

The United States Army Transportation Corps Cargo Barge FS-790 pictured on her first trial sea run. Seattle, Washington skyline in background.



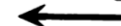
## FS-790

Trial voyages of the FS-790, built by Puget Sound Bridge and Dredging Co., Seattle, were held in April. A prototype vessel, innovations and departures from the conventional are many. Included among these are the cargo handling gear, the latest type of electro-hydraulic steering, and folding hatch covers.

The Army Transportation Corps describes the carrier as the latest design in logistical support vessels. Built for and developed by the Transportation Research and Development Station at Fort Eustis, Va., and designed by John G. Alden, Inc., Boston, Mass., the new vessel is designated as the Army 210 foot dry cargo, self propelled barge. Working drawings were drawn by the engineering and design section of Puget Sound Bridge and Dredging Co.

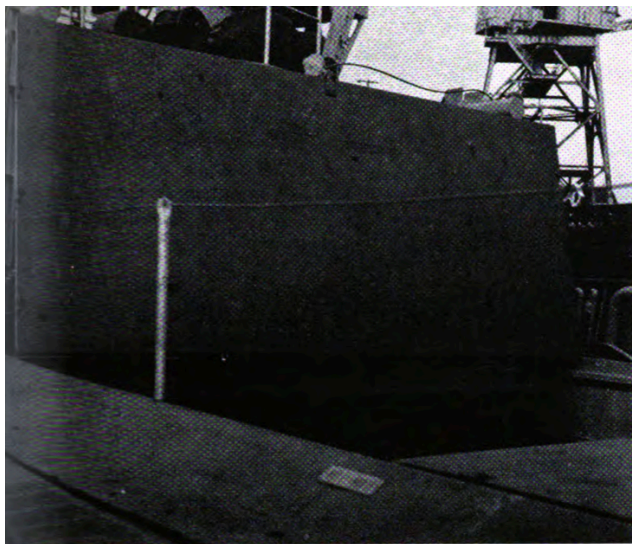
The barge was conceived to better serve the Army's supply lines to overseas military installations which may be remotely located from principal ports. Installations in such remote areas must be reached by traversing shallow rivers, harbors and waterways, accessible only to small low draft craft. Design of the FS-790 is such that she can nose in on beaches, sand bars, and shoals for discharge.

The ship is able to generate power even though left high and dry by

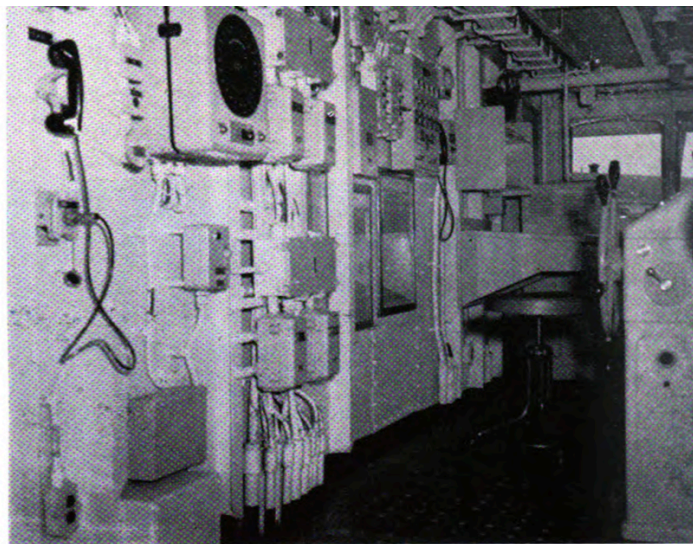


One of the two shipboard cargo handling cranes aboard the FS-790. This photograph taken at one of the first dock trials of the crane actually handling a load. The cranes were designed and built by Colby Steel and Manufacturing, Inc. of Seattle, Wash.





Campbell-Sabin folding hatch cover, No. 2 hold, is pictured in raised position.



After bulkhead of pilot house is lined with control cabinets and indicators, including Raytheon Fathometer, Henschel intercom apparatus, and Sperry steering stand.

## New Army Prototype Cargo Vessel

tidal conditions such as exist in Korea, Alaska, and the Bay of Fundy. Diesel generators are able to maintain their cooling functions by drawing water from three skeg tanks which serve as reservoirs when the ship is mud borne. Thus, skegs conventionally dry in normal ships are utilized on this ship for water circulation, radiation and cooling purposes, comparable to skin coolers on some ships, to permit operation of generators, cargo handling gear and other equipment regardless of tidal conditions.

