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* Patent Specification

New Controllable Pitch Propellers

The U.S.S. *Graham County* (LST-1176) has the largest controllable pitch propellers in service on U.S. Navy vessels. They are of the most modern design found on any ship afloat and they represent many years of study and experimentation. The 442-ft. landing ship, commissioned in April 1958, is powered by four Nordberg FMD-16-HSC turbocharged Diesel engines (two per shaft), each developing 3,600 b.h.p. at 300 shaft r.p.m. The propellers give the ship excellent manœuvrability and allow the engines to develop 100 per cent mean effective pressure at any engine speed by variation in the propellers' pitch. Stopping distances are greatly reduced as compared with those for conventional fixed pitch propellers. The ship can stop dead in the water from full speed ahead within two ships' lengths. The 9ft. 9in. diameter four-bladed propeller absorbs 6,850 s.h.p. while turning at 300 r.p.m. The 34in. diameter hub contains the part that converts hydraulic energy to mechanical motion, and consists of the servo-pistons and four-way valve. The main servo-piston connects to the main cross-head that engages on crankpin of each blade assembly. Four counteracting pistons connect to four separate crossheads, each of which engages the remaining crankpin of each blade. The opposite and equal forces on the crankpins of each blade result in a force couple that gives a balanced turning movement to each blade about its spindle axis. This arrangement is commonly known as the "double crank" system. For the ahead pitch, the four-way valve moves ahead and admits high pressure hydraulic fluid to the after side of the main piston and to the forward side of the four small pistons. These cavities are connected by pressure equalizing ports to assure equal pressure on all servo-pistons. For the astern pitch, hydraulic fluid is admitted to the common cavity between the one large and four small pistons so that the blade is turned in the opposite direction. This arrangement of the double crank system is flexible enough to provide a balanced turning moment about the blade spindle axis; therefore, the length of the connecting rods is not critical. The lands of the four-way valve are designed to provide a negative overlap in relation to the valve body ports so that a small quantity of hydraulic fluid is kept in constant circulation for maintaining a live system. This circulation also keeps the hydraulic fluid and the hydraulic equipment cool. An extension of the four-way valve stem connects the valve with the control coupling cross-head and serves as a passage way for the high pressure oil to the hub. The annulus between the outside circumference of the valve stem and the shaft bore provides a passage for the return oil. Each of the four 1,000-lb. propeller blades is threaded into the crank ring. It is supported within the hub casting by an integral thrust ring that absorbs the combined forces of blade loading. A solid buttress thread is used for maximum strength in joining the blade shank and crank ring. The inboard components of the propeller system consist of the control coupling, overshaft seal unit, control panel, engine room and pilot house controls, and associated auxiliary equipment. By use of the engine room or pilot house control valve, the propeller blades can be hydraulically actuated to any desired pitch, within the pitch range, in the ahead or astern direction. The position of the four-way valve in the hub is controlled by the position of the non-rotating control coupling sleeve. The sleeve is positioned longitudinally along the shaft by two hydraulic power cylinders. This movement upsets the four-way valve and admits high pressure oil to one side of the servo-pistons, causing them to move in unison with the valve. At the same time, hydraulic oil is released from the opposite side of the pistons through the low pressure return passage to the sump tank. Hydraulic oil is fed into and extracted from the rotating shaft passages by a two-passage overshaft seal. Piping connexions on the stationary sleeve of the seal tie into the servo-pump and sump tank.—*J. W. Barden, Bureau of Ships Journal, June 1959; Vol. 8, pp. 18-20.*

Nuclear Powered Submarine Oil Tanker

This article gives a brief outline of a study and research project of the design of a 30,000-d.w.t. nuclear submarine oil tanker with a submerged cruising speed of about 22 knots. The author states that, in addition to the high cruising speed, remarkable progress may be expected with regard to a reduction in the weight of the hull as compared with that of a conventional tanker. These advantages will become increasingly marked in the case of larger tankers. A nuclear powered tanker having a cargo capacity of 30,000 tons is shown in the sections given in Fig. 1, and the structural arrangement of the reactor and engine room is shown in the sections given in Fig. 3.—*M. Shigemitsu, Atomic Marine Propulsion Panel, Japan, October 1958; pp. 40-46.*

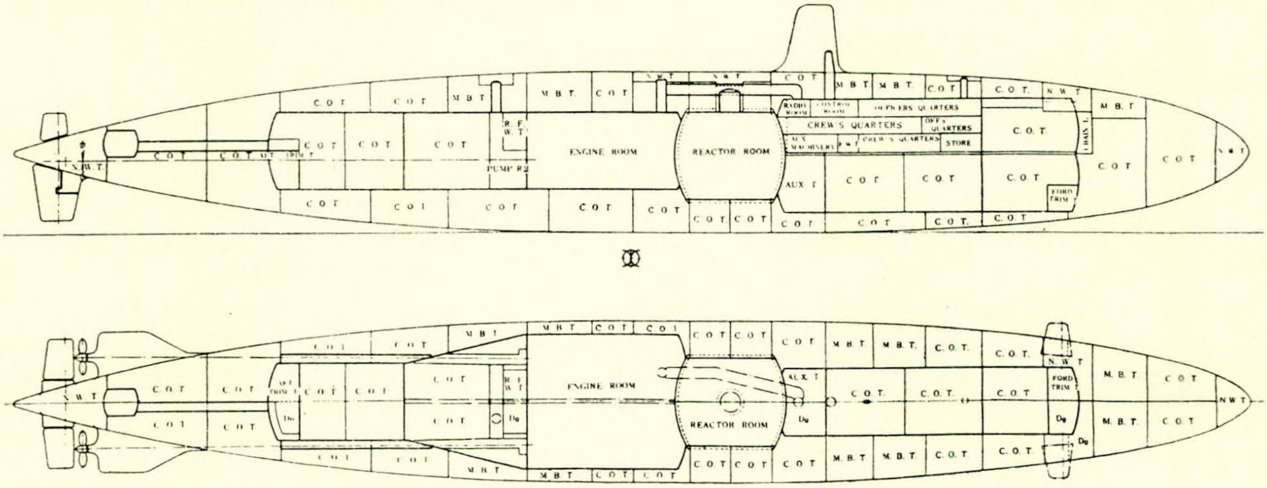


FIG. 1—*Arrangement of a nuclear powered submarine oil tanker*

Principal Particulars

Length overall	180·0 m.
Breadth maximum	24·0 m.
Depth amidships	24·0 m.
Cargo oil capacity	30,000 KT
Cruising speed (submerged)	22 knots

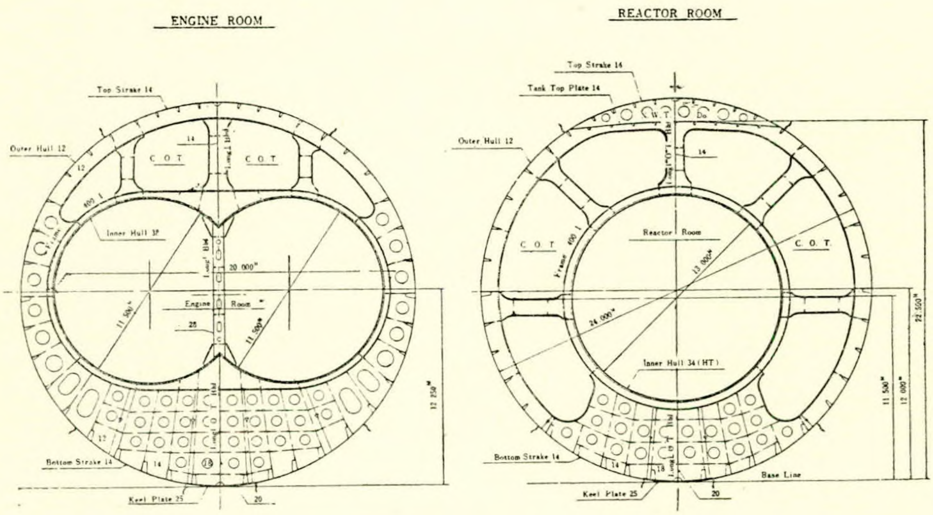


FIG. 3—*Structural arrangement at the reactor and engine room sections*

Coal to Diesel Conversion

Built in 1945 as a collier and owned by Wm. France, Fenwick and Co. Ltd., the *Birdwood* has just completed an extensive refit and conversion from steam to Diesel propulsion at the Wear yard of Austin and Pickersgill Ltd. In view of the continually falling demand for coal and the need to find alternative cargoes for vessels of this type, the form of conversion of the *Birdwood* is particularly interesting. As a collier normally relies upon shore installations for the discharge of coal, the change to general cargo carrying requires the use of winches and derricks, and the installation of the necessary power supply for such equipment. In the case of the *Birdwood* it was decided to fit all-electric cargo winches, a windlass and a capstan, while at the same time putting the ship through the special 12-year survey of Lloyd's Register. The main particulars of the vessel are as follows: —

Length overall	326ft. 6in.
Length, b.p.	312ft. 0in.
Breadth, moulded	44ft. 6in.
Draught, summer	19ft. 10½in.
Power at gearbox output ...	1,825 s.h.p.
Speed (approximately) ...	12 knots

In her new form the *Birdwood* is still a raised quarterdeck vessel suitable for the carriage of bulk and general cargoes. Before conversion the vessel was fitted with a triple-expansion steam engine with h.p., i.p. and l.p. cylinder diameters of 18½in., 29in. and 52in. respectively and a stroke of 39in. Steam at 220lb. per sq. in. was supplied by two Scotch marine type boilers. The power output was approximately 1,200 i.h.p. at 60-65 r.p.m., which gave the ship a speed of nearly 10 knots. The new engine is a nine-cylinder, four-stroke, turbocharged Ruston and Hornsby Diesel engine, type 9VOXM, with a cylinder diameter of 17in., a piston stroke of 18in. and a continuous power rating of 2,040 s.h.p. at the gearbox coupling when running at 435 r.p.m. This is the largest engine of its kind built by Rustons and the necessary 4 : 1 speed reduction is through a Hindmarch-M.W.D. oil operated, reverse reduction gearbox. An oil operated brake is fitted to the short intermediate shaft, and arranged to lock the shaft when the gear is in neutral. The winches are electrically operated and the ship's electrical supply is taken from two 100-kW, 220-volt generators, each driven by a five-cylinder, 170-b.h.p. Ruston type VEBZ engine running at 600 r.p.m. There is also an 80-kW generator driven by a four-cylinder Ruston VEBZ engine. Steam for accommodation heating and domestic purposes is supplied by a Spanner auxiliary boiler, fired either by oil or the main engine exhaust. With the main engine developing 1,870 b.h.p. and using feed water at 120 deg. F., the boiler will produce 1,550lb. of steam/hr.—*The Motor Ship, June 1959; Vol. 40, p. 117.*

