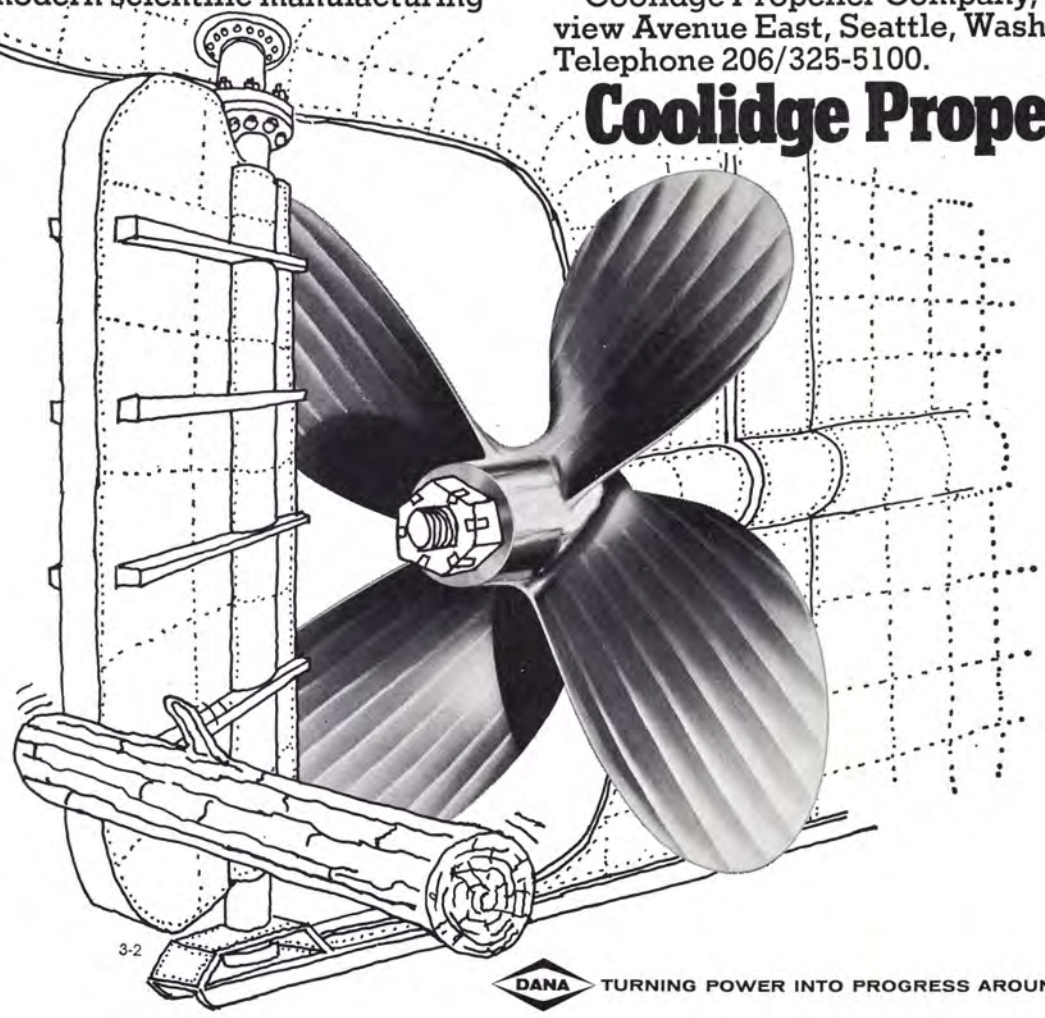
In sizes through 14-ft. diameter. And in 3-, 4- and 5-blade models. (Cast steel or bronze also available through 13-ft. diameter.)

If you're tired of prop trouble every time you turn around, get yourself a Coolidge stainless steel propeller.

And you've got yourself a real underwater champ.

Coolidge Propeller Company, 1608 Fairview Avenue East, Seattle, Wash. 98102. Telephone 206/325-5100.

Coolidge Propellers



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DANA TURNING POWER INTO PROGRESS AROUND THE WORLD

INCO Engineers Survey Current Practices To

Evaluate Your Shipboard Piping Systems Based On First Cost Versus Annualized Cost

A.H. Tuthill and S.A. Fielding*

There has been a considerable upgrading of shipboard piping system materials especially in the larger, more expensive modern cargo and tanker vessels in the last decade. This upgrading has, in all too many cases, fallen short of the improvement in reliability and reduction in maintenance the ship operators expected. The reasons for specific shortcomings vary widely, but the result has been premature failure and substantial maintenance in systems the owner expected to last the full life of the vessel.

A key problem appears to be a lack of understanding on the part of those developing the piping specifications, and on the part of the yards building to these specifications.

For example, a logical decision to paint a steel or cast-iron waterbox to extend its life can and has led to: premature localized pitting-type failure of the waterbox itself; increased failures of aluminum-brass tubes; increased dezincification of naval brass and Muntz-metal tube sheets, and partial blockage and additional condenser tube failures as the coating begins to fail and spall toward the end of its normal useful life.

Another logical decision that has led to seemingly unassociated, and certainly unanticipated results, is the decision to upgrade from steel to nonferrous piping but stay with standard "off-the-shelf" marine brass and bronze pump and valve components. Upgrading to nonferrous piping deprives the "standard marine" brass and bronze alloys of the cathodic protection they require to reduce their normal corrosion rates in seawater to the point where they give useful service.

In another category is the decision to automate sections of the auxiliary seawater cooling system so that banks of unneeded heaters and coolers are taken out of service and the flow increased proportionately through the heaters and coolers left in service. Such automation has resulted in excessive velocities and turbulence failures in small diameter (principally 4-inch and smaller) nonferrous piping.

Other problems encountered include: nonferrous pipe failures from turbulence downstream of short-radius fittings or downstream of internal obstructions from poorly fitted, field-fabricated tees and Y's; condenser-tube failures from excessive air entrainment in certain higher-speed cargo vessels with bottom-fitted scoop injection; tube failures from polyethylene bags entering the condenser in ships with no provision for removal of entrained debris; tube failures from biofouling growth in bare steel, coated, or rubber-lined steel waterboxes and piping, and premature failure of brass and bronze alloys in modern, high rotational speed pumps.

There is also the matter of cost. When an owner pays a premium to obtain a high reliability piping system that is expected to last the life of the vessel, he naturally expects to receive a system that will not fail prematurely, require costly shutdowns, or necessitate early replacement. Owners have few, if any, reliable published standards for piping systems that will insure this result. They can incorporate such piping standards as the naval architect has developed in the invitation to bid. Alternately, the owner may simply accept the successful bidder's "standard vessel" piping system.

In either case he is often requested by the shipyard to approve alternate materials if he wishes to avoid a delay in vessel delivery. Given the present design and procurement system, the variations in component availability and cost, and the numerous side effects of changes, it is little wonder that there are some modern multi-million dollar vessels with leaking pipes, condensers and heat exchangers.

There are really only two possible seawater piping systems. First, there is the older style, "low" first-cost system based on coated steel pipe and waterboxes, brass tube sheets, and aluminum-brass tubes. Second, there is the high reliability, minimum maintenance system based on copper-nickel pipe, waterboxes, tube sheets and tubes.

Both the low first-cost and the high reliability systems are true systems in that each component interacts with and directly affects the performance of other nearby components — galvanic, biofouling, and corrosion products. There are also two additional interactions arising from the detailed design of the system and the inherent properties of the materials used — velocity and debris. All interactions occur in both systems and each has a pronounced effect on condenser performance. These interactions are summarized as follows:

Biofouling Interaction — Bare steel, coated, or rubber-lined waterboxes and piping provide a benign habitat where marine organisms attach, grow, and multiply within the system itself. Attachment occurs primarily at flow rates below three feet per second. This happens when the ship is in port and the circulating-water system is shut down. Once attached, and attachment occurs in a matter of hours, the organisms remain attached and grow at the normal operating flow rates. Ultimately the marine organisms die and are swept into the condenser—plugging tubes, reducing flow, and increasing tube failure rates. Ships operating in different trade routes develop these internal colonies of marine organisms at different rates, depending upon the number of calls they make to ports with relatively clean water in temperate and tropical areas where the incidence of these organisms is greatest.

Two countermeasures have been used or advocated—physical reaming out of pipe and waterboxes, and chlorine injection. Chlorine injection units are produced and promoted for shipboard use, especially in Japan where a high percentage of ships are still fitted with steel circulating-water system piping. While there is no cost data available to the authors on these shipboard units, Dow Chemical Company has estimated a capital cost of $25,000 for a chlorination system in a coastal plant suitable for treating 14,000 gallons per minute of seawater in a 36-inch-diameter intake pipe. Chlorine costs (at six cents per pound) are reported as $8,700 per year. Manhours per year are estimated as 250. It is reasonable to expect shipboard chlorination costs would be comparable.

The proponents of shipboard chlorination clearly recognize that biofouling control within the piping system is necessary to improve condenser performance. What is not so clearly recognized is that effective biofouling control can be achieved by the use of 90-10 copper-nickel piping and waterboxes and that the use of 90-10 copper-nickel for the pipe and waterbox results in much improved condenser-tube performance. Just how much condenser performance can be improved by the use of fouling resistant 90-10 copper-nickel piping is easily appreciated when naval experience is evaluated. The 0.27 percent 20-year condenser tube plugging rate reported can be credited in considerable measure to the use of fouling-resistant 90-10 copper-nickel piping on these and all naval vessels. The authors believe that similar condenser-tube performance can be achieved by any shipowner with a properly constructed, reasonably well operated system fitted with fouling-resistant 90-10 copper-nickel pipe and other high reliability system components.

Galvanic Interaction — Seawater is a low resistance electrolyte and intensifies the galvanic interaction between nearby components of different composition. In seawater circulating systems the galvanic interactions of primary concern are those between valve bodies and the piping, between valve trim and the valve bodies, between the waterbox and tube sheet, and between the tubes and tube sheet. Adverse galvanic effects can be costly when the owner or shipbuilder fails to consider fully the relative potential and the relative area ratios as they influence galvanic corrosion in evaluating alternative materials for use in the various components of seawater piping systems.

Corrosion Product Interactions —The voluminous corrosion products generated when steel or cast-iron pipe corrode are sufficient in themselves to plug condenser tubes and increase tube failure rates. However, the ferrous ion released in the corrosion process has a beneficial effect on both the formation and the stability of the protective corrosion-product film on which aluminum-brass tubing depends for its performance. So pronounced is the effect of ferrous ion that one of the leading authorities on con-

(continued on page 19)

*Mr. **Tuthill** and Mr. **Fielding** of the International Nickel Company presented the paper condensed here before a recent meeting of the Eastern Branch, U.S.A., of The Institute of Marine Engineers. The full paper contains many tables on corrosion rates and costs.

Evaluate Your Shipboard Piping Systems—

(continued from page 14)

denser tubes strongly recommends the injection of ferrous sulphate whenever aluminum-brass tubes are used. The effect of ferrous ions on other copper alloys has not been clearly established.

Ferrous-ion content, generally has little effect on the long-term performance of copper-nickel tubing (which contains intentional additions of iron in the alloy). There is, however, considerable use of ferrous-sulphate injection with copper-nickel tubes during the initial outfitting period especially in heavily polluted outfitting harbor areas. The use of ferrous sulphate does seem to assist the inital formation of the protective film on copper nickel in these adverse conditions.

Debris — Much condenser maintenance is directly or indirectly related to the amount and nature of the debris, such as crab claw, sea shell, or organic coating particles that the flow brings to the several thousand small passages formed by the tubes. Finely divided debris will be swept through the tube and do little harm. In order to permit more debris to pass, many designers increase the tube diameter, sacrificing the slight advantage in heat transfer gained with small tubes. The 7/8-inch and even one-inch diameter tubes, as compared to the older 3/4-inch, are increasingly advocated and used to reduce clogging of condenser tubes.

Debris that will not pass through the tubes often lodges and partially plugs the tubes. Flow is reduced in the plugged tubes until the debris is physically removed, usually when the ship is in port and the condenser can be opened and cleaned. If the debris is not removed periodically, the affected condenser tubes in time often show signs of localized pitting beneath encrusted debris or just downstream of particles that lodge in the tube.

To reduce debris problems, designers start with proper bar grates and screens in the sea chest and the use of copper-nickel pipe and waterboxes that resist growth of marine fouling. It seems a bit ridiculous to use the main condenser as the primary screen to filter debris from the seawater, as all too many ships do. However, it has been our observation over the years that over 50 percent, perhaps as much as 75 percent, of all marine condenser-tube failures are directly attributable to debris that lodged in and was not removed from the condenser tubes.

Velocity-Condenser — Much attention has been devoted to the proper water velocity through condenser tubes. Trade-off studies between the increase in the cost of pumping and the increase in effective heat transfer as the velocity increases indicate rapidly diminishing advantages for velocities above 7-8 feet per second (fps). Many condensers are designed to take advantage of the higher heat transfer possible at velocities above 8 fps for emergency full-speed operation.

Less attention has been paid to the effects of operation at lower velocities. The settling rate for debris places a lower limit of about 3 fps for the minimum desirable flow rate in any tube. In practice, this usually means designing for a minimum flow rate of 5 fps for the coldest water condition and 7.5 fps for the warmer water condition with a provision for flow rates up to 9 to 10 fps under emergency conditions.

Velocity-Piping — Less attention has been paid to the economic design velocity for piping. Circulating seawater piping has been designed for various velocities from 5 to 12 fps with the higher velocity limits being rather widely used for nonferrous piping in European-built vessels. For scoop injection, the pipe diameter must be large enough and the pressure drop through the piping system must be low enough to insure adequate flow to the condenser.

For pump installations, the pump capacity and head are normally such that the pipe diameter is determined by the limiting velocity for the piping material rather than pressure drop. The friction factor which determines pressure drop varies more widely than often recognized for nonferrous and steel piping in the several conditions commonly encountered aboard ship.

The pressure drop in steel piping systems will increase significantly as the surface of the steel pipe is roughened by corrosion and by the growth of biofouling organisms. Since the 0.2 to 0.3 mils of zinc on galvanized pipe only will protect the steel for a few months, it is likely that the increase in pressure drop and reduction in flow to the condenser will be noted by the owner after termination of the normal guarantee period rather than during the first year of operation.

In the chemical processing industries it is common practice to design piping systems to the economic pipe size. Since pipe cost increases and pumping cost (pressure drop) decreases as pipe diameter increases, there is a diameter (and flow rate) for which the annualized pipe cost plus the pumping cost is at a minimum.

For quite a range of fluids, including water, and for a number of piping materials, the economic flow rate usually falls between 5 and 8 fps. For shipboard piping, the assumptions in regard to the friction factor for galvanized steel and the effect of velocity on the corrosion resistance of steel and copper alloys will determine the economic and practical pipe diameter.

Shipbuilders' Material Costs

Galvanized Schedule 80 carbon steel is generally accepted as the low first-cost piping material and is used as the reference for economic trade-off studies. A 4-inch copper-nickel pipe is 5.3 times the cost of galvanized steel, but at 24-inches it is only twice as expensive. Fittings follow the same trend, and at 24 inches the copper-nickel tee actually costs less than the steel tee. If, as required in one specification, Schedule 160 steel pipe is used for the ballast system, copper nickel is found to be only 1.2 times the cost of galvanized steel.

It is concluded that as pipe diameter increases the premium for 90-10 copper nickel decreases significantly until at 24 inches it is 2.1 times the cost of steel when compared size for size.

The total head loss for new, corroded and biofouled steel pipe has been calculated for a flow rate of 6 fps for several diameters. This study shows that a 6-inch diameter 90-10 copper-nickel pipe will carry the same flow, at the same pressure drop, as an 8-inch diameter steel pipe with biofouling growth. The velocity required in the copper-nickel pipe is 8.45 fps which is above the 8 fps maximum for 6-inch diameter. The marine engineer would select 7-inch diameter copper-nickel pipe as equivalent to 8-inch diameter steel and within the suggested velocity limit for 90-10 copper nickel.

Installed Cost

The largest portion of the actual installed cost of the piping system is not the material but the labor to fabricate and install the piping. Since even the full installed cost of the piping is usually less than two to three percent of the vessel cost in any material, shipyards can seldom afford to analyze this portion of their total construction costs in detail.

The labor to fabricate piping is rather directly related to the manhours required for welding. Welding time also is related rather directly to the number of passes required to produce a satisfactory butt weld. It is evident that after making full allowance for the slower rates that may be required to weld copper alloy as compared to steel, the manhours to fabricate thin-wall 90-10 copper-nickel pipe will not exceed and may be significantly less than the manhours required to fabricate Schedule 80 steel pipe. This is due to the much heavier wall of steel pipe that must be welded.

