SURVEYING SHIPS (CONT'D)

NEW SURVEYING SHIP AND WOODEN TENDER FOR U. S. COAST AND GEODETIC SURVEY.

The following important details have been extracted from the official specifications for the single-screw Survey Ship (displacement 1500 tons) now under construction for the U. S. Coast and Geodetic Survey.

At the same time as this vessel a 125-ton wooden tender is under construction and both are to be completed early in 1940 for surveys in the Aleutian Islands.

I. SURVEYING SHIP

GENERAL:

Dimensions.—	Length between perpendiculars.....	198'—8½"
	Breadth moulded	38'—0"
	Depth moulded	23'—0½"
	Height moulded-Lower Deck.....	9'—0"
	» » Lower Deck to Main Deck	7'—0"
	» » Main Deck to Upper Deck	7'—0½"
	» » Upper Deck to Superstructure Deck	7'—0½"

General Description.— All decks are to be of steel, the weather decks sheathed with wood and interior decks to have composition coverings where specified as indicated on "Deck Covering Plan".

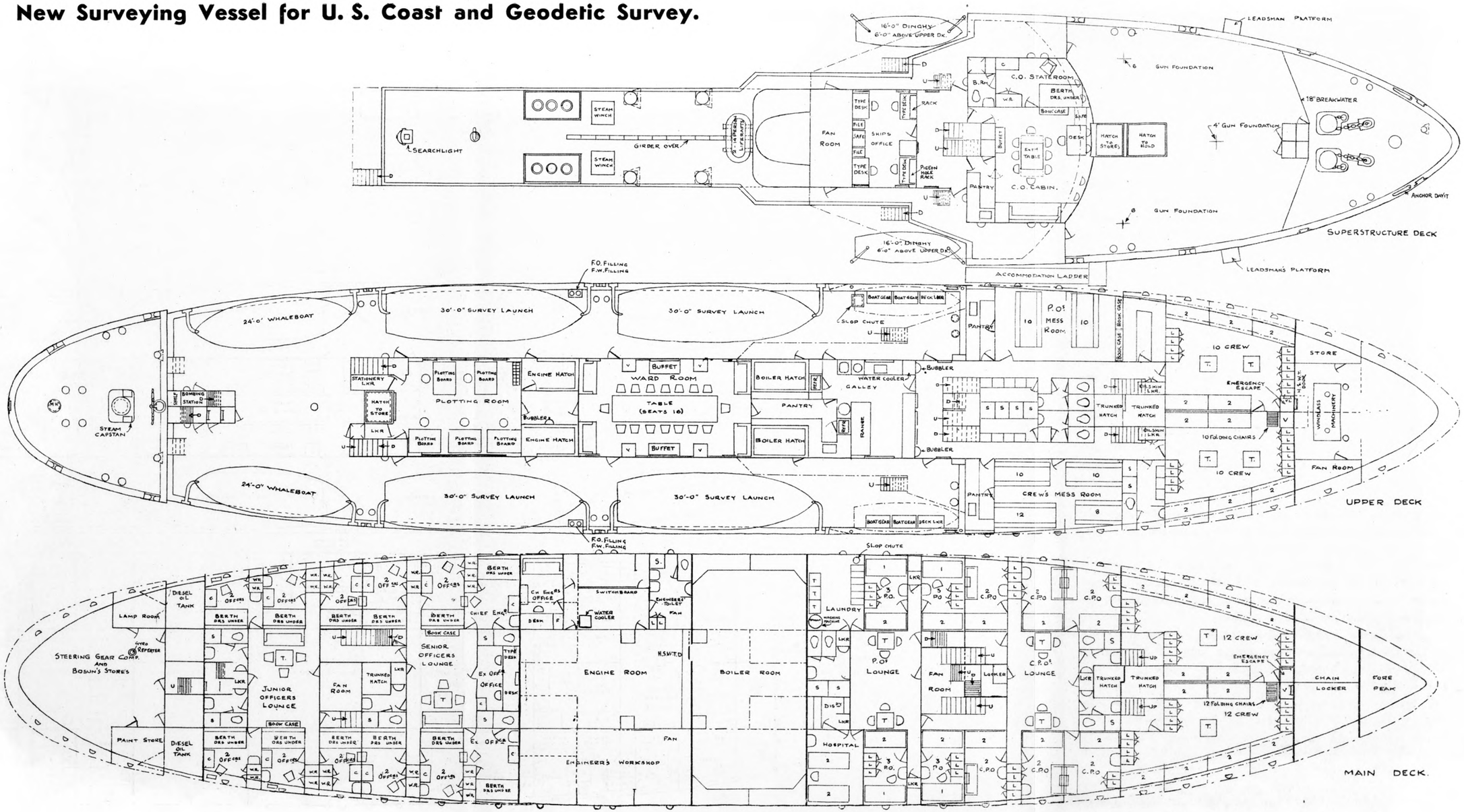
All deckhouses are to be of steel. Double bottom all fore and aft is to be formed by Lower Deck flat forward and aft of machinery space together with normal double bottom in machinery spaces carried up at sides to height of Lower Deck for bilge protection.