Timing of Locked Train Reduction Gears

A revised method of timing locked train reduction gears has been developed at San Francisco Naval Shipyard, and is being used there successfully. A recurring problem on high power naval ships is that of properly distributing the load through locked train reduction gears. This type of gear is driven by one high pressure and one low pressure turbine, each connected directly through a coupling to a first-reduction pinion. Each first-reduction pinion drives two first-reduction gears, and each of the four first-reduction gears is connected through a quill shaft to a second-reduction pinion. The four second-reduction pinions drive the bull gear. To equalize the load, the mating teeth of all corresponding gears on the high pressure or low pressure turbine sides must make contact on their ahead (or astern) faces whenever loads, even though light, are applied. As the load from each turbine is divided through two gear trains, accurate positioning of each train in respect to the other must thus be made. Typical instructions pertaining to reduction gears on aircraft carriers, destroyers and cruisers accomplish this positioning or timing to either the h.p. or l.p. turbine sides by removing the coupling hub-quill keys at the after end of one of the quill shafts and forcing the ahead faces of the gear teeth making up the gear set into contact by means of wrenches attached at the points indicated on Fig. 1. To obtain proper timing, the amount of offset between the keyways in the coupling hub and the quill shaft, with keys removed, is corrected to within a few thousandths of an inch by shifting combinations of gear and coupling teeth, or by other methods. Extensive checks made by the San Francisco Naval Shipyard have indicated that the timing of gear trains by the above method is unreliable because of errors generated from the following cases: (1) Deflexion of keyed quill shaft when torque is applied from the first-reduction pinion through the quill shaft to the second-reduction pinion. (2) Tendency of journals to rise out of their bearings and to cock when torque is applied. (3) Gears not exactly centred in meshes and in bearings, and thus not establishing perfect tooth mesh. (4) Slack in keyways and couplings, static friction in bearings, and others. To improve accuracy, a revised method of timing has been developed and used by the shipyard during the past few years, with excellent results. Under this method, the timing is managed by applying load with special wrenches simultaneously to each gear and pinion of the train, the after keys of both upper and lower quill shafts being removed. Exact locations of wrenches for starboard gear, with rotation of the bull gear shaft clockwise looking forward, are indicated in Fig. 2. Locations of wrenches for oppositely rotating gears on the port side are the same as are shown in Fig. 2 for starboard side gear; however, the loads applied on the wrenches are opposite in direction. Measured offsets of the after keyways in both the upper and lower quill shafts and their mated coupling hubs, with keys removed, are added or subtracted to obtain the correction necessary to attain equal load division. This method eliminates torquing through either quill shaft, and thus the amount of force applied by the wrenches will have no effect on the offset of the timing keyways. As each gear and pinion is individually torqued, the position of journals in the bearing

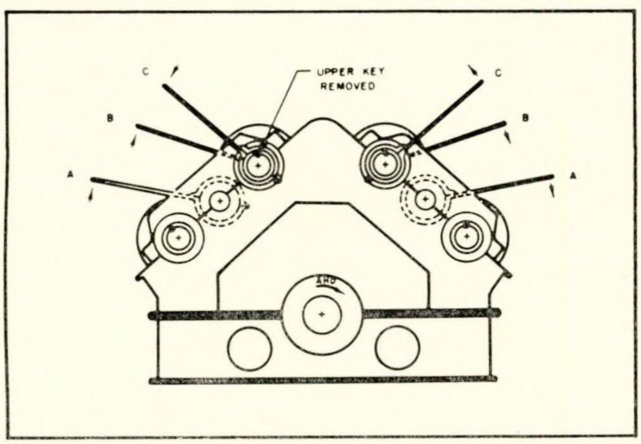


FIG. 1—*Starboard gear, looking forward*

a) Wrench fastened to coupling flange of the first-reduction pinion; b) Wrench fastened to forward quill shaft coupling hub or the forward end of the quill shaft; c) Wrench fastened to aft quill shaft coupling hub

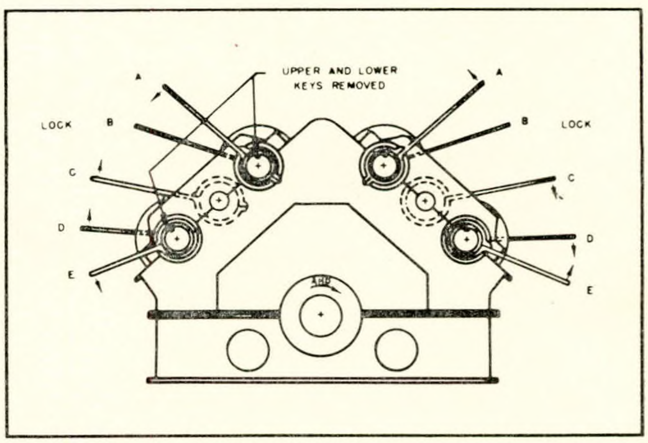


FIG. 2—*Starboard gear, looking forward*

a) Wrench fastened to upper aft quill shaft coupling hub; b) Wrench fastened to upper forward quill shaft coupling hub or the forward end of the quill shaft; c) Wrench fastened to coupling flange of the first-reduction pinion; d) Wrench fastened to lower forward quill shaft coupling hub or the forward end of the quill shaft; e) Wrench fastened to lower aft quill shaft coupling hub seatings, centring of gears, and proper gear mesh can be more easily controlled. Results obtained by this revised method have proved accurate and consistent.—*C. E. Alsop, Bureau of Ships Journal, June 1959; Vol. 8, pp. 26-27.*

Effect of Shot Peening

In general, metals and alloys under repeated loading are subject to fatigue, finally rupturing at a stress which is below the tensile or yield strength. When repeated stress is imposed on the material, a number of structural imperfections or minute cracks in the surface layer gradually propagate inwards, resulting in fatigue failure. Furthermore, if oxidation or decarburization occurs in the surface layer, its strength decreases, while the presence of notches causes stress concentrations, in both cases leading to early failure of the material. Consequently, to enhance fatigue strength, it is desirable to harden the surface layer and to eliminate the presence of notches. Methods of hardening the surface layer include carburizing, nitriding, induction heating and quenching, surface rolling, and shot peening. Of these, the first three methods are applicable to iron and steel but hardly to other alloys, while surface rolling gives rise to a number of practical difficulties. Consequently, as shot peening is comparatively simple and has proved effective, the present investigation is concerned with fatigue tests carried out on polished and shot peened specimens of pure iron, a brass, a Si-Mn spring steel, and an aluminium alloy, the chemical compositions of which are given in Table I. Also, as iron and steel products generally

TABLE I. PERCENTAGE COMPOSITION OF SPECIMENS TESTED

	Iron	Brass	Si-Mn steel	Al-alloy
Carbon	0·053	—	0·540	—
Silicon	0·160	—	1·500	0·50
Manganese	0·110	—	0·810	0·54
Copper	—	59·22	0·230	4·06
Chromium	—	—	0·034	—
Zinc	—	39·93	—	0·45
Iron	99·667	0·15	96·866	0·49
Lead	—	0·29	—	—
Tin	—	0·41	—	—
Magnesium	—	—	—	0·83
Phosphorus	0·004	—	0·007	—
Sulphur	0·006	—	0·013	—
Aluminium	—	—	—	93·13

have a decarburized layer, it was considered desirable to carry out additional tests to clarify the effects of shot peening on the Si-Mn spring steel with a decarburized layer, as it was believed reasonable to expect that shot peening should have a beneficial effect on fatigue strength in such a case. Before use, all specimens were subjected to heat treatment, i.e. 980 deg. C. for the iron, 650 deg. C. for the brass, 850 deg. C. for the Si-Mn steel, and 415 deg. C. for the aluminium alloy. In all cases, the duration of heat treatment was 1 hr., and the specimens were allowed to cool in the furnace. A summary of the experimental results obtained is given in Table II. It should

TABLE II. SUMMARY OF EXPERIMENTAL RESULTS

Specimen	Tensile strength, kg/mm^2	Increase in hardness by shot peening, per cent	Increase in fatigue limit by shot peening, per cent
Iron	30·4	56	3
Brass	43·3	88	13
Si-Mn steel	87·6	43	5
Al-alloy	24·5	40	11

be noted that, although shot peening hardens the surface layer, with a beneficial effect on fatigue strength, it also tends to produce uneven surfaces as a result of the impact of the shot, thus producing notches or sites of stress concentration, which have an adverse effect on fatigue strength. If, therefore, a specimen is annealed at high temperature after shot peening, the hardened layer will naturally be softened, leaving only the uneven surface, enhancing the notch effect and causing the fatigue strength to drop considerably.—*S. Takeuchi and T. Homma, Science Reports of the Research Institute Tohoku University, Series A, Vol. 10, No. 6, pp. 426-434; Vol. 11, No. 1, pp. 48-55. The Engineers' Digest, June 1959; Vol. 20, pp. 245-246.*

15,000-b.h.p. Diesel for Norwegian Tanker

Shop trials have recently been completed in the engine works of Uddevallavarvet, Sweden, of an Uddevalla-Götaverken twelve-cylinder Diesel engine which develops 15,000 b.h.p. (17,900 i.h.p.) at 112 r.p.m. This is the highest powered Götaverken-type engine built to date. The cylinders have a bore of 760 mm. and the piston stroke is 1,500 mm. This design of turbocharged engine is longitudinally scavenged and retains a reciprocating double-acting scavenging air pump for each cylinder to give greater reliability in the event of one or more turboblowers being out of action. These pumps are simple units without rings built into the upper part of the engine entablature, and driven from each crosshead. Turbocharging is on the constant-pressure system with the pumps connected in series with the turbochargers. Exhaust gas temperatures remain below 350 deg. C. at 112 r.p.m., this leaving a suitable margin of safety for the centrally disposed exhaust valve in each cylinder cover. Fresh water cooling is adopted for the cylinder jackets, but the pistons are oil cooled. This class of engine has a welded bedplate and entablatures, there being a separate entablature to each cylinder. A larger size of pressure charged engine is at present under construction at the Götaverken works, this having a cylinder bore of 850 mm. and a piston stroke of 1,700 mm. It will be built with from six to twelve cylinders to give a maximum output of 22,000 b.h.p. The prototype, an 11,000-b.h.p. engine, is scheduled for shop trials in June 1960. The Uddevalla-built 15,000-b.h.p. engine is now being installed in the 34,000-ton tanker *Norse King* being built for A/S Norseman, of Oslo.—*The Motor Ship, June 1959; Vol. 40, p. 122.*