A third conclusion on comparative economics is that manhours to fabricate copper-nickel pipe are significantly reduced by the lighter wall and may well be less than the manhours required to fabricate Schedule 80 carbon steel. Also, the manhours saving tends to increase with pipe diameter.

The other principal component of shipyard labor is the manhours required to install aboard ship. Installation labor is related to handling costs which in turn are related to weight.

The actual labor and material installed cost of copper-nickel piping is certainly less than widely assumed and may in reality be but little more than the installed cost of Schedule 80 steel piping, especially in the larger diameters when compared on a functionally equivalent diameter basis.

The actual premium, if any, the shipowner pays for the high reliability copper-nickel piping is included in the contract price for the vessel if copper-nickel piping is specified in the invitation to bid or if copper-nickel piping is included in the shipyard's "standard vessel construction schedule" as is the case for some of the leading shipyards.

A true life-cycle total-cost analysis for the high reliability systems requires realistic figures not only for the "difficulty to identify" premium the shipowner pays but also realistic estimates for each item of annual savings. The authors developed a model for life-cycle cost analysis based on data from a special study of piping-system costs on a 90,000-dwt tanker.

The results show that for main circulating seawater-cooling systems Schedule 80 galvanized steel is competitive in annualized cost with 90-10 copper nickel only if the owner assumes that the steel piping will require replacement but once in 25 years and assumes further that there will be no degradation in performance of the steel system that would delay ship operations. If steel piping must be replaced twice within 25 years, as published data from actual experience indicates, the owner is found to be paying a 40 percent premium in annualized cost for the privilege of operating with a "low first-cost steel piping system" assuming no delay in ship operation. If the steel piping system leads to as much as a day per year delay in sailing, the premium the owner is paying for steel increases to 120 percent.

In the case of ballast piping assuming only one replacement for steel is required, and assuming that labor for replacement will not exceed three times the cost of labor for the original installation, the premium the owner pays in annualized cost for steel is 10 percent. Copper nickel appears far more competitive with steel for ballast piping than has been yet widely recognized.

The authors conclude that the marine industry might find it profitable to re-examine some of its traditional assumptions about piping systems, their performance and costs. High reliability systems can be obtained if the technical factors influencing performance are understood and followed in design and construction.

United States Lines Enters Oil Trade

The United States Lines award of a $38.4-million contract for construction of a San Clemente-Class tanker to Todd Shipyards Corporation marks the first venture into the oil trade for the company, long established as a containership and cargoship operator.

The announcement was made by **Edward J. Heine Jr.**, president of the company, who said that delivery of the 89,700-ton vessel was scheduled for November of 1979.

Mr. **Heine** said the company's primary interest is the Alaska trade—transporting oil from Alaska to the West and East Coasts. He added that ultimately, the company might develop a tanker fleet.

The 100-year-old company already has 37 vessels in service—16 containerships which maintain a 15,000-mile trade route, a "Sea Bridge" service between Europe, the United States and the Far East, 14 cargoships under charter to the U.S. Government, and seven "feeder" vessels carrying cargoes to ports which are not on the primary trade route.

The envisioned tanker, which will be 894 feet long and will do 16.5 knots, is referred to as a Pan Max vessel, the largest ship that is able to pass through the Panama Canal.

"This is a logical progression in the growth of our company and its services," Mr. **Heine** said. "We know there will be a strong market in the future for vessels of this type that will satisfy the energy needs of the United States."

Nicholas Bachko, senior vice president of United States Lines, added that the company has also completed feasibility studies on the conversion of some of its break-bulk cargoships to tankers. "There is a definite possibility that we may undertake this project at some future date," he said.

United States Lines has port and terminal installations on both the East and West Coasts, but the addition of a tanker to the fleet will require little or no additional investment in shoreside facilities.

"We have the operations expertise to handle this trade even though it is new to us. The oil companies we will be dealing with all have the necessary off-loading equipment and storage facilities. All we will have to do is to get the cargoes to their door," Mr. **Bachko** said.

The San Clemente-Class tankers have a capacity of 568,000 barrels.

Lakers To Be Built To Transport Coal From New Wisconsin Facility

A $100-million agreement among three major industrial corporations will result in the largest transshipment facility for Western coal in the United States at Superior, Wis.

The terminal, which will cost an estimated $25 million, will be located on a 225-acre tract adjacent to the St. Louis River, which flows into Minnesota from Lake Superior. Reportedly, it will feature the most sophisticated water and dust pollution control techniques and the largest shiploader of any coal-handling terminal currently in existence. Groundbreaking is scheduled in late September of this year if all contract negotiations and natural resource reporting work is completed on schedule. In addition, the Michigan Public Service Commission must approve the venture.

The three participants of the multi-company agreement are Orba Corporation, West Caldwell, N.J.; Detroit Edison Company, Detroit, Mich., and C. Reiss Coal Company, Sheboygan, Wis. Orba will handle design and construction of the facility. The prime customer for the coal will be Detroit Edison, who will use the fuel in power generating plants at St. Clair Shores, Mich. When completed in 1976, the terminal will be operated by the Ortran Corporation —a company established by Orba and C. Reiss Coal.

At least one Great Lakes self-unloading bulk carrier, 778 feet in length with a capacity of 43,000 tons, is already under contract for the terminal operation. Letters of intent have also been signed for the construction of two other vessels in the "super carrier class"—each 1,000 feet in length with a 58,000-ton capacity—to handle the coal trade between Superior and St. Clair Shores.

North American Ports To Spend $1.4 Billion To Improve Facilities

The Maritime Administration has released a survey which shows that North American ports will spend a total of $1.4 billion for new and improved facilities through 1977.

The report, North American Port Development Expenditure Survey, points out that since 1946, capital expenditures exceeding $3.8 billion have been made by ports located in the United States, Canada and Puerto Rico.

The report by the Maritime Administration was based on answers by 127 ports to a questionnaire sent to a total of 152. MarAd said in the report, it assumes those who did not answer made no capital expenditures since 1965, the year ports were last surveyed by the American Association of Port Authorities.

Copies of the survey are being sent to port officials as an aid to future planning.

According to the report, ports in the continental U.S. will spend $1,-484,450,440 between 1973 and 1977. Projected expenditures by Alaska, Hawaii and Puerto Rico are $35,-504,000. During this five-year period, Canada plans improvements totaling $220,504,000.

Since the data was gathered by port jurisdictions on the local levels, not all private investments in port development is included.

"Therefore, the dollar totals compiled in this survey include both public and private, but the amount of private monies is considerably less than actual, while the public port figures should be considered quite definitive for the latest survey period," the report said.

Gladders/Ohio River Order St. Louis Ship's 'FAST' Sewage System

St. Louis Ship has announced that its FAST No Discharge Sewage System has been ordered by Gladders Towing Company, and by The Ohio River Company for installation aboard vessels currently under construction.

FAST enables operators to comply with regulations which prohibit the discharge of sewage from vessels. The system removes the impurities from sewage, and reuses the purified water for flushing the toilets. The water is clear and odorless. The impurities are retained in the unit in the form of sludge, and the system is pumped out at three-month intervals.

The system is simple and reliable. There are no process adjustments, no moving parts inside the tank to clog or jam, and no special chemicals or fuel are required. Also, FAST operates with conventional toilet fixtures and piping systems.

The system has been in regular service aboard river towboats for several years. The first marine unit was installed aboard Federal Barge Lines' M/V Missouri in 1970.

Subsequent units have been installed aboard Federal's M/V Tom Talbert and M/V Herman Pott, Sioux City and New Orleans Barge Lines' M/V Robert Crown, and American River Transportation Company's M/V Sally Archer. At present, a total of 29 FAST units are installed or on order.

FAST is the result of years of research and development, a joint effort of two industry leaders. St. Louis Ship Division of Pott industries Inc. is one of America's largest inland shipbuilding and repair firms, and Ecodyne Corporation, Smith & Loveless Division, is one of the world's largest manufacturers of factory-built waste water treatment plants and lift stations. Both parties recognized the need for practical means of meeting the no discharge requirements then imposed on vessels by certain states, and subsequently by the U.S. Environmental Protection Agency.

Smith & Loveless furnished their sanitary engineering expertise and the FAST process (FAST is a trademark of Ecodyne Corporation). St. Louis Ship provided the engineering and experience needed to meet the special requirements of the marine industry.

FAST can handle wide variations in loading, including short-term overloads and intermittent disuse. As a result, it will effectively treat the sewage from small as well as large crews, and it is unusual in its ability to do so. Standard units are available for crews of from 5 to 50 persons.

Supership Maintenance Seen As Missing Link In Profit Projections

Traditional systems of vessel maintenance and repair have proved to be inadequate in today's age of jumbo-sized ships, a leading British shipping expert stated recently in New York.

John W. Common, chairman of the board of Sir Joseph W. Isherwood & Co., Ltd., Newcastle upon Tyne, told a luncheon press conference at the Whitehall Club: "What with vessel costs in the neighborhood of $25,000 per day and a worldwide shortage of yard facilities, a badly timed VLCC (very large crude carrier) breakdown can easily mean a quarter-million dollar loss, which in turn can upset profit projections in the worst possible way."

To provide "financial preventive medicine" against this kind of expensive disaster, Mr. **Common,** who is also president of the North-East Coast Institution of Engineers and Shipbuilders, announced the development of a special Isherwood marine service "designed to improve profitability of ships by systematic control of maintenance, repairs, and spare gear." The service is titled A-MAR-Z, Mr. **Common** said, "signifying its A to Z comprehensive nature," and is being represented in the United States by Common Brothers U.S.A. Ltd., 61 Broadway, New York, N.Y.

A-MAR-Z, according to Mr. **Common,** has four main objectives: (1) to provide comprehensive planned maintenance and spares control systems; (2) to provide a working service to monitor the total repair and maintenance functions; (3) to offer a full range of support services to maximize savings, and (4) to ensure that vessel owners obtain maximum benefits from modern management methods.

"This is decidedly an idea whose time has come," Mr. **Common** said. In noting that the A-MAR-Z system is applicable to the new generation of cargo-carrying ships as well as supertankers, Mr. **Common** mentioned that the system is presently operational or in the installation or planning stage for 28 vessels ranging in type from cellular containerships, product tankers, VLCCs, offshore supply and service vessels and bulk carriers. Total value of the vessels being equipped with A-MAR-Z is approximately $250 million and includes such companies as Conoco, Blandford Shipping, Trinidad Corporation, Federal Commerce and Navigation, Sea Containers and Common Brothers.

"Nonetheless, maintenance and repair programs often remain the missing links when new multi-million dollar, jumbo-scale marine ventures are projected." Recent corporate austerity programs resulting in staff reductions, plus the shortage of experienced management and the higher frequency of crew turnover are contributors to the lack of continuity and breakdown of the maintenance and repair function when the fact is that unexpected costs in these functional areas can severely disrupt the cash flow forecasts.

Mr. **Common** said that Common Brothers U.S.A. would provide full technical staff backing to the A-MAR-Z system, including design and installation, a working bureau service to administer and monitor the system, and the capability to recommend and provide specialist work squads when they prove to be necessary. In addition, he said, Common Brothers U.S.A. would represent and market the full line of other Isherwood services, which include ship design, plan approval, supervision of construction, drydocking management, vessel surveys and preparation of tenders for newbuildings.

Stuart S. Danoff, who has had a wide and varied career in the maritime industry, is president of Common Brothers U.S.A. Limited.

F.J. Franco Joins Furness Withy

T.J. Cassidy, president of Furness Withy Agencies (USA), New York, N.Y., has announced the appointment of **F.J. Franco** as vice president, finance.

A graduate of St. John's University, Mr. **Franco** joins Furness, having been associated with Haskins and Sells and most recently, with Norton, Lilly as vice president, finance.

P. Deslauriers Joins ARCTEC, Incorporated

Paul Deslauriers

Jack W. Lewis, president of ARCTEC, Incorporated, announced that **Paul Deslauriers** has joined the firm as electrical and environmental engineer. Mr. **Deslauriers's** initial assignments have been related to the conduct of ice model tests in ARCTEC's ice model basin and environmental studies in ice-covered waters.

Mr. **Deslauriers** is a graduate of the University of Rhode Island, where he worked as a research assistant in marine zoology and chemical and physical oceanography. His studies included ecology of coastal areas, behavioral patterns of marine animals, effects of oil pollution on the marine environment, deepsea currents, study of air/sea interface, and the design and construction of special equipment used in these studies.

ARCTEC, Incorporated, 9104 Red Branch Road, Columbia, Md. 21045, provides consulting engineering services in the field of cold regions marine technology, ice technology and naval architecture. Their ice model testing laboratory is the only commercial facility in the country in which models of marine vehicles, offshore structures, port facilities and pollution control devices may be tested in properly scaled ice environment.

SS U.S./Ship Of State Floating American Expo Ready For April 1976

SS U.S./Ship of State, a reactivation of the SS United States into a world-cruising trade fair and American exposition, will be ready for launching by April 1976, it has been announced by **Geoffrey Leeds,** head of the private sector consortium which plans to acquire and convert the retired ocean liner. It will not only promote American industry in markets around the world, but will also fulfill the stated themes of the American Bicentennial Commission—Heritage, Horizons, Festivals.

The principal clients among exhibitors on the vessel will be major American corporations, associations and institutions, who will lease space on the ship for exhibits that will tell their story and also have a cultural and historical thrust. The project is a private profit-making continuing enterprise, but will actually get under way in the atmosphere of the nation's 200 Anniversary.

The planning team under Mr. **Leeds's** direction is thus far comprised of the following:

Vincent Ponte of the firm of Cossutta and Ponte. Mr. **Ponte** is North America's leading city planner, well-known as a specialist in multilevel city centers and particularly pedestrian circulation in such cities as Montreal, Dallas, Columbus, Paris, France and Melbourne, Australia. In Washington, D.C., the firm was responsible for planning L'enfant Plaza.

Bruno J. Augenti, chairman of the board of the Marine Index Bureau, Inc. He is also a consultant to Ocean Systems Grumman Aerospace Corporation, and representative of the U.S. Department of State as advisor to the United States Delegation Inter-Governmental Maritime Consultative Organization since 1970.

Thomas J. Deegan Jr., chairman of T.J.D. Management Services Corporation and a founder and chairman of the New York World's Fair 1964-65 Corporation, will direct the marketing and merchandising of the entire project, with a budget for services of $1 million over a four-year period.

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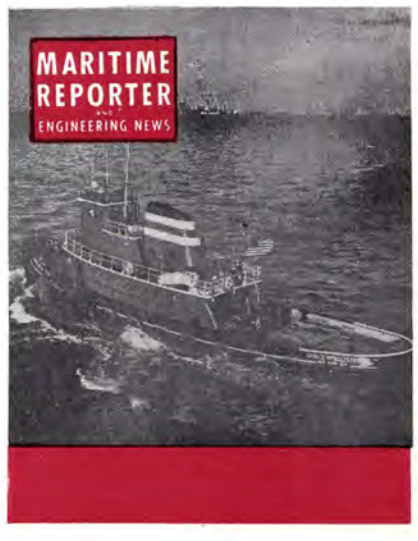

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Water-Jet Propulsion Gaining Wide Acceptance

Accurate Guidelines Are Established To Specify The Jet-Engine Combination

Jack Seastrom*

While water-jet propulsion has been on the market since the early 1950s, it was not until 1970 that a general market acceptance was really felt. Up to then, four major companies, Buehler (a Hamilton licensee), Berkeley Pump Company, Hamilton in New Zealand, and Jacuzzi Brothers were the primary suppliers of water-jet propulsion units.

By 1970, Jacuzzi Brothers and Berkeley Pump Company were commanding the lion's share of the U.S. domestic pleasure-boat market with sales accounting for over 90 percent of all units sold. This was due to three major developments.

First, both companies had refined their units in terms of installation space required and reliable control systems. There was available a competitively priced, high-horsepower automotive V8, the Oldsmobile 455-cubic-inch high-compression engine.

During this same period, Jacuzzi Brothers also was developing a new unit, the 12YJ, for use with engines in the 125-300 shp range. This unit was a low-pressure, high-mass-flow, mixed-flow design optimized for best performance in the 40-60 mph range. It also incorporated such design advances as a trimmable steering deflector for thrust-line adjustment and more responsive steering with the use of an integral rudder.

According to the Joint Boating Industry Association: National Association of Boating and Engine Manufacturer's monthly report in 1973 a total of just over 95,000 inboard-outboard units were sold. The jet-drive industry's share of this market was over 15 percent, or 16,000 plus units.

The workboat market has been paralleling the pleasure-boat market in growth rate.

Only two companies are significant in this latter market. Hamilton is quite strong in New Zealand and several foreign countries, while Jacuzzi Brothers commands the U.S. workboat and military market, is predominant in Canada, and has other market outlets throughout the world.