Vessel to be single screw. Propelling machinery to consist of four impulse turbines, or their equivalent, operating a propeller through a single case, double reduction , double helical gear together with all necessary auxiliaries.

Steam to be provided by two watertube boilers, with a working pressure of 310 lbs with 200° F. superheat, at the superheater outlet. Engines and boilers in separate compartments amidships with casings carried to Superstructure Deck, boiler uptakes to be carried to one stack one uptake on each side of vessel.

With regard to delivery and other general requirements in the contract, the specifications follow the usual lines for all naval vessels.

New Surveying Vessel for U. S. Coast and Geodetic Survey.



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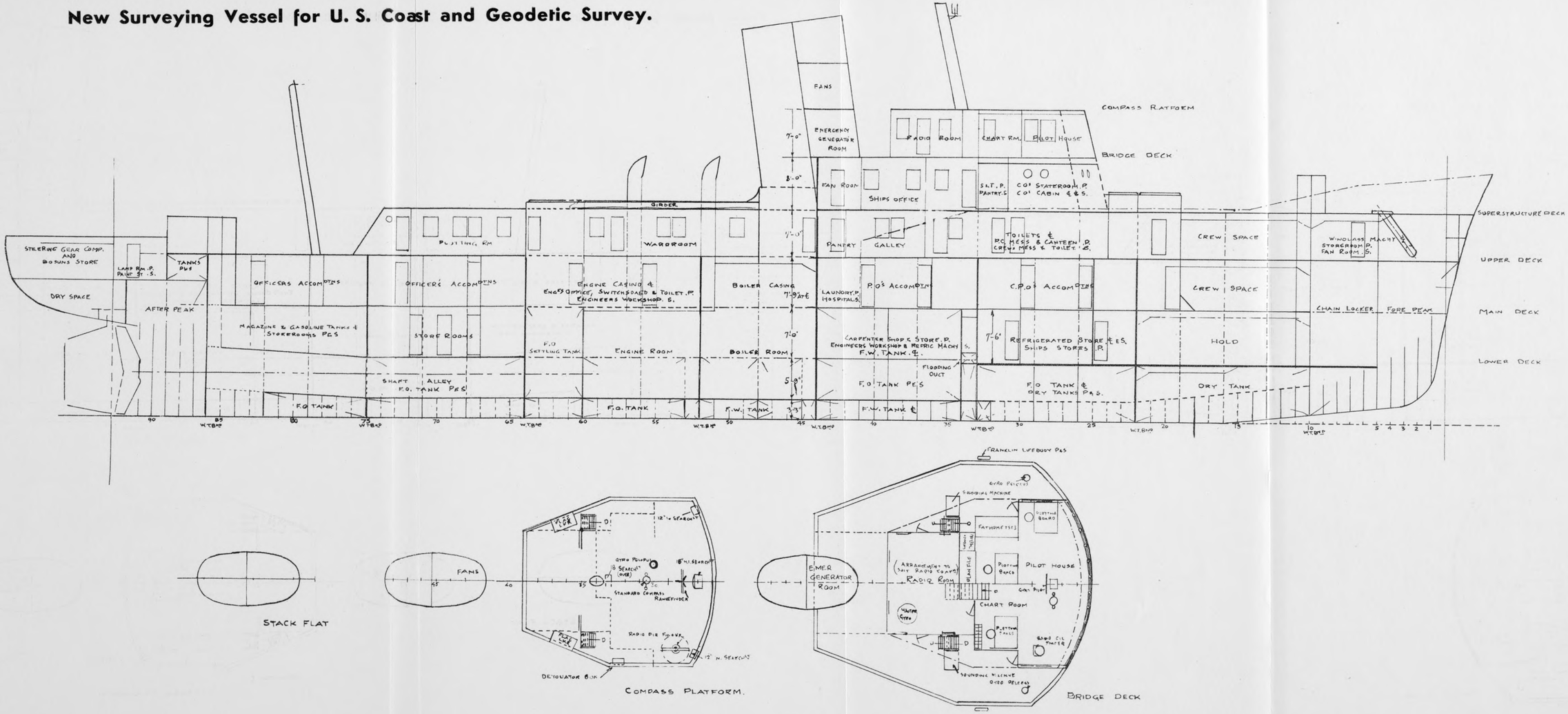

