SURVEYING BOATS

by

REAR ADMIRAL J. D. NARES, D.S.O., PRESIDENT OF THE DIRECTING COMMITTEE.

In most Marine Surveys there are areas where owing to shallowness of the water or for other reasons it is necessary to carry out the soundings from boats; these areas may be at a considerable distance away from the land or from the parent ship and exposed to heavy seas; the necessity of having thoroughly seaworthy boats is therefore most important. The weight and therefore the size of the boats are restricted by the fact that they must be capable of being hoisted on board their parent ship, often in heavy weather; one therefore has to combine a comparatively small size with good seaworthiness.

In designing such boats, apart from their seaworthiness it is necessary that they can be easily handled so that close examinations can be carried out of shoal areas, pinnacle rocks, etc. Another most important point is that they should be fitted with thoroughly reliable engines capable of driving the boat at slow speed when sounding and also at comparatively high speed when proceeding to and from her work or against heavy seas or strong tidal streams, also the "astern" speed of the boat must be powerful as soundings have often to be continued close up to dangerous areas leaving no room to turn the boat and it is only by reversing the engines and backing out, often against a heavy sea, that she can regain safe waters. The engines must be thoroughly trustworthy as, should they break down at a critical time, not only the boat herself but the valuable lives of her crew may be lost. It is also considered most important that the boat, whether steam or motor, should be fitted with fore and aft sails and that they should always be carried in the boat (not stowed away on board the ship as is sometimes the case!). In the writer's own experience he has frequently been caught in bad weather in the open sea when the steadying effect of setting sail has enabled the boat to be safely navigated back to port. Oars should also be provided but these are considered of secondary importance to sails as being of little use except in very calm weather.

With the object of exchanging ideas as to the most suitable design of Surveying Boats of different dimensions the Hydrographic Offices of many of the States Members have been requested to supply details of the boats used in their Surveying Services with information regarding their engines, seaworthiness, etc., differentiating between those designed for use in sheltered and open waters, and as these are received in the Bureau they will be published in a series of articles in the *Hydrographic Review*, the first of which appears in the present number.

NOTE. — For reasons of economy only a selection of the plans and figures have been reproduced in this article. Should further details be required the Bureau will be pleased to supply them on request.

UNITED STATES OF AMERICA.

The following types of boats are used by the United States Coast and Geodetic Survey for hydrographic purposes :

(1) 30 foot surveying Motor Boat, 1917 and 1924.
(2) 30 foot surveying Motor Boat, 1932.
(3) 24 foot Whale boat — pulling.
(4) 16 foot Dory Skiff.
(5) 16 foot Dinghy.
(6) 14 foot Dinghy.

Details of these boats are as follows :

(1) 30 Foot Surveying Motor Boat, 1917-1924.

(See Plan N° 1 and Figs 1 & 2)

Dimensions of Hull.

Length overall	30 ft. 00 inches	—	9.14 metres
Beam.....	6 ft. 10 »	—	2.08 »
Draft (about).....	2 ft. 11 —	—	0.89 »

The 30 foot launches built for the Coast and Geodetic Survey in 1917 and 1924 are practically identical as to lines and construction. Two of these launches have been fitted with Kitchen rudders which permit their being slowed down below the minimum speed possible by throttling down the engine alone.

Engine. — The 1917 launch was equipped with a 25-30 H.P. "Buffalo" 4 cylinder, 4 cycle engine, giving a speed of about 8 knots at about 700 R.P.M. This was replaced in 1929 by a 6 cylinder, 4 cycle "Red Wing" engine 3 1/8 inch bore and 5 inch stroke, developing 30 H.P. at 1400 R.P.M.

The 1924 launches were equipped with engines built by Wellman-Searer-Morgan Company, Cleveland, Ohio, 4 cylinder, 4 cycle, 4 3/4 ×6, 47 H.P. at 1000 R.P.M.

General Performance. — Although good sea boats they roll considerably in a seaway and are not entirely satisfactory on that account. Their beam 6'10" is somewhat too small for a 30 foot hydrographic launch. These boats have a turning circle of about 70 foot diameter ; their weight is 6915 lbs, and, built by the Navy Department, they cost $6,500 each.

(2) 30 Foot Surveying Motor Boat, 1932.

(See Plan N° 2 and Fig. 3).

Dimensions of Hull.

Length overall	30 ft. 00 inches	—	9.14 metres
Beam.....	7 ft. 04 »	—	2.23 »
Draft	2 ft. 06 »	—	0.76 »

Boat is of the chine construction, designed to permit the use of bent frames in addition to the deep sawed frames customary in V bottomed boats. The lap strake planking has not been used in previous U.S. Coast and Geodetic Survey launches and a comparison of this form with carvel planking is not

yet possible. The aim of this design is to obtain a higher speed than possible in the usual round bottomed ship's launches. The deck over the engines is intended for the use of the observers in obtaining sextant angle fixes, and the plotting table slides under the forward cabin with sufficient headroom for plotting while the working sheet is protected from spray or rain. A light awning is being made to shelter the observer. It is supported by a fore and aft centre line ridge pole with headroom of 7 feet.

Engine. — The engine installed in this boat is a "Kermath" 6 cylinder, 5×5 3/4, rated 130 H.P. at 1500 R.P.M. On trials the launch attained a speed of 18 knots at 1630 R.P.M.

General Performance. — Only two of these boats have been built and at the time of writing had not been used in surveying and had not been tested in a seaway, but they appear to be quite stable and it is expected that they will prove to bo good sea boats. Their turning circle is about 80 feet in diameter. They are intended for the equipment of the large seagoing vessels which usually carry two launches of this size to be used for inshore sounding, as a liberty boat in port and for transporting Triangulation parties.

Cost. — In all African mahogany planking and cabins the cost, built in a commercial boatyard, was $4,000.

(3) 24 Foot Pulling Whale Boat.

(See Plan N° 3 and Fig. 4)

Dimensions of Hull.	Length overall	24 ft. 00 inches	—	7.32 metres
	Beam.....	7 ft. 00 —	—	2.13 »

Weight. — About 1800 lbs.

This a is standard boat as used in the U.S. Navy. Two are usually carried in each Surveying Ship.

General Performance. — They are excellent sea boats if not overloaded, but are rather heavy and slow pulling boats and sail badly owing to the lack of a centre board.

(4) 16 Foot Dory Skiff.

(See Plan N° 4 and Fig. 5)

Dimensions of Hull.	Length overall	16 ft. 02 inches	—	4.93 metres
	Beam.....	4 ft. 08 »	—	1.42 »

Weight. — About 460 lbs.

General Performance. — A very useful boat in protected waters. Makes good speed with an outboard motor. Is stable and does not list over when grounded on the beach.

(5) 16 Foot Dinghy.

(See Plan N° 5)

Dimensions of Hull.	Length overall	16 ft. 00 inches	—	4.88 metres
	Beam.....	4 ft. 06 »	—	1.37 »

Weight. — About 425 lbs.

Fig. 1

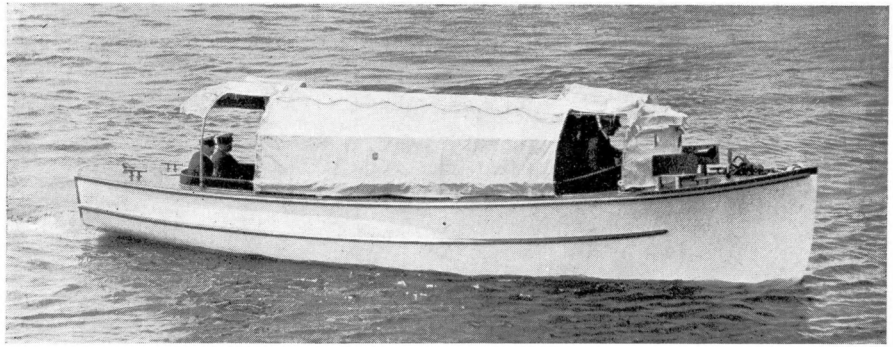
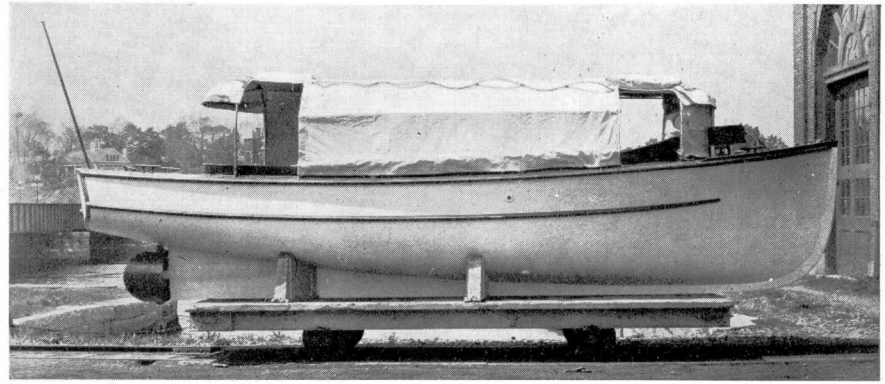
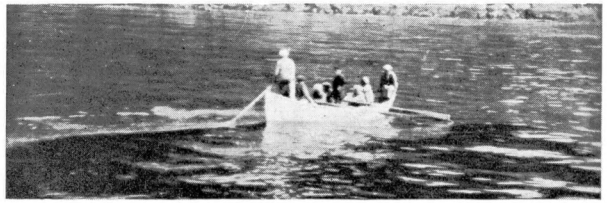


Fig. 2



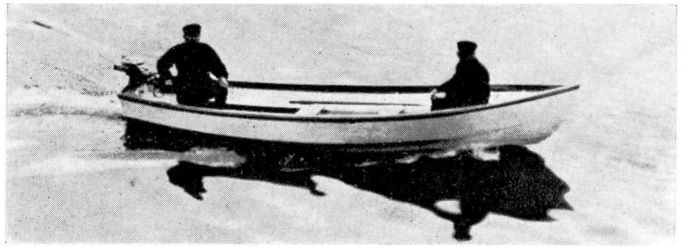
30 foot Surveying Motor Boat 1917 and 1924
Embarcation hydrographique à moteur, de 30 pieds, Modèle 1917 et 1924.

Fig. 4



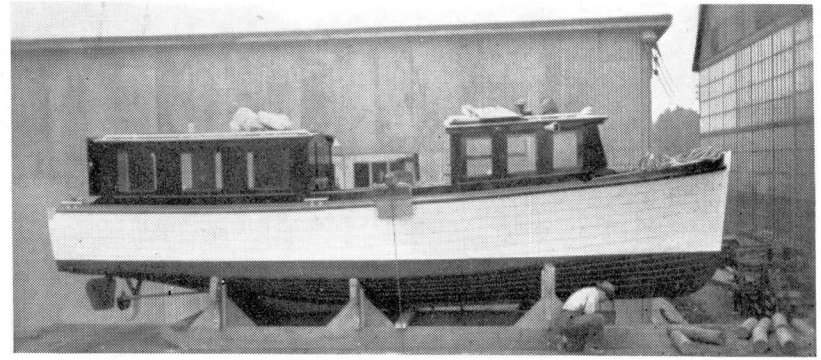
24 foot Pulling Whale Boat — Baleinière à avirons, de 24 pieds.