The Hamilton units are axial flow in design, with a good range of application suitability, especially with the lower-horsepower diesels and gasoline engines. Units manufactured by Jacuzzi Brothers include the 14YJ designed for use with the 6V53 Detroit diesel, 3160 Caterpillar, and other related-rpm engines; the 20YJ for use with 8V73 and 12V73 Detroit diesels and related-rpm engines; and the 36YJ for larger, low-rpm applications up to 3,500 shp at 1,100 rpm.

All these industrial-duty jet drives are intended for long-life reliability and can be fitted into the same engine spaces normally provided for direct shaft-line propeller installation.

Effect of Thrust Line

Visualize a 26-foot planing boat that swings an 18-inch-diameter propeller. The thrust line is below the bottom and produces a distinct lever arm at the junction of transom and bottom. This lever arm produces two separate actions in that it has a kick-up effect at the transom, which tends to help lift the boat on plane, and it is always working to lift the bow, which keeps the boat lighter on the water and gives reduced wetted area.

Conversely, the jet thrust line is some six inches above the junction of the transom and bottom and has a tendency to push the bow down. This increases wetted area (drag) and results in measurable reduction in speed. Hump or planing speed is also raised by one mph or so, due to the lack of lift under the transom. There is considerable evidence to indicate that hard acceleration actually creates a hole at low speeds.

Power Selection

When the designer or boat builder considers jet propulsion for a given design, there are two methods of determining what the probable performance range of the craft will be. Once the top speed and normal operating speed for a craft have been determined, and a relatively accurate gross operating weight established, one can consult with the naval architect and determine a relatively accurate performance range by use of hull resistance curves, model tests, and use of the jet manufacturer's thrust curves.

Unfortunately, the majority of pleasure-boat builders and many commercial-boat builders do not have accurate resistance curves, model tests, etc. In this case, most jet-drive manufacturers have been forced to develop potential performance predictions based upon past experience and trials of actual boats.

A typical performance prediction curve is relatively simple, since most boat builders have reasonably accurate weights for their craft, and the engine horsepower available can be determined from the engine manufacturer's data sheets. The boat builder simply divides the available engine power into the gross displacement of the boat. This gives him a pound-per-horsepower ratio which can then be compared to the jet manufacturer's curve.

Suitable Hull Types

Discussion of the various hull types best suited for use with jets will be limited to planing types only, since all the major jet manufacturers offer only jets optimized for operation in the higher-speed boats. Examples of these units are the Berkeley 12-inch and the Jacuzzi 12WJ units. These units perform best in the lighter, higher-speed boats with less than 4,000-pound displacement. When used with 300-plus horsepower engines, they are capable of speeds in the 50-70 mph range and are most efficient at these speeds. The Jacuzzi 12YJ unit is designed for efficient operation in the 30-60 mph speed range, and can be used with engines from 140-325 shp. Larger industrial units such as the Jacuzzi 14YJ and 20YJ have design operating speeds from 25 to 45 mph.

Three basic hull designs used most effectively with jets are the cathedral, deep vee (constant deadrise), and prismatic vee. In every case, the use of hard chines or strakes helps reduce the wetted area, lowers the hump speed required, and improves overall operation.

Air ingestion to the jet is a prime source of poor performance and must be avoided by the elimination of deep keel protrusions, etc., that extend forward of the stagnation line and serve as channels for the air.

Because of the elimination of underwater gear such as struts, shafts, shaft logs, and rudders, directional stability of jet-driven hulls is more critical. This is especially true of boats with prismatic vee sections and fairly low deadrise angles. Addition of subkeels or chine strakes that do not interfere with water flow to the jet will usually give this type of hull suitable directional stability.

A major problem in the past, and still present to a degree in workboats and the older pleasure-boat designs, was a tendency to bow steer. Generally, these boats had little or no constant deadrise in the aft planing surfaces and very sharp vee sections in the stem area. Loss of lift from the propeller and the downward movement supplied by the jet caused these boats to run quite flat, causing the bow section to contact water and exert steering forces which were not counteracted by the directional stability of underwater appendages. Builders have been successful in using these designs with jets either by adding more constant vee planing section to give amidships lift or by using skegs or a combination of both.

Newer craft being designed primarily for jets usually incorporate several features, some of which are long constant vee planing sections, hard chines with strakes or reverses at the chine, deadrise angles from 10-24 degrees, and relocation of fuel, machinery, etc., to give a longitudinal center of gravity further aft than normal for propeller boats.

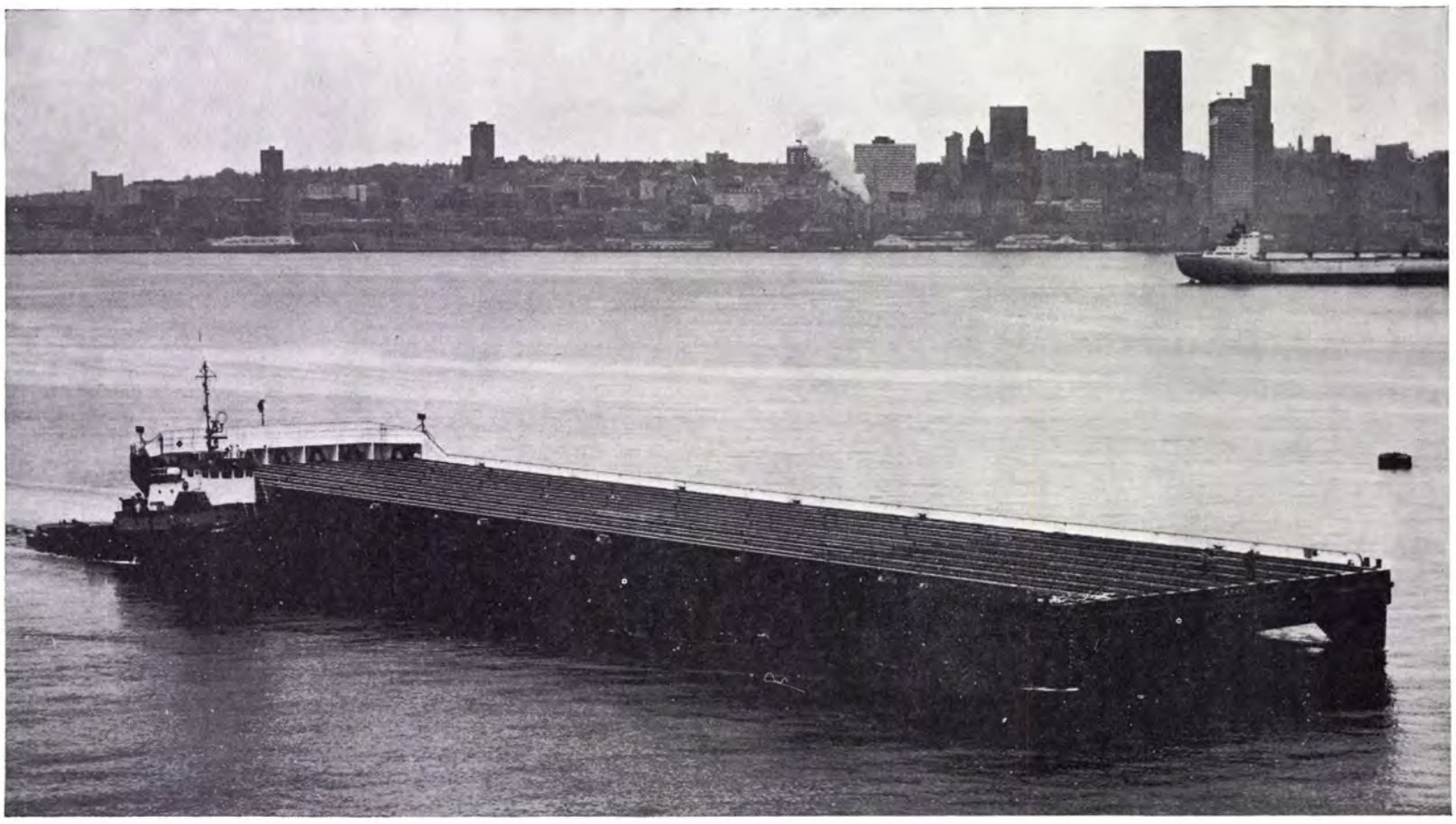
Summary

There is ample evidence that marine jet propulsion has gained wide acceptance both in the pleasure and workboat market. As this acceptance has been felt on the market, both engine manufacturers and boat builders have learned the advantages of proper engine to jet match and have, through trial and error or a new design, built jet-propelled boats that eliminate practically all the old complaints regarding handling, poor performance, or lack of performance range.

Accurate charts or guidelines have been established to enable first users of jets to specify properly the jet-engine combination best for their particular craft and give their customers accurate performance predictions.

Several years and many millions of hours of usage in all sizes of boats, including over 500 U.S. Navy P.B.R.'s, a large fleet of 46-foot crew boats in Maracaibo, and other craft throughout the world have proved jet propulsion can compete with propellers, reduce downtime and save overall cost of craft operation.

* Mr. **Seastrom,** service manager, Jacuzzi Bros. Inc., presented the paper abstracted here before the recent 26th Annual Spring Meeting of the Gulf Section of The Society of Naval Architects and Marine Engineers.



Bethlehem-Built barges to help supply Alaska's North Slope

Our San Francisco Yard builds barges right along with its ship repair work. By this fall, it will have delivered the eighth of a series of 16 ordered by Crowley Maritime Corporation for its major operating subsidiary, Puget Sound Tug and Barge Company, Seattle, Washington. Some of these barges will be outfitted by the yard to carry rail cars; the others will carry miscellaneous deck cargo. All will bolster Crowley Maritime's capability to transport material between the American mainland and the Alaskan oil fields.

Each barge measures 400 ft by 99 ft, 6 in., by 20-ft deep, and requires the fabrication of more than 2,800 tons of steel. It is built to three-quarter width on the yard's building ways, then launched and floated to the yard's large drydock where side shell assemblies are installed and the completed barge is outfitted and painted. The yard has put on additional workers to expedite the project, which is scheduled for completion in mid-1975.

The Crowley Maritime barge project requires stiffeners by the hundreds.

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Bethlehem Shipyards:
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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.

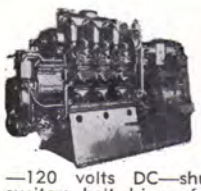
3

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

415 KW 250 VOLT DC GM 6-278 DIESEL GENERATOR SETS



ENGINE: GM Model 6-278—6-cylinder—8½ x 10½—2-cycle—800 RPM—complete with heat exchanger. GENERATOR: Allis-Chalmers—415 KW—250 volts DC—800 RPM—1660 amps—shunt wound. Top mounted exciter—800/1600 RPM—208 amps—type EB5-123. Pilot exciter 2½KW—120 volts DC—shunt wound—20.8 amps. Both exciters belt-driven from main generator shaft.

5

ELECTRIC PROPULSION MOTOR

1 Available. 515 HP—230 volts DC—shunt wound—1040/1400 RPM—1660 amps—120 volts DC exciter.

6

ALSO SUITABLE FOR COMPANIES OPERATING AN NET TENDERS

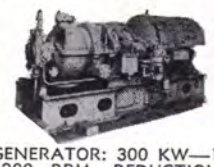
TURBO GENERATOR SETS

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



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.

9

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.

10

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.

11

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.

12

TWO 538 KW WESTINGHOUSE T-2 AUX. GENERATORS (COMPLETE)

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

13

BETH. CLASS—13,600 H.P.

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

14

H.P. & L.P. COUPLINGS

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

T-2 TURBINES & ROTORS

15

UNUSED GENERAL ELECTRIC 750 KW TURBINE ROTORS

2 Available

General Electric Instruction Book 16846 for type FN3-FN24—seven stage 10033 RPM. TURBINE: 525 lbs. per sq. inch—825°TT. Originally built for CL68-122-CUL 48 class cruisers and now used on many merchant, tankers and cargo ships. G.E. drawing No. 6665729AA-1—FSN2825-373-0489.

16

1250 KW WESTINGHOUSE 8050 RPM

2 Available

One Curtis Stage and 8 Rateau Stages—mfg drawing 25T-556—BuShip Plan No. BB61-561-061. Rebuilt and rebladed by Westinghouse. Factory boxed. LIKE NEW.

17

T2-SE-A1 MAIN PROPULSION ROTOR—G.E.

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

18

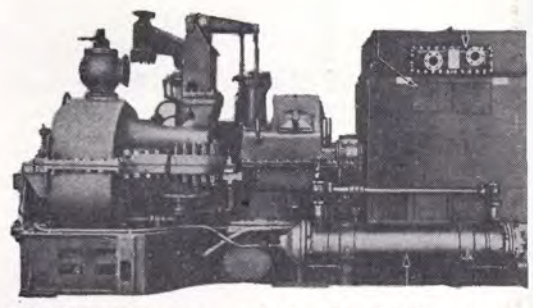
T-2 TANKER UNUSED—4 UNITS AVAILABLE

AUX. G.E. TURBO GEN. ROTORS

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

19

TURBO GEN



TURBINE: 11 Stage type FN4— 8145 RPM—3½" absolute back pressure—complete steam with seal regu

GEAR: Type S-195A—reduction 8145 RPM to 1200

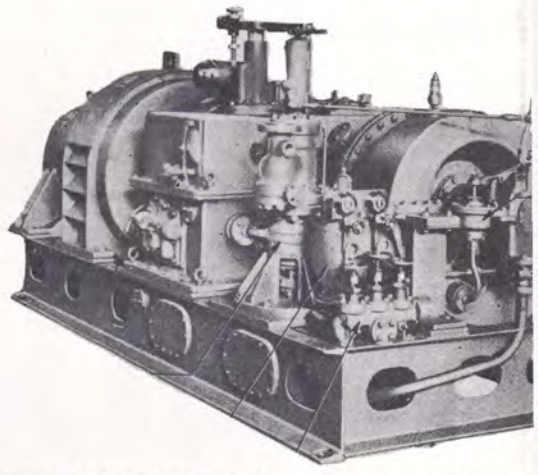
GENERATOR: 1500 KW —450 volts—2405 amps—enclosed. Insulation: Class B stator and rotor. Tempe thermometer. Mfg type AT1—form HL. Oil lubricate sump in turbo generator set base. Generator coolir —120 volts —110 amps—40°C rise—frame 654—

GENERAL INFORMATION: Overload rating 2 hours—weight 36,000 lbs. Guaranteed steam flows & condi flange. The set will carry 1500 KW with steam conc flange. The set will withstand 644 PSI and 850°F. at exhaust flange:

50% Load	—	750 KW	—
75% Load	—	1125 KW	—
100% Load	—	1500 KW	—

Exhaust flange size: 18" x 38" rectangular.

20



GENERATOR: 400 KW 450 volts 3-phase 1200 RPM sulation—natural self-ventilated cooling. Exciter: 5(

GEAR: Single helix—single reduction—10059/1200

TURBINE: Six stage—10059 RPM—525 PSI—825° tors. **OVERLOAD CONDITIONS AT NORMAL STEAM** overload for 2 hours at normal conditions; overload turbine generator will deliver full load output 400 k capable of withstanding 634 lbs PSIG 850°TT.

STEAM FLOWS

100% Load	—	400 KW AC
75% Load	—	300 KW AC
50% Load	—	200 KW AC

When operating at 575 PSIG & 0° Superheat and 1

125% Load	—	500 KW AC
100% Load	—	400 KW AC
75% Load	—	300 KW AC

UNIT DESIGNED FOR NAVY FOR DD692 CLASS HOUSE 8316.

Since Westinghouse and G.E. built them for the sam able.

DIMENSIONS: OAL 10' 10⅛"—OAW 4'10½"—OA

TOTAL WEIGHT: 14,855 lbs.

2" steam inlet—17" Round exhaust—20½" bolt

UNIT DIMENSIONS OAL 16' 3⅜"—OAW 6'6"—

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ERATOR SETS

4 G.E. 1500 KW AC SHIPS SERVICE SETS

G.E.I. BOOK 19320

m inlet. Normal steam conditions 525 PSI 825°TT—1 lb
r.
A.
)0 RPM—P.F. 0.8—60 cycles—3-phase—6-pole—totally
re rise normal—stator 60°C by thermometer—rotor 70°C by
/ positive displacement pump for gears and bearings from
air stream and circulating water. Amplidyne Exciter: 13.2 KW
g type 5AM654A1.