HULL FITTINGS:

Airports, Windows.—

Pilot house windows to be Kearfott K800. Pilot house window or equal 26 × 22 1/2. Frameless 1/4" heat-treated plate glass sliding in felt lined channels and with rubber gaskets in frame and dogs to seal weathertight. Window to be complete with drain pocket.

Clear vision screens are to be fitted at corner port and starboard windows in Pilot House as specified under Miscellaneous Equipment, to be arranged on panel and with suitable fittings that they may be hinged overhead when not in use and when down will be weathertight.

Sliding Watertight Doors.— Sliding doors to be constructed in accordance with best existing practice and shall be power operated by approved Electric system as specified further with control in Pilot house and the gearing so arranged that the doors can also be power operated at the door — except door at bulkhead N° 10 which shall be hand operated only.

The arrangements shall be such that the doors will close automatically if opened by local control after being closed by central control and also such that any door can be kept closed by local arrangements which will prevent the door being opened from the central control. The doors shall also be provided with hand gear workable at the door itself from either side and from an accessible position above the bulkhead deck. Door indicators shall be fitted at all operating stations other than at the door itself, showing whether the door is opened.

OUTBOARD FITTINGS:

Booms : Two 2-Ton Booms 25'0" long constructed of steel pipe to be supplied and installed with sockets on forward side of deckhouse, port and starboard. Gooseneck pins fitted with alemite lubrication.

Suitable stowage is to be arranged for booms when not in use.

Sounding boom :

Two sounding booms 20'00" long constructed of steel pipe to be supplied and installed forward port and starboard.

BOATS AND DAVITS:

Boats.—	Four Survey Launches.....	30'
	Two Whaleboats	24'
	Two Dinghies	16'

Davits.— Six pairs of mechanical boat handling davits of the modified sheath-screw type, Welin or equal, and two pairs of rotating-boat handling davits.

Four pairs will be required for handling the 30' survey launches having a gross weight of 12,000. These davits will have an out-reach of not less than 6'6" and an inreach of 5'3".

Two pairs will be for handling the 24' whaleboats having a gross weight of 5000 lbs. These davits will have an out-reach of 6'0" and an in-reach of 4'9".

Two pairs of rotating davits will be required for handling the 16' dinghies having a gross weight of 1000 lbs. These davits will have an out-reach of not less than 4'6"', and are to be constructed of forged steel or structural steel (welded) with the necessary sockets, etc.

Each davit is to be equipped with a complete set of blocks. The falls are to be Manila rope,

4" for Launches,
3" for Whaleboats
2" for Dinghies

of sufficient length to reach the water when vessel is at the lightest draft and with leads to the boat winches. The blocks to be galvanized with malleable iron shell, cast steel sheaves, upper blocks to be fitted with swivel shackle and becket, lower block to be non-toppling type with swivel eye suitable for releasing gear and becket ; all necessary lead sheaves and blocks are to be supplied to give suitable leads to boat winches (survey launch) capstan aft (whaleboats). All davits, blocks and sheaves to be equipped for Alemite lubrication.