Ship Propulsion by Means of Free Piston Gas Turbines

The free piston gasifier may be considered as a single cylinder supercharged Diesel engine, working on the two-stroke cycle with opposed pistons whose work is transferred directly to the compressor pistons. The special feature of the conception is that a minimum of moving parts is required through the direct connexion of the compressor pistons to the engine pistons and the location of the engine cylinder between the compressor cylinders. There is no crankshaft, no crankshaft bearings, no camshaft, no drive, nothing; it cannot be simpler. In a gasifier, the whole of the air from the compressor is delivered to the engine cylinder, which is therefore highly supercharged, the large excess of air passing out to the exhaust as scavenge air. The power gas consists of at least 75 per cent of unburnt air, the remainder being the products of combustion of the fuel. Fig. 26 shows an engine room layout for a 10,000-ton deadweight cargo ship equipped with a 5,790-s.h.p. free piston, gas turbine propulsion installation. In this design the gain in deadweight and cargo space shows to full advantage. Expressed in figures the ship equipped with a free piston gas turbine realizes, in comparison with the same ship but Diesel engined, a gain in deadweight of about 250 tons and a gain in cargo space of about 370 m^3. Also, with regard to the accommodation the free piston, gas turbine propulsion plant presents many possibilities, thanks to the small casing required. To provide for the electrical requirements at sea, either a shaft driven, constant voltage dynamo can be used, or a gas turbo-dynamo taking power gas from the main gas line. Consequently the whole plant runs on residual fuel during sea service. As a rule the harbour load of these ships is not sufficient to have a gasifier in economic service so that in this case the application of a gas turbine driven generator is not justified and Diesel driven generators are employed.—*A. S. Anneveld, International Shipbuilding Progress, June 1959; Vol. 6, pp. 265-269.*

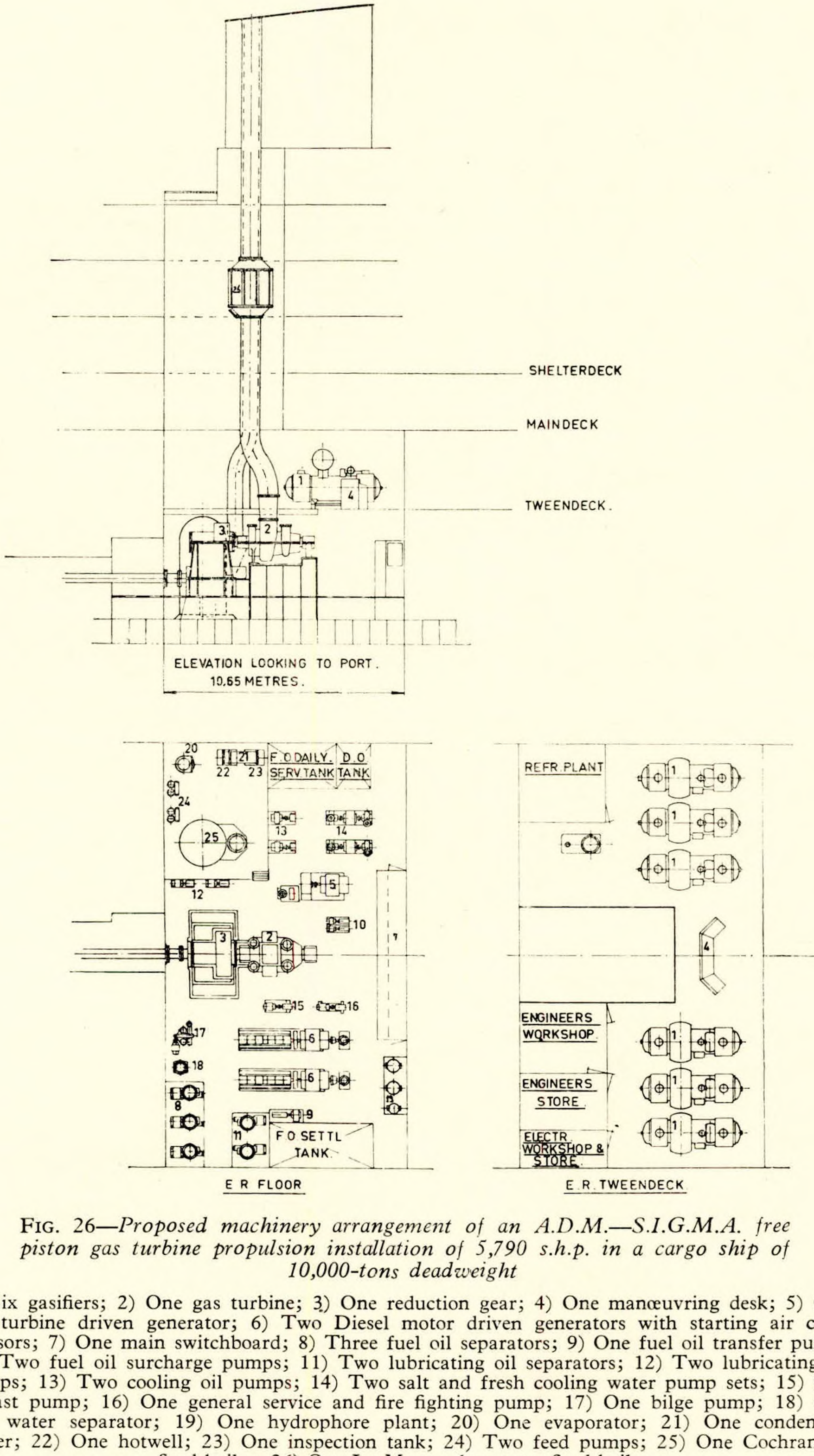


FIG. 26—*Proposed machinery arrangement of an A.D.M.—S.I.G.M.A. free piston gas turbine propulsion installation of 5,790 s.h.p. in a cargo ship of 10,000-tons deadweight*

1) Six gasifiers; 2) One gas turbine; 3) One reduction gear; 4) One manœuvring desk; 5) One gas turbine driven generator; 6) Two Diesel motor driven generators with starting air compressors; 7) One main switchboard; 8) Three fuel oil separators; 9) One fuel oil transfer pump; 10) Two fuel oil surcharge pumps; 11) Two lubricating oil separators; 12) Two lubricating oil pumps; 13) Two cooling oil pumps; 14) Two salt and fresh cooling water pump sets; 15) One ballast pump; 16) One general service and fire fighting pump; 17) One bilge pump; 18) One oily water separator; 19) One hydrophore plant; 20) One evaporator; 21) One condensate cooler; 22) One hotwell; 23) One inspection tank; 24) Two feed pumps; 25) One Cochran oil fired boiler; 26) One La Mont exhaust gas fired boiler

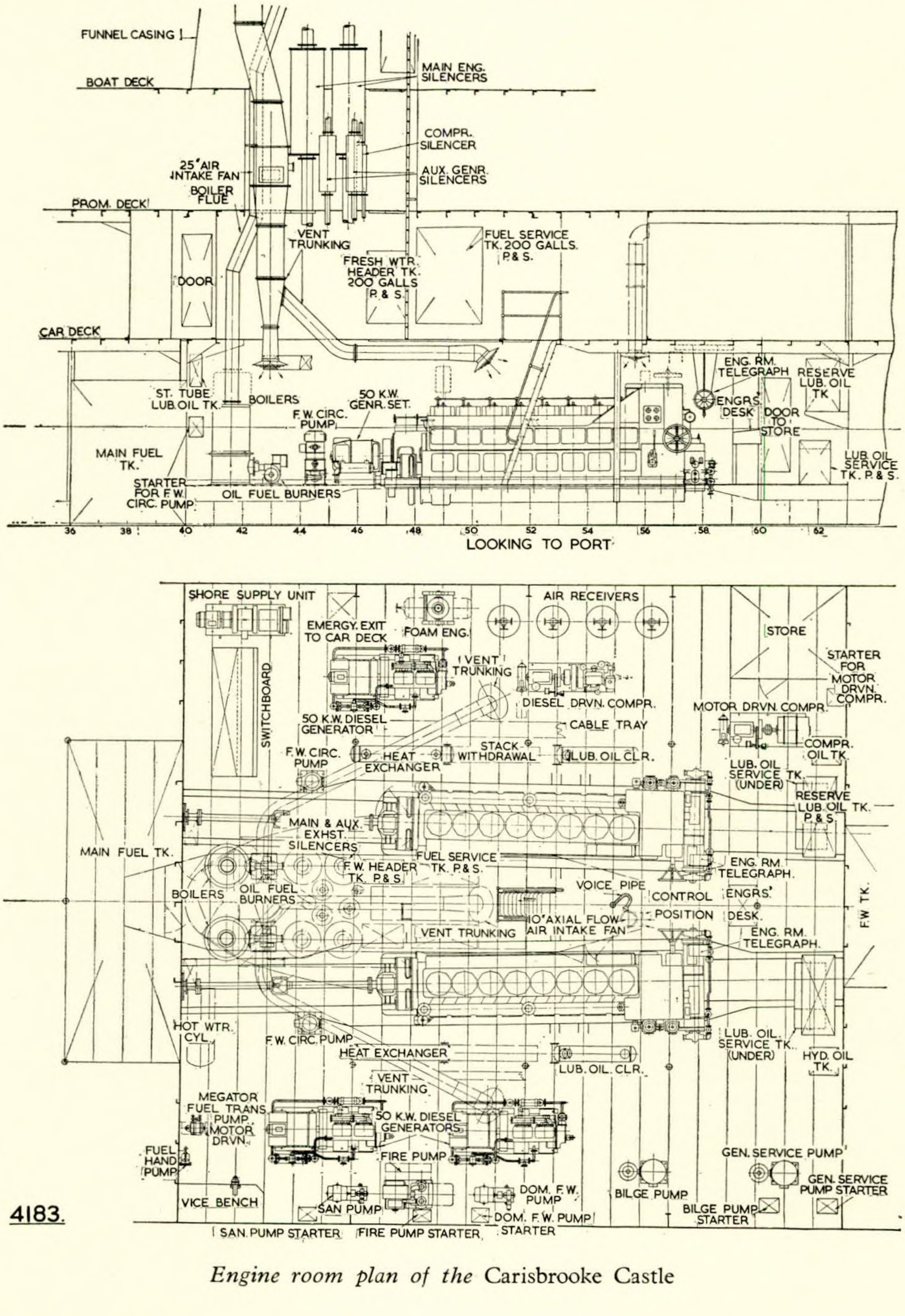
Comparison of weights:	
Diesel propulsion installation	418 tons
Free piston gas turbine propulsion installation	168 tons
Benefit in deadweight with free piston propulsion installation	250 tons
Benefit in cargo capacity with free piston propulsion installation	870 m^3

Twin-screw Ferry

The *Carisbrooke Castle*, owned by the Southampton, Isle of Wight and South of England Royal Mail Steam Packet Company, Ltd. (Red Funnel Steamers), has recently entered service between Southampton and the Isle of Wight. The principal particulars of the *Carisbrooke Castle* are as follows: —