25% load; Overload rating 5 minutes—150% load. Total
is: normal 525 PSIG—825°TT and 1 PSI absolute at exhaust
ns 420 PSIG and 825°TT and 1 PSI absolute at exhaust
aranteed steam flows—525°F & 825°TT at 1 PSI absolute

C. Exciter 5.9	—	Steam Flow 8190 lbs/hr
C. Exciter 8.0	—	Steam Flow 11385 lbs/hr
C. Exciter 10	—	Steam Flow 14790 lbs/hr

400 KW WESTINGHOUSE/GE DESIGN

MFG. BY WESTINGHOUSE

).8 PF 641 amps alternating current generator—class B in-
.W—120 VDC—1200 RPM.
PM
normal. Type G.E 618N—equipped with synchronizing mo-
25 LBS/825°TT: Sets 500 KW AC and 62.5 KW DC—
apacity 50%—600 KW & 75 KW DC for five minutes. The
AC & 50 KW DC at 420 lbs and 825°TT. The turbine is

			STEAM RATE
—	50	KW DC	5100 lbs/hour
—	37½	KW DC	3999 lbs/hour
—	25	KW DC	2885 lbs/hour

o/square inch absolute back pressure at flange:

—	62½	KW DC	—	8720 lbs/hour
—	50	KW DC	—	6980 lbs/hour
—	37½	KW DC	—	5450 lbs/hour

ESTROYER—G.E. INSTRUCTION BOOK 17716—WESTING-

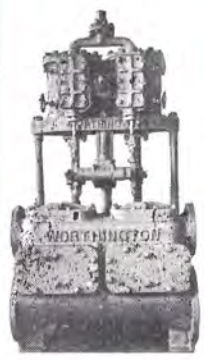
class destroyer, G.E. and Westinghouse parts are interchange-

5'5¼".

cle.
AH 7'5¼" over steam strainer.

PUMPS

21

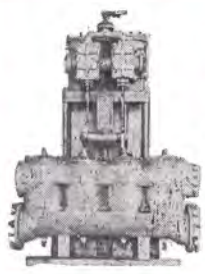


CARGO STRIPPING PUMPS

BRONZE T2 TANKER STRIPPING PUMPS

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

22



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.

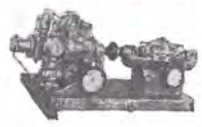
23

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.

24

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.

25

DAYTON-DAWD 2-STAGE FIRE AND BILGE PUMP

Vertical 2-stage type TDV-10—20 HP—200 GPM @ 184'—3" discharge—4" suction—1775 RPM—Maumee Sun. Motor: 120 volts DC—20 HP—1775 RPM.

26

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

27

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.

28

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.

29

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.

30

SINGLE ENGINE REDUCTION GEAR

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

31

DOUBLE INPUT SINGLE OUTPUT GEAR—7.9:1 RATIO

Final output 175 RPM. Mfg by Farrell-Birmingham —for use with two 515 HP—230 volts DC shunt wound motors—1040/1400 RPM.

32

ANCHOR WINDLASS

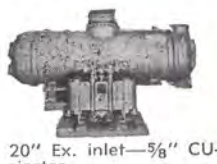
Hyde 2-11/16" — 12x14 — 100 PSI — steam — 54,100 lbs.

33

SHARPLES 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.

34



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

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

35

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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16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

31 32 33 34 35

NAME..... COMPANY.....

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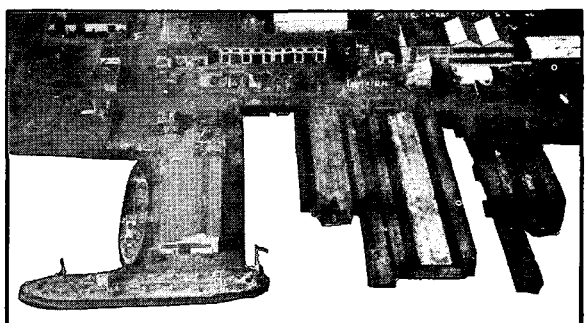
CITY..... ZONE..... STATE.....



Butterworth Systems Corporate Name Change

A.J. Kelly Jr. (left) is shown the new corporate masthead by **W. Lynn Nelson** in the office of the Croydon, England, subsidiary.

One of the oldest companies in specialized marine hardware has contemporized its corporate name to Butterworth Systems Inc. and adopted a "mermaid" design for its advertising and literature.

"Although the name change appears slight from the previous 'Butterworth System, Incorporated,' the plural 'Systems' is more indicative of the diversity in which the company finds itself today," states **A.J. Kelly Jr.**, president of Butterworth Systems Inc., Bayonne, N.J.

At a special presentation ceremony to the directors and personnel of J.G. Edmiston & Company, Ltd., Mr. **Kelly** and **W. Lynn Nelson,** managing director of the Croydon, England, subsidiary, the announcement was made of the "Edmiston" change to Butterworth Systems (UK) Ltd. In addressing the group at the Croydon plant, Mr. **Kelly** stressed the significance of the unification, especially in view of their growing international operations.

Butterworth Systems Inc. recently introduced the LAVOMATIC™ Tank Cleaning Machine, a fixed-in-place, programmable unit with an integrated power source. The company also markets an oil/water separator and SCAMP™ underwater hull-cleaning service.

Zapata Corporation Listed On London Stock Exchange

Shares of Zapata Corporation, the Texas-based multinational natural resources firm, began quotation on May 29 on The Stock Exchange of London.

Zapata said that London quotation of its shares is in response to the increased interest in the company which has been expressed by investors from the United Kingdom and from Europe.

Zapata's sponsoring banker for the London listing is N.M. Rothschild & Sons, Ltd., and the sponsoring broker is Casenove & Co. In addition to their quotation on The Stock Exchange of London, Zapata securities are also traded on the New York, Luxembourg, Pacific Coast, and Toronto stock exchanges.

Zapata was founded in 1954 as an offshore drilling company. In 1966, it began a systematic program of expansion and diversification which has yielded dramtic growth in the years since. Today, Zapata provides diversified natural resource services and products around the world. Current operations include: contract drilling and supply vessel services for offshore operators, petroleum exploration, copper and coal mining, menhaden and tuna fishing, agricultural development, and building, general and marine construction. Corporate headquarters are in Houston, Texas, with major subsidiary plants, offices or bases located in 10 states in the United States, and in 17 countries.

Although Zapata's London listing is a new development, the company has been active in the United Kingdom area for a number of years. Zapata began offshore drilling operations in the North Sea in June 1966, and presently has three rigs there, with a fourth, the brand-new semisubmersible Zapata Ugland, en route. Zapata marine service vessels, which provide tug, supply, anchor handling and engineering support capabilities for international oil companies, have been operating in the North Sea since June 1965. Zapex, as Zapata's petroleum exploration subsidiary is informally known, began operations in December 1972 with widespread interests in North Sea acreage primarily in conjunction with British partners.

BOSTON SHIPYARD INSPECTION: The Technical Advisory Group members for Boston Shipbuilding Corporation inspect the plant and equipment at the former Boston Naval Shipyard and confirm manufacturing details for the recently announced plans to convert the yard to private shipbuilding operations. Shown, left to right: Dr. **Alfred Keil,** dean of engineering, Massachusetts Institute of Technology; **Richard Myers,** vice president of Teledyne Corp., Toledo, Ohio; **Christopher J. Foster,** president of Christopher J. Foster, Inc., consulting shipyard engineers, Port Washington, N.Y., and **Lloyd Bergeson,** president, Boston Shipbuilding Corp.

Lufkin Industries Names Two New Vice Presidents

Fred D. Griffin

Ben M. Queen

Lufkin Industries, Lufkin, Texas, has named **Fred D. Griffin,** formerly chief engineer for Lufkin, vice president and director of engineering, and **Ben M. Queen,** sales manager of Lufkin's Machinery Division, has been named vice president.

After graduating from the University of Texas in 1942, with a B.S. degree in mechanical engineering, Mr. **Griffin** joined Lufkin Industries, Inc. in 1947 in the engineering department. His career progressed from junior draftsman to design engineer, project engineer in 1952, chief engineer-oilfield in 1962, chief engineer in 1968, and to his present position of vice president and director of engineering. Mr. **Griffin** is a member of the Texas Society of Professional Engineers and the National Society of Professional Engineers. In college, his honor societies included Tau Beta Pi, Pi Tau Sigma and Phi Eta Sigma.

Mr. **Queen** graduated from the University of Arkansas with a B.S. degree in geology in 1950, and began his career with Lufkin Industries in 1958 as a sales representative in Tulsa, Okla. He was then made district manager in Tulsa, where he remained until he was moved to the home office in Lufkin in 1972 as assistant sales manager. After being promoted to acting sales manager in July of 1973, Mr. **Queen** was made sales manager of the Machinery Division in September of the same year, and has now been promoted to vice president of sales, Machinery Division. He is a member of SPE of the American Institute of Mining, Metallurgical and Petroleum Engineers.

NEARING COMPLETION IN SAN DIEGO: This 165-foot-long passenger ferry is scheduled for October 1 delivery to the Golden Gate Bridge, Highway and Transportation District for service on San Francisco Bay. It will be joined by two additional vessels within the next year. The ferry is initially scheduled to provide service between Sausalito and San Francisco. Service will be extended to central Marin County with the addition of a ferry terminal in Larkspur next year. The aluminum-hulled craft, currently under construction at Campbell Industries, San Diego, will be powered by Avco Lycoming gas turbine engines, propelled by Jacuzzi water jets, and will have a 25-knot service speed.

Dart, O'Neill And Creech Appointed By Newport News —Wilson Announces Retirement

John P. Diesel, president and chief executive officer of Newport News Shipbuilding, Newport News, Va., has announced three senior management appointments in the company. They are: **Charles E. Dart** as senior vice president; **William T. O'Neill** as vice president, finance, and **Hunter Creech** as vice president.

"These moves will significantly strengthen the company in the financial and contracts area and enhance our emphasis on the importance of contract pricing," Mr. **Diesel** said.

Mr. **Diesel** also announced that shipyard senior vice president **W.F. Wilson** has elected to take early retirement.

Mr. **Diesel** said, "I want to express my warm appreciation to **Bill** for the service he has rendered me and to Newport News Shipbuilding."

Mr. **Dart** joined the shipyard in 1939 after graduating from the University of Michigan with a B.S. degree in naval architecture and marine engineering. He began his career as a designer and has held several management positions. He was named contract administrator in 1960, assistant to the executive vice president in 1964, manager of estimating in 1965 and manager of the contracts division in 1967. He was elected a vice president of the company in 1970.

Mr. **Dart** has been active on several committees and panels relating to the shipbuilding and defense industry.

In his new post, Mr. **Dart** will be directly responsible for the development of company pricing policy with regard to new ship construction and for the review of major pricing actions.

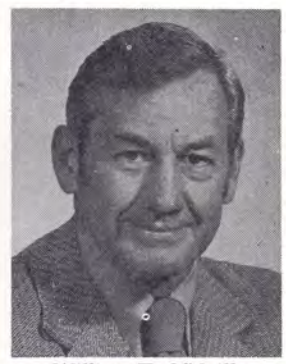
Mr. **O'Neill** joins Newport News after serving as director of financial controls for International Telephone and Telegraph Corporation since 1971. He joined ITT in 1966 as director of special projects. From 1954 to 1966, he was with Colgate Palmolive, Inc.

He is a graduate of New York University with a B.S. degree in industrial engineering, and has also studied at Columbia University.

Mr. **O'Neill** served in the Navy from 1942 to 1946, and at one time early in his career was a shipfitter.

As vice president, finance, Mr. **O'Neill** will be responsible for all shipyard financial matters.

Charles E. Dart



William T. O'Neill

Hunter Creech

W.F. Wilson

Mr. **Creech** joined the shipyard in 1964 as assistant to the general counsel. He became assistant personnel manager in 1966, and then served successively as assistant general counsel and assistant secretary before being elected secretary and general counsel in 1970.

Mr. **Creech** is a graduate of the University of Virginia, holding a B.S. degree and an LL.B degree. He served previously as an attorney for the U.S. Navy Bureau of Ships, a contract administrator of Kaman Aircraft, and an attorney for Ingalls Shipbuilding.

Mr. **Creech's** responsibilities will include contracts, estimating and legal.

Mr. **Wilson** joined the shipyard in 1969 as vice president for administration, after serving in various management assignments with Tenneco. He was director of systems for Tenneco Inc. when he joined Newport News. He was elected a senior vice president of the shipyard in 1972.

Mr. **Wilson** is a 1940 University of Texas graduate, and he has done graduate work at Texas A & M University and the University of Houston.

Caterpillar Plans To Open Another Diesel Engine Factory

Caterpillar has announced plans for the construction of a building of approximately 1,250,000 square feet for the additional manufacture of diesel engines at its Basic Engine Plant complex at Mossville, near Peoria, Ill.

The new building will equal the size of the adjacent facility, which is currently being phased into production of 3400 Series engines. Construction of the addition will begin in September, and completion is scheduled for 1977.

Restricted Draft Carriers Compared To Conventional In Report By Hydronautics

A report, "Concept Design and Cost Analysis of Restricted Draft Dry Bulk Carriers," submitted to the U.S. Army Engineer Institute for Water Resources by Hydronautics, Inc., 7210 Pindell School Road, Laurel, Md. 20810, is being distributed to a limited number of agencies and private parties and firms to whom the subject matter is considered to be of interest from a professional, program, or business point of view.

The report develops and describes design characteristics of restricted draft dry bulk carriers and compares the operating and capital costs of such carriers with carriers of conventional design.

The restricted draft concept is relevant to oceangoing carriers whose conventional design draft would exceed the permissible draft in ports and channels which they would serve. This condition exists at a number of U.S. East and Gulf Coast ports and channels through which dry bulk import and export commodities move, such as grains, coal, phosphate rock, and iron ore.

Copies of the report are available from The National Technical Information Service, Department of Commerce, Springfield, Va. 22151, for $5, identification number AD 777-884.

SNAME Los Angeles Discusses Undersea Pipeline Technology —Past Chairmen Honored

Shown aboard the SS Princess Louise during the meeting, left to right: **Charles K. Pollock,** chairman elect; **Phillip Eisenberg,** national president of SNAME; **C. N. Springett,** author; Dr. **Yoram Goren,** author, and **Frank Nickels,** chairman of the Section.

Eighty-one members and guests assembled aboard the S/S Princess Louise for the last meeting of the 1973-74 season of the Los Angeles Metropolitan Section of The Society of Naval Architects and Marine Engineers.

The feature of the evening was the presentation of a paper on "The Application of Model Testing to the Design of Stingers for Pipelaying Barges," by **Charles N. Springett** and Dr. **Yoram Goren** of Santa Fe Engineering Services. The meeting was also highlighted by a visit from **Phillip Eisenberg,** the president of the Society of Naval Architects and Marine Engineers, and by the presence of several past chairmen on hand for the annual Past Chairmen's Night activities, and by the election of officers for the 1974-75 season.

Mr. **Eisenberg** spoke to the members about recent Society activities on the national level. He discussed the recent reorganization of the Society's Technical and Research Committee and the recently inaugurated program of national meetings on Ship Technology and Research (STAR).

The subject of the paper was particularly timely in that economic forces are currently taking offshore drilling activity to unprecedented depths and distances from shore. This has led to quantam jumps in undersea pipeline technology, not the least of which is the development of high-capacity stingers for pipelaying barges. The paper describes how model testing was used to assist in the design of two advanced pipelaying barges—the Choctaw I and Choctaw II. An excellent film was shown of the Choctaw I during design, under construction, and in operation in Bass Strait.

Past chairmen of the Los Angeles Metropolitan Section in attendance included **Phil Finkelstein** (1954-55), **Lou Dingler** (1962-63), **Nat Friedland** (1967-68), **Henry Rumble** (1968-69) **Bob Rourke** (1970-71), and **Tom Wilson** (1971-72).

The officers elected for 1974-75 were **Charles Pollock,** chairman; **Harry Levy,** vice chairman; **Bob Apple,** secretary-treasurer, and **John Graham** to the executive committee.

Executive Personnel Changes At Swan Hunter Shipbuilders

In order to facilitate the making of changes in executive appointments in Swan Hunter Shipbuilders Limited—the wholly owned subsidiary of Swan Hunter Group Limited—Sir **John Hunter,** C.B.E., announced that, while remaining chairman of the Group, he has relinquished the chairmanship of Swan Hunter Shipbuilders Limited.

He is succeeded as chairman of that company by **T. McIver,** C.B.E., who was deputy chairman, and in addition the following executive appointments have been made: **J.E. Steele,** formerly purchasing director, becomes deputy chairman; Dr. **P.A. Milne,** former joint deputy managing director, becomes managing director, and Dr. **F. Taylor,** development director, takes on, in addition, the duties of technical director.

Bethlehem Names Hamilton Gen. Supt. San Francisco Yard

The appointment of **William Hamilton** as general superintendent at Bethlehem Steel Corporation's San Francisco shipyard was announced by **Patrick G. Filip,** general manager of the shipyard.

Prior to this promotion, Mr. **Hamilton** had been superintendent of ship repair at the yard. In his new position, he will be responsible for all of the yard's ship repair and barge construction work.