Boat Winches. — Two steam boat-winches of approved make (Lidgerwood, McKiernan-Terry or equal) are to be fitted on Superstructure Deck.

ACCOMMODATIONS:

These are shown on the plans reproduced herewith.

Plotting boards, 8 in number. These boards are to be used for plotting on Field Sheets; they shall be removable and may be stowed elsewhere. They will be made of laminated selected White Pine 1½" thick, stiffened on the underside, with kerfs to prevent warping. Each board will rest on two steel filing cabinets 34½" high each fitted with two drawers making a total height of 36". Angle fastenings to be provided for securing all parts together to insure rigidity when boards are in use.

PROPELLING MACHINERY:

General.—

The main propelling unit will consist of four impulse turbines, or their equivalent, two pinion, single case, double reduction gear of the latest design driving a propeller through line shafting at 130 RPM when developing 2000 SHP normal and with reserve power of continuous operation with turbines developing 10 % in excess of normal power.

The turbines at normal SHP when furnished with steam at the throttle at 300 lb. pressure with 200° F. superheat, sea water 70° F.

and vacuum 28.0" will have a designed water rate straight condensing not exceeding 11,8 lb. per SHP hour.

The electrically driven auxiliaries which are subject to continuous operation will be driven by 115 volts D.C. motors.

Generators will be steam turbine driven, with a guaranteed water rate not exceeding 27 lb. of steam per K.W. hour.

Two water-tube boilers of an approved make generating superheated steam at 310 lb. gauge pressure with 200° F. superheat at the superheater outlet with desuperheater, each capable of desuperheating about 2500 lb. of steam with superheat not exceeding 50° F. and fitted for burning of fuel oil under induced draft.

The boilers will be fitted with superheaters and all other necessary equipment.

Turbines and Gear.— The main turbine and gear unit will consist of four impulse turbines, or their equivalent, connected to a single propeller by a two pinion, single case, double reduction, double helical gear.

The ahead turbines and gears are to be designed to deliver a total normal rated power of 2000 SHP at 130 RPM with steam pressure 300 gauge 200° superheat and will also be designed and nozzled to operate continuously at 10 % in excess of normal SHP.

The astern turbine will be designed to develop 100 % of normal ahead power with 130 % normal ahead steam flow.

The power for ahead operation will be furnished by three elements; a high, intermediate and low pressure and the remaining element will furnish the power for astern operation.

Propellers :

There is to be one right hand, four bladed, solid manganese bronze propeller about 12'—0" diameter and 13'—0" pitch, to be approved.

Main Boilers:

Two water tube boilers, each boiler to have a total water heating surface combined with superheating surfaces sufficient to evaporate at least 18000 lbs. steam per hour at 325 lbs. gauge pressure and 200° superheat at superheat outlet under normal conditions with an evaporation rate not to exceed 5 lbs. per sq. ft. of heating surface. Each boiler to be capable of supplying 2500 lbs. of desuperheated steam containing not more than 50° F. superheat.

The boiler to be built for a working pressure of 350 lbs. per square inch on drum.

Each boiler will be fitted with superheater to give 200° F. superheat.

Smoke Stack:

One smoke stack of suitable proportions will be fitted above boiler room, generally as indicated on plans.

ELECTRIC PLANT:

The electric plant will consist of two turbine driven, main generators, each of 50 K.W. capacity, 120 volts D.C., two wire, compound wound, arranged for parallel operation. These machines will be located on the Engine Room floor level in a position approximately under the switchboard flat.

The turbine will operate at 300 lbs. gauge, 200° F. superheat at throttle and exhaust against a back pressure of 10 lbs.

A motor generator of 15 K.W. capacity will be installed on the generator flat or switchboard platform as may best suit the general arrangement of machinery or equipment in these spaces. This machine is for the purpose of taking three phase 110 volts A.C. current from shore, when ship is tied up to the dock, and converting it to 120 volts D.C. for ship's use. Necessary starting and control equipment will be mounted on and in conjunction with the main switchboard.

SEARCHLIGHTS :

(a) One 18" incandescent pilot-house type control searchlight equal to Sperry Cat. N° 204; will be mounted at a suitable height on the foremast and provided with a suitable length of control shafting to enable it to be operated from the foot of the mast. One 115-volt, 1,000-watt, Biplane filament bulb to be furnished with lamp, and one to be furnished as spare.