Fig. 5



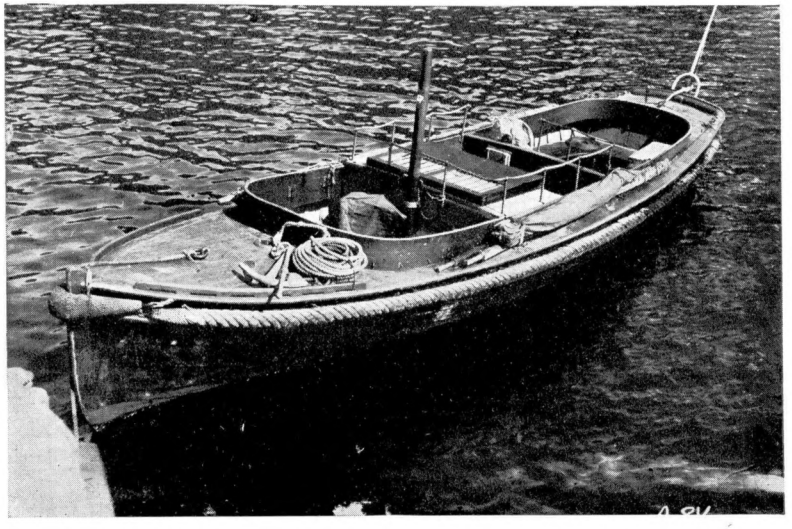
16 foot Dory — Doris de 16 Pieds

Fig. 3



30 foot Surveying Motor Boat 1932
Embarcation hydrographique à moteur, de 30 pieds, Modèle 1932

FIG. 6 & 7



10.2 metre (33½ feet) Surveying Motor Boat 1932
Embarcation hydrographique à moteur de 10.2 mètres, Modèle 1932

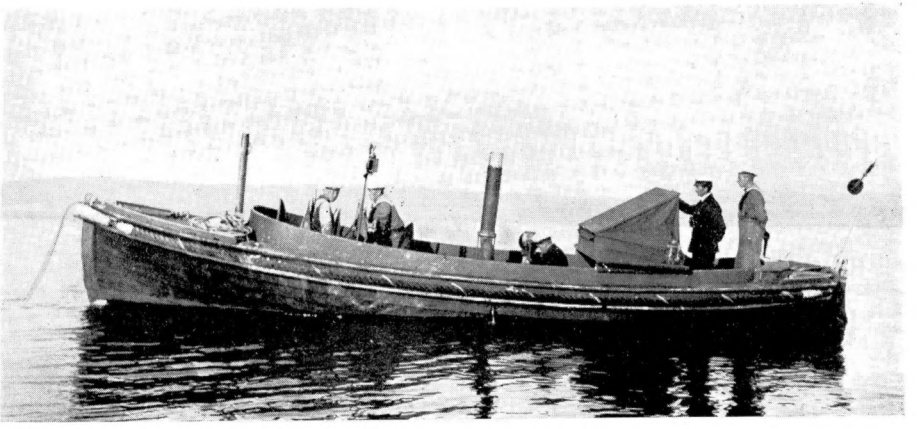


FIG. 8 — *9.2 metre (30 feet) Surveying Boat 1911-1913*
Embarcation hydrographique à moteur de 9.2 mètres, Modèle 1911-1913

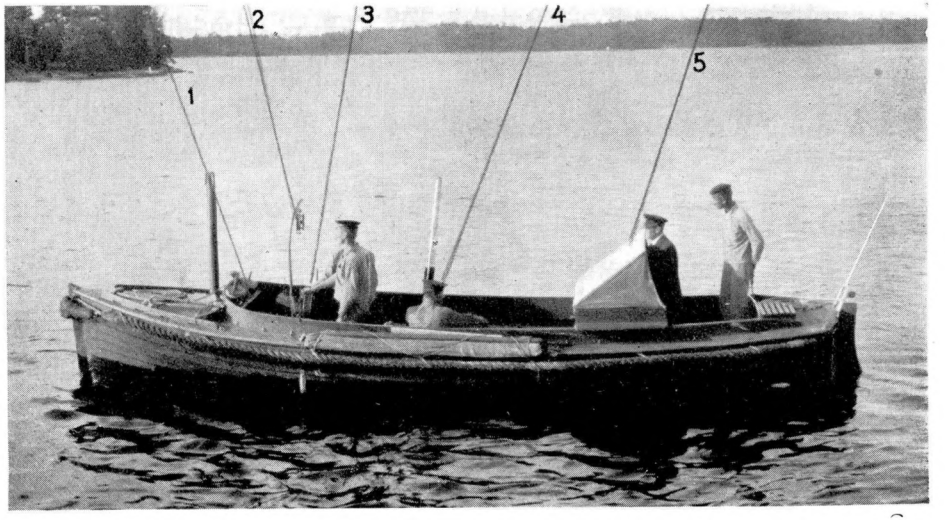


FIG. 9

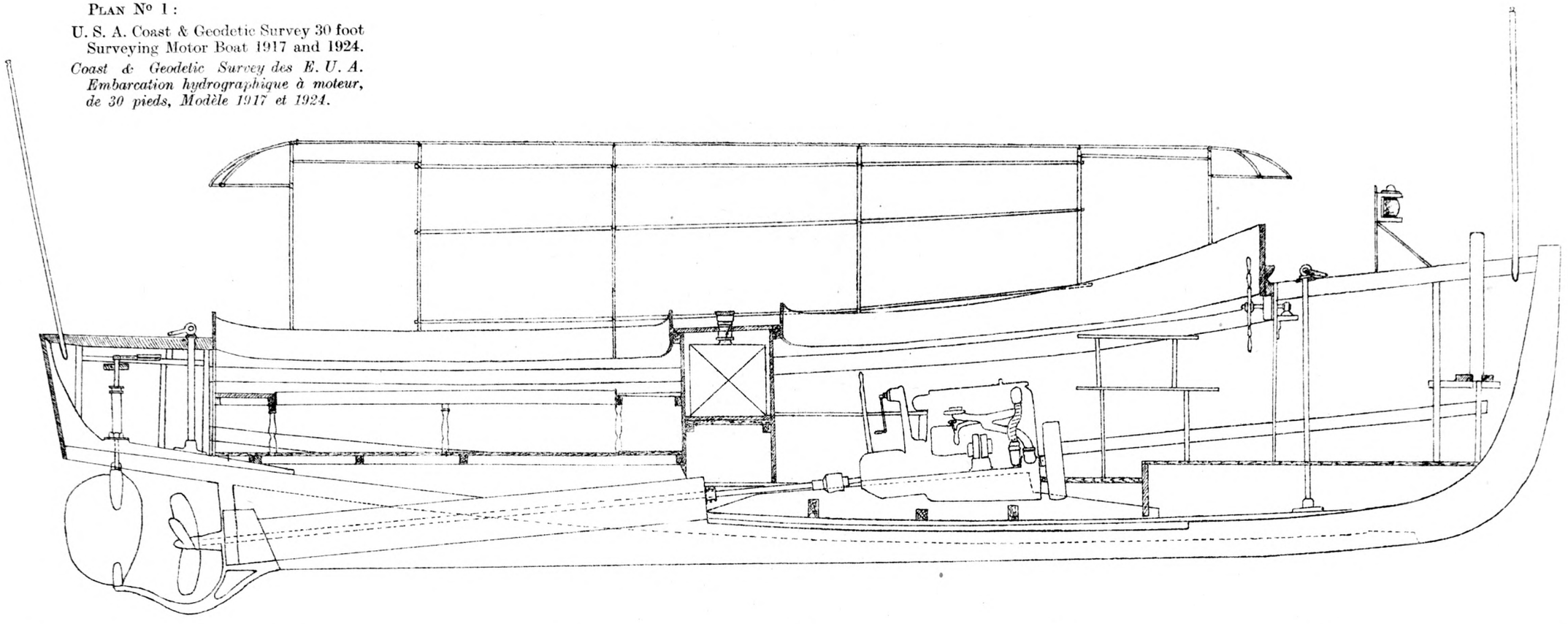
7.8 metre (25.6 feet) Surveying Motor Boat. — Embarcation hydrographique à moteur de 7.8 mètres

1 - Buoys-Bouées — 2 - Metre-Wheel - Poulie-Compteur — 3 - Sounding Winch - Treuil de Sondage
4 - Engine-Moteur — 5 - Drafting table - Table à dessin.

PLAN Nº 1 :

U. S. A. Coast & Geodetic Survey 30 foot Surveying Motor Boat 1917 and 1924.

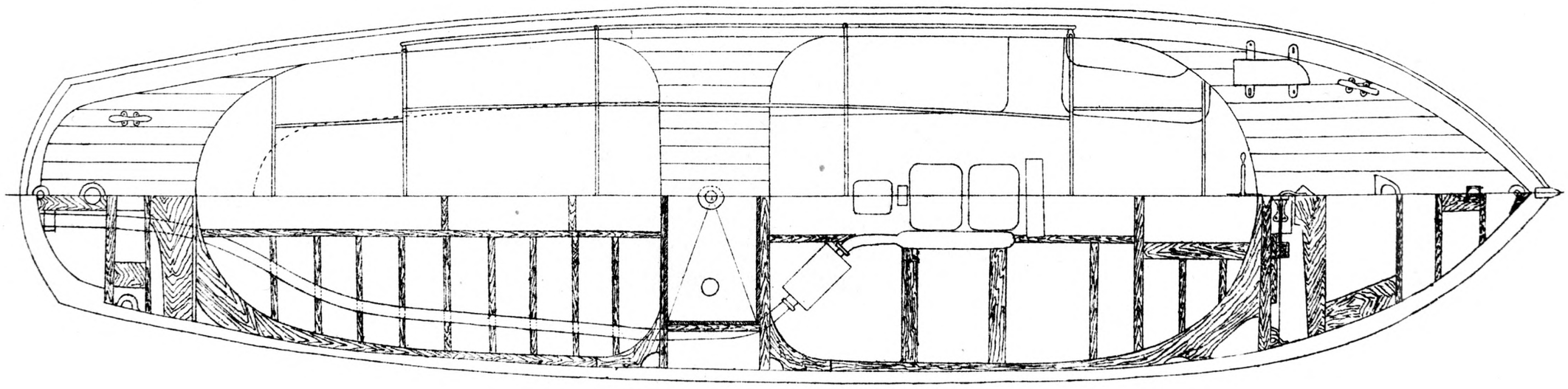
Coast & Geodetic Survey des E. U. A. Embarcation hydrographique à moteur, de 30 pieds, Modèle 1917 et 1924.