Length overall, including ramp and fender	191ft. 2in.
Length on waterline	180ft. 0in.
Breadth, moulded	40ft. 0in.
Depth, moulded to main deck	10ft. 7in.
Draught amidships	6ft. 0in.
Gross register	671 tons
Service speed	14 knots

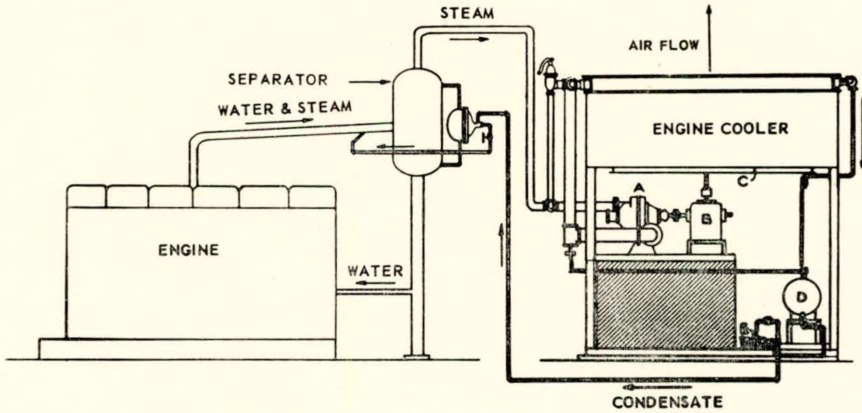
Using the roll-on, roll-off principle, the new vessel can carry motor cars and all types of commercial vehicles, including lorries, mobile cranes and outsize vehicles, the sailing times being arranged so that it is possible to complete the outward and return passages in one day. Approximately 45 vehicles can be carried on the main deck with an unrestricted height at the fore end for lorries of up to 20 tons in weight each. All the deck machinery is of the Vickers-Armstrong/V.S.G. electric hydraulic type, and includes one cable lifting and warping capstan on the starboard side, a warping capstan to port, two ramp hoisting winches in the forward machinery houses, and a warping capstan fitted aft. The steering gear is of the hand/power electric hydraulic type coupled to twin rudders of spade design. Propulsion is by two eight-cylinder, two-stroke, direct-reversing, Crossley Diesel engines, type H.R.N.8/45, with cylinders 10½-in. diameter and a piston stroke of 13½in. At 450 r.p.m. each engine develops 900 b.h.p. and is direct coupled to a propeller of Thornycroft's design. The propeller shafts run in oil-bath stern tubes.—*The Motor Ship, June 1959; Vol. 40, pp. 134-135.*



Engine room plan of the Carisbrooke Castle

Engine Waste Heat Utilization

Diesel engine cooling by means of boiling heat transfer or ebullient cooling has received considerable attention within the past few years because of its numerous advantages. These advantages include more uniform heating of cylinder walls and heads, reduction of condensation in the combustion chamber and crankcase, and the possibility of using cheaper fuels. The ebullient cooling system has many of the characteristics of a low pressure watertube boiler. A steam separator is required that separates the steam from the boiling water. The system operates at about 15lb. per sq. in. gauge, and the steam is normally sent to a condenser and returned to the system. One method of condensing the steam is considered in this paper. The low pressure steam is expanded through the turbine to atmospheric pressure, and condensed by the cooling air supplied by the turbine driven fan. To obtain the maximum utilization of the available energy in the steam it is desirable that the turbine have the highest possible efficiency. —*Paper by J. C. Georgian, presented at the 1959 ASME Oil and Gas Power Conference.*



Diesel engine ebullient cooling system using steam turbine driven air condenser fan (59—OGP-7)

A) Steam turbine; B) Speed reducer; C) Fan; D) Condensate tank; E) Condensate pump

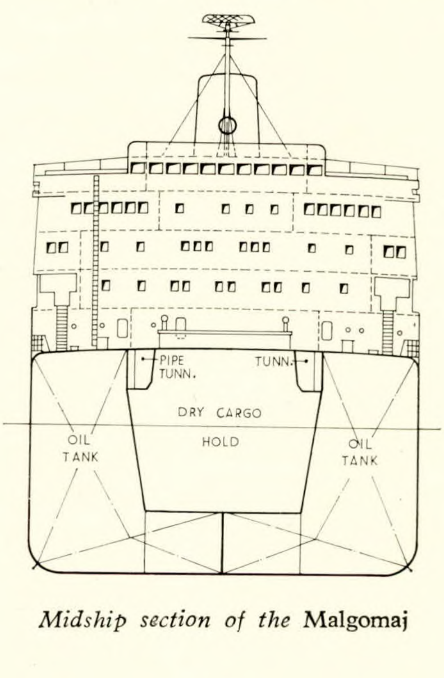
Improved Fusion Abrading Process for Removing Surface Material from Metals

Although the principle of using frictional heat for removing material from a workpiece has already been employed successfully in friction parting discs and fusion bandsaws, recently patented equipment differs from such arrangements in that removal is effected by fusion of the material by the rapid action of friction edges, followed by entraining and projecting the fused material away from the workpiece by centrifugal action. This process, which is suitable for removing surface material from flat or curved metal workpieces, including rods and wires, comprises pressing on to the surface a special rotary power driven tool which presents one or more narrow friction edges rotating at a high speed and provided with fine teeth. The tool passes over the surface at right angles to the applied pressure, the heat of friction produced causing fusion of the surface to the plastic or liquid state, the fused material then being removed by centrifugal action. In practice, the tool can be equipped with a revolving disc fitted with one or more projecting friction rings of high strength steel and provided with fine teeth, and the operation can be combined with the use of abrasive particles introduced by a gas or liquid between the surface to be worked and the friction edges. The use of oxygen as a carrier for the abrasive is particularly suitable, as it assists removal of the fused material by causing its combustion. In addition, supplementary heat can be produced by electric arcs between the tool and workpiece. It is stated that, by combining the fusion treatment with the use of an abrasive, any surface irregularities left on the workpiece by the friction rings are removed.—*The Engineers' Digest, June 1959; Vol. 20, p. 234.*

Swedish Combined Ore and Oil Carrier

The Swedish shipowners, Trafikaktiebolaget Grängesberg-Oxelösund, Stockholm, have taken delivery of a large combined ore and oil carrier. This vessel, the *Malgomaj,* 34,200 tons d.w., is the largest vessel of its type so far built by Götaverken A/B, Gothenburg, but follows the lines of several ships that have already been constructed for the owners, who operate a large fleet of vessels in the iron ore trade. The *Malgomaj* is powered by a Götaverken Diesel engine. The principal particulars of the *Malgomaj* are as follows:—

Length o.a.	655ft. 0in.
Length b.p.	630ft. 0in.
Breadth, moulded	88ft. 6in.
Depth, moulded	50ft. 6in.
Draught	35ft. 0in.
Deadweight	34,200 tons
Net tonnage	15,013 tons
Gross tonnage	24,223 tons
Machinery output	9,350 b.h.p.
Speed on trials, loaded ...	15 knots



Midship section of the Malgomaj

The *Malgomaj* has her propelling machinery and navigating bridge aft, and has been constructed on the longitudinal framing system, both at the bottom and the sides. The transverse bulkheads are of the Götaverken corrugated design, and the longitudinal bulkheads in the ore holds are flat. Two tunnels run below deck on either side of the ship, and these can be used by the crew in bad weather. They also serve the purpose of carrying the electric cables and telephone wires. A feature of the vessel is the size of the two long centre holds for carrying ore. The length of the forward cargo hold is about 240ft. and the after hold about 195ft. Both holds have a mean breadth of about 41ft. and a depth of about 38ft., the total volume, including the hatchways, being in the region of 633,000 cu. ft. There are thirteen hatchways and each of these measures 24ft. by 29ft. The covers are of a special design developed by Götaverken, and each cover is in two sections connected by hinges and hydraulically operated by a telescopic unit located on the outside of the hatch coaming. The oil cargo tanks are arranged on each side of the ship and below the ore holds. There are thirteen of these tanks on each side with a total capacity of 1,275,000 cu. ft. A cargo pump room is located amidships. The propelling machinery consists of a single-acting two-stroke Götaverken Diesel engine of welded construction. It has ten cylinders of 760 mm. bore and 1,500 mm. stroke, developing 9,350 b.h.p. at 112 r.p.m. The diameter of the propeller is 20ft. 1¼in. and the pitch at 0·7 R is 13ft. 3½in. The engine has been designed to run on heavy boiler fuel. Alternating current at 440 volts, 3 phase, 60 cycles is supplied by three 6-cylinder, four-stroke Götaverken Diesel engine driven 324-kVA alternators. Each engine has an output of 380 b.h.p. at 360 r.p.m. In addition there is a steam turbine driven 245-kVA alternator supplied with steam while the ship is at sea from the exhaust gas boiler. Steam for cargo pumping is generated by two Scotch boilers.—*The Shipping World, 2nd September 1959; Vol. 141, pp. 121-122.*

New Direct Reversing Engine

Based upon the specific requirements of marine propulsion installations in near water trawlers, coasters, tugs and similar sized craft, the National Gas and Oil Engine Co. Ltd. of Ashton-under-Lyne have produced a new range of direct-reversing Diesel engines, known as the Sovereign class. These engines have a cylinder diameter of 12in. and a stroke of 15in. and they have been developed from the background of successful experience gained with the National type-F4A unidirectional power unit. The new design is a vertical, in-line, four-stroke cycle engine, and is to be built in six, seven and eight-cylinder units, either with normal aspiration or with turbocharging. In the six-cylinder form, the engine has already been ordered for installation in nine near water trawlers, to be built for the Aberdeen and Lowestoft fleets. Of a new tank tested design, the Aberdeen vessels incorporate the unusual feature of a transom stern and the dimensions are 109ft. 0in. overall by 23ft. 0in. moulded by 11ft. 0in. moulded. In each case, the main propelling machinery will consist of a Sovereign class-F4AUUDM6 six-cylinder turbocharged direct reversing engine, with intercoolers, and directly coupled to the propeller shaft. This type of engine is capable of developing 500 b.h.p. at 300 r.p.m. The same type of propulsion unit is to be installed in the Lowestoft vessels, although there will be some variation in the overall dimensions of the hull. The engine has a length, including thrust block, of 19ft. 0in., a width of 5ft. 10in. and a height of 9ft. 2in., and weighs 20 tons. Special attention has been paid to the minimum time required to slow down the engine sufficiently to operate the extremely simple reversing mechanism, and the changeover from ahead to astern is completed in one movement with very little effort by the operator. To achieve this, the tappets are located between the ahead and astern cams, the cam motion being transmitted to the tappets by the cam follower lever. This cam follower has offset rollers, each in line with one of the cams, and the actual effort required to move from the ahead to astern position is provided by a compressed air cylinder on the manœuvring shaft. Throughout the speed range, the engine is under full governor control and any rapid load change, such as may occur in heavy seas, does not give rise to wide variations in engine speed. The engine controls, illustrated in Fig. 4, are grouped on the opposite end to the flywheel and consist of two levers. One lever, mechanically connected to the governor speed control, operates the engine speed, while the other controls the valves which supply the compressed air for starting, stopping and manœuvring.—*The Shipbuilder and Marine Engine-Builder, September 1959; Vol. 66, pp. 531-533.*