(b) Two 12" incandescent pilot-house control type searchlights, equal to Sperry Cat. N° 201; will be located Port and Starboard on the forward corners of compass platform and operated from within the pilot house. One 115-volt, 500-watt bulb to be furnished with each light and also one to be furnished as a spare for each light.

(c) One 18" inch high intensity pilot-house control type searchlight equal to Sperry Cat. N° 91-505, to be located on the centre line on the forward side of the top of compass platform and operated from within the pilot-house. The equipment for this light shall consist of:

(1) Line rheostat
(2) 25 Pairs Carbons
(3) Set spare parts and tools
(4) Canvas cover
(5) 2 Sets of Instructions.

(d) One 12" incandescent, pedestal type, searchlight equal to Sperry Cat. N° 202, to be located on the after end of house top, about Fr. 73. One 115-volt, 500-watt, bulb to be furnished with light, and one to be furnished as a spare.

COMMUNICATION SYSTEMS:

Gyro Compass: The gyro compass equipment will be supplied and installed by the shipbuilders; will be Sperry type G-69644 and will comprise the following:—

(a) Master Compass
Control Panel 115 volts D. C.
Voltage regulator
Amplifier panel
Motor generator for operating on 115 volts D. C.
Alarm unit
Spare parts and tools
Filter.

(b) 1 Steering repeater for mounting atop of Gyro pilot Cat. SG 130.

(c) 2 Bearing repeaters with standard type of column stand Cat. SG 155.

(d) 1 Bearing repeater with special stand comprising repeater, Cat. SG 155 and Stand 69148D to provide mounting grooves for range finder.

(e) Repeater for Steering Gear Room, Cat.

(f) 1 Course recorder, Cat. SG 170.

(g) 1 Radio Direction finder repeater, Cat. SG 160.

(h) 2 Azimuth circles, Cat. 146.

The circuits of the Gyro Compass and its associated equipment are to be adequately filtered so that no interference whatever will be produced in either the radio direction finder, the radio receivers for long or short waves nor in audio amplifiers of high gain at low frequencies.

Radio, Short and Intermediate Wave Sets: Transmitters: The contractor will furnish two radio transmitters for communication by code. They will be provided with an emergency equipment so that they may be operated from a 12 volt storage battery if the ship's 110 volt D.C. supply is not operative.

The transmitters shall be of Radio Marine Corporation's manufacture and installed by them. They shall be crystal controlled throughout.

The intermediate frequency set shall be Radio Marine Corporation's type E.T. 8010-A for 200 watts main and 50 watts emergency modified for crystal control on the frequency of 375 K.C., 400 K.C., 425 K.C., 454 K.C. and 500 K.C.

The short wave set shall be of the Radio Marine Corporation's manufacture type E.T. 8002-C for 150 watts modified for the frequencies of 4135 K.C., 8270 K.C., 12,405 K.C., 16,540 K.C., and 4160 K.C., 8320 K.C., 12,480 K.C., and 16,640 K.C. Two crystals each of frequencies 4135 and 4160 K.C. will be supplied from which the harmonics may be obtained by auxiliary tubes.

Radio Direction Finder: The shipbuilder will supply and install in the Pilot-house a Radio Direction Finder, Radiomarine Corporation's model AR-8703 or equal, this instrument will be complete with all necessary batteries, loop, automatic compensator, amplifier, etc. The Gyro repeater used with this instrument will be furnished as a part of the Gyro Compass equipment.

Fathometer: The Government will furnish and the Submarine Signal Co. will install a Dorsey Fathometer.

The installation will include a 5 K.V.A. turbo generator. Contractor to furnish necessary foundation in the Engine Room, also necessary steam supply and exhaust piping and valves for the operation of this machine.

The installation of the oscillators and tranceivers, 4 in number (2 Port, 2 Starboard) will require openings in the hull of the vessel, each about 15" in diameter.