0 5 10 15 20 25 30 feet

Scale - Echelle

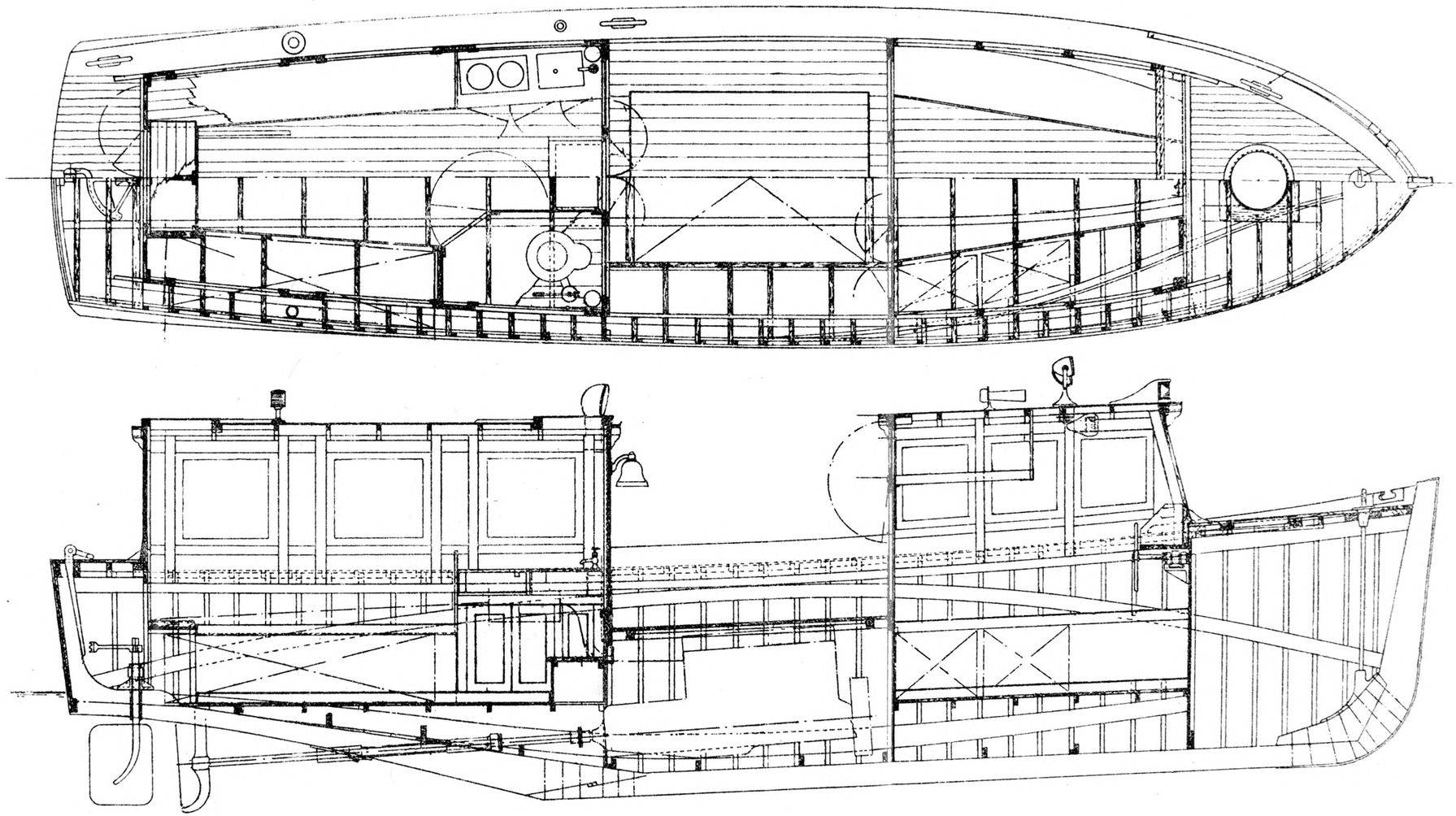
0 1 2 3 6 7 8 9 metres

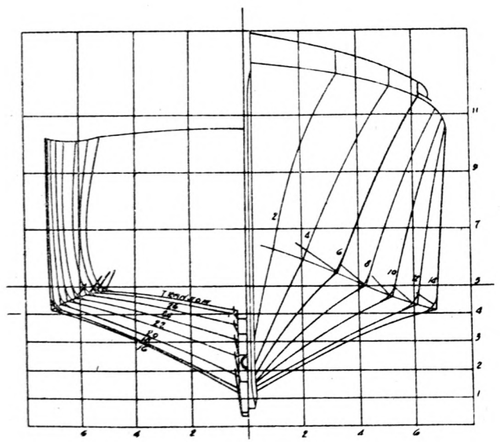


PLAN Nº 2 :

U. S. A. Coast & Geodetic Survey 30 foot Surveying Motor Boat 1932.

Coast & Geodetic Survey des E. U. A. Embarcation hydrographique à moteur, de 30 pieds, Modèle 1932.

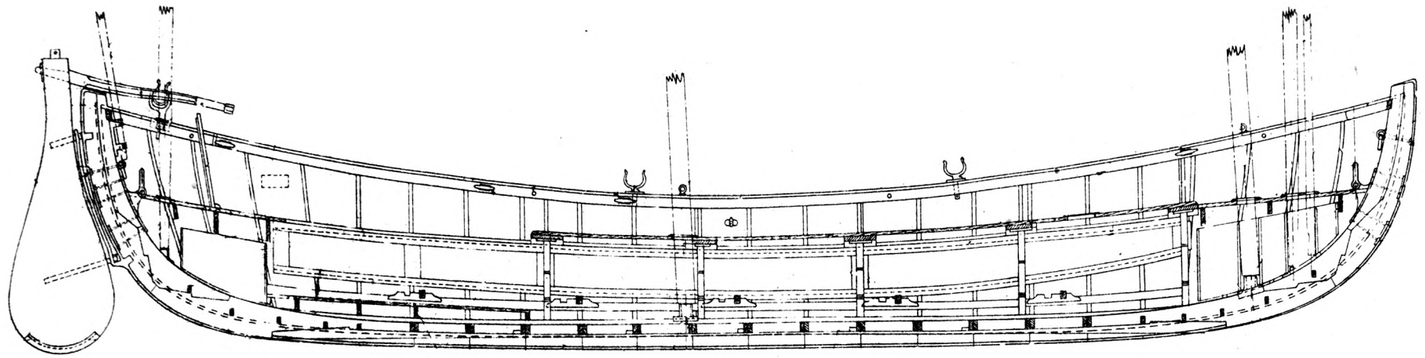


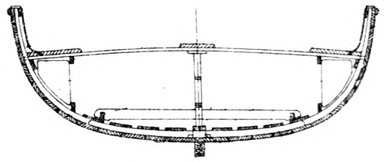


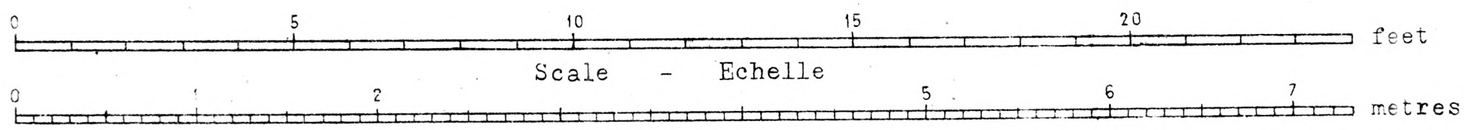
0 5 10 15 20 25 30 feet

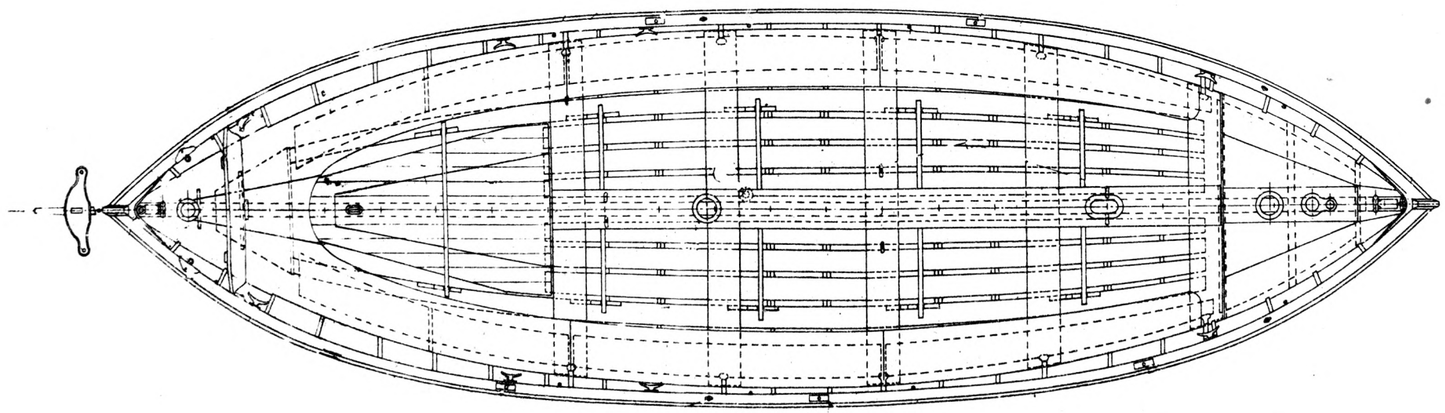
Scale - Echelle

0 1 2 3 6 7 8 9 metres





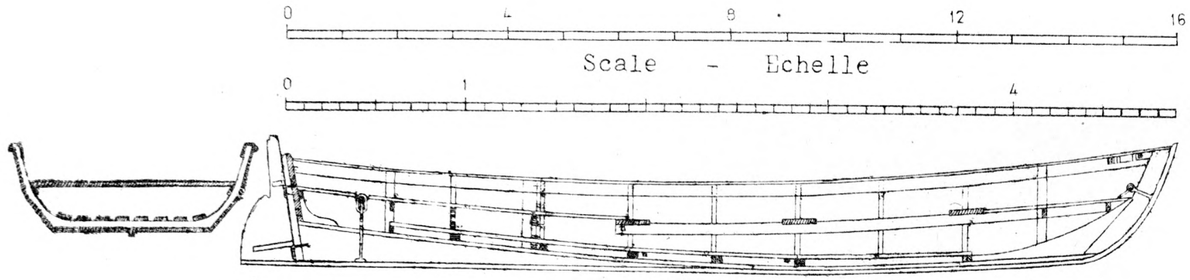




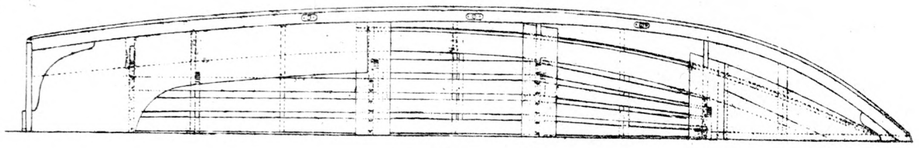
PLAN No 3 :

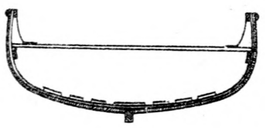
U. S. A. Coast & Geodetic Survey 24 foot Pulling Whale Boat.

Coast & Geodetic Survey des E. U. A. Baleinière à avirons, de 24 pieds.