Nuclear Reactor for Marine Propulsion

Contrary to most other designs of reactor put forward for marine propulsion, the G.E.C./Simon-Carves design is based on the gas cooled, graphite moderated reactor already well established in Britain. Major advances in fuel element design, however, have resulted in much higher outlet gas temperatures, and very much reduced overall size of the reactor system. Of completely new design, the fuel elements consist of slightly

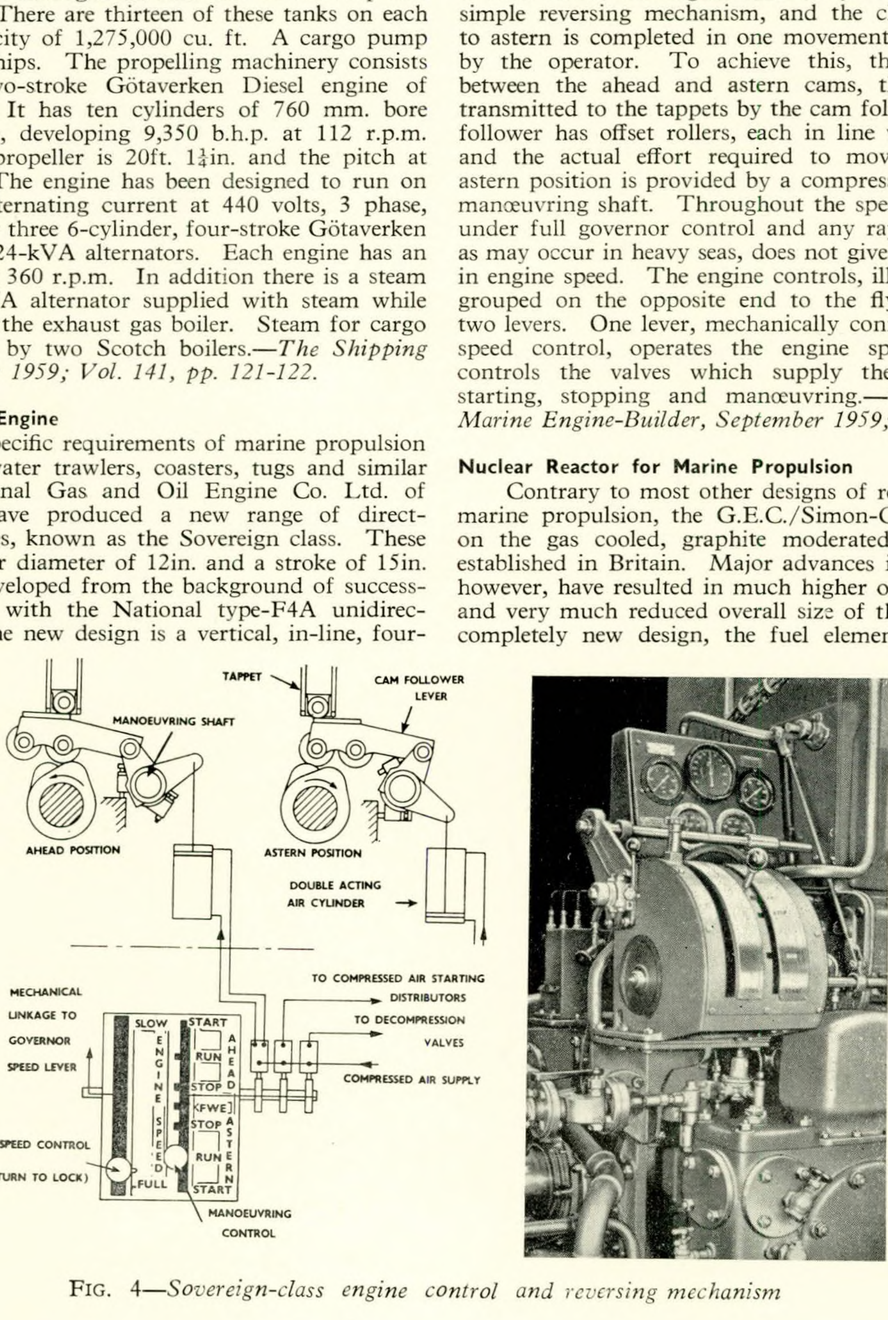


FIG. 4—*Sovereign-class engine control and reversing mechanism*

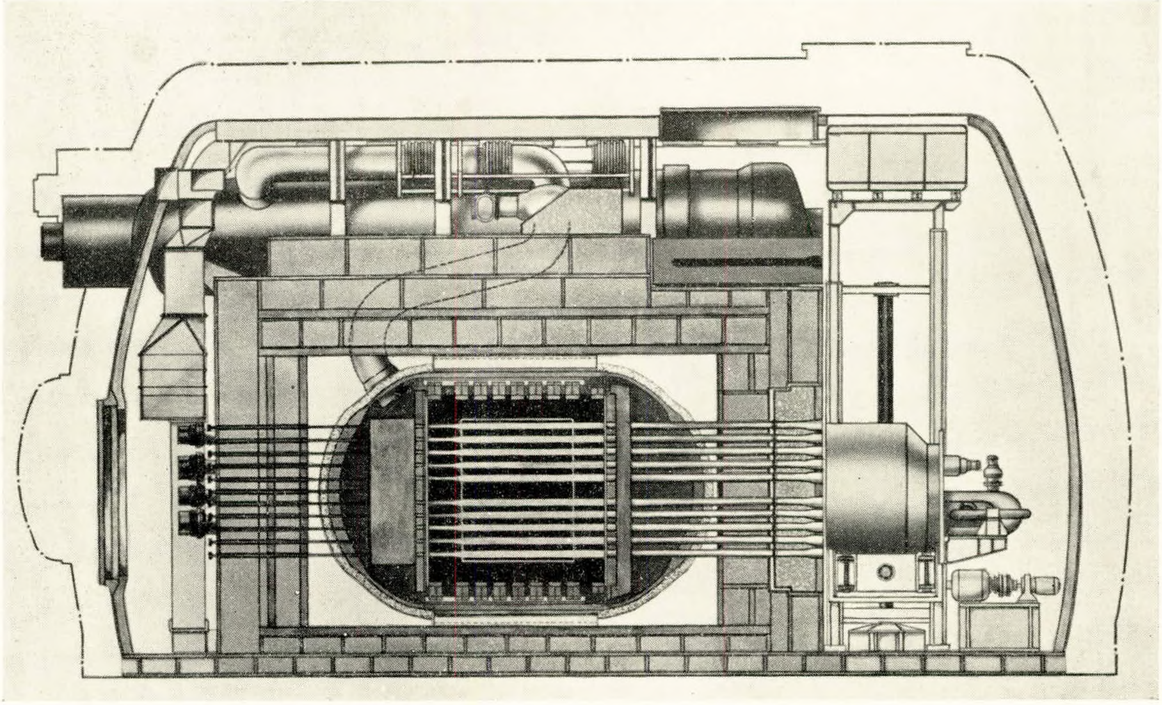


FIG. 1—*Longitudinal section through G.E.C./Simon-Carves reactor*

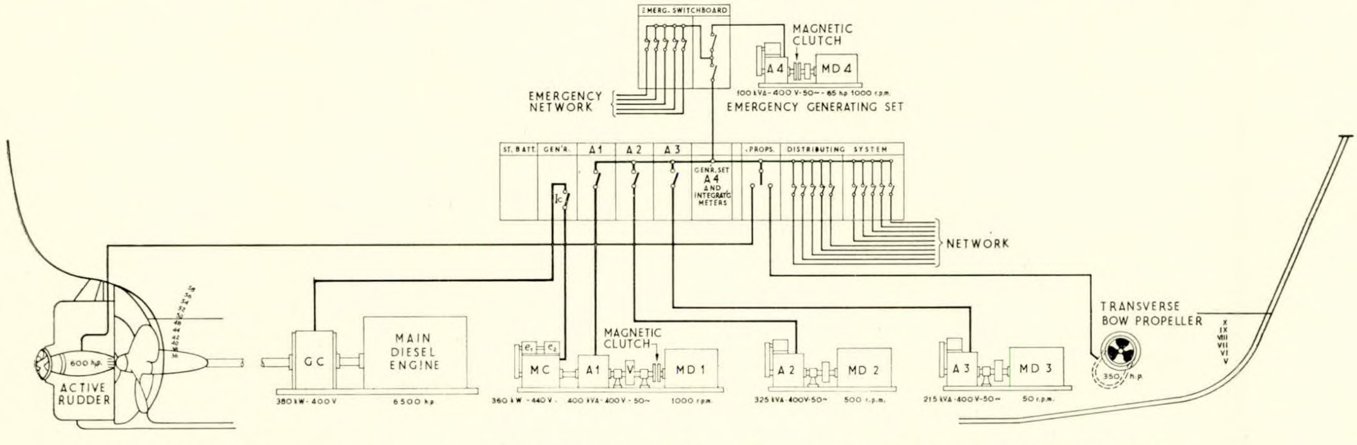
enriched uranium dioxide canned in stainless steel. As in other G.E.C. reactors, the elements are provided with graphite sleeves. Blocks held together and supported by a surrounding steel structure form the graphite core, through which the fuel element channels extend horizontally and are interspersed with control rod channels, also horizontal. The reactor pressure vessel is a horizontal cylindrical vessel with domed ends. Charge/discharge standpipes are at one end, and a control rod and emergency access pipes at the other. The main gas ducts are connected through suitable nozzle forgings. Constructed of steel plate, the main shielding structure surrounds and supports the pressure vessel. The construction is of an essentially cellular nature, and, to provide a neutron shield, the voids are filled with purified water. At the charge/discharge end of the standpipes there is a concrete plug and the shielding water is circulated through an external cooling circuit. For carrying the high pressure, carbon dioxide gas coolant between the reactor vessel and the four steam raising units, there are primary coolant ducts with suitable butterfly isolating valves, safety valves, bellows expansion units, supports and restraining damper systems. There are four steam raising units, which are mounted on the outside of the main shielding structure above the reactor. Each unit has an economizer, evaporator and superheater sections, and turbine driven circulators are mounted at their after ends. Internal headers are used and all steam/water connexions pass out through the specially shaped head at the forward end of the unit. The charge/discharge machine is a pressurized and shielded unit which can be connected to any one of the charge/discharge standpipes, there being one of these for each fuel channel. It is possible to charge fuel with the reactor under load and the ship at sea, should this be required. To control the nuclear reaction, there is a series of neutron absorbing tubes, which can be inserted into the graphite core. A separate emergency shut-down system is provided in the form of additional rods housed inside the normal control tubes. The secondary gas circuits include the CO_2 generation and storage equipment (make-up CO_2 of high purity is generated from fuel oil) and CO_2 filtration and drying circuits. A separate circuit is provided to cool fuel elements in the charge/discharge machine. To enable a continuous check to be maintained on the conditions of the fuel elements in each channel, there is burst cartridge detection equipment, which is similar to existing systems. Resting on a flat grillage, the containment vessel is a truncated cylindrical structure, which houses all the nuclear and steam raising plant, with the exception of the steam drums, and has the minimum possible number of penetrations.—*The Shipbuilder and Marine Engine-Builder, September 1959; Vol. 66, pp. 539-541.*