An early plan was a 190 foot barge. Preliminary studies revealed that to increase the length between perpendiculars from 190 feet to 210 feet would increase the cargo carrying capacity and would improve the draft and trim characteristics. Therefore, the prototype was designed to be approximately 210 feet in length at the load-water-line, have a beam of 38 feet and a cruising speed of 12.25 knots with normal load.

Power is from twin Fairbanks-Morse Model 3808 diesels, each developing 800 HP at 720 RPM. Drive is through Farrel-Birmingham reduction gears to 82 inch diameter three blade bronze propellers. A normal maximum cruising range of 7500 nautical miles may be obtained from normal fuel tanks. Cruising range may be extended to a maximum of 10,000 miles in an emergency through the use of ballast tanks for additional fuel. This cruising range permits delivery of the vessels under their own power anywhere in the world.

The cargo handling gear consists of two Colby HSB-LL hydraulically powered cargo handling cranes, designed and produced by Colby Steel & Manufacturing, Inc., of Seattle. The FS-790 is the second American ship ever to be equipped with this type of high speed, level-luffing gear. Similar cranes, designed and built by Colby, have been in use for three years aboard the W. R. Chamberlin Co.'s West Coast lumber schooner "C-Trader" with successful results.

With a rated capacity of five tons each at a 38 foot maximum radius, the Colby cranes are of the king-post type and are mounted between the hatches on the fore and aft center line of the vessel, positioned to serve three hatches. They are capable of continuous rotation in either direction. With a proper spreader bar the two cranes can be used to handle a ten ton load in the center hatch area. Regardless of operator action, special safety devices built into the crane prevent damage to the crane by overloading.

The hoist speed is automatically adjusted to the load, heavy loads being handled at relatively slow speeds, and lighter loads proportionately faster. The crane's boom can be completely raised or lowered in approximately 20 seconds and the crane can be rotated twice per minute. This speed and maneuverability enables the crane operator to handle one palletized load per minute under normal operating conditions.

The operator's cab is simple and

complete. It employs both heat and weatherproofing. Safety glass is used throughout and the operator is afforded maximum visibility. Relatively inexperienced personnel are able to operate the crane because of the simple control system. Equipment installed in these Colby cranes include Vickers hydraulic pumps and motors, and products of a dozen Seattle sub-contractors.

### New Shipboard Crane

In a statement, C. D. Gould, vice-president and contract manager, Colby Steel & Manufacturing, Inc. supplies a general description of the new type hydraulic shipboard cranes as follows:

"The Colby patented HSB-LL shipboard crane has been designed and constructed to eliminate the objectionable features inherent in ordinary land type cranes when used aboard ship for cargo handling. It also represents a vast improvement over the ordinary type of shipboard crane in use up to the present time.

"Because of the inertia caused by rotating a shipboard crane and raising or lowering its boom, an objectionable swinging of the load usually occurs in those cranes employing a single load line over the boom tip. This uncontrolled swinging of the load is hazardous, and adversely affects the efficiency of the cargo handling operation.

"To overcome these objectionable features, inherent in all conventional type shipboard cranes, Colby engineers have embodied the fol-





Left to right: Colonel H. F. McFEELY, Terminal Service Division, Office of Chief of Transportation, ATC; Colonel H. C. DODENHOFF, Chief, Equipment Division, Seattle Port of Embarkation; Colonel S. M. COX, Chief, Marine Division, Transportation & Research & Development Station, ATC.



RAYMOND J. HUFF, Vice-President and Secretary; H. W. McCURDY, President, Puget Sound Bridge & Dredging Co. Kearfott windows and swipes installed in the pilot house appear in the background.



Captain P. R. SELIG, Alaska Line skipper acts as trial captain; H. W. McCURDY, President, Puget Sound Bridge & Dredging Co., takes over as quartermaster.

lowing exclusive features in their HSB-LL crane:

- 1) A two-line double drum compensating and stabilizing hoist unit.
- 2) A two-line double drum boom hoist unit.
- 3) A single hinged boom with sufficient width at the boom tip to mount two swivelled self-aligning boom tip hoist line sheaves, and one or more boom hoist line sheaves at each side near the boom tip, as required to assure boom tip stability.
- 4) A compensating hoist line reeving system providing substantial level luffing of the load line.
- 5) A power limiting device which automatically prevents the crane from lifting more than a predetermined safe overload.
- 6) A two-line hoist reeving, developed to a practicable and workable system.
- 7) Hydraulic power on all motions.
- 8) Simple, easy operating controls.