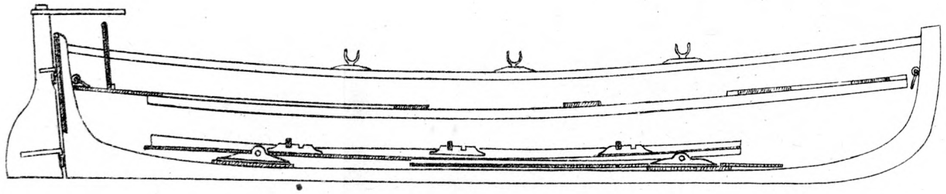


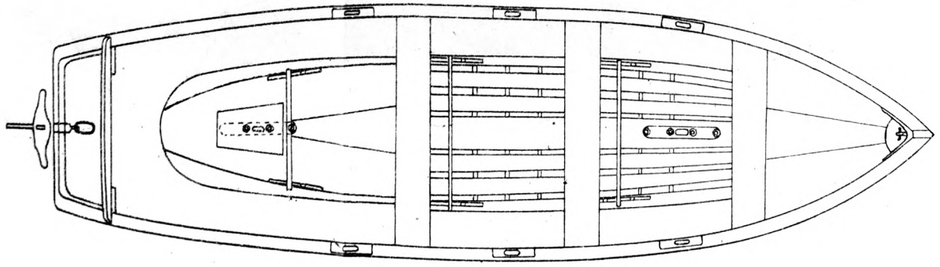
PLAN Nº 4 :
U. S. A. Coast & Geodetic Survey 16 foot Dory.
Coast & Geodetic Survey des E. U. A. Doris de 16 pieds.

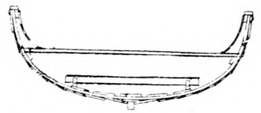




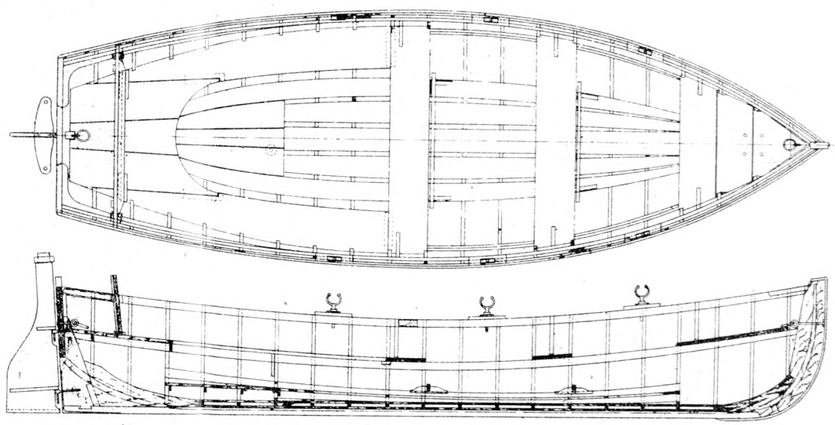
PLAN Nº 5 :
U. S. A. Coast & Geodetic Survey 16 foot Dinghy.
Coast & Geodetic Survey des E. U. A. You-you de 16 pieds.

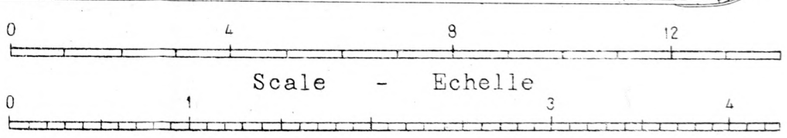


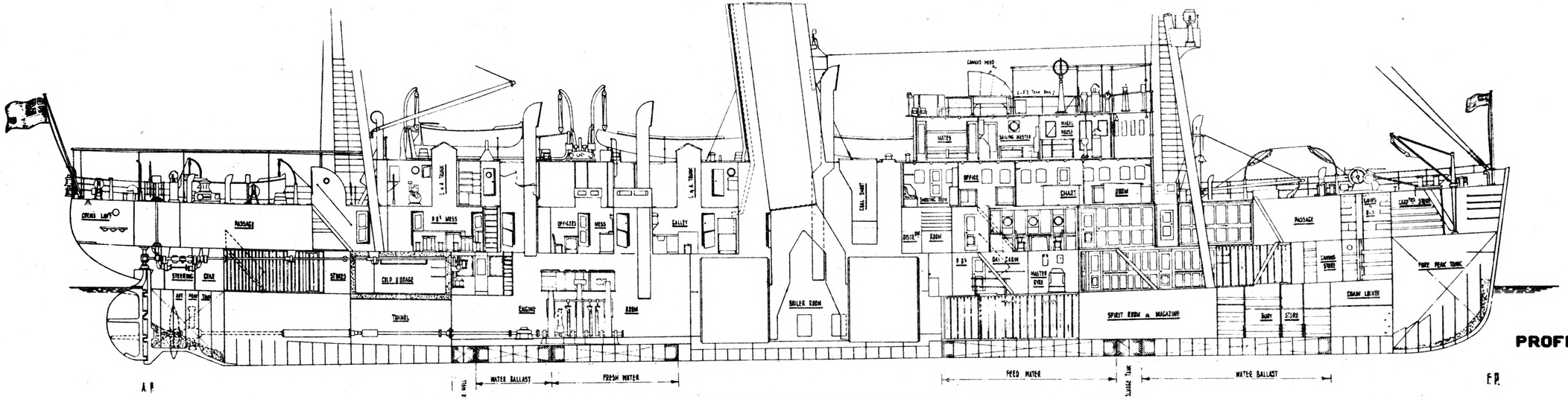




PLAN Nº 6 :
U. S. A. Coast & Geodetic Survey 14 foot Dinghy.
Coast & Geodetic Survey des E. U. A. You-You de 14 pieds.







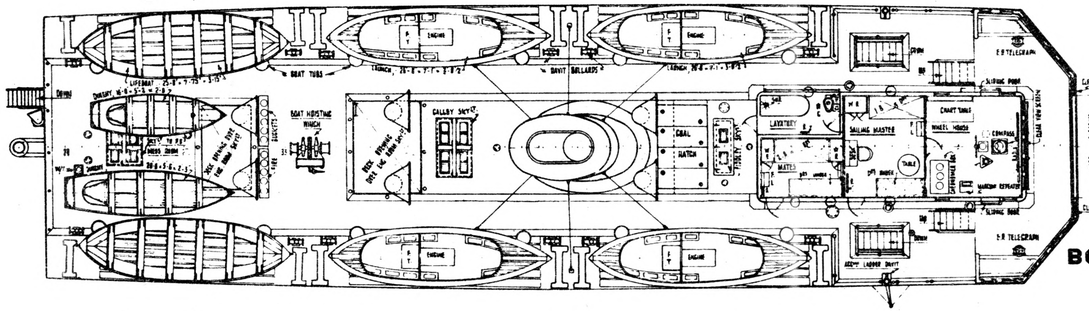
T. S. S. Wm. J. STEWART

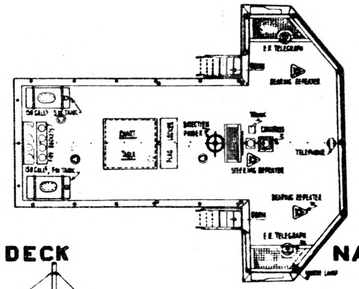
GENERAL ARRANGEMENT

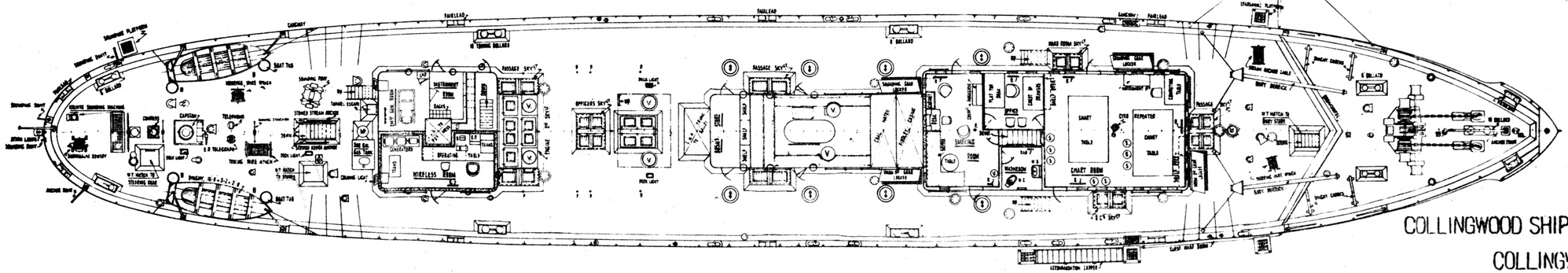
SCALE 1: 200

PRINCIPAL DIMENSIONS

LENGTH	O.A.	228'0"
LENGTH	B.P.	214'0"
BREADTH	Mld.	36'0"
DEPTH	Mld.	23'6"