A native of Belfast, Ireland, Mr. **Hamilton** holds a bachelor's degree in naval architecture from Queens University there. He also holds a degree in naval architecture from Belfast College of Technology.

In 1949, he settled in Montreal, Canada, and for the next eight years held various management positions in ship design, new construction and conversion work for Canadian Vickers, Ltd.

Mr. **Hamilton** joined the San Francisco shipyard in 1957 and spent his first six months in the yard's design office. He was then named production planner during conversion of the USS Oklahoma City from a light cruiser to a guided missile vessel. He subsequently was chief draftsman during construction of two 1040-class destroyer escorts built at the yard, and was responsible for the final outfitting and sea trials of the second of these ships.

In 1964, Mr. **Hamilton** was named project superintendent on the conversion and repairs of a C-4 type troopship to a bulk steel carrier. Two years later, he was appointed administrative assistant to the general manager, and in 1968 advanced to superintendent of ship repairs.

Mr. **Hamilton** is a member of The Society of Naval Architects and Marine Engineers, The Propeller Club of San Francisco and the Marine Exchange of San Francisco.

Wesley D. Wheeler Opens Own Practice

Wesley D. Wheeler

Wesley D. Wheeler has announced the formation of his new corporation, Wesley D. Wheeler Associates, Ltd., International Maritime Consultants, with offices at 104 East 40th Street, Suite 901, New York, N.Y. 10016.

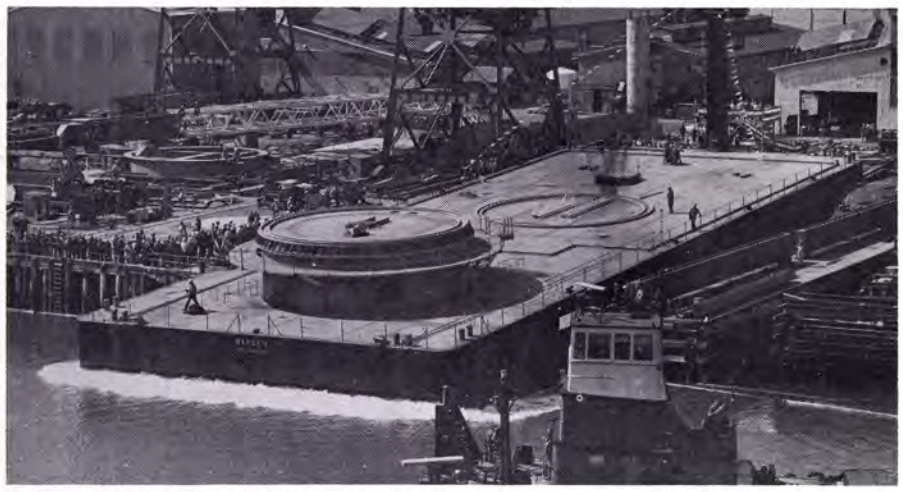
Prior to establishing his own practice, Mr. **Wheeler** was technical director of American Bulk Carriers, New York. He has spent extensive time in Europe, leading vessel construction and conversion programs and was technical counselor to Astilleros Espanoles, S.A. New Shipbuilding Group in the Bay of Cadiz (he speaks Spanish fluently). His experience is most broad and varied—practical as well as theoretical—having worked for shipowners, shipbuilders and leading consultants, with more recent endeavors in the field of vessel operations.

He holds a master's degree in naval architecture and marine engineering from the University of Michigan, a bachelor's degree in mechanical engineering from Worcester Polytechnic Institute, and is a chartered engineer.

His professional affiliations include memberships in The Society of Naval Architects and Marine Engineers, the Royal Institution of Naval Architects, I.Mar.E., NECIES, Asociacion de Ingenieros Navales (Spain), and The Society of Marine Port Engineers.

He is the son of **Wesley L. Wheeler** and grandson of **Howard E. Wheeler,** builders of over 2,500 yachts and commercial craft, plus hundreds of military vessels during both world wars.

Paceco Launches Smith-Rice Crane Barge



Barge 3, first of two identical revolving crane barges for Smith-Rice Derrick Barges, Inc., San Francisco, Calif., was launched before a crowd of 500 people at the Paceco —a division of Fruehauf Corporation—yard, Alameda, Calif., on May 17, 1974. The 215-foot-long barge, weighing 1,100 tons at the time of launching, was christened by **Mrs. Jody Rice,** wife of **E.R. Rice,** vice president of Smith-Rice. A 250-ton full revolving crane is currently being installed aboard the barge. The crane will be equipped with four hooks—one 250-ton main hook, two 75-ton auxiliaries, and one 40-ton whip hook. The boom length is 190 feet. The rated capacity of 250 tons is at a 56-foot radius over the side of the barge and 350 tons over the stern. In addition to planned work in marine construction, salvage and heavy lift marine jobs, the new crane will be equipped with a clamshell bucket for dredging operations.

Bently Nevada Names Two Vice Presidents

Donald E. Bently, president of Bently Nevada Corporation of Minden, Nev., has announced the appointment of **George Palmatier** as vice president in charge of marketing, and **Richard Pieper** as vice president in charge of operations.

Mr. **Palmatier** was formerly field sales manager for the vibration monitor manufacturing firm. He is a native of Nevada and has been with Bently Nevada for five years. He holds a B.S. degree in industrial management from Georgia Institute of Technology.

Mr. **Pieper** joined Bently Nevada after 20 years in management positions with various national electronics firms. He holds a B.S.E.E. degree from Worcester Polytechnic Institute, and prior to this promotion held the post of internal marketing manager.

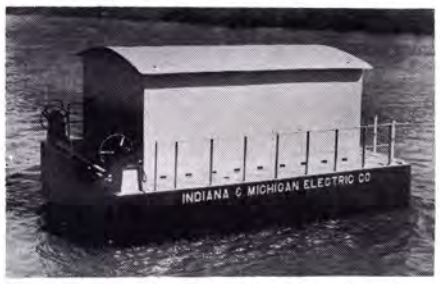
Coan Named To Head Sundstrand Sales Force For Hose And Fittings

Joseph J. Coan has been named sales manager for Sundstrand Hose and Fittings, division of Sundstrand Corporation, according to an announcement by **Don Malaney,** general manager.

Mr. **Coan** is a native of Chicago, Ill., and a graduate of St. Henry's College, Belleville, Ill.

Sundstrand Hose and Fittings manufactures a wide range of hydraulic hose couplings and assemblies in a new 45,000-square-foot manufacturing facility in Wise, Va. Sundstrand Corporation, which had 1973 sales totaling $383.7 million, is a diversified manufacturer of air comfort, power transmission, fluid handling, aerospace, and machine tool products.

SteelShip Delivers First Dock Barge For Storage Of Oil Booms



The storage house on the new SteelShip dock barge is 14 by 20 feet.

SteelShip Corporation, Pine Bluff, Ark., has announced the availability of a newly designed dock barge developed especially for the storage of oil booms and other apparatus necessary for the safe loading and unloading of oil-carrying barges. Four different power companies will use the dock barges, and the first of these vessels was recently delivered and placed in operation on the upper Ohio River.

With the EPA push to prevent water pollution from oil spills, many companies have responded as good corporate citizens and have purchased the necessary equipment to properly contain any spills which may occur, only to find that physical storage and handling of the equipment was very impractical. American Electric Power Company, a New York-based headquarters for a group of Mideast power generating companies, was one of these corporate citizens that found itself plagued with this problem at its many plants located on the Ohio River and its tributaries. SteelShip Corporation, using American Electric Company's operational criteria, developed a 20-foot by 25-foot landing barge with a specially designed mooring device and deck equipment to house the spill recovery equipment.

The storage house on the vessel is constructed of 3/16-inch steel plate heavily framed and braced. It has an 11-foot-wide steel overhead garage door, thus opening one end of the cabin entirely for easy access to the oil skirt. The house is equipped with a raised ventilated wood floor to provide best drainage and air circulation for the skirt and other paraphernalia. Guards, brackets and a special roller are provided to suit the oil skirt being stowed.

Edward D. Fry, president of SteelShip Corporation, offers the company's engineering assistance for development of any oil spill, pollution or marine problem. For engineering assistance without obligation, write SteelShip Corporation, Route 4, Box 167, Pine Bluff, Ark. 71601.

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Capt. S.F. Sammis Appointed President National Cargo Bureau

National Cargo Bureau has announced the appointment of Capt. **S. Fraser Sammis** as president. The announcement was made by **T.J. Smith,** chairman of the board, following a meeting of the board of directors. Captain **Sammis** succeeds Captain **Hewlett R. Bishop** upon his retirement July 1, 1974. Captain **Bishop** came with the bureau in 1964 and has served as executive vice president and president.

Captain **Sammis** has been chief surveyor of the bureau since 1969, and in 1972 was appointed vice president and chief surveyor. His original affiliation with the bureau was in 1957, as a surveyor in Baltimore, Md. A native Long Islander, he is a graduate of the U.S. Merchant Marine Academy, Kings Point, N.Y., class of 1950, and served his sea time with United States Lines. He is a master mariner and is a member of The Society of Naval Architects and Marine Engineers.

Captain **Sammis** serves as an advisor to the U.S. Delegation to the Inter-Governmental Maritime Consultative Organization Sub-Committee on Containers and Cargoes, and the Sub-Committee on the Carriage of Dangerous Goods. A frequent speaker to marine industry organizations in ports throughout the United States and Canada, he was the recipient in 1970 of the Kings Point award for outstanding professional achievement. Captain **Sammis** has contributed to the development of technical safety booklets on cargo stowage, particularly on the loading of grain cargoes and the proper stowage of intermodal containers.

Capt. S. Fraser Sammis

The promotion of Capt. **Donald W. Gates** to chief surveyor was also announced by the bureau. Captain **Gates** has been serving as senior deputy chief surveyor, and started his career with the bureau in 1951 in the Port of Philadelphia. He is a graduate of the State University of New York Maritime College, class of 1942, and sailed as deck officer and master with Isthmian Steamship Company and United States Lines. He is an advisor to the U.S. Delegation to the IMCO Sub-Committee on the Carriage of Dangerous Goods, for which he received a Public Service commendation from the Commandant of the U.S. Coast Guard. Captain **Gates** is a member of several technical committees dealing with the stowage and transportation of hazardous cargoes, and is currently president of the Council of Maritime Academy Alumni Associations.

National Cargo Bureau is a nationwide nonprofit membership organization dedicated to the safe stowage, securing and unloading of cargo on all vessels for the purpose of claims prevention. It formulates recommendations to Government on safe stowage of dangerous goods and other cargoes, and offers low-cost cargo-loading inspection service (breakbulk and containers) and inspection of cargo-handling gear.

Navy Awards Boeing Contract To Design Hydrofoil For NATO

As part of a U.S. Navy-NATO hydrofoil program, a $3.8-million contract to design a class of missile-carrying hydrofoil ship for West Germany has been awarded The Boeing Co. by the U.S. Navy. The ship will correspond to two vessels now being built for the Navy at Boeing's plant in Renton, Wash. Two contracts valued at $46.5 million to construct two Navy lead ships have been received by the firm. The first ship is nearing completion and will be launched in late 1974.

Adams & Porter Names New Vice Presidents

Gaston M. Broyles

John V. Polk Jr.

Joe H. Parker

Adams & Porter Associates, Inc. has announced the appointment of **Gaston M. Broyles, John V. Polk Jr.** and **Joe H. Parker** as vice presidents of the Houston, Texas, office, according to **Clyde W. Hanks,** president of the company.

Mr. **Broyles** graduated from the University of Oklahoma with a Bachelor of Science degree in business, and has been with the company for six years. He was previously with the Oklahoma City Chamber of Commerce and the Travelers Insurance Company.

Mr. **Polk** has been with Adams & Porter Associates for four years. He graduated from Southern Methodist University with a Bachelor of Science degree in geology. Before joining Adams & Porter, he was employed with another insurance group, and the Continental Casualty Company.

Mr. **Parker,** who attended the University of Houston, has spent his entire business career in the insurance business. He was president of the Houston Association of Insurance Agents in 1969. He is also a life member of the Houston Chamber of Commerce.

Adams & Porter Associates, Inc. is an international marine insurance brokerage firm which specializes in offshore property and casualty insurance.

Portable Tool For Metal Fabrication Described In Brochure

The Bohn Combi® 7 in 1 tool is described in a new brochure as "a must tool for metal fabricators."

Specifications of the portable Bohn Combi tool are listed, showing its capabilities to cut angle iron and steel rod, cut, bend or twist band iron, punch channel iron, etc.

Copies of the new literature can be obtained by contacting Shaw Aero Development, Inc., Industrial Road, East Hampton, N.Y. 11937.

Lykes Promotes Five Executives

W.J. Amoss Jr., president of Lykes Bros. Steamship Co., Inc., has announced the promotion of five executives of the company, including four who were named senior vice presidents and one who moved up to the post of vice president.

The new senior vice presidents are **Lloyd J. Fitzpatrick, Robert J. Brennan** and **Mac Gregor Bulloch Jr.,** all of New Orleans, and **Richard E. Berkefeld** of Houston. The new vice president is **Thomas E. Killeen Jr.** of New Orleans.

Mr. **Fitzpatrick** has been vice president of the Finance Division since 1970, and has been a member of the Lykes organization since 1937. He is also a member of the company's board of directors.

Mr. **Brennan,** whose period of service with Lykes dates back to 1942, has been vice president of the Traffic Division since 1968.

Mr. **Bulloch** joined the Lykes staff in 1951, and became vice president of the Operating Division in 1972.

Mr. **Berkefeld** has been vice president of the West Gulf Division since 1969, and has 28 years of service with Lykes, both in the United States and in Europe.

Mr. **Killeen** has 19 years of service with the company, and has been assistant vice president-tonnage control since 1969.

Marra To Manage Hempel's Marine Paints Maintenance Program

John T. Marra

A consultative service for shipping companies on programmed maintenance has been announced by Hempel's Marine Paints, Inc., 25 Broadway, New York, N.Y. 10004.

The Maintenance Program Department will be managed by **John T. Marra,** who joined Hempel's on May 13.

Mr. **Marra** has had long experience in establishing coatings programs on new construction and existing vessels for ship operating companies. He is a member of The Society of Naval Architects and Marine Engineers, on SNAME's Panel 023.

Mr. **Marra** graduated from the Maine Maritime Academy in 1962, and has had extensive service with Sea-Land Service, Inc., prior to joining Hempel's.

ASNE DELAWARE VALLEY SECTION MEETS: At the Delaware Valley Section meeting of the American Society of Naval Engineers, which was held at the Commissioned Officers Club/Philadelphia Naval Base, approximately 100 members of The Society of Naval Architects and Marine Engineers and of ASNE enjoyed a very interesting program. The subject was a panel discussion on contracting with the Navy. Names of the panel discussers were, as shown above, standing left to right: Capt. **V. Klemm,** vice chairman, Delaware Valley Section; Capt. **R.P. Pawson,** Officer in Charge, Naval Regional Procedure Office/Philadelphia; **Hugh Hosford,** Counsel, Naval Regional Procedure Office; **R.O. Carter,** RCA, and **Gil Carlton,** chairman, Delaware Valley Section. Seated, left to right: **J. Dawson,** Contract Administration Officer; **R. Carr,** president, System Engineering Associates Inc., Defense Contracts Agency Service Region; **R.S. Watson,** coordinator, J.J. Henry Co., Inc., Government sales, and **W.E. Gould,** Procedure Officer, Naval Regional Procedure Office.

Mid-America Barge Requests Aid To Build Five 200-Foot Barges

Mid-America Barge Carriers of Sedalia, Mo., has applied to the Maritime Administration for construction loan and mortgage insurance to help finance five 200-foot barges to be built by Missouri Valley Steel Inc., Leavenworth, Kan., for use in ports and on inland waterways. The cost was estimated at $150,000 per barge.

Fulton Steamship Loan Approved By MarAd

The Maritime Administration has approved construction loan and mortgage insurance to aid in the building of a 28,100-deadweight-ton self-unloading bulk carrier for Great Lakes service for Fulton Steamship Company, 555 Madison Avenue, New York City. The vessel will cost approximately $14.3 million. It was to be built by Bay Shipbuilding Corp., Sturgeon Bay, Wis.

IHI Establishes New Firm In Rotterdam

IHI (Ishikawajima-Harima Heavy Industries Co., Ltd.), a leading Japanese shipbuilder, has established a new company with a 100 percent investment in Rotterdam, the Netherlands, with the purpose of expanding its business in Europe.

The new company, which has been named IHI Marine B.V., is capitalized at one million guilders and will be mainly engaged in technical services for ships operating in Europe. Almost all the business previously handled at IHI's Rotterdam office will also be shifted to the new company. **Kiyoshi Kawasaki,** manager of the Rotterdam office, has been appointed representative director of IHI Marine B.V.