Taffrail Log-Electric: The shipbuilders will supply an electric taffrail log, "TRIDENT" or equal and install same complete with contact making device, wiring, batteries, etc. The taffrail register will be attached by a flexible cable connected electrically to the contact maker inside the case. From the taffrail location aft, permanent wiring will be installed to the Pilot-house for the operation of the register in that location.

Submerged Log - Electric: The contractor will furnish and install a "Meridian" type submerged electric log, together with all necessary wiring, fittings, etc., to make a complete and workable installation.

Radio Broadcast Receivers: There will be three broadcast receivers, one of which will be located in the Radio Room with speakers located in crew's mess-room and C.P.O. mess-room.

The receiver for the Wardroom mess will be a standard, all wave type, R.C.A. or equal and shall be suitable for operation on 115 volts D. C. Necessary outlet will be provided on the ship's lighting circuit for operation of this instrument. If any special antenna is required it shall also be furnished as a part of the outfit.

A similar receiver to that described above for the Wardroom will be located in the Commanding Officer's cabin.

Bombing Signal System: There will be supplied and installed a bombing signal system consisting of bells, buzzers and contact makers, connected and located as follows:—

Bombing Station aft: A watertight receptacle and portable contact maker, with portable cord sufficient in length to reach side of ship, will be installed at this location, connected to W/T buzzers located in the Pilot-house and Radio Room.

Pilot-house: A permanently mounted push button or contact maker will be installed in the vicinity of the fathometer connected to a 6" W.T. Bell located at the bombing station.

Radio Room: A permanently mounted push button, or contact maker, will be installed in this room connected to the 6" bell mentioned above to be located at the bombing station.

Push buttons and contact makers shall be of the "quick-break" type. Wiring to be grouped in one set of I.C. Cables as far as possible and system to operate on 115 volts D.C. Feed to be taken from the Emergency Switchboard.

PRINTING CHRONOGRAPH:

The contractor will furnish a Printing Chronograph as manufactured by Société Génevoise d'Instruments de Physique of Geneva, Switzerland.

The Chronograph shall be model V, which prints numbers of minutes, seconds, tenths and hundredths of seconds on a moving paper tape, the printing being through an inked ribbon.

The Chronograph shall be completed with glass cabinet, 4 inked ribbons, 4 replacement switches, 2 complete sets of instructions, and 100 rolls of recording paper.

MISCELLANEOUS EQUIPMENT:

Clear View Screens:

Two Cory-Kent clear view screens will be fitted one in each of the for'd corner windows of the Pilot-house. Necessary outlets and wiring will also be provided for the operation of these screens. Current will be obtained from the ship's 115 volt lighting circuit.

Sounding Machines - Electric:

The Government will furnish two electric sounding machines to be located on the bridge wings as indicated on "Arrangement Plan". The Shipbuilder will install this equipment complete including all wiring, necessary deck fittings, etc. A single feeder from the main switchboard will supply current for the two machines; each machine will be equipped with a 3 HP motor.

Electric Watertight Door Controls:

The vessel will be equipped with two motor-operated watertight doors located as follows:—

One over tank top, stbd. of centreline, between Engine Room and Shaft Alley.
One main deck level, between Engine Room and Boiler Room, Blkhd. 52.

II. WOODEN TENDER.

Principal Dimensions and Power:

Length, overall	88'	
Beam, moulded	18'	
Depth, moulded	11'	
Draft, forward	6'10"	(approx.)
Draft, aft	8'00"	»
Freeboard to deck forward	9'09"	»
Freeboard, least	4'11"	»
Freeboard, aft	6'05"	»
Height of bulwark	1'07"	»

Main propelling machinery twin screw, diesel, direct reversing, each engine 150 H.P., 500 R.P.M., 75 lb. M.E.P.

General Description:

The vessel to be flush deck with plumb stem, elliptical stern, long deck house, raised pilot house, and two pole masts. The hull to be divided into five compartments by four watertight bulkheads. The machinery space to be amidships, officers' quarters aft and forecastle forward. There will be a peak compartment and lazaret. The deck house will contain pilot house and chart room forward, crew's toilets, crew's mess room, galley and entry to wardroom. There will be suitable accommodations for 3 officers and 12 men.