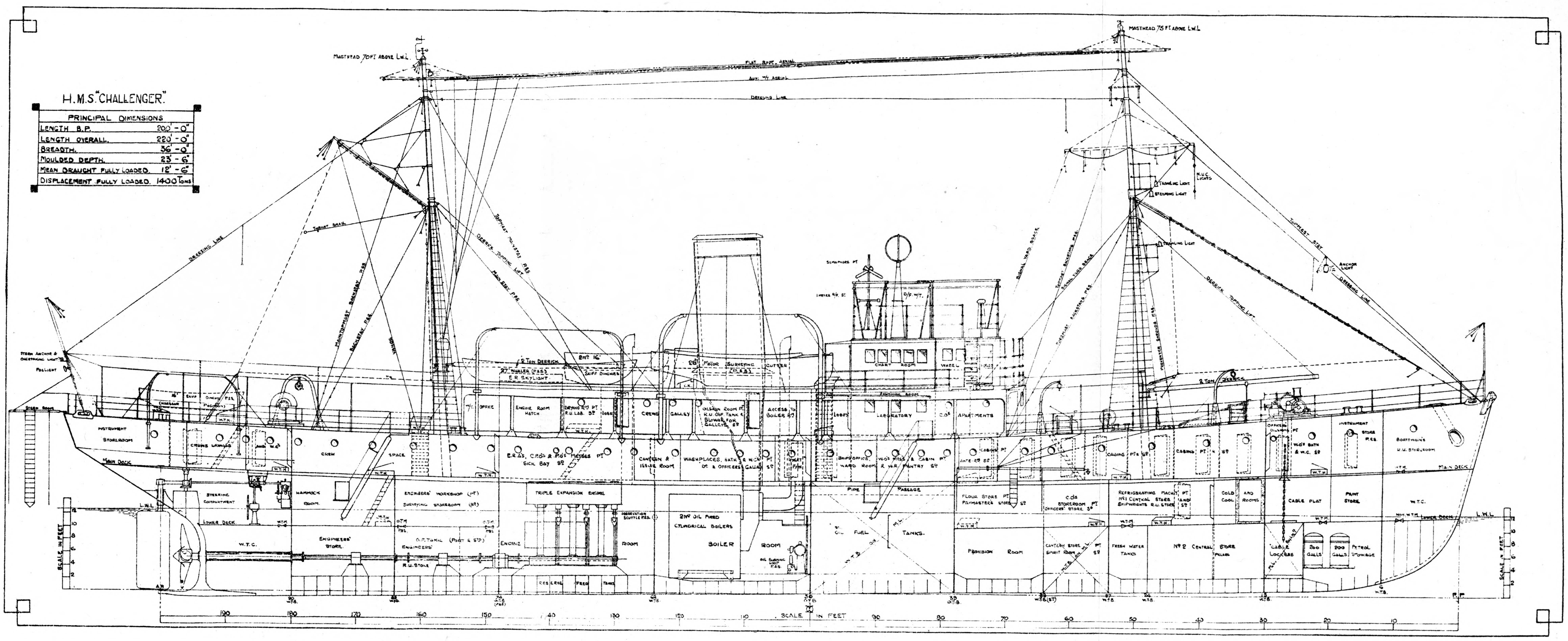




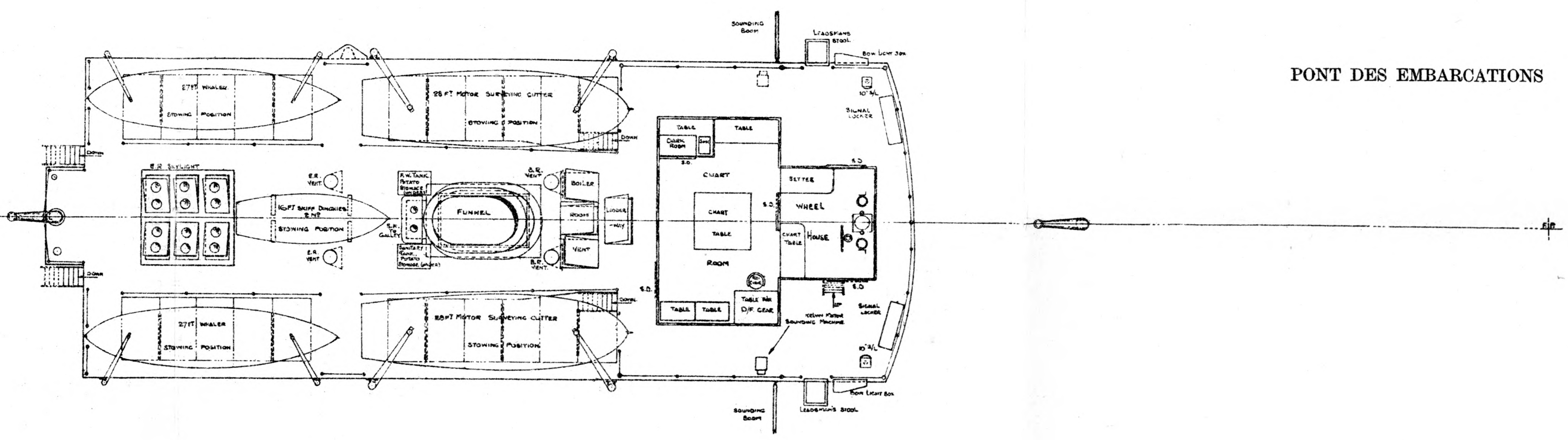


COLLINGWOOD SHIPYARDS, LIMITED
COLLINGWOOD
ONTARIO

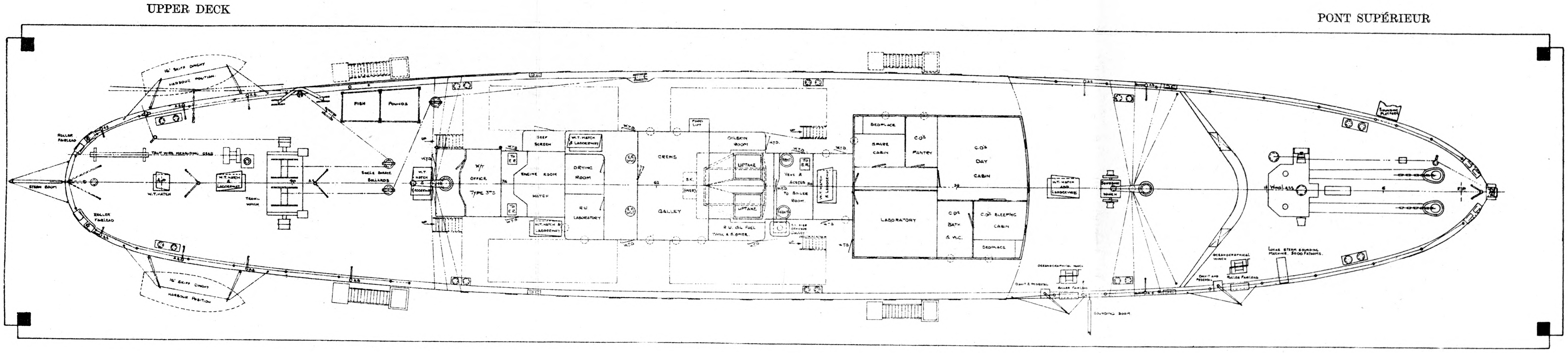
H. M. S. CHALLENGER



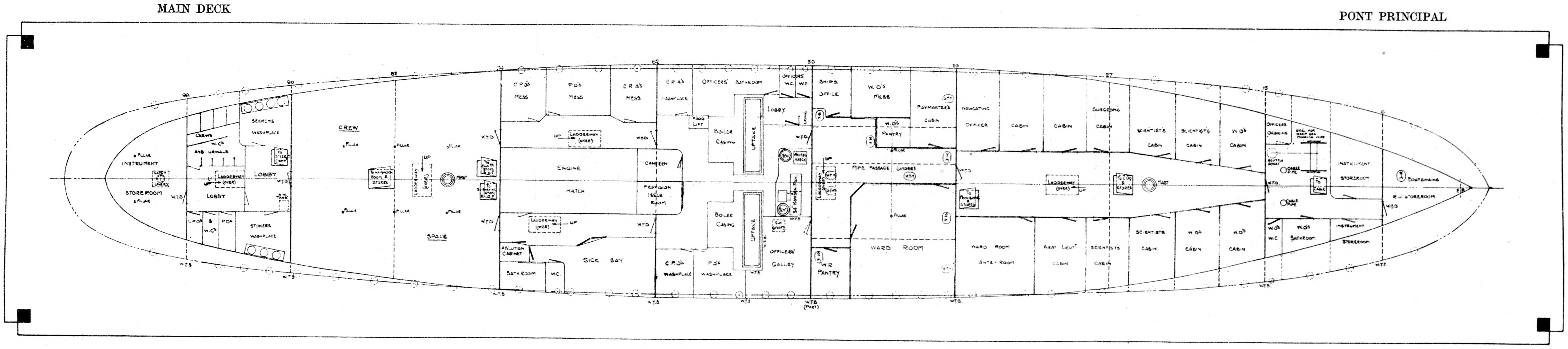
BOAT DECK | **PONT DES EMBARCATIONS**



UPPER DECK | **PONT SUPÉRIEUR**



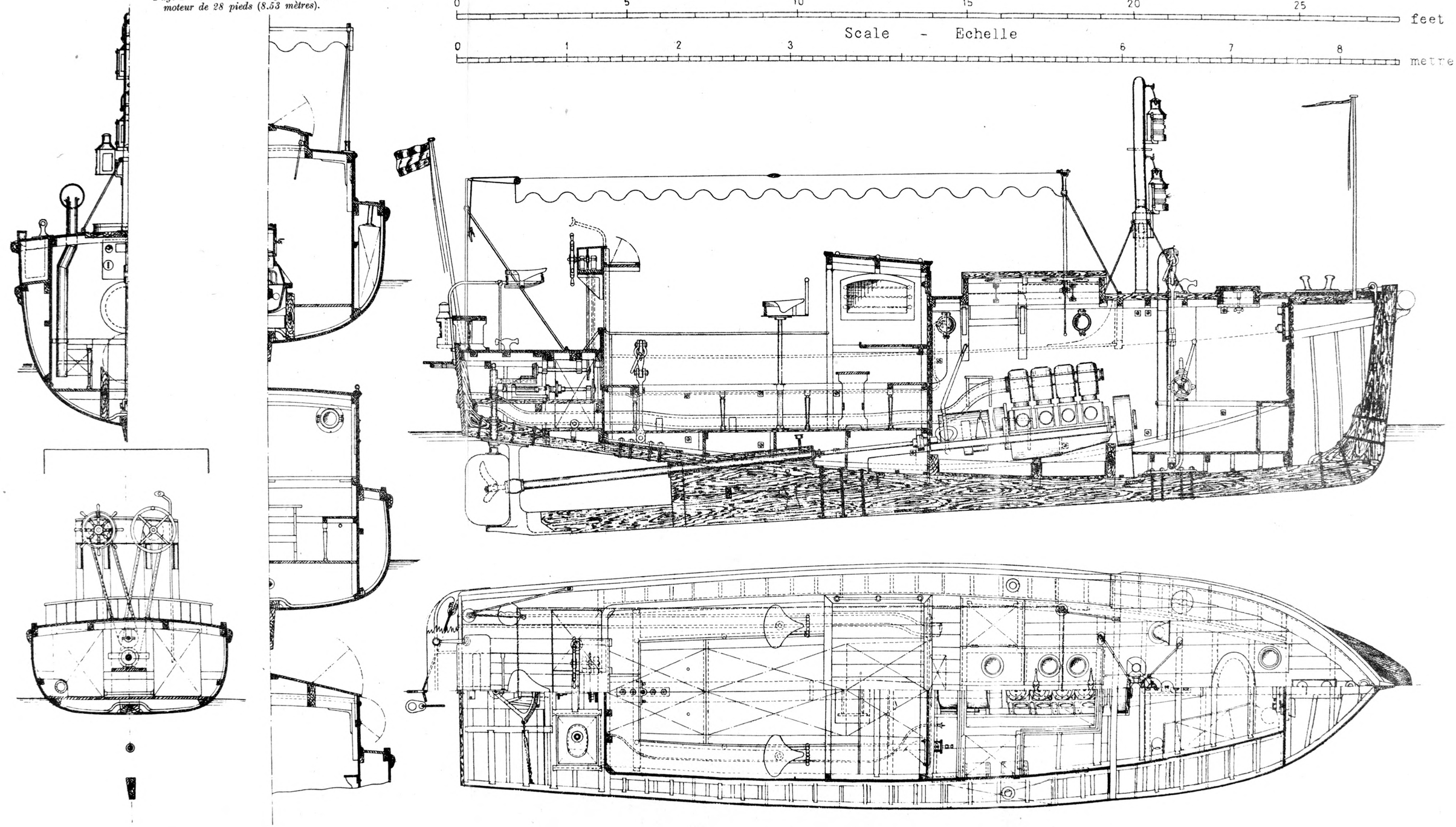
MAIN DECK | **PONT PRINCIPAL**



PLAN N° 7 :

Netherlands — 28 foot (8.53 metres) Surveying Motor Boat.