The new company's main lines of business are:

(1) Technical services — (a) Technical services for ships operating in the areas of Europe, the Americas, Africa and the Middle East: onboard consultation, supervision of ship repairing work, inspection of ships, and supply of spare parts. (b) Information service for ship repair. Information on ship repair work and docks availability, and related business.

(2) Agency—(a) Agency for ship repair and construction. (b) Sales, repair and agency services for marine equipment and industrial machinery.

Keene Corp. Names Texas Marine For Texas Gulf Area

Clint E. Wells

Texas Marine & Industrial Supply Company, Houston, Texas, has been named a distributor for the Keene Marine Discharge Control System™ by Keene Corporation's Fluid Handling Division, which manufactures the new system.

Texas Marine & Industrial Supply Company has been serving the commercial marine industry since 1938, when the company was founded. With branch operations in Shreveport, La., and Port Arthur, Texas, the company will sell, service, and supervise the installation of the Keene system on customers' vessels operating in the entire Texas Gulf coastal area.

Texas Marine president **Charles C. Anderson** has announced that **Clint E. Wells,** vice president-marketing, will be in charge of all sales and service for the new Keene system.

In operation, the Keene Marine Discharge Control System removes oil and other contaminants from a ship's bilge water and prevents oil contamination from entering waterways, harbors, or the open sea.

Beginning July 1, 1974, the U.S. Coast Guard is enforcing stringent new Federal regulations which prohibit discharge of fluids in U.S. navigable waters "if such discharge causes a film or sheen on the surface of the water." Vessels equipped with the new Keene system will not only be able to avoid violations, but will also be able to demonstrate their compliance with the system's special recorder and monitor. The system maintains a permanent record in the form of a printed paper chart showing the quality of water discharged overboard. This tape becomes a permanent part of the captain's log. (See complete description in the MARITIME REPORTER/Engineering News issue of April 15, 1974.)

Texas Marine & Industrial Company's headquarters is located at 8050 Harrisburg Boulevard in Houston, Texas.

Ships Float On Land Using New Lift System In Ship Construction

A new heavy lift system for moving big ship sections and completed ships of 1,200 tons and greater throughout the assembly yard has been developed by Aero-Go, Inc. of Seattle, Wash.

Presently being used in a large West Coast shipyard, the new system floats the heavy units with Aero-Caster equipment that lifts and floats a load on air film. Friction under the loads virtually disappears, and forces to move them are greatly reduced. The Aero-Caster water film bearing system design and construction represents the latest advancement in technology. Thoroughly tested and proven under severe load conditions, the Aero-Caster has no practical limit in load-lifting capacity. Aero-Caster requires only a compressed air supply and a smooth nonpourous surface to move very heavy assemblies.

For literature completely describing the Aero-Go System, write to Aero-Go, Inc., 5800 Corson Avenue South, Seattle, Wash. 98108.

Exxon USA Chairman Sees Assault Mounting On Private Enterprise

M.A. Wright, chairman and chief executive of Exxon USA, recently said that an assault is being mounted on the private enterprise system in the U.S. by its critics.

And he urged the business community to consider the problem of restoring the credibility of business as a prime responsibility of business leadership.

Speaking before the 26th annual Business Conference at Rutgers University, New Brunswick, N.J., Mr. **Wright** stated: "For more than a decade now, the business community as a whole has been declining in public favor. Business has failed to do as effective a job as its critics in communicating its point of view to the general public.

"As a result, its critics have grown stronger. Substantial support is being gathered for the passage of legislation which eventually could lead to the reorganization and restructuring of many of our most basic American industries."

He pointed out that before Congress today are proposed laws which could have the effect of permanently crippling the U.S. oil and gas industry's ability to meet public needs.

"Of even broader significance, many of these proposals represent an approach which could be used against any U.S. industry," he added.

For example, Mr. **Wright** said, current efforts to put the Federal Government into the oil business in direct competition with private companies "go far beyond either reason or need. And what is more important . . . the pattern set against oil can be used against others. For example, why not a U.S. Automobile Corporation? Or a Federal Steel Company? Perhaps even Government banking or insurance companies? Once precedent has been set, what guarantee would any industry have that it would be exempted from such action?"

Mr. **Wright** said businessmen must redouble efforts to restore the credibility of business.

"Even more, we must work to restore the credibility of other institutions—including Government. Private enterprise cannot hope to prosper or even survive in a society which has no faith or confidence in its major decision-making entities."

He said business must carry its point of view effectively to the general public.

"Business will be unable to persuade legislators to respond positively to business needs until public opinion toward the business community has shifted to the positive," he explained.

And he said business must recognize the interdependence of the total business community, monitoring and acting on all matters affecting business in general.

"We must become alert to all that happens in Washington—not just to the activities which affect our own industry," he concluded.

First Of Three U.S.-Flag LASH Vessels Launched For Central Gulf At Avondale

Principals at the launching of the S/S Green Valley, are left to right: **Edwin Hartzman,** president, Avondale Shipyards, Inc.; **Erik F. Johnsen,** president, Central Gulf Lines, Inc.; **Mrs. William B. Johnson,** sponsor; **J.W. Van Gorkom,** president, Trans Union Corporation, and **Niels W. Johnsen,** chairman of the board, Central Gulf Lines, Inc.

The company that introduced the world's first LASH ship in 1969 has launched the first of a new generation of LASH vessels in ceremonies at Avondale Shipyards in New Orleans, La.

Central Gulf Lines' 893-foot-long 46,000-ton S/S Green Valley is the first of three U.S.-flag LASH carriers ordered by the New Orleans-based vessel owner and operator from Avondale. The new ships will have the largest cargo-carrying capacity of any LASH vessels built in the United States, including carriage of 89 LASH barges each, as well as other spaces for thousands of tons of additional cargo.

The Green Valley, scheduled to begin operation in late August, and sister ships Green Harbour and Green Island, following at 75-day intervals, are part of a $100-million expansion program for Central Gulf's American-flag fleet. The company is also adding 600 LASH lighters (barges) to bring its total LASH barge capacity to 1,100 units, largest in the world for one operator.

Central Gulf president **Erik F. Johnsen** said the Green Valley will initiate service on a new trade route between U.S. Gulf and East Coast ports and ports in Southeast Asia, including such areas as Singapore, Saigon, Malaysia, Indonesia and the Philippines.

"Our three new LASH vessels will be offering sailings every three weeks between the United States and Southeast Asia, serving inland and coastal points here, as well as offering direct service to and from smaller Southeast Asian ports that have hitherto had only indirect access for imports and exports," he said.

Central Gulf began its American-flag fleet operations more than 25 years ago with one vessel named Green Wave in honor of Tulane University in New Orleans. All of the company's subsequent U.S.-flag ships have been named for actual places that have the word "Green" in their names.

Mr. **Johnsen** said that Central Gulf has continually renewed and expanded its vessel operations to become one of the leading United States steamship companies. "We're proud to continue our growth pattern with these new LASH carriers, which were ordered under the Merchant Marine Act of 1970 that has provided for a resurgence of the American merchant marine during this decade," he said.

He said that Central Gulf's affiliation in 1971 with Trans Union Corporation, a Chicago-based company that has achieved phenomenal growth in many areas of the transportation industry, has "contributed substantially to our prospects for growth."

More than 300 launching guests, including Central Gulf and Trans Union officers and directors and exporters and importers from many parts of the nation, were welcomed by Avondale president **Edwin Hartzman.** The invocation was delivered by the Reverend **Allen T. Sykes,** Chaplain of the Episcopal Diocese of Louisiana.

Principal speaker for the Green Valley launching was **J.W. Van Gorkom,** president of Trans Union Corporation. He was introduced by Central Gulf president **Erik F. Johnsen,** who delivered opening remarks to the assembled guests.

Sponsor for the Green Valley was **Mrs. William B. Johnson,** wife of the chairman of Illinois Central Industries, Inc., who is a member of the board of directors of Trans Union Corporation.

The principal characteristics of the Green Valley, designed by Friede & Goldman, Inc., naval architects and marine engineers headquartered in New Orleans, include overall length of 893 feet, molded beam of 100 feet, depth at side of 60 feet, service speed of 22 knots, propulsion of 32,000 shaft horsepower, and deadweight of 46,039 long tons at the design draft of 40 feet 8½ inches.

Sister ships Green Harbour and Green Island, scheduled to be launched in July and September, respectively, will be identical in dimensions and other characteristics.

First Maritime Transportation Certificate Granted By School At Seamen's Church Institute

Participating in the presentation were, left to right: **Clifford Wise,** manager, ship repair/sales, Bethlehem Steel Corporation and SCI board member; Mr. **Towner;** Dr. **John M. Mulligan,** SCI director, and **Robert T. Young,** chairman and president of the American Bureau of Shipping.

William P. Towner, surveyor for the American Bureau of Shipping and an ex-seaman has been awarded the first Maritime Transportation Certificate granted by the Roosevelt Institute—the evening adult education division of the Seamen's Church Institute of New York.

Mr. **Towner** logged 20 years of sea duty before coming shoreside as surveyor for the American Bureau of Shipping.

The six-course evening Maritime Transportation Program is designed to teach the latest developments in the intermodal/multimodal aspects of the maritime field and has met with enthusiastic response from the industry.

Since its inception a year ago, 96 students representing more than 30 companies in the field have enrolled for one or more of the program's courses, with the majority working toward the full six-course certificate.

Salcedo To Direct Development Projects For Prudential-Grace

Fred Salcedo has been appointed director of developmental projects for Prudential-Grace Lines, New York, N..Y, according to an announcement by **Martin F. Ytuarte,** executive vice president-finance of the company.

Mr. **Salcedo** joined Prudential-Grace two years ago and has been director of ship repairs and crew maintenance. In his new assignment, he will be in charge of the implementation of a company-wide "pulse" reporting system.

Before coming to Prudential-Grace, Mr. **Salcedo** served nine years as an aviator in the U.S. Navy. He completed his undergraduate studies at Cooper Union School of Engineering and earned two subsequent graduate engineering degrees—one at the Polytechnic Institute of New York, and one at the Cranfield Institute of Technology at Cranfield, England.

MTS Conference Features Strong Technical Program

The 10th annual Marine Technology Society conference in Washington, D.C., will feature 26 sessions covering a complete range of ocean technical and policy issues.

In addition, there are to be two major luncheon speeches, an MTS Honors Lecture, an evening underwater film festival and two receptions during the September 23 to 25 meeting. Running concurrently is to be a university short course on energy sources from the sea.

Following the conference will be a one-day Law of the Sea Briefing co-sponsored by MTS and the Law of the Sea Institute of the University of Rhode Island. This session will constitute the first report on the events of the Third United Nations Law of the Sea Conference to be held June through August in Caracas.

The MTS conference program strikes a balance ranging from coverage of highly technical specialties to issues involving diverse disciplines such as economics, biology or land use planning.

In addition to formal sessions on technical topics, such as buoy technology, underwater cables and connectors and oceanographic submersibles, there are to be several panel sessions at the conference. Groups of experts will trade information on such topics as offshore facilities, current and near-future; underwater photography techniques and equipment; diving physiology considerations, and beach preservation.

Some of the major policy questions of the day involving the ocean will also be discussed. Ocean dumping, managing coastal zone development, the possibilities of alternate energy sources from the sea and current offshore oil drilling technological developments are additional session topics.

The annual MTS awards ceremony will be addressed this year by Dr. **Robert M. White,** administrator of the National Oceanic and Atmospheric Administration. Four awards will be presented on Monday, September 23, at a luncheon. A project team, a company and two individuals will be cited for achievements in the ocean.

Another major event of the conference will be the Monday evening film festival featuring six presentations by leading photographers. The film show will be introduced by one of the outstanding ocean personalities of today.

On Tuesday, the MTS Industrial and Institutional Advisory Committee will hold a luncheon, to be addressed by Dr. **David A. Potter,** Assistant Secretary of the Navy for Research and Development. The committee consists of representatives of firms and nonprofit organizations with industrial and institutional memberships in MTS.

Dr. **Athelstan Spilhause** will present this year's MTS Honors Lecture in which he will review development of oceanography in the United States in the last decade or more.

Running concurrently with the 10th annual MTS conference will be a short course co-sponsored by the University of Miami School of Engineering and Environmental Design. The four-day course will deal with possible energy sources in the ocean. Full particulars will be announced this month.

Following the conference on Thursday, September 26, will be a one-day briefing on this summer's Third United Nations Law of the Sea Conference held in Caracas, Venezuela. The presentation at the Sheraton-Park Hotel will represent the first public reporting by U.S. officials on the developments at the conference. There will be a separate registration for this event.

Two additional social events are planned at the conference. There will be an early-bird reception Sunday evening, and the president's reception on Tuesday evening.

Instead of a formal exhibit this year, companies are being invited to display their services and products in suites at the conference headquarters, the Sheraton-Park Hotel. Plans for student and complementary exhibits in the registration area are being made.

Further information can be obtained from the Marine Technology Society, 1730 M Street, N.W., Washington, D.C. 20036.

Taylor Diving & Salvage Appoints Wallace And Jones

Ken W. Wallace

Jerry Jones

Ken W. Wallace has been named executive vice president and **Jerry Jones** senior vice president of Taylor Diving & Salvage Co., Inc., an affiliate of Brown & Root, Inc., Houston, Texas.

Announcement of the promotions was made by **Hugh W. Gordon Jr.,** president of Taylor Diving, which is headquartered in New Orleans, La. Taylor, a subsidiary of the Halliburton Company, is one of the largest international underwater engineering, construction and salvage companies in the world.

Mr. **Wallace** has previously been senior vice president in charge of operations, and Mr. **Jones** was vice president-administration of Taylor.

Mr. **Wallace** served in the U.S. Navy from 1943 to 1945, and from 1950 to 1964, when he joined Taylor. He graduated from the Naval Deep Sea Diving School in 1952, and was designated a master deep sea diver, U.S. Navy in 1961, and appointed master diver of the First Nuclear Submarine Squadron. In 1962, he was assigned to the Naval Experimental Diving Unit as a master diver in charge.

Upon joining Taylor, Mr. **Wallace** was involved in the company's research and development work pertaining to diving. He was elected vice president, special assignments in 1970, and senior vice president in 1972.

Mr. **Jones** came to Taylor from Brown & Root, where he was manager of the company's Electronics Division. He joined Brown & Root, one of the largest engineering and construction firms in the world, in 1968, doing research and development work for the Microwave Survey System and computer controlled systems for dynamic positioning of offshore construction barges.

Prior to joining Brown & Root, a Halliburton subsidiary, Mr. **Jones** attended Washington State University, served in the U.S. Air Force from 1957 to 1965, and worked as engineering supervisor of Welex Electronics doing underwater sonar development and testing, serving as test director of the Seneca Lake (N.Y.) Experimental Test Facility for the Navy.

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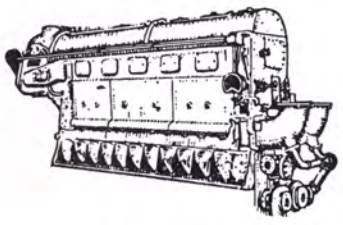
A partial listing of our stock from EX-NAVY and MARITIME VESSELS

Certifications to A.B.S. or Lloyd's a routine

SEE OUR 2-PAGE SPREAD IN ALTERNATE ISSUES OF M.R.

MARINE DIESEL ENGINES

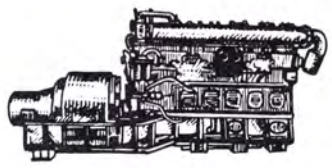


MATCHED PAIR . . . FAIRBANKS-MORSE Model 38D8-⅛ — 1 Port; 1 Starboard. Used condition, 1800 HP, 800 RPM, 2 cycle, 8½″ bore, 10″ stroke, Air Start.. Complete with Westinghouse Reduction Gears, 2.216:1 ratio —with Hydraulic Coupling.

MARINE DIESEL GENERATORS

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

2—SUPERIOR Diesel Engines . . . Model GBD8 Marine, 150 HP, 1200 RPM, 8 cylinder, with Delco Generators, 100 KW, 120/240 DC.



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

3—GENERAL MOTORS, Model 3-268A, Marine, 150 HP, 1200 RPM, 3 cylinders, with Allis-Chalmers Generators, 100 KW, 120/240 DC.

Many other units in stock

TURBINE GENERATORS—AC and DC Voltage

A.C.

2—1500 KW, GENERAL ELECTRIC Turbines: Type FN4-FN30, Steam 525 PSIG. 8145 RPM, with G.E. Generators, 1500 KW, 450/3/60.

4—1250 KW, GENERAL ELECTRIC Turbines: Type FSN, 525 PSI, 7938 RPM. Generators: 1250 KW, 450/3/60, 3600 RPM, Type ABT2.