KEEL:

To be 9 1/2" × 11 1/2" S4S laid on the flat and in one length from the forefoot to the sternpost. To be rabbeted for the planking. After end to be tapered in siding to suit the sternpost.

SHOE:

To be of ironbark or other approved hardwood 2" × 11 1/2".

STEM:

To be of tough fir butt (or yellow pine butt, dense, merchantable or white oak, selected, structural) sided 11 1/2" S2S and moulded as shown.

STERNPOST:

To be of tough fir butt (or white oak, selected, structural) sided 11 1/2" and moulded 20".

STERN:

To be built up to shape about as shown on the plans and rabbeted to take planking.

FRAMES:

To be of two thicknesses of 3 1/2" flitch S2S, spaced 18" centres, moulded 9" deep at keel with uniform taper to 5" at heads. To be sawed so that the keelson will be seated 12" above keel. All frames to have laps of not less than 30" and to be bolted together with two 5/8" monel metal screw bolts in each lap and suitable monel metal spikes at each butt. Frames to be bolted to keel with one 5/8" monel metal drift bolt. All half frames to be boxed into deadwoods and horseshoe and well bolted thereto. Forward of frame N° 53 the frames will be run solid to the stem.

KEELSONS:

Main keelson to be in one length 9 1/2" × 11 1/2" S4S laid on the flat running on top of the floor timbers.

OUTSIDE PLANKING:

To be finished 2 1/2" × 5 1/2" and in long lengths with butts in adjoining strakes shifted not less than four frame spaces.

DECK BEAMS:

To be sided 4 1/2" S2S and 6" deep.

DECKING:

Deck planks to be 2 1/2" × 2 1/2" net.

WATERTIGHT BULKHEADS:

The transverse structural bulkheads shall be four in number and located about as shown (at frames Nos 8, 22, 36 and 50). They shall be constructed of N° 9 U.S.S. gauge genuine wrought iron, galvanized, with 2" × 2" × 3/16" galvanized angle irons riveted or welded thereto, spaced about 16" centres.

BULWARKS AND RAILING:

A rail chock 5" × 5", bearded as shown, shall be run continuously around the sides of the vessel, from stem to stern, landing on top of covering board and set in 3 1/2" from outer edge of same.

MASTS AND RIGGING:

Two masts to be located where shown on the plans. To be 10" diameter at the deck; foremast 30' above the deck and mainmast 33' above the deck. To be fitted with lignum vitae trucks with brass pulleys, galvanized iron mast withes with four eyes each to take shrouds, forestay, springstay and throat halliards and to be grooved for electric light conduits.

STEERING GEAR:

A brass steering wheel with mahogany rim shall be located in the forward end of the pilot-house.

PILOTHOUSE:

Pilothouse shall be raised 27" above the remainder of the house. It shall have two doors and six windows of the Kearfott frameless type at the forward end, and six windows of the hinged type in the after end.

At the forward end of the pilothouse there shall be a combination steering pedestal and compass ledge, the top of which will be about 14" square and on one side of which there shall be located bell pulls for engine-room signals. On the opposite side there shall be a pedestal type, double engine, telegraph, with engine-room reply, similar to Thos. Laughlin N° 31. There shall be installed a brass voice tube to the engine room. Along the after port side there shall be a ledge about

4'10" above the deck or on the line of the after deck housetop, over the entry to the crew's quarters. On the starboard side there shall be a plotting board 2'6" wide ×6'66" long, the after end of which will extend over the forward end of the engine-room entry. The top of this board shall be of seasoned white pine 1 1/2" thick kerf cut on the under side, 1" deep by 2" centres, to prevent warping. Under the forward end of the board there shall be a series of chart drawers 2 1/2" deep and as large as possible. Along the after end of the room there shall be a 24" wide work ledge for the radio equipment with drawers and lockers under. On the port side just forward of the radio bench there shall be a step, and half doors under the ledge for interior passage to the after end of the house. Forward of these doors the space shall be reserved for the installation of the fathometers.