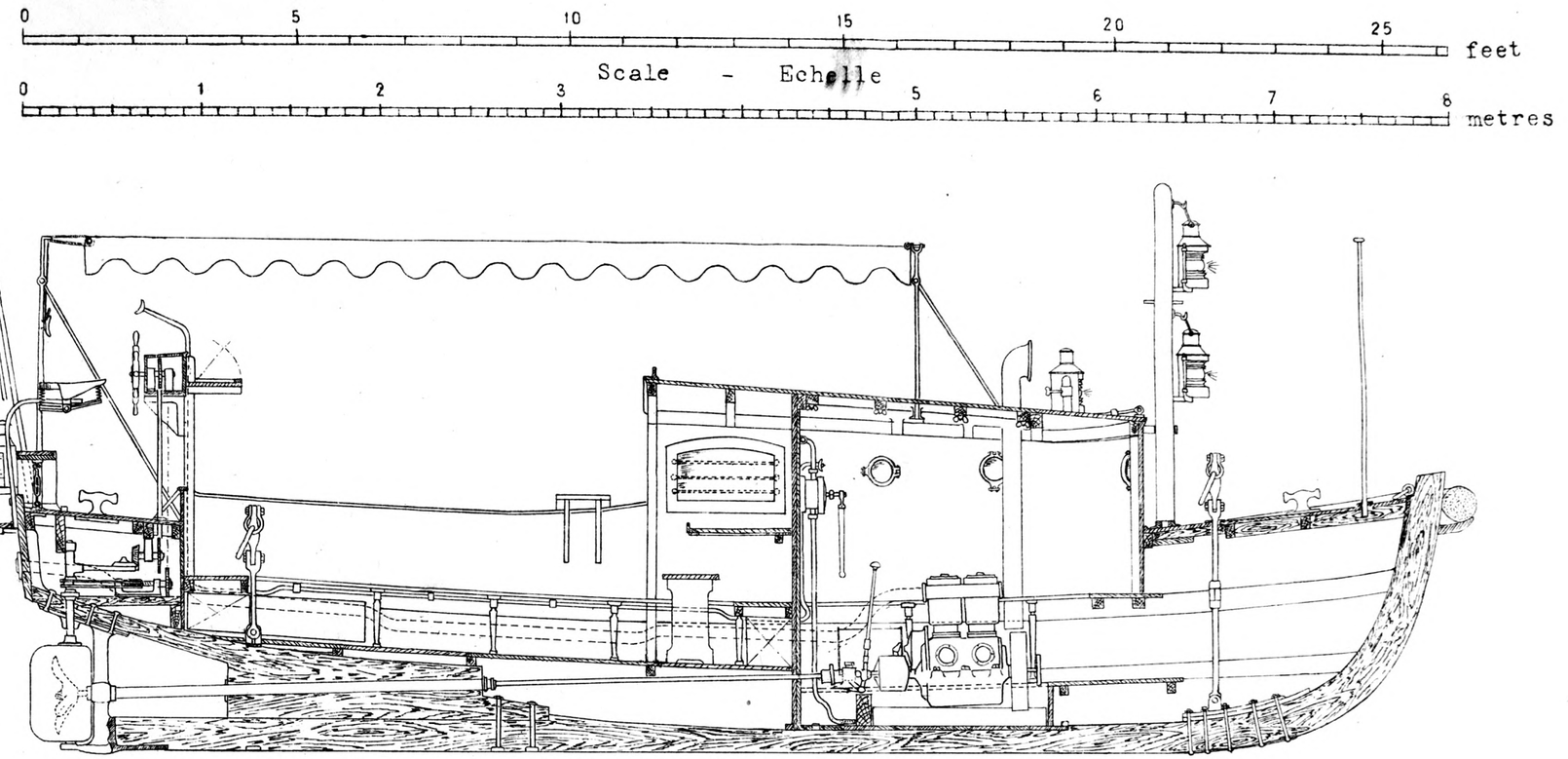
Pays-Bas : Embarcation hydrographique à moteur de 28 pieds (8.53 mètres).

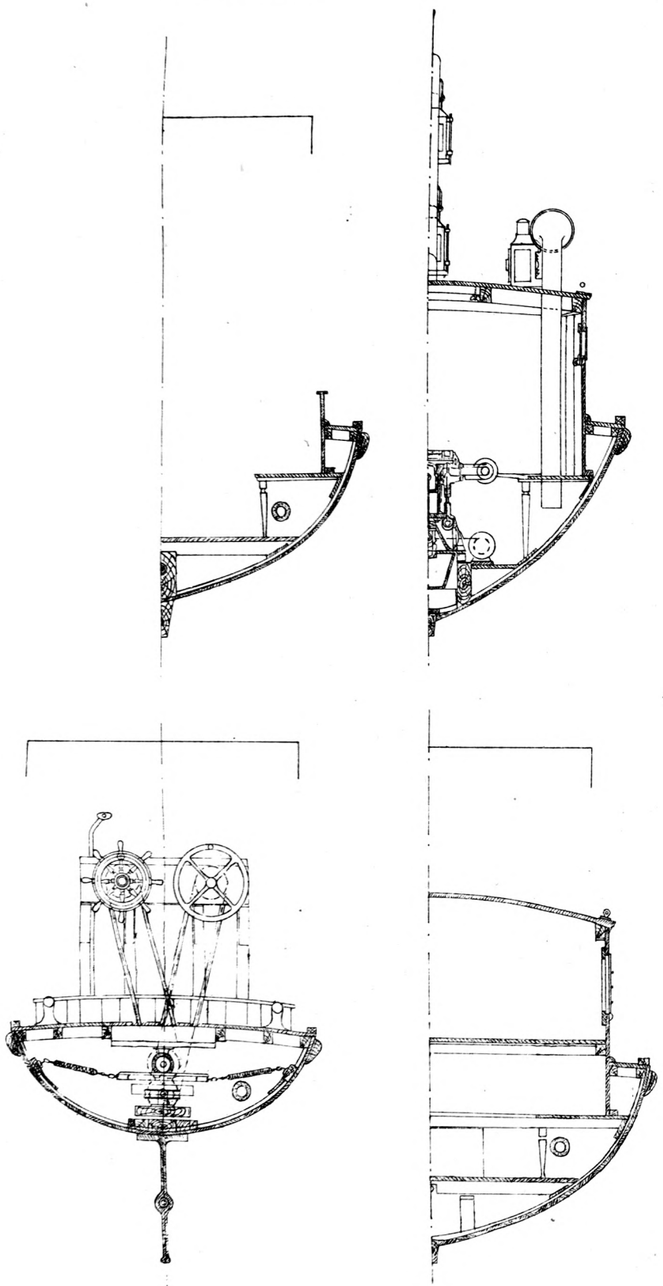


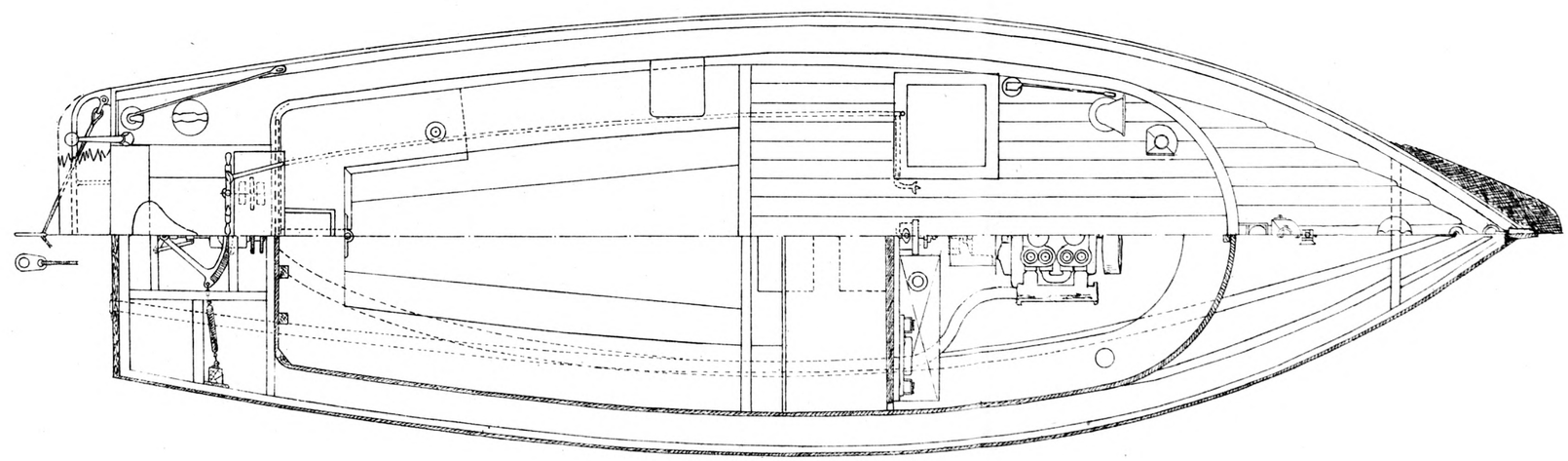
PLAN Nº 8 :

Netherlands — 26 foot (8 metres) Surveying Motor Boat.

Pays-Bas : Embarcation hydrographique à moteur de 8 mètres.