#### Crane Operation

"In operation, the Colby HSB-LL crane with the above exclusive features handles cargo safely and efficiently. Even under conditions where the vessel is listed or rolling, the crane affords a noticeable absence of load swinging. A further exclusive and useful feature employed in the crane is a provision enabling the crane operator to unbalance the tension on the two hoist lines when loaded, by applying a brake on either of the hoist drums. In this manner, he can cause the load to move sideways with respect to the boom tip. This feature is helpful both in spotting loads and in placing them under the wing decks of vessels.

"The use of Vickers hydraulic equipment has resulted in extreme smoothness and flexibility of control on all motions of the HSB-LL crane. It has also permitted the crane's machinery to be arranged with unusual compactness and a low center of gravity, while still permitting full accessibility to all parts. This compactness is of great importance aboard ship where space is at a premium and where all weight above deck must be kept as low as possible. In addition to these advantages, the hydraulic drives afford maximum protection against the elements during sea voyages.

"Careful consideration has been given to making the HSB-LL crane ultra-safe in performance and extremely simple to operate. To this end Colby engineers have devised

a control system requiring only two hand-operated levers for actuating the hoist, luffing, and rotate motions of the crane. Only three-foot operated brake pedals are required for the two hoist drums and for the rotate unit. In actual practice the brake pedals are seldom used unless the vessel is loading or discharging cargo in rough water."

#### Electro-hydraulic Steering

The electro-hydraulic steering was furnished by Sperry Gyroscope Co. Four steering stations; pilot house, flying bridge, after weather deck, and steering gear room, are provided for controlling the steering gear. The steering gear consists of two pump and valve units, one a standby, that supply oil to two  $4\frac{1}{2}$  x 22 inch cylinders connected to the tiller arms. In addition to the four electric steering stations, an emergency manual steering station is provided on the after weather deck.

The Sperry assembly utilizes Vickers pumps and motors for the electro-hydraulic controls. The cylinders position the rudder directly. Flexible hydraulic lines to each of the cylinders are connected in parallel to the hydraulic pump units. The rudders, therefore, are positioned by the combined force of both pistons operating together. The hydraulic pump operates at 900 rpm and delivers 6 gallons of oil per minute. At this rate, hard over to hard over rudder time is about 15 seconds.

The folding hatch covers are the Campbell-Sabin type, supplied by A. R. Campbell Co., San Francisco. Rubber sealed when in closed position, they are easily hinged back and secured in a matter of seconds, using crane gear and power for the operation.

Officer's and crew quarters are well fitted. Metal doors and metal furniture are used throughout. Berthing accommodations for 38 are provided.

Cargo space is forward, divided into three holds. Designed cargo capacity, under deck, is 56,400 cu. ft., cargo capacity, special, 3,383 cu. ft.; and space provided for refrigerated cargo is 1,678 cu. ft. Designed displacement, normal load, is 1893 tons. Displacement, ballast condition, is 1068 tons.

Main machinery spaces are aft. Bulkheads fitted with watertight doors divide them into three compartments. Main engines, the usual pumps, valve manifolds, switchboard panels and appurtenances fill the forward section. The generators, auxiliary machinery and supple-



W. I. EON, Fairbanks-Morse, Seattle; J. C. ELMBURG, Fairbanks-Morse, Portland; E. HUNDLEY, ATC Research and Development Station, Fort Eustis, Va.