7—750 KW, GENERAL ELECTRIC Turbines: Type FN3-FN24, 525 PSI, 10,033 RPM. Generators: 750 KW, 450/3/60, 1200 RPM, Type ATI.

2—500 KW, GENERAL ELECTRIC Turbines: Type FN3-FN20, steam 375/425 PSI, 6 Stage, 9987 RPM. Generators: 500 KW, 450/3/60, 1200 RPM, Type ATI.

D.C.

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

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

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.

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

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

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.

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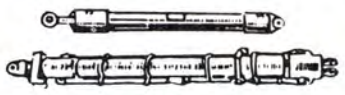
Size A½	Size A4	Size A10
Size A1	Size A5	Size A12
Size A2	Size A6	Size A16

Electro-Mechanical STEERING GEAR

1—SPERRY No. 2, 5 HP, 230 Volts DC, complete with Steering Winch, Controller Panel, Ballast Resistor, Electro-Mechanical Steering Stand—with Steering Wheel (with Pull-out Knob).

HYDRAULIC CYLINDERS



Bore	Overall Stroke	Rod Diameter	Retracted Length	Action
10″	12″	3.75″	45½″	double
10″	26″	3.75″	58½″	double
2″	8″	1½″	20″	double
2.5″	15″	1.12″	25½″	double
3″	8″	1.37″	15½″	double
6″	8Ft.	4″	144″	double

CARGO HOISTER BLOCKS

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

$44.50 ea. **$49.50 each with pull test certificates**

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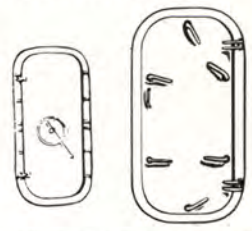

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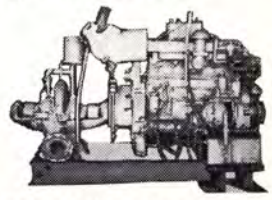
26″x48″-4 Dogs—**$60.00 ea.**
26″x57″-6 Dogs—**$80.00 ea.**
26″x60″-4 Dogs, 6 Dogs—**$86.00 ea.**
26″x66″-6 Dogs, 8 Dogs—**$100.00 ea.**
26″x66″-Q.A. Type—**$175.00 ea.**

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.

AIR COMPRESSORS

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

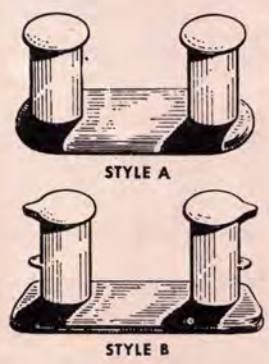
3—INGERSOLL - RAND, Size 5x5x4x4, 50 CFM, 150 PSI, with G.E. Motor, 20 HP, 440/3/60.

2—WESTINGHOUSE AIR BRAKE Steam, Size 11x11x12, approximately 60 CFM at 100 PSI.

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

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

DOUBLE BITS



STYLE A

STYLE B

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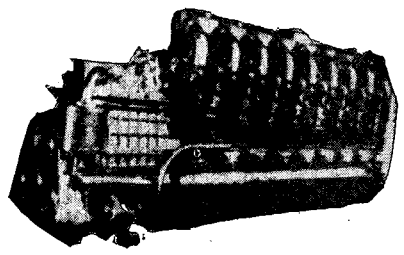

Engine—12-278A-1200HP. Motor—Allis Chalmers, 1020 HP—560 Volts DC, 1454 Amps 875 RPM
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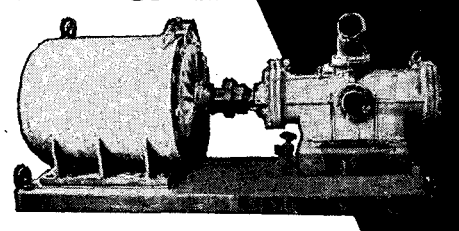

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2600 LBS/HOUR

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(Vessels are located in Baltimore, Md. Certain items of personal property required for Coast Guard use will be removed prior to sale.)

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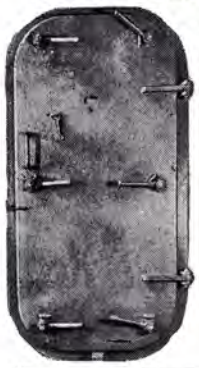

6-Dog right and left hand hinged steel doors—with frames. Built and tested to A.B.S. specifications.

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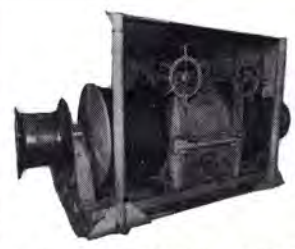

2 LIDGERWOOD DOUBLE DRUM TOWING WINCHES

CAPACITY: Each drum stows 1800' of 1¼" wire. Each drum independently 30,000 lbs. on 2nd layer at from 10 to 50 feet per minute. Both drums simultaneously 15,000 lbs. each. Drums equipped with clutch shift levers. 24" Winch heads for 8" circumference manila rope. Static load 52,000 lbs. applied at mid-length. Base 10' 6" wide with 2 outboard winch heads 20¼" each. Drum diameter 22½"—flange 50"—28" between flanges. Equipped with level wind spooling devices and compressor hand brake. MOTOR: 75 HP—under deck with horizontal drive through worm gear. Drip-proof—fully protected. Mfg by Allis-Chalmers—type EB-127-DC—compound wound—125/250 volts—254 amps—reversible—575/1150 RPM. CONTROLLER: Allis-Chalmers drum type—with 1 off position and 5 heave in positions and five payout conditions in opposite directions. Control cabinet also located below deck. Worm gear reduction 62T at 1½ CP worm wheel 31:1 reduction. Drum shaft beveled bull gear 61T. Drive shaft beveled pinion gear 14T—ratio 4.857:1.

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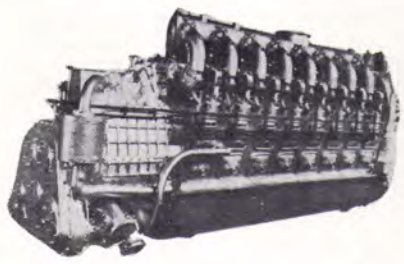
G.M. 16-278A
1700 H.P.
DIESEL ENGINES



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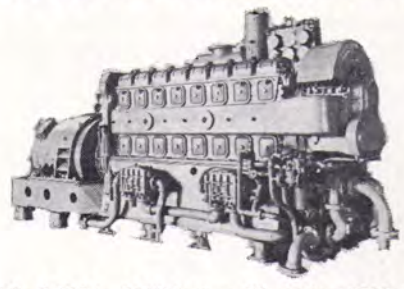
G.M. 8-268A
200 KW A.C.
DIESEL GENERATOR SETS



ENGINE: 8-268A—6½" bore x 7" stroke—1200 RPM—driving 200 KW Westinghouse generator—440 volts—3-phase—60 cycle—321 amps—80% power factor at 1200 RPM. Switchgear available.

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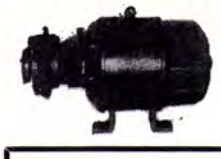

200 GPM — 180' head — 2½"x2"—bronze—flange connections. MOTOR: 20 HP—115 volts DC—2400 RPM—153 amps.

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Mfg by Electric Specialty Co. INPUT: 5 HP 115 VDC 38.5 amps 1800 RPM. AC OUTPUT: 2.5 KW —120/1/60 41.6 amps 1800 RPM. With controls. Write for price.

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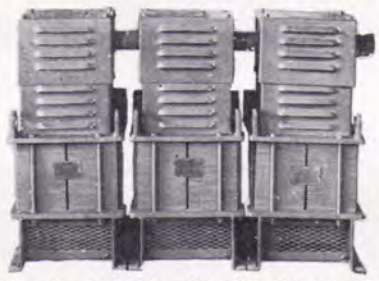

15 KVA—3 per bank—450 V primary—177 volt secondary. $295.00 PER BANK

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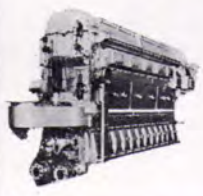

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Very Little Use

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350 GPM—100 lb. head—1750/3500 RPM—40 H.P. Furnished with Nash Hytor Pump MO-571 & float switch, for self-priming. All controls. Pump & primer weight 900 lbs.

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15 GPM—20 lb. head—1750/3500 RPM—¾ HP motor. Furnished with Nash Hytor MD-2 vacuum pump. Approx. weight 250 lbs.

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35 GPM—40 lb. head—3500 RPM—1 H.P. Pump weight 40 lbs.

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Positive displacement—gear head—15 GPM—20 lb. head —350 RPM—1 HP—pump weight 260 lbs.

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Positive displacement—gear head—30 GPM—35 lb. head —273 RPM—2 HP motor—weight of pump 350 lbs.

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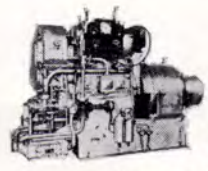

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100 KW A.C. Diesel GENERATOR SET

Like new, ENGINE: G.M. 3-268A —3 cylinder—6½"x7" bore & stroke. GENERATOR: Century — 100 KW—440 volts—3-phase—60 cycle. Switchgear available.

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Markey Machinery Co., Inc., 79 S. Horton St., Seattle, Wash. 98134
DIESEL ACCESSORIES
A.G. Schoonmaker Co., Inc., P.O. Box 757, Sausalito, Calif. 94965
DIESEL ENGINES
Alco Engines Division, White Industrial Power, Inc., 100 Orchard St., Auburn, N.Y. 13021
Bruce GM Diesel, Inc., 180 Route #17 S. at Interstate 80, Lodi, N.J. 07644
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
H.O. Penn Machinery Co., Inc., 1561 Stewart Ave., Westbury, N.Y. 11590
Waukesha Motor Co., 1000 W. St. Paul Ave., Waukesha, Wis. 53186
DOCK BUILDERS
GHH Sterkrade Ferrostaal Overseas Corp., 17 Battery Place, New York, N.Y. 10004
DOCK BUMPERS
Johnson Rubber Co. (Marine Div), 16025 Johnson St., Middlefield, Ohio 44062
DOORS—Watertight—Bulkhead
Overbeke-Kain Co., 20905 Aurora Rd., Cleveland, Ohio 44146
ELECTRICAL EQUIPMENT
AMP Special Industries, P.O. Box 1776, Paoli, Pa. 19301
ASEA Marine, Rep. in U.S.A. by Stal-Laval, Inc., 400 Executive Blvd., Elmsford, N.Y. 10523
Brown and Ross of New Jersey Incorporated, 370 Paterson Plank Road, Carlstadt, N.J. 07072
Elkan Electric Cable Co., 248 Third Street, Elizabeth, N.J. 07206
Merrin Electric, 162 Chambers St., New York, N.Y. 10007
Oceanic Electrical Mfg. Co., Inc., 159 Perry Street, N.Y. 10014
Port Electric Supply, 157 Perry Street, N.Y., N.Y. 10014
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, Ore. 97201
ELECTROPLATING
Sifco Metachemical Div/Sifco Industries, Inc., 5708 Schaaf Road, Independence, Ohio 44131
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
Crosby Group, Box 3128, Tulsa, Okla. 74101
FENDERING SYSTEMS—Dock & Vessel
Hughes Bros., Inc., 17 Battery Place, New York, N.Y. 10004
Johnson Rubber Co. (Marine Div), 16025 Johnson St., Middlefield, Ohio 44062
Uniroyal, Inc., 1230 Avenue of the Americas, New York, N.Y. 10020
FITTINGS & HARDWARE
AMP Special Industries, P.O. Box 1776, Paoli, Pa. 19301
Esco Corporation, Wire Rope Rigging Div., 2141 N.W. 25th St., Portland, Oregon 97210
Robvon Backing Ring Co., 675 Garden St., Elizabeth, N.J. 07207
GANGWAYS
Rampmaster Inc., 1226 N.W. 23rd Ave., Fort Lauderdale, Fla. 33311
GAS DETECTION SYSTEMS
Mine Safety Appliance Co., MSA International, 201 Penn Center Blvd., Pittsburgh, Pa. 15235
HULL CLEANING
Butterworth Systems, Inc., P.O. Box 9, Bayonne, N.J. 07002
INSULATION—Marine
Bailey Carpenter & Insulation Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231
KEEL COOLERS
Johnson Rubber Co. (Marine Div), 16025 Johnson St., Middlefield, Ohio 44062
LADDERS
Duo-Safety Ladder Co., 513 West 9th Ave., P.O. Box 497, Oshkosh, Wisc. 54901
LIGHTS—Emergency, Search & Navigation
Phoenix Products Co., Inc., 4751 North 27th St., Milwaukee, Wisc. 53209
LNG—Tankage, Measurement Systems
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
Simmonds Precision, 150 White Plains Road, Tarrytown, N.Y. 10591
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., 348 Ridge Road, Lyndhurst, N.J. 07071
Philadelphia Gear Corp., Schuylkill Expressway, King of Prussia, Pa. 19406
MARINE EQUIPMENT
Beaver Tool & Machine Co., 525 S.E. 29th St., Oklahoma City, Okla. 73109
Comet Marine Supply Corp., 157 Perry St., New York, N.Y. 10014
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
Waukesha Bearings Corp., P.O. Box 798, Waukesha, Wis. 53186
MARINE INERTING SYSTEM
Smit Nymegen Corp. (Smit Ovens Nymegen), 275 Kisco Ave., Mt. Kisco, New York 10549
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
UK P&I Club (Bermuda): Thos. R. Miller & Son, Mercury House, Front St., Hamilton, Bermuda (P.O. Box 665)
MARINE PROPULSION
Combustion Engineering, Inc., Windsor, Connecticut 06095
Delaval Turbine Inc., Turbine Div., Trenton, N.J. 08602
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
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
Qualpeco Services, Inc., 750 Third Ave., New York, N.Y. 10017
Rhode Island Hospital Trust National Bank, 15 Westminster Street, Providence, R.I. 02903
NAVAL ARCHITECTS AND MARINE ENGINEERS
American Standards Testing Bureau, Inc., 40 Water Street, New York, N.Y. 10004
Amirikian Engineering Co., 1401 Wilson Blvd., Arlington, Va. 22209
J. L. Bludworth, 608 No. Clear Creek Drive, Friendswood, Texas 77546
Breit Engrg. Inc., 441 Gravier St., New Orleans, La. 70130
James G. Bronson Associates, 166 Altamont Ave., Tarrytown, N.Y. 10591
C.D.I. Marine Co., Suite 151, 5400 Diplomat Circle, Orlando, Fla. 32810
Childs Engineering Corp., Box 333, Medfield, Mass. 02052
Coast Engineering Co., 711 W. 21st St., Norfolk, Va. 23517
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, Mass. 02026
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
Parker C. Emerson & Associates, 17935 Cardinal Drive, Lake Oswego, Oregon 97034
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
George A. Gilmore/Associates, 3020 K Street, N.W., Washington, D.C. 20007
Morris Guralnick, 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 and Co., Inc., 3333 Rice Street, 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., 401 Broad Hollow Road, Rte. 110, Melville, N.Y. 11746
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
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., 50 Hunt Street, Watertown, Mass. 02172
M. Rosenblatt & Son, Inc., 350 Broadway, New York, N.Y. 10013 and 657 Mission St., San Francisco, Calif.
Seaworthy Engine Systems, Pond Road, Canton, Conn. 06019
George G. Sharp, Inc., 100 Church St., New York, N.Y. 10007
Southern Engineering Associates, P.O. Box 748, Ocean Springs, Miss. 39564
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
Tremayne, Jeffrey and Associates, Inc., 951 Government St., Suite 216, Mobile Ala. 36604
Whitman, Requardt & Associates, 1304 St. Paul St., Baltimore, Md. 21202
Xplo Corporation, 229 Fifth St., P.O. Box 492, Gretna, La. 70053
NAVIGATION & COMMUNICATIONS EQUIPMENT
American Hydromath Co., 55 Brixton Rd., Garden City, N.Y. 11530
Benmar Division, Computer Equipment Corp., 3000 W. Warner Avenue, Santa Ana, Calif. 92704
Communication Associates, Inc., 200 McKay Road, Huntington Station, N.Y. 11746
Edo Corporation, 13-10 111th Street, College Point, N.Y. 11356
Edo Western Corporation, 2645 South 2nd West, Salt Lake City, Utah 84115
Electro-Nav, Inc., 1201 Corbin St., Elizabeth Marine Terminal, Elizabeth, N.J. 07201
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

Raytheon Marine Co., 676 Island Pond Road, 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
Tracor, Inc., 6500 Tracor Lane, Austin, Texas 78721

OILS—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

PAINT—Marine—Protective Coatings
Ameron Corrosion Control Div., Brea, Calif. 92621
Carboline Co., 350 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
Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002