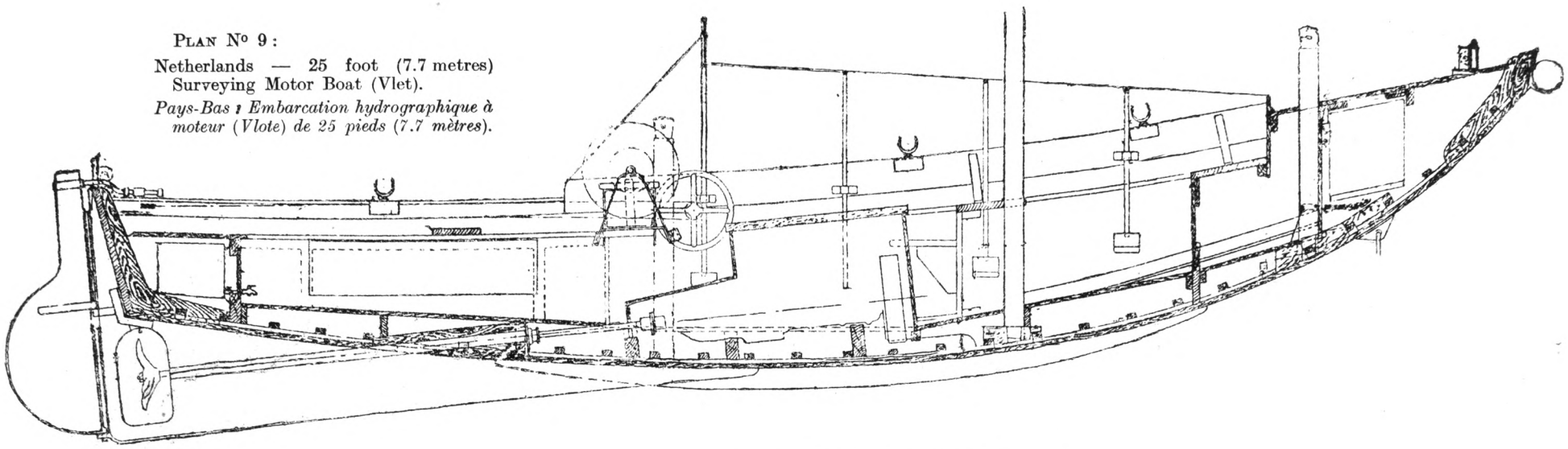


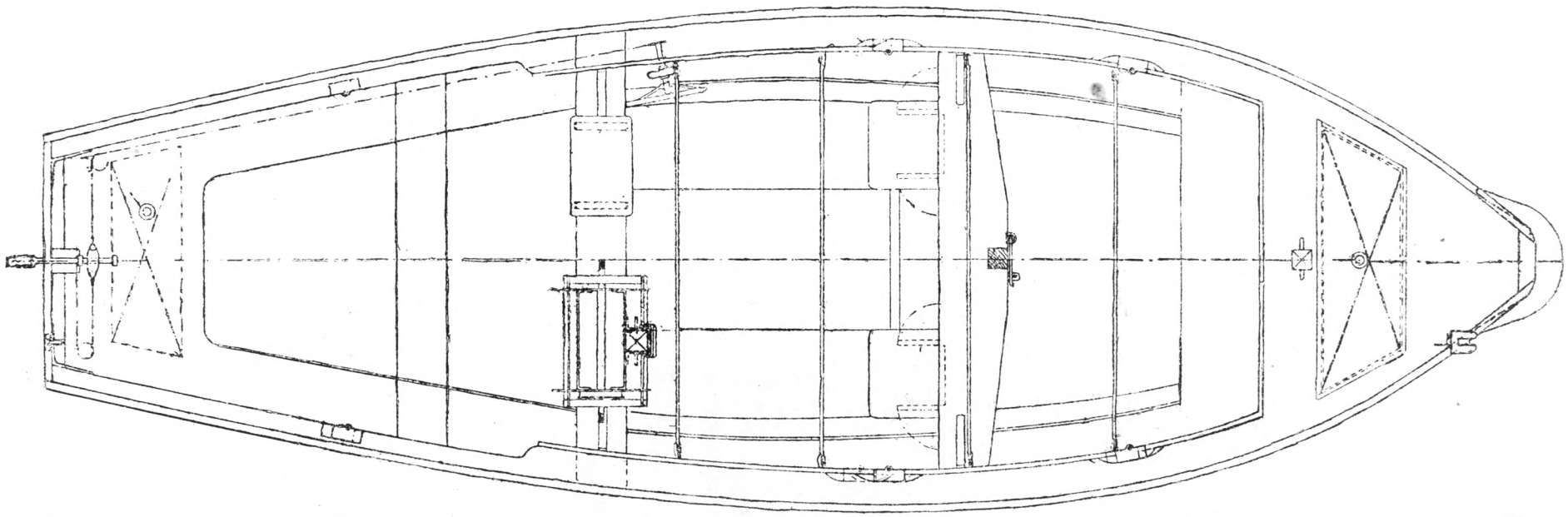


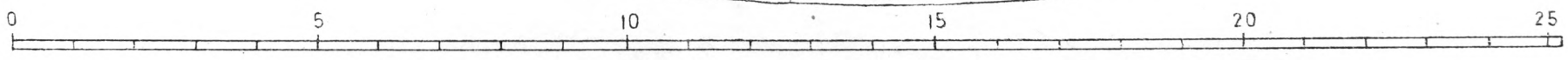
PLAN Nº 9 :

Netherlands — 25 foot (7.7 metres) Surveying Motor Boat (Vlet).

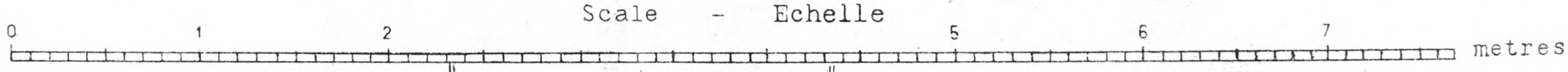
Pays-Bas : Embarcation hydrographique à moteur (Vlote) de 25 pieds (7.7 mètres).

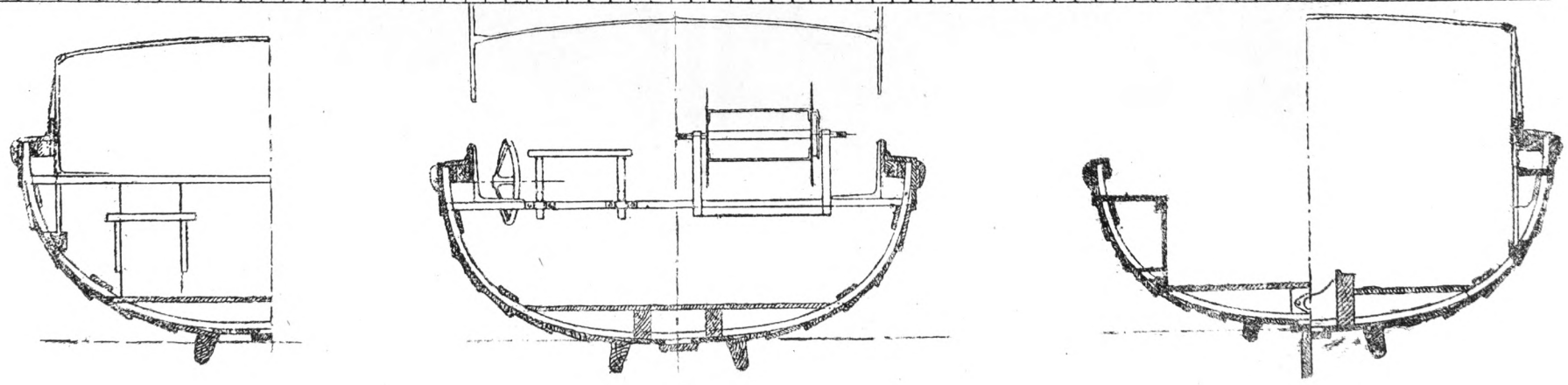






Scale - Echelle

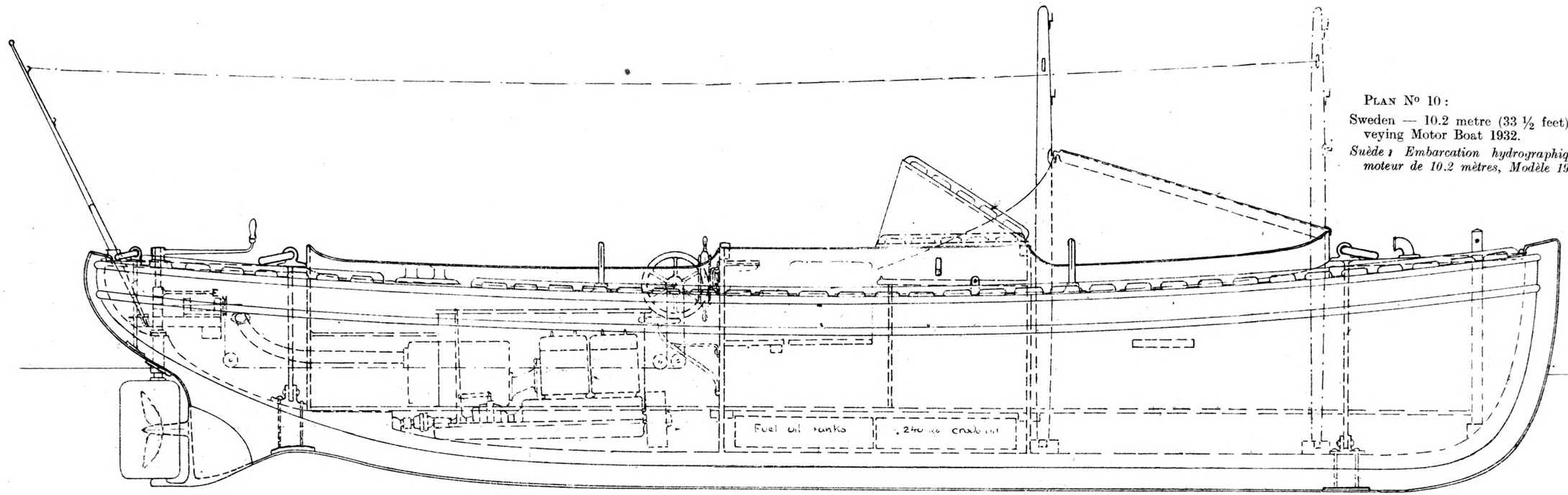


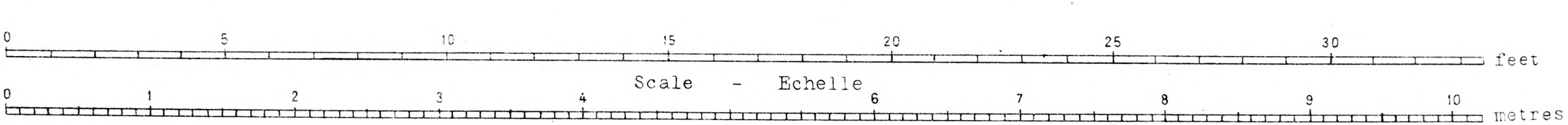


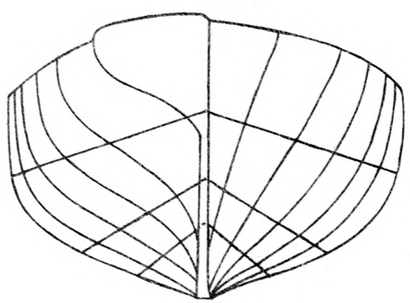
PLAN Nº 10 :

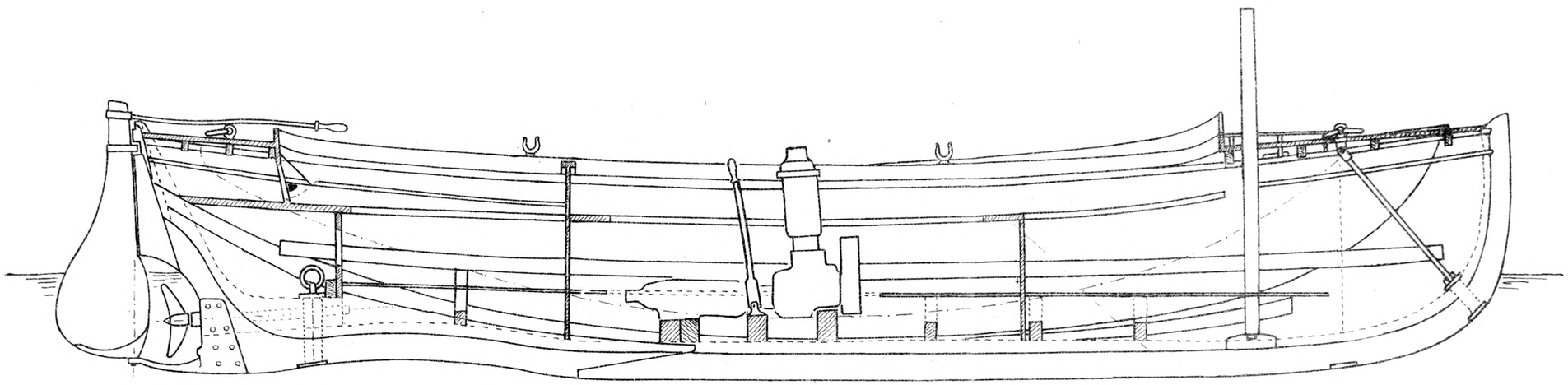
Sweden — 10.2 metre (33 ½ feet) Surveying Motor Boat 1932.

Suède : Embarcation hydrographique à moteur de 10.2 mètres, Modèle 1932.