Ebullient Cooling

Ebullient cooling for towboat engines, already commonplace on the lower Mississippi River, is now considered practical for use in motor vessels that work in harbours well to the north. A major advantage of such a system is this: a boat using ebullient cooling for its engines can run on Bunker C fuel instead of more expensive Diesel fuel. Until recently, however, a serious disadvantage has made ebullient cooling impractical in northern harbours. Standard antifreezes will not azeotrope with water, and the result has been that a vital portion of the cooling system has remained unprotected in freezing or sub-freezing temperatures. The answer to the problem is a heat transfer agent that will mix with water. It was introduced by the Dow Chemical Company under the trademark, "Dowtherm 209". Dowtherm 209, which will azeotrope with water, proved superior in giving freeze protection both in the engine and in the condensate return line. The product has also been inhibited to minimize corrosion. The formulation's heat transfer efficiency compares favourably with water. It is recommended for use in a 53 per cent (by weight) solution in water, a mixture that gives freeze protection down to approximately −45 deg. F. A 60 per cent mixture provides freeze protection down to −80 deg. F. Ebullient cooling keeps an internal combustion engine operating at a constant, uniform temperature at all times, no matter how the engine speed or load might vary. The key to this ability is that circulation in an ebullient cooling system does not start until the coolant reaches the boiling point. And if one cylinder is operating at a greater load than others, additional cooling benefits reach that area. Usable horse power can often be increased by the resultant increase in engine efficiency. Since the natural law of boiling is used as an automatic control of temperature, the uniform temperatures that result provide still other advantages over conventional engines. For example, there is less cylinder wear and lubricating oil sludging—a fact that naturally decreases maintenance costs while lengthening the life of the engine.—*Marine News, September 1959; Vol. 46, p. 31.*

French Cargo Vessel with Transverse Jet Unit

The French Shipowners, Nouvelle Compagnie Havraise Peninsulaire de Navigation, Paris, have recently taken delivery of a cargo vessel fitted with a transverse jet unit in the bow. This vessel, the *Ville de Nantes,* 8,700 tons d.w., has been built by Ateliers et Chantiers de La Seine Maritime. The owners of the *Ville de Nantes* have already had four vessels with Pleuger active rudders, but this is the first of their ships to be equipped with a bow unit as well: in point of fact, it is the first cargo vessel to be equipped with Pleuger transverse bow propulsion. The propelling machinery in the *Ville de Nantes* consists of a Burmeister and Wain two-stroke five-cylinder Diesel engine, type 574-VTBF-160, built by the Chantiers de l'Atlantique Penhoët-Loire. This engine has a continuous output of 6,250 b.h.p. at 115 r.p.m. The exhaust gases from the main engine and from the auxiliary Diesel engines pass through a waste heat boiler and supply steam for heating and other services on board. The N.T. system of electric power generation has been employed in this ship. In addition to the 600-h.p. Pleuger active rudder motor, there is a 350-h.p. motor fitted to the Pleuger bow unit. These motors are supplied by the ship's a.c. supply and are used when the vessel is manœuvring in harbour, and it is one of the advantages of the N.T. system that the heavy starting current for these motors can be supplied without any fear of interruption of any other of the ship's supplies. The accompanying drawing shows schematically the system of power generation by the Diesel driven alternators and the propeller shaft driven d.c. generators. Electricity at 440 volts, three-phase, 50 cycles is supplied by three Diesel driven a.c. sets comprising two normally-aspirated B. and W. engines coupled to 215 and 325 kVA alternators respectively, and one turbocharged 500-h.p. M.G.O. Diesel engine driving through a magnetic coupling one 400-kVA alternator (A1), one 360-kW motor (MC), a heavy flywheel (V) and two exciters (e_1 and e_2), one of which energizes the alternator and the other the shaft driven generator. At sea the d.c. generator (GC), which will operate over a wide range of speed varying from 90 to 120 r.p.m., supplies a constant 440 volts potential and excites the d.c. motor (MC) which is connected to the 400-kVA alternator (A1). This unit, which rotates at 1,000 r.p.m., is called the manœuvring unit. While the vessel is under way the magnetic coupling on the 500-h.p. M.G.O. set is disengaged, and the current supplied by the shaft-driven generator feeds the d.c. motor (MC). Should the weather be so bad that the propeller revolutions drop below 70 r.p.m., and the ship's demands cannot be met by the alternator (A1), an automatic switch (Ic) comes into operation and cuts off the supply from the shaft-driven alternator and opens a d.c. circuit which energizes the magnetic coupling. This acts as a clutch and the flywheel inertia starts the Diesel engine. The time taken for this changeover is about one second, and neither the frequency nor the voltage at the busbars show any substantial variation. This installation has been designed so that, in the event of a sudden breakdown of the M.G.O. Diesel engine, the inertia stored in the flywheel on the manœuvring unit will drive the alternator for about 15 seconds: this is sufficient time for the vessel to be kept under power, and more than is required for another Diesel engine equipped with an electro-magnetic starting device to be put in parallel. This arrangement ensures complete continuity of the ship's electricity supply. The cylinder heads of the auxiliary Diesel engines are kept constantly circulated with warm water so that only a few seconds are required for starting.—*The Shipping World, 26th August 1959; Vol. 141, pp. 97-99.*



Schematic arrangement of power generation by Diesel driven alternators and propeller shaft driven d.c. generators

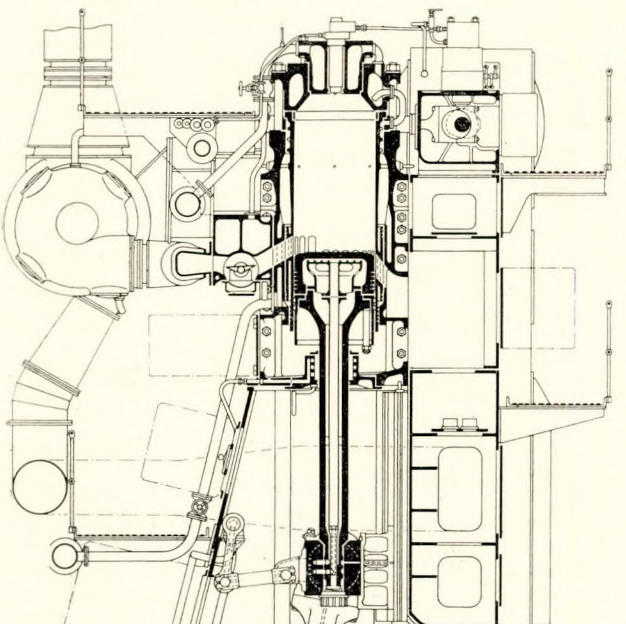
A4) 100-kVA alternator; MD4) 65-h.p. Diesel engine; GC) 380-kW generator; MC) 360-kW motor; A1) 400-kVA alternator; V) Flywheel; MD1) Diesel engine; A2) 325-kVA alternator; MD2) Diesel engine; A3) 215-kVA alternator; MD3) Diesel engine.

Diesel Oil Water Separator

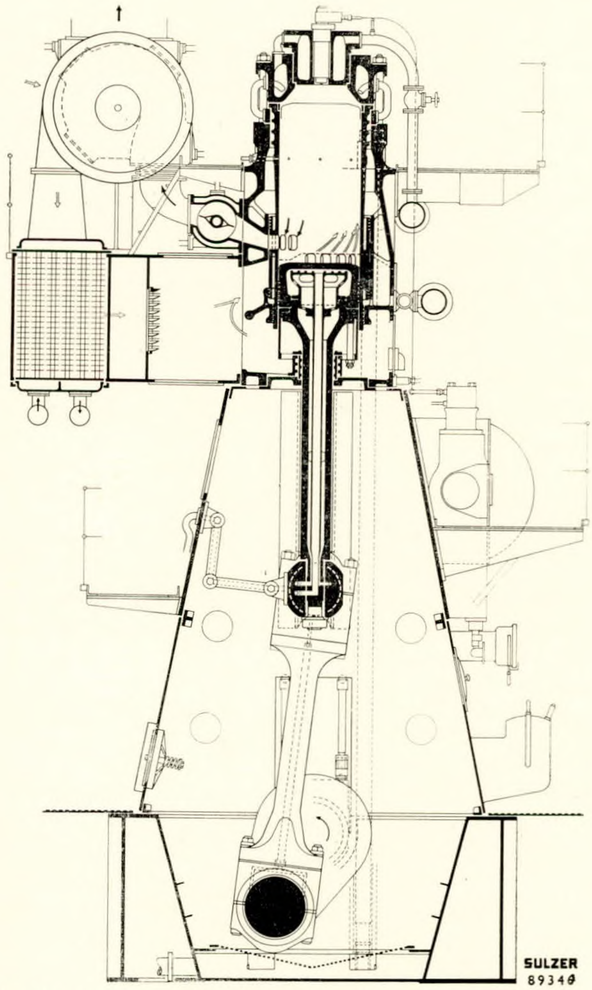
A Diesel oil water separator and filter unit has been developed recently by the Bureau of Ships to replace the centrifugal purifier on almost all new construction ships. The unit can remove virtually all water from the fuel delivered to the engines. The new Diesel oil water separator includes replaceable coalescer and separator elements arranged in two stages in a casing provided with a sump for receiving water and settled impurities. The coalescer elements are made of glass fibre or resin impregnated paper, or a combination of both. The first-stage element serves to break up Diesel oil/water emulsions, coalesce the water into large drops, and remove entrained solids. The second-stage elements are called separator elements and are usually made of resin impregnated paper that is chemically treated to pass the Diesel oil freely and to stop the passage of water. The separated water settles to a sump at the bottom of the casing from where it is drained. Provision is made for observing the water level in the sump. The water separator unit is installed in the discharge line from the Diesel oil transfer pump. From the separator, the Diesel oil flows to the Diesel oil service tank. The Diesel oil/water separator units have several important advantages over centrifugal Diesel oil purifiers. As rapid failure of Diesel engine fuel injection equipment can be caused by water in the fuel in quantities as low as 0·2 per cent, BuShips has continuously endeavoured to establish suitable procedures to ensure delivery of water-free fuel to Diesel engines. The Diesel oil/water separator unit was evaluated aboard six net tenders (AN class), which had no provision for the purification of oil, and was evaluated also at the Naval Engineering Experimental Laboratory, Annapolis, Md. All tests met the prescribed specifications. The Diesel oil centrifugal purifiers have heretofore been the standard equipment on naval ships for ensuring removal of water from the fuel. However, the cost, weight, space, operation, and maintenance requirements have limited the installation of centrifugal purifiers to those ships where the number of Diesel engines, units, or total horse power installed was sufficiently large.—*Bureau of Ships Journal, September 1959; Vol. 8, pp. 27-28.*