WARDROOM:

Shall be arranged as shown on the plans. There shall be three built-in berths each 3'0" ×6'6" fitted with coil springs. They shall have drawers under them. There shall be three wardrobe lockers and two additional lockers. There shall be a buffet at the after end and one at the after side of the stairway. These shall consist of drawers and lockers under the top which shall have a small brass rail worked around its edge; over the forward one there shall be a cabinet with shelves and racks for dishes and glassware and over the after one there shall be a bookcase. A transom seat shall be worked around the table. The seats shall have genuine leather upholstery and the space under the seats shall be utilized as lockers with access through the top. A drop leaf table shall be built in as shown and a desk shall be built in on the port side. The trim in this space shall be of mahogany and mahogany soffits shall be worked on the deck beams and on the sides of the shelf. The deck shall be 1" T & G with portable openings worked for access to the hold and stuffing boxes of the shafting. There shall be a locker under the companionway with entry through a door on the starboard side.

FORECASTLE:

Shall be arranged as shown. There shall be twelve folding pipe berths with N° 4 canvas bottoms each 27" ×6'3" under which there shall be a transom seat with upholstered seats and lockers under. There shall be two ladders up to the main deck one at the after end of the forecastle and the other at the watertight deck hatch. Along the after bulkhead there shall be twelve half lockers each 16" ×18" ×36" high. The lockers shall be of metal with metal doors. The deck in this space shall be of 1" T & G on 2 1/2" ×5" beams. Portable sections shall be worked for access to the hold space below. About 6'6" from the forward end there shall be a step up of 12" to increase the hold space.

BOAT CRADLES:

Two 16' Navy type dinghies will be furnished by the Government, but cradles for these are to be supplied by the builder and placed on the boat deck. Cradles will be arranged to have one side hinged and are to be firmly fastened in place by galvanized bolts extending through the carlines of roof. Ringbolts shall be provided to take boat lashings.

BOAT DAVITS:

There will be two sets of boat davits of 3" diameter with about 4' outreach and have suitable bronze bearings on main deck and boat deck, and to be supplied with the necessary eyebolts in head, spanners, guys, cleats and fairleads.

FATHOMETER:

The Government will furnish and install the fathometer equipment to go on this vessel during construction. The contractor will cut the required openings in the hull and introduce the necessary reinforcements where required.

RADIO EQUIPMENT:

The contractor shall furnish and make suitable installation of the following radio equipment:

2 ea. Transmitters for ship frequencies and high frequencies of 4,160, 8,320, 12,480 and 16,640 kilo cycles, types EP-8003 and EP-8004.

2 ea. Receivers for ship frequencies and high frequencies, types AR-8501 and AR-8503.

1 ea. Motor generator operated from 110 volt. D.C. power.

PROPELLING MACHINERY:

There will be a pair of twin full diesel engines, similar to Cooper-Bessemer E-N-6; each to develop 150 H.P. at 500 R.P.M. at not more than 75 pounds M.E.P. weighing not more than 10,500 pounds each; over-all dimensions to be not more than 9'6" long and 34" wide. The engine shall be of the direct reversing type. It shall be 4 cycle and not less than 6 cylinders (opposed pistons or V types not acceptable) and shall be capable of cold starting without the use of torches, hot plates, plugs or electrical devices of any kind.

STACKS:

The main stack shall be about 33" long, 27" wide, 6'6" high, and 16-gauge, galvanized wrought iron. It shall be mounted on a 4" coaming, have a 2" × 2" angle worked around its base, and a 2" × 1/4" band worked around its top. The stack will contain the main and auxiliary exhaust pipes, the Arcola stack, the surge tank and heating system expansion tank. At the upper end of the stack there shall be

baffle plates, permitting it to ventilate and still prevent the entry of water. The baffles shall be drained on to the deck.

PROPELLERS, SHAFTS, etc.:

The propellers shall be one right hand and one left hand carefully bored and keyed to the shaft. Taper, etc. shall be S.A.E. standard. The propellers shall turn outboard and be of true pitch and balanced to prevent vibration.

BATTERIES:

There shall be three sets of lead and acid batteries, a 12-volt starting battery for each of the auxiliary units and a 32-volt 200 ampere hour Navy type battery for the auxiliary lighting system. A charging panel shall be provided for charging this battery from the 110-volt system.

H.M.S. "FRANKLIN." (SURVEYING SHIP)

SKETCH OF RIG. (AS FITTED)