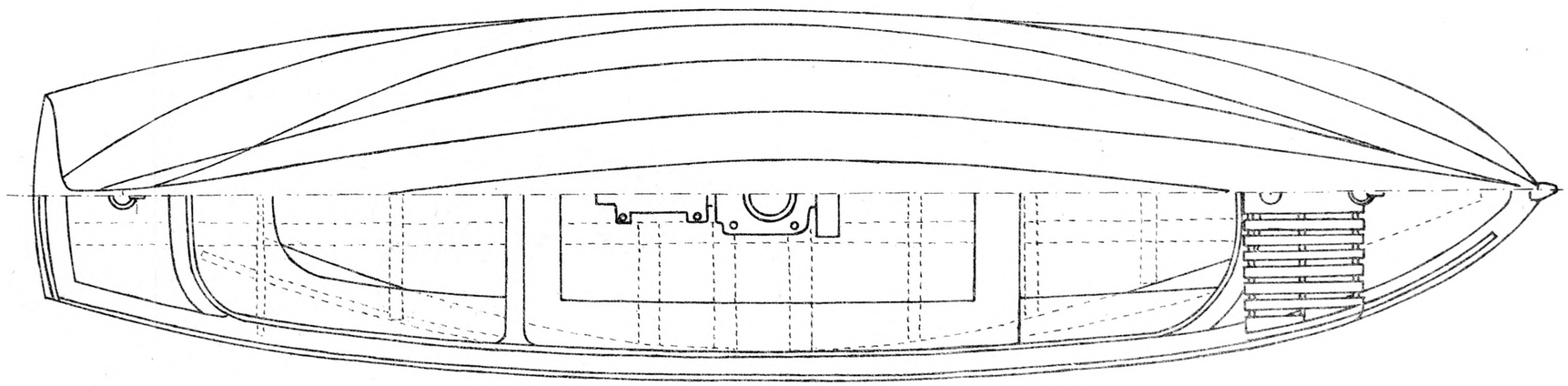




0 5 10 15 20 25 30 feet

Scale - Echelle

0 1 2 3 6 7 8 9 metres



PLAN N° 11 :

Sweden — 9.2 metre (30 feet) Surveying Motor Boat 1911-1913.

Suède : Embarcation hydrographique à moteur de 9.2 mètres, Modèle 1911-1913.

One or two of these boats are carried in each Surveying Vessel for general use in port and for launch tenders.

General Performance. — This boat is not intended for use in the open sea; however, lightly loaded it is quite seaworthy. Although intended as a pulling boat, an outboard motor is sometimes used for propulsion.

(6) 14 FOOT DINGHY.
(See Plan N° 6).

Dimensions of Hull.	Length overall	14 ft. 00 inches	—	4.27 metres
	Beam.....	4 ft. 06'4 »	—	1.38 »

Weight. — About 180 lbs.

These boats are tenders to the 65 foot Wire Drag launches.

General Performance. — They are intended for use in protected waters only, and can be easily handled by one oarsman.

NETHERLANDS.

The principal types of boats used by the Netherlands Hydrographic Service are as follows :

(1) 28 foot Surveying Motor Boat.
(2) 26 foot Surveying Motor Boat.
(3) 25 foot Surveying Motor Vlet.

The two former are used for surveying work in the Netherlands East Indies, the last, which is flat-bottomed, is used for shallow water work in home waters in addition to an old type of steam launch which is of no particular interest. This is also the case for the pulling boats which are only used for transporting material.

The 28 and 26 foot boats are fitted with KITCHEN rudders.

Details of the first three types of boats are as follows :

(1) 28 FOOT (8.53 METRES) SURVEYING MOTOR BOAT.
(See Plan N° 7).

Dimensions of Hull.	Length overall	28 ft. 00 inches	—	8.53 metres
	Beam.....	7 ft. 03 »	—	2.21 »
	Draft	3 ft. 02 »	—	0.94 »

These boats were designed for surveying work in the Netherlands East Indies. They are divided by a transverse bulkhead into two main compartments, the engine being forward and the surveyors' compartment aft. In addition there is a small watertight compartment forward, and another one aft containing the steering gear. They are fitted with KITCHEN reversing rudders, the wheel being aft. There are two deck houses, one over the engine

and the other protecting the chart table in the surveyors' compartment. A canvas sun awning is also fitted.

Engine. — A "Willemsoord" 4 cylinder motor is fitted, developing 28-30 H.P. at 750-800 R.P.M. Bore of cylinders: 12 c/m; stroke: 16 c/m. Diameter of propeller: 49 c/m. Pitch: 58 c/m. Fuel used: Benzine.

Speed. — 7 knots for a draft of 0.5 m. forward and 0.94 m. aft.

General Performance. — Their behaviour in a seaway is said to be very good.

(2) 26 Foot 03" (8.0 Metres) Surveying Motor Boat.

(See Plan N° 8).

Dimensions of Hull.	Length overall	26 ft. 03 inches	—	8.0	metres
	Beam.....	8 ft. 03 »	—	2.5	»
	Draft	2 ft. 05 »	—	0.73	»

These boats were designed for surveying work in the Netherlands East Indies. They are divided by a transverse bulkhead into two main compartments, the surveyors' one being aft. In addition there is a small compartment aft containing the steering gear. A deck house protects the engines and chart table. They are fitted with Kitchen rudders, the wheel and control gear being aft. A canvas sun awning is also fitted.

Engine. — A "Willemsoord" 2 cylinder motor is fitted, developing 12-14 H.P. at 750-800 R.P.M. Bore of cylinder: 12 c/m, stroke: 15 c/m. Diameter of propeller: 40 c/m. Pitch: 50 c/m. Fuel used: Benzine.

Speed. — 6.7 knots at a draft of 0.39 m. forward and 0.73 m. aft.

General Performance. — Their behaviour in a seaway is said to be very good.

(3) 25 Foot 03" (7.7. Metres) Surveying Motor Boat (Vlet).

(See Plan N° 9).

Dimensions of Hull.	Length overall	25 ft. 03 inches	—	7.7	metres
	Beam.....	8 ft. 06 »	—	2.63	»
	Draft (about).....	3 ft. 00 »	—	0.95	»

This boat is used in home waters only, in addition to an old type steam launch which is of no particular interest.

Engine. — A "Kermath" 4 cylinder motor is fitted, developing 20 H.P. at 1000 R.P.M. Bore of cylinders: 10.16 c/m, stroke: 10.16 c/m. Diameter of propeller: 44 c/m. Fuel used: Benzine.

Speed. — 6.8 knots with normal equipment. The rudder is of ordinary type fitted with a tiller aft.

General Performance. — Said to be very good, but as stated above this type of boat is for home service, in sheltered waters only.

SWEDEN.

The various types of motor boats used by the Swedish Hydrographic Service may be divided into three types :

(1) 10.2 metre (33 ½ feet) Surveying Motor Boat, 1932.
(2) 9.2 metre (30 feet) Surveying Motor Boat, 1911-1913.
(3) 7.8 metre (25.6 feet) Surveying Motor Boat.

In type (1) both petrol engines, "Albin" or "Penta", and crude-oil engines, "Bolinder" or "Avance", are used ; in type (2) "Avance" crude-oil engines are used. Both these types are designed for use in open sea or sheltered waters ; Type (3), also fitted with an "Avance" crude-oil engine, is preferably used in sheltered waters.

Details of the above three types of boats are as follows :

(1) 10.2 METRES (33 ½ FEET) SURVEYING MOTOR BOAT, 1932.

(See Plan N° 10 and Figs. 6 & 7).

Dimensions of Hull.	Length overall	33 ft. 06 inches	—	10.2 metres
	Beam.....	8 ft. 00 »	—	2.4 »
	Draft	3 ft. 07 »	—	1.1 »

The hull is of similar shape to the 9.2 metre boat, but it has two athwartship bulkheads which divide the boat into three compartments, the surveyors' compartment being the middle one, engine aft and crew's quarters and sounding machine forward. The wheel is at the forward end of the after compartment.

This class of boat is fitted with the KITCHEN reversing rudder.

Engine. — Four different types of engines are used, the "Albin" Motor, the "Penta" Motor, the "Avance" and the "Bolinder" Motors.

The "Albin" is a 4 cylinder engine, bore of cylinder : 9.5 c/m, stroke : 12 c/m., developing 18-25 H.P. at 800-1200 R.P.M.

The "Penta" is a 4 cylinder engine, bore of cylinder : 7.0 c/m, stroke : 9.6 c/m. developing 10-15 H.P. at about 1000 R.P.M.

The two above motors are petrol engines.

The "Bolinder" is an engine of 4 cylinders grouped in pairs, burning crude oil, developing 20 H.P. at 900 R.P.M.

Speed. — The speed of the boat is about 7 ½ knots.

General Performance. — The boat is seaworthy and is designed foi use in both sheltered waters and open sea. It is claimed that the surveyor has a better position in the middle of the boat than in the smaller-sized ones ; there is also more room for the equipment. Also in consequence of being fitted with a KITCHEN rudder this boat is much easier to manage.

The crew consists of : 1 Surveying Officer (sometimes a second Surveyor or Recorder is added), 1 Coxswain, 1 Engineer and 2 Leadsmen.

(2) 9.2 METRE (30 FEET) SURVEYING MOTOR BOAT, 1911-1913.
(See Plan N° 11 and Fig. 8).

Dimensions of Hull.	Length overall	30 ft. 01 inches	—	9.2 metres
	Beam.....	7 ft. 04 »	—	2.2 »
	Draft	3 ft. 00 »	—	0.9 »

These boats are built of pine planking and with keel, frames, stem and stern posts of oak. An athwartship bulkhead divides the boat into two compartments, the surveyors' one being aft, the chart table being protected by a canvas canopy. The boat is steered by means of a tiller aft. The sounding machine and crew's quarters are forward before the engine.

Engine. — These boats are fitted with "Avance" crude oil, one cylinder, two stroke cycle engine developing 8 H.P. and a speed of about 6 ½ knots. It is proposed eventually to fit these boats with KITCHEN reversing rudders.

General Performance. — These boats are designed for use both in the open sea and in sheltered waters. Experience has shown that they are very good for practical use, being strong, well fitted for the purpose of hydrographic use and very good in a seaway. The engine is economic in use and easy to manage, but has the disadvantage of being noisy and causing vibration in the boat.

(3) 7.8 METRE (25.6 FEET) SURVEYING MOTOR BOAT.
(See Fig. 9. No plan is available)

Dimensions of Hull.	Length overall.....	25 ft. 07 inches	—	7.8 metres
	Beam	6 ft. 07 »	—	2.0 »
	Draft	2 ft. 04 »	—	0.7 »

These boats are built of pine planking with keel, frames and stem and stern posts of oak. An athwartship bulkhead divides the boat into two compartments, the surveyors' one being aft, the chart table being protected by a canvas canopy. The boat is steered by means of a tiller aft. The sounding machine and crew's quarters are forward before the engine.

Engine. — These boats are fitted with an "Avance" crude oil, one cylinder, two stroke cycle engine developing 5-6 H.P. and a speed of about 6 knots.

General Performance. — These boats are designed for use in sheltered waters. No further details of these boats are available.

(to be continued)