New Diesel Engine

Test bed trials of the latest Sulzer Diesel engine have now been completed. This engine, designated type RD, is a simplified version of the well known RS engine which was constructed in both turbocharged and non-turbocharged form, and supersedes this engine. The first Sulzer two-stroke engine with cross scavenging and turbocharging built at the Sulzer Works was the 9 RSAD 76 engine; a nine-cylinder engine of 760-mm. bore and 1,550-mm. stroke, having an output of 13,500 b.h.p. at 119 r.p.m. The engine recently demonstrated on test was a 6 RD 76 type intended for a Polish cargo vessel. Streamlining the RS engine has resulted in a saving of about 50 tons, and it is estimated that on the basis of results obtained on the new engine while on test it will be possible in future to increase the output of all RD engines. An output of 1,500 b.h.p. per cylinder has already been obtained from the 6 RD 76 engine. Three bore sizes of RD engine are at present being built. These are as follows: —



The earlier Sulzer RSAD 76 engine, fitted with scavenge pumps and with fuel pumps at top platform level



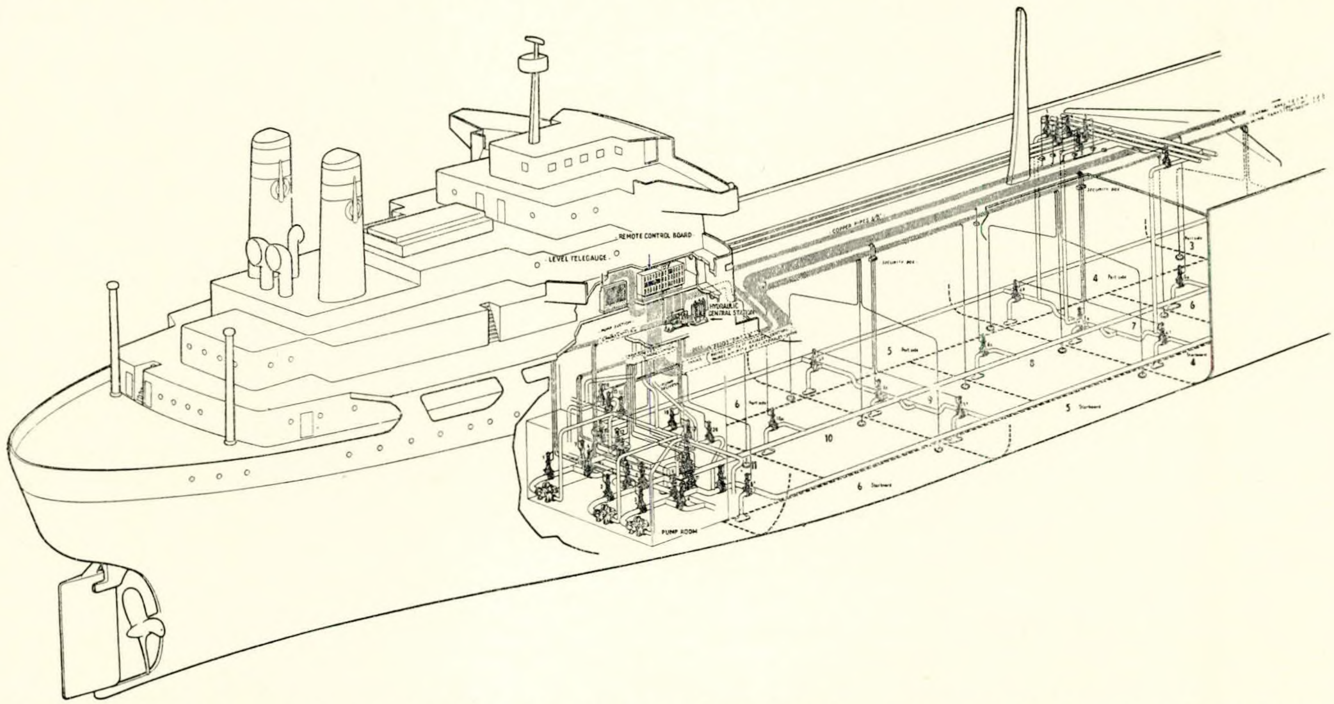
The latest Sulzer RD 76 engine, with scavenge pumps removed, and the turbochargers, exhaust and scavenge air trunking rearranged all on the same side. The fuel pumps are now located at middle platform level

Type	*Bore*	*Stroke*	*Output per cylinder*	*R.P.M.*
RD 68	680 mm.	1,180 mm.	900 b.h.p.	135
RD 76	760 mm.	1,550 mm.	1,300 b.h.p.	119
RD 90	900 mm.	1,550 mm.	1,835 b.h.p.	119

As will be seen from the accompanying sectional drawings of the RD and the earlier RS engine, the scavenge pump casing has been removed and the turbochargers, exhaust and scavenge air trunking are now all on the same side. The air manifold now incorporates the air coolers. With the removal of the scavenge pumps symmetrical columns can be used, and in place of the single crosshead fitted to the RS engine, double-crossheads as fitted to earlier type engines are employed. Another noticeable feature is that the fuel pumps have been removed from cylinder top level and are now mounted in a block halfway up the engine at middle platform level. This new arrangement has enabled the former chain drive to be dispensed with, the drive now being taken through a train of four gears driven from the crankshaft. The RS engine exhaust gases are controlled by means of an oscillating valve driven by means of a flexible rod, but with the RD engine a rotary valve is used. This valve, which is necessary to seal off the cylinder spaces while the piston is at top dead centre, rotates at half the speed of the engine and has flexible edges so that it cannot be jammed in the event of foreign bodies, such as pieces of piston ring, getting in.—*The Shipping World, 14th October 1959; Vol 141, pp. 247-248.*

Hydraulic Remote Control of Cargo Valves

Since the earliest days of tankers cargo valves have been operated by the same method, although the continued increase of valve size renders more and more difficult this performance exclusively by muscular energy. In the suction mains, for instance, the valves are normally controlled by means of a hand wheel set on the deck and connected with the gate by a steel rod, the length of which may attain, or even exceed 40ft. The rod is stayed by intermediate guides with bearings of steel, bronze or fibre and passes through a deck stuffing box. The rods must always be carefully aligned and the operating hand wheel must always be vertically above the valve to be controlled, as universal joints are impractical in such positions. The maintenance of this equipment is expensive and time consuming, for the intermediate guides must be periodically renewed, which involves the erection of scaffolding, the cost of which is often more than that of the work itself. The deck packings require to be renewed regularly to ensure watertightness, while the rods themselves are subject to such intense corrosion that it is absolutely vital to renew them, accidental breakage apart, on each occasion of survey. As early as 1956, the Companie Navale des Pétroles made an effort to replace the manual equipment by remotely controlled servo-operated valves, and, in the following year, their 30,000-ton tanker *Samarrah* was provided with a trial installation. The results of these trials were so satisfactory that the owners have decided to standardize such equipment in their new series of 47,800-ton d.w. tankers. The first of these to be completed is the *Altaïr,* a vessel of striking appearance which we described briefly last June. The largest motor tanker in actual service at the moment, she is 738ft. in overall length, has a beam of 102ft. and her 33 tanks have a cargo capacity of 2,277,000 cu. ft. The *Altaïr* has her machinery, bridge and all accommodation concentrated aft, there being no centrecastle. Suppression of the centrecastle has greatly reduced the amount of personnel movement, no small matter in a 738-ft. tanker, and is also accompanied by a reduction in weight, in the price of construction and a 4 per cent reduction in hull stress. The entire cargo handling system is controlled by 49 remotely operated hydraulic valves of which there are 14 of 14-in. diameter and 35 of 12-in. diameter. While such an installation inevitably adds to the prime cost of a vessel, this extra decreases with the increasing size of the installation because some of the elements such as the hydraulic pumping set are independent of the number of remotely controlled valves. Maintenance costs are much lower than those of the conventional system because every set of rods, brackets and stuffing boxes is replaced by two small bore pipes clipped to the bulkheads and frames and carried over the most suitable course. The reliability factor of such equipment is the same as that of a steering gear telemotor, the least failure of which could have very serious consequence. A portable emergency device is provided which can be set up on deck, enabling a hand pump to operate the valve in the event of accidental breaking of a circuit. The hydraulically operated valve system is not only used for the main tank suction but also for the most frequently used valves in the pump room and on the discharge system on deck. There is a remote indicating tank level gauge panel in the control room which displays the liquid levels in each tank. There are two hydraulic pumping sets in the hydraulic control station, one of which is installed for standby purposes. Each comprises a 2-kW electric motor driving a hydraulic pump with an output of about 3½ gals. per min. at 570lb. per sq. in. Coupled with these are three 20-gallon oleo-pneumatic accumulators and the necessary changeover valves. With this set in use the pressure is maintained automatically. The power consumed is negligible. The system installed in the *Altair* has five main components, the central control station embracing the remote-control panel for the valves and the level indicators, the pipe system and the hydraulically controlled valves themselves. The control station and remote control board have been designed and supplied by the Société Industrielle Générale de Mecanique Appliquée (Sigma), better known to our readers as the principal licensees in France for the free piston engine system. The hydraulically controlled tank valves have been designed and provided by Munzing (S.A.), of Paris, and the remote level gauge has been supplied by Intertechnique and employs the well known hydrostatic pressure principle.—*The Marine Engineer and Naval Architect, September 1959; Vol. 82, pp. 340-342.*