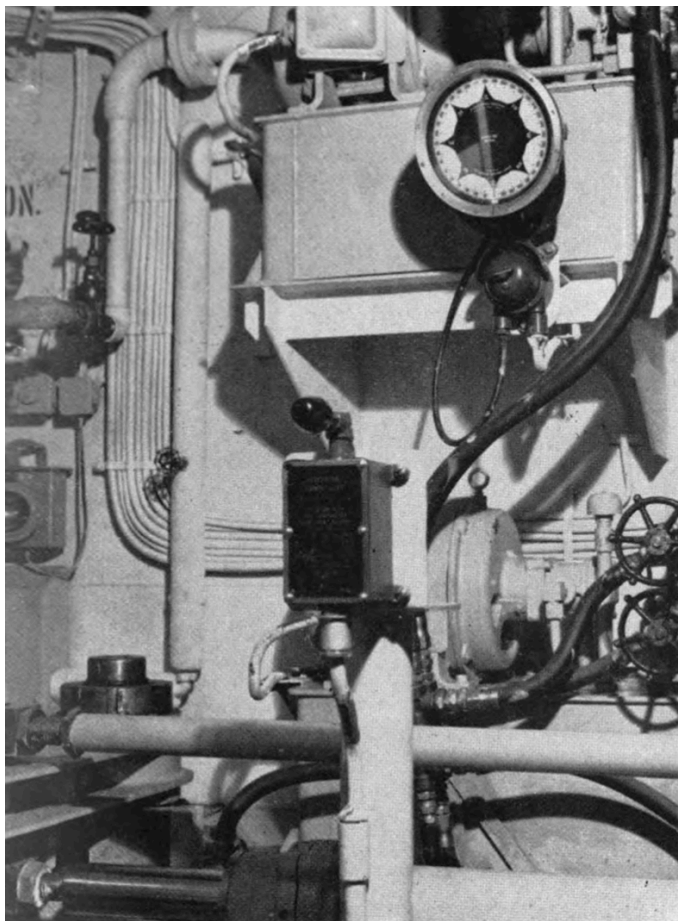


Markey Anchor Windlass, foreground. Background, left to right: R. G. KENNARD, Markey Machinery Co., Seattle; DON VANEK, project engineer, Puget Sound Bridge & Dredging Co.



Left to right: A. C. DALGLEISH, Seattle; J. W. RINSCHLER, Great Neck, New York; H. S. BURTIS, Seattle; HARVEY FULLERTON, Seattle; all of Sperry Gyroscope Co., assemble in the steering engine room.





The electro-hydraulic gear assembly, supplied by Sperry Gyroscope Co., is confined in a small, effectively used, steering gear room. The assembly includes two pump and valve units, one a standby pictured at top, somewhat hidden by the compass and rudder direction indicators; and the other below, by the emergency steering control stand and valve handles. Flexible hydraulic lines run from the pump units to cylinders shown in lower part of picture. The cylinders are connected to the tiller arms.

mentary switchboard panels are in the middle compartment. Refrigeration equipment takes up the major portion of the after space.

Space for shop equipment is provided in the aft compartment and in the focsle house. Spare parts and deck stores are compacted in these two areas and in the steering engine room.

### Principal Particulars

Length—overall	222'-9 3/4"
Length—(Load line regulations)	210'-7 1/4"
Beam, molded	38'-0"
Depth amidships	19'-0"
Cargo capacity, under deck	56,400 cu. ft.
Cargo capacity, special	3,382 cu. ft.
Cargo capacity, refrigerated	1,678 cu. ft.
Draft, mean, ballast conditions, designed	7'-10"
Draft, mean, normal load, designed	12'-9"
Draft, mean, load line regulations	15'-10"
Displacement, ballast condition, designed	1068 tons
Displacement, normal load, designed	1893 tons
Freeboard, normal load, designed	6'-9"
Horsepower, main engines, about	1400 min., 1600 max.
Speed, normal load, designed	12.25 knots
Cruising range, normal, approximately	1700 miles
Cruising range, emergency, up to	10,000 miles