PIPE—Cargo Oil, Clamps
Kubota, Ltd., 22, Funade-cho 2-chome, Naniwa-Ku, Osaka, Japan
Stauff Corp., 41 Newman Street, Hackensack, N.J. 07601

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

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
Coffin Turbo Pump, FMC Corp/Pump Division, 326 So. Dean St., Englewood, N.J. 07631
Colt Industries, Inc., Fairbanks Morse Pump & Electric Div., 3601 Kansas Ave., Kansas City, Kansas 66110
Crisafulli Pump Co., Box 1051, Glendive, Montana 59330
Delaval Turbine Inc., IMO Pump Division, P.O. Box 321, Trenton, N.J. 08602
Houttuin-Pompen N. V. Sophialaan 4, Utrecht, Holland
Jacuzzi Bros., Inc., 11511 New Benton Highway, Little Rock, Arkansas 72204
Johnston Pump Company, 1775 East Allen Ave., Glendora, Calif. 91740

REFRIGERATION—Refrigerant Valves
Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231
Foster Refrigerator Corp., Mill & North Second Streets, Hudson, N.Y. 12534
Port Refrigeration Div., 157 Perry Street, New York, N.Y. 10014

ROPE—Manila—Nylon—Hawsers—Wire
American Mfg. Co., Inc., Noble & West Sts., Brooklyn, N.Y. 11222
Columbian Rope Company, 309 Genesee Street, Auburn, N.Y. 13022
Du Pont Co., Room 31H1, Wilmington, Delaware 19898
Jackson Rope Corp., 9th & Oley, Reading, Pa. 19604
Wall Rope Works, Inc., Beverly, N. J. 08010

RUBBER BEARINGS
Johnson Rubber Co. (Marine Div.), 16025 Johnson St., Middlefield, Ohio 44062

RUDDER ANGLE INDICATORS
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., 285 Lawrence Avenue, South San Farncisco, Calif. 94080

SCAFFOLDING EQUIPMENT
Patent Scaffolding Co., 2125 Center Ave., Fort Lee, N.J. 07024
Western Gear Corp./Sky Climber Inc., 17311 S. Main St., Gardena, Calif. 90248

SEALS
Syntron Co., Parts & Material Handling Div., FMC Corp., Homer City, Pa. 15748

SEAWATER TREATMENT
Engelhard Industries, 430 Mountain Avenue, Murray Hill, N.J. 07974

SHAFT REVOLUTION INDICATOR EQUIP.
Henschel Corp., 14 Cedar St., Amesbury, Mass. 01913

SHIPBREAKING—Salvage
American Ship Dismantlers, Inc., Division of Schnitzer Industries, 3300 N.W. Yeon Avenue, Portland, Ore. 97210
The Boston Metals Co., 313 E. Baltimore St., Baltimore, Md. 21202
National Metal & Steel Corp., 691 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

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
Bell Aerospace Company, Div. of Textron, P.O. Box 1, Buffalo, N.Y. 14240
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
C.M.R. (Compagnie Marseillaise de Reparations), 274 Chemin du Littoral, 13 Marseille (15E) France
Conrad Industries, P.O. Box 790, Morgan City, La. 70380
Curacao Drydock, Inc., P.O. Box 153, Willemstad, Curacao, N.A.
Dillingham Shipyard, Pier 41, P.O. Box 3288, Honolulu, Hawaii 96801
Empresa Nacional Bazon, 65 Castellana, Madrid 1, Spain
Equipment Systems Division, AMCA International Corporation, 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
Glacier Metal Co., Ltd., Alperton, Wembley, Middlesex Hao 1HD, England
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.
Hitachi Shipbuilding & Engrg. Co., Ltd., 47 Edobori 1-Chome, Nishi-Ku, Osaka, Japan
Hongkong United Dockyards Ltd., Kowloon Docks, Hong Kong
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
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
Matton Shipyard Co., Inc., P.O. Box 428, Cohoes, New York 12047
Mercantile Marine Engineering & Graving Docks Co., N.V., Antwerp, Belgium
Mitsui Shipbuilding & Engrg. Co. Ltd., 6-4, Tsukiji 5-chome, Chuo-ku, Tokyo, Japan
Monark Boat Co., P.O. Box 210, Monticello, Ark. 71655
Murray & Stewart (Marine) (Pty) Ltd., Ocean Road, Table Bay Harbour, P.O. Box 4854, Cape Town, South Africa
National Steel & Shipbuilding Corp., San Diego, Calif. 92112
Northwest Marine Iron Works, P.O. Box 3109, Swan Island, Portland, Oregon 97208
O.A.R.N. (Officine Allestimento-Riparazioni Navi), P.O. Box 1395, Genoa, Italy 16126
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
Service Machine & Shipbuilding Corp., Box 1578, Morgan City, La. 70380
Silverton Marine Corp., 120 Kettle Creek Road, Toms River, N.J. 08753
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
Terrin Shipyards, Societe Provencale des Ateliers Terrin, 287, Chemin DeLa Madrague, 13345 Marseille—Cedex 3, France
Todd Shipyards Corp., 1 State St. Plaza, New York, N.Y. 10004
Tracor/Mas, Inc., P.O. Box 13107, Port Everglades, Fla. 33316
Union Dry Dock & Repair Co., Foot of Pershing Road, Weehawken, N.J. 07087
Vancouver Shipyards Co., Ltd., 50 Pemberton Ave., North Vancouver, B. C., Canada

SHIP MODEL BASIN
Hydronautics, Incorporated, Laurel, Maryland 20810

SHIP MODELS
Yankee Shipwrights, P.O. Box 35251, Minneapolis, Minn. 55435

SHIP STABILIZERS
Sperry Marine Systems Div., Charlottesville, Va. 22901, Division of Sperry Rand Corp.

SHOCK CORD
Wm. B. Bliss, Jr. & Co., Inc., 381 Park Avenue So., New York, N.Y. 10016

STEAM TURBINES
Nicolai Joffe Corporation, P.O. Box 2445, South San Francisco, Calif. 94080

STEERING SYSTEMS
Wm. E. Hough Co., 1125 P N.W. 45th St.. Seattle, Wash. 98107

STUFFING BOXES
Johnson Rubber Co. (Marine Div.), 16025 Johnson St., Middlefield, Ohio 44062

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
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
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.
Fabri-Valve Co., 2100 N. Albina Ave., Portland, Oregon 97208
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

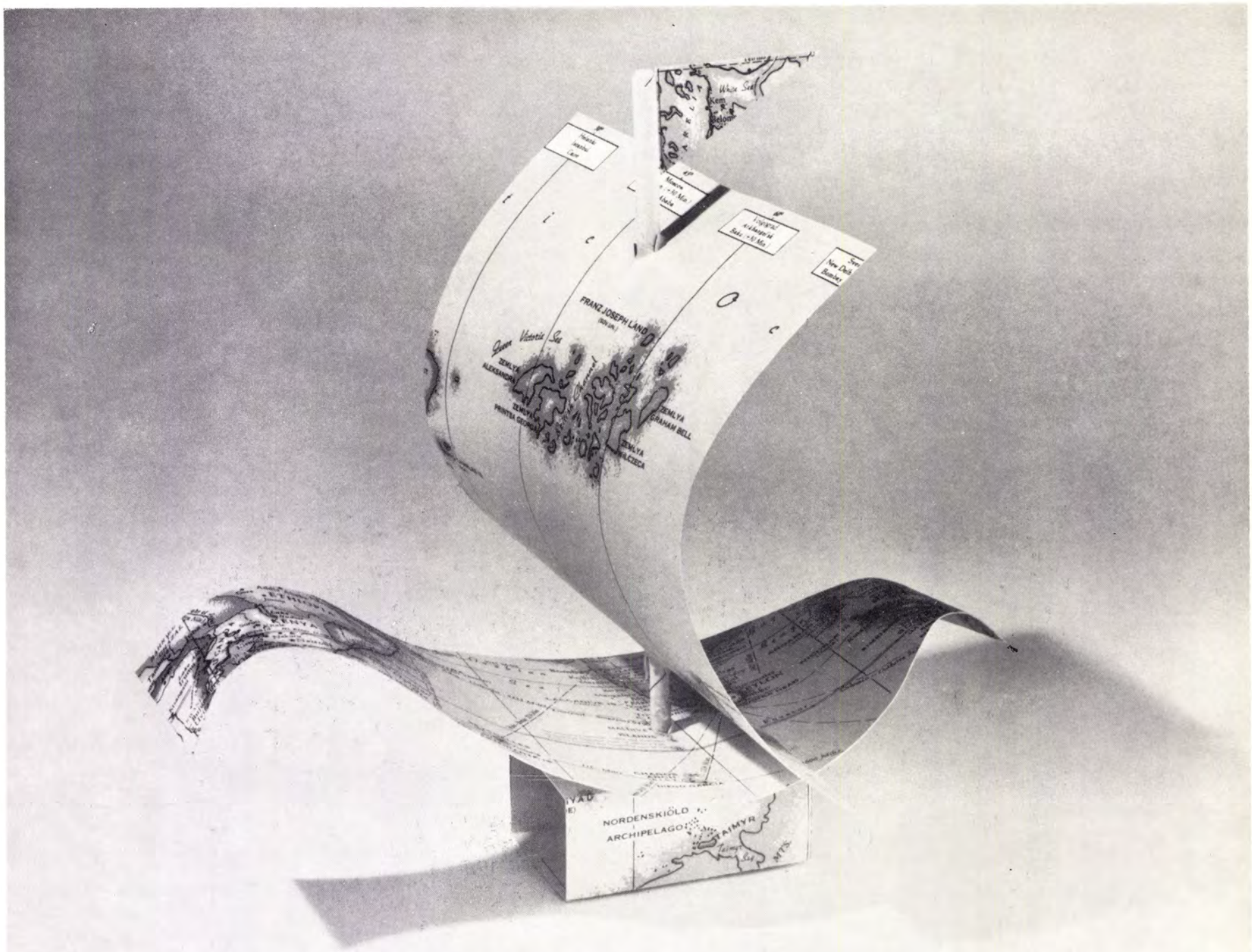
WATER POLLUTION CONTROL
Colt Industries, Water & Waste Management Operation, Beloit, Wisc. 53511
Keene Corporation, Fluid Handling Div., Cookeville, Tenn. 38501
Koehler-Dayton, Inc., P.O. Box 309, New Britain, Conn. 06050

WEATHER ROUTING
Weather Routing Inc., 1415 Boston Post Road, Larchmont, N.Y. 10583

WELDING EQUIPMENT—Flame Cutting
Liquid Carbonic Corp., 135 S. LaSalle Street, Chicago, Illinois 60603
Unitor Ships Service, Sorligaten 8, P.O. Box 2814 K, Oslo 5, Norway

WIRE ROPE
Armco Steel Corp., 703 Curtis St., Middletown, Ohio 45042
Bethlehem Steel Corp., Bethlehem, Pa. 18016

ZINC
Smith & McCrorken, 153 Franklin St., New York, N.Y. 10013



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SHIPBUILDER TO THE WORLD

Sumitomo ships ply the sea lanes of the world carrying the cargoes that keep the wheels of industry turning.

For over 70 years now Sumitomo has been building vessels of every type for every purpose. And whether they are mammoth tankers, bulk carriers, combination carriers or special kinds of ships, such as LASH and liquefied gas carriers they are all built with the same attention to detail and the high technical standards that mark all Sumitomo products. And with future requirements of its customers in mind Sumitomo has recently completed the Oppama Shipyard which includes some of the most sophisticated shipbuilding equipment and machinery in the world. In this way Sumitomo is confident that it can offer even better service to its clients.

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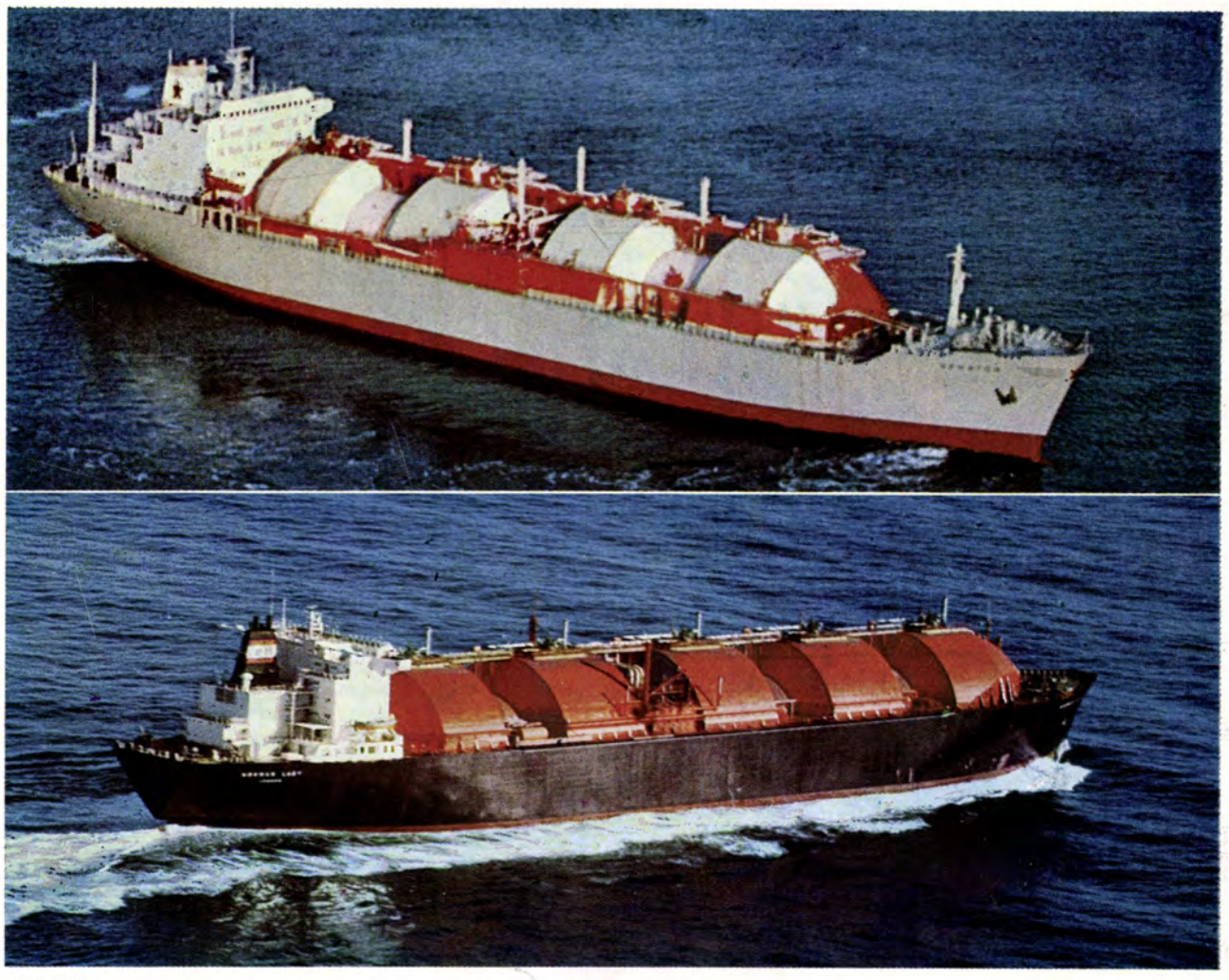
New York Office: Suite 4949, One World Trade Center, New York, N.Y. 10048, U.S.A.
Telex: 232699, 422145 Cable: SUMIJUKI NEWYORK

London Office: 35, New Broad Street, London, EC2M 1NH, England
Telex: 886450 Cable: SUMIJUKI LONDON EC2M 1NH

Certain should be spelled with an "S"

Moss Rosenberg LNG-design

Safety · Simplicity · Certainty



LICENSEES:

U.S.A.:	General Dynamics Corp. / Quincy Shipbuilding Division.	**Belgium:**	S.A Cockerill Yards, Hoboken
Japan:	Mitsubishi Heavy Industries Ltd. Kawasaki Heavy Industries Ltd. Mitsui Shipbuilding & Engineering Co., Ltd.	**Spain:**	Astilleros Espanoles S.A.
		Italy:	Italcantieri S.p.A.
Germany:	Howaldtswerke Deutsche Werft AG Bremer Vulkan Schiffbau und Maschinenfabrik	**Finland:**	Oy Wärtsilä AB
		Poland:	Centromor (United Polish Shipyards)

At the top:
LNG/Ethylene Carrier
"Venator"
of 29.000 m³

At the bottom:
LNG Carrier
"Norman Lady"
of 87.600 m³

Moss Rosenberg Verft a.s
Member of the Kvaerner Group.

Yards:

Moss Verft
P.O.B. 53 (Jeloey)
1501 Moss
Norway
Tlx.: 16334 mvd n

Rosenberg Verft
P.O.B. 139
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