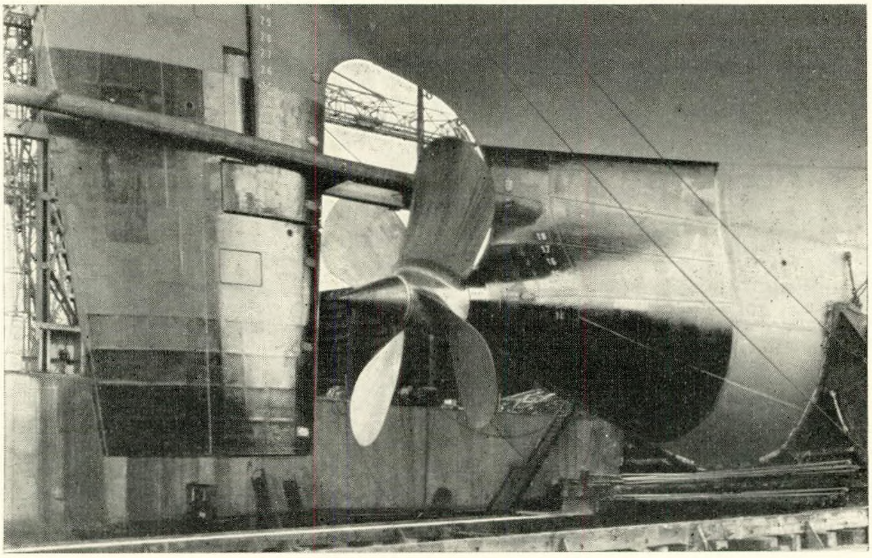
Diagrammatic sketch of tank control and metering systems. Vertical hatching valve control. Cross hatching remote contents indication

Novel Stern Design

The 48,000-ton tanker *Hadrian* was delivered earlier this year by A. G. "Weser", Bremen, to the Norwegian shipowner Hilmar Reksten. A novel feature of the design of this ship is the shape of the stern, in which bulbous shaft bossing is combined with pronounced fining of the stern lines in way of the upper part of the propeller aperture. The object of the design (for which patents are being taken out in Great Britain) is to approach as closely as possible to achieving a uniform flow of water all round the circumference of the propeller, without at the same time increasing unduly the frictional resistance of the afterbody of the ship. This aim, it appears, was successfully achieved. Model tests to determine the best hull form for the *Hadrian* were carried out in the model tanks at Berlin and at Hamburg. As can be seen, the main features of the final design is that the hull is fined away aft above propeller shaft level to give a good clean flow of water to the upper part of the propeller, the bulb lower down both giving space for the stern tube and compensating for what has been removed higher up. The resulting form closely resembles a bulbous bow in reverse, and no doubt will come to be known as a bulbous stern. The *Hadrian* is a steam turbine tanker of 48,035 tons deadweight. Her principal particulars are as follows:

Length o.a.	740ft. 0in.
Length b.p.	703ft. 0in.
Breadth, moulded	102ft. 0in.
Depth to upper deck ...	50ft. 0in.
Draught (summer)	37ft. 9in.
Gross tonnage	31,044 tons
Maximum horse power ...	19,000 s.h.p.
Service horse power ...	17,300 s.h.p.
Service speed	17·5 knots
Complement	65 men

The ship is of the normal three-island type, with bridge and deck officers' accommodation amidships. There are 30 cargo tanks in all, and these are divided into two blocks by a group of three ballast tanks amidships. The propelling machinery consists of a two-cylinder steam turbine installation of A. G. "Weser" design. The turbines are of double-casing type, and drive through double-reduction gearing which gives a propeller speed of 100 r.p.m. at normal power (17,300 s.h.p.). The two main boilers are of Babcock and Wilcox type, constructed by the shipbuilders. They supply steam at about 890lb. per sq. in. and 880 deg. F.—*The Shipping World, 30th September 1959; Vol. 141, p. 201.*



The bulbous stern of the tanker Hadrian *on the stocks*

Vertical Welding Process

Vertomatoc welding is applied mainly to the vertical seaming of plates of medium and heavy thickness. The plates are set up in a vertical plane and the square cut edges to be welded are positioned with a parallel space between them. The gap is bridged by watercooled copper shoes on each side forming, in effect, a mould for the molten weld metal and giving the required contour to the finished weld. The shoes are mechanized so that they move vertically upwards as welding proceeds. A prepared block is placed below the plate edges to close the welding cavity for starting. Granulated flux is dropped into the cavity and an initiating arc established with the electrode wire in a manner similar to the submerged arc process. Arc energy, however, is used only initially to fuse the flux into molten slag which then, owing to its temperature, becomes a highly ionized mass offering a path of relatively low resistance to current flowing from the electrode wire to the pool of weld metal and the adjacent plate edges. Electrical energy expended in the slag and weld metal in this way becomes the medium through which heat is maintained for the continuous fusion of the electrode wire. To obtain consistent energy dissipation with thick plates, a transverse motion, backwards and forwards, can be automatically imparted to the electrode wire as it is fed into the slag. Furthermore, for very thick plates, and with suitable equipment, two or three wires may be run into the same pool simultaneously. As the pool of weld metal builds up, the lower part is continuously cooling to form a homogeneous weld with effective penetration of the parent plates and with smooth clean external faces contoured by the copper shoes.—*Shipbuilding and Shipping Record, 24th September 1959; Vol. 94, p. 212.*

Patent Specifications

Tow Hook Installation

This invention relates to tow hook installations. A tow hook installation according to the invention includes a bracket for securing the installation to the deck of a vessel and a pivot journalled at two spaced points in bearings carried by the bracket. It also includes an arm fixed at one end to the pivot between the bearings and a tow hook secured to the other end of the arm. As will be noted in Figs. 1 and 2 the numeral 1 denotes a bracket secured to the deck (2) at the rear of a vessel. Numeral 3 denotes a vertical pivot, the upper and the lower end portions of which are journalled in bearings (4 and 5) carried by the bracket (1). An arm (6) in the form of a triangle is fixed at one end to the pivot (3) between the bearings (4 and 5). The tow hook (7) is mounted on the other end of the arm (6), the length of the base of which is approximately two and a half times that of the vertical side. A friction band (8) fitted to the bracket (1) embraces the pivot (3) intermediate its ends and is adjustable by a clamp (9) to lock the pivot (3) and the arm (6) in the desired position relatively to the deck (2) or to restrict turning movement of the pivot (3). A bridle (10) journalled in a fulcrum (11) on the hook (7) is provided at the other end with a tapered shear pin (12). A cylinder (13) mounted on the bridle (10) contains a piston (14) operable by pressure fluid, such as compressed air, to disengage the pin (12) and to disengage the bridle (10) from the hook (7). A counterweight (15) is mounted on a cranked arm (16) projecting from the fulcrum (11). Pressure fluid is admitted to the cylinder (13) through a tube (17). In practice, when the vessel fitted with the installation is towing another vessel and approaches broadside to the fore-and-aft line of the towed vessel, there is a tendency for the tow rope to be pulled upwards and sidewise of the towing vessel. The pull on the tow rope causes a couple at the bearings (4 and 5) which exerts a righting moment on the hull of the towing vessel and prevents the vessel heeling over towards the vessel being towed. When it is desired rapidly to release the tow rope from the hook (7), it is necessary only to admit compressed air to the cylinder (13). The piston will then be urged in the direction to disengage the shear pin (12) which moves clear of the hook (7) to disengage the bridle (10) from the hook (7). The bridle (10) swings upwardly under the influence of the counterweight (15) and the rope is released from the hook (7).—*British Patent No. 817,187 issued to the Clyde Shipping Co. Ltd. Complete specification published 29th July 1959.*

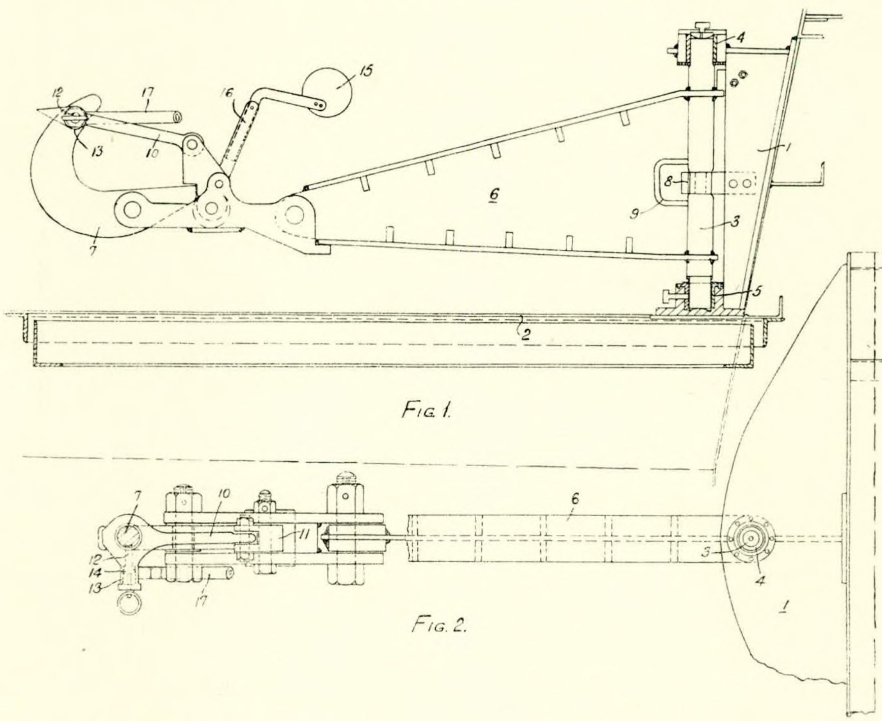


Fig. 1.

Fig. 2.

Tank Lining

This invention relates to protective means for the prevention of corrosion and water impact damage to the tank walls of tanker ships occasioned in carrying corrosive liquids and in cleaning by hot water spraying. The invention originates from the knowledge that the water spray cleaning not only promotes the pitting corrosion to a large extent but in most cases is also its starting cause. A confirmation of this knowledge has been given by experiments in which, from a nozzle of 5-mm. diameter, water at a temperature of 60 deg. C. and a line pressure of 10 kg. per sq. cm. was sprayed on to steel plates, the surface of which was not treated after hot rolling, at a distance of 1 metre. Different steels were subjected to this treatment for several weeks. All test pieces showed at locally defined places of the exposed surface an average hourly disintegration of about 0·01-0·02 mm. However, the experiments showed that under the foregoing conditions, sustantially

Fig. 1

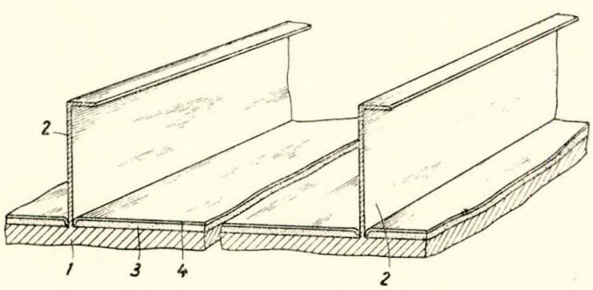