### Technical Data

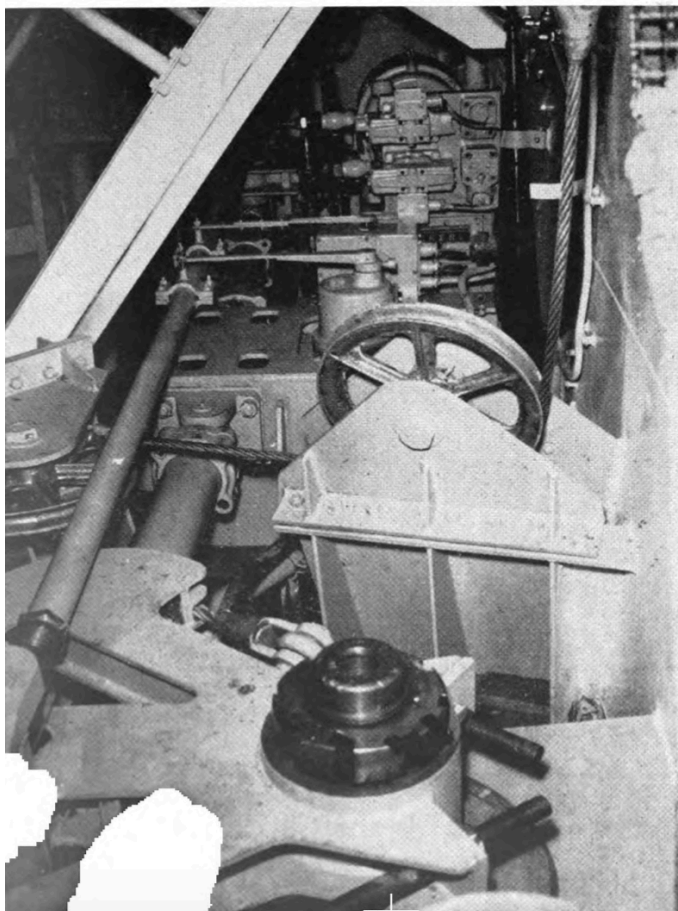
#### Colby HSB—5—LL Cranes

Maximum rated capacity	10,000 lbs.
Maximum operating radius	38' 0"
Maximum Hoist Speed (Approx.)	225 FPM
Maximum crane Rotating Speed (Approx.)	2 RPM
Maximum time to luff boom	20 sec.
Maximum diameter of machinery deck	10' 0"
Maximum list of vessel with crane operating	10 Deg.
Prime Power	440 volts, 3 phase 60 cycles
Control	Infinitely variable speed, with mechanical serve control of pumps
Weight of crane in operating condition, including kingpost, approximately	60,000 lbs.

### Partial Equipment List

Main Engines	Fairbanks-Morse
Reduction Gear	Farrell-Birmingham
Fire & Ballast Pump	Fairbanks-Morse
Lub. oil Transfer Pump	Fairbanks-Morse
Sanitary Pumps	Fairbanks-Morse
Fresh Water Pumps for Main Engines	Fairbanks-Morse
Portable water pump	Fairbanks-Morse
Hot Water Circulating Pump	Fairbanks-Morse
Air Heater Circulating Pump	Fairbanks-Morse
Fuel Oil pump	Blackmer
Lube Oil Hand Pump	Blackmer
Air Compressors	Gardner-Denver
Emergency Air Compressor	Worthington
Eductors	Schutte-Koerting
Generators	Hercules Diesel-U. S. Motors
Mufflers	Burgess
Ventilating Fans	L. J. Wing Mfg. Co.
Air Conditioning Controls	Minneapolis-Honeywell
Stuffing Box Bearings	L. Q. Moffitt
Drive Shafts	cutless type
Propellers	Isaacson
Switchboards	Iron Works
Intercom System	Coolidge
Hatch Covers	Propeller Co.
Cranes	Pelham Mfg. Co.
Anchor Windlass	Henshell Corp.
Capstan	A. K. Campbell Co.
Pilot Ladders	Colby Steel & Mfg., Inc.
Anchors, anchor chain & stoppers	Markay
Gyro Compass Equipment	Machinery Co.
Steering engine & stands	Great Bend
Boat davits, winches & life boats	Mfg. Co.
Depth Indicator	Baldt Anchor
Smoke Detecting, Fire Fighting System	Chain & Forge
Pilot House Windows & Swipes	Sperry
Watertight Doors	Sperry
Metal Cabin Doors	Wellin
Metal Furniture	Raytheon
Metal Furniture	Walter Kidde
Metal Furniture	Kearlott Co.
Hydraulic Pumps & Motors	Supplied by M. J. Gigg
	World Steel Co.
	Royal Metal Mfg. Co. of Cal.
	General Fireproofing Co.
	Phineas Juster
	Vickers, Inc.

### The Log



With camera pointed athwartship from starboard to port the Sperry electro-hydraulic steering engine appears in the top background. (Vickers hydraulic pumps and motors.) Picture taken aboard the FS-790 Army prototype 210 foot dry cargo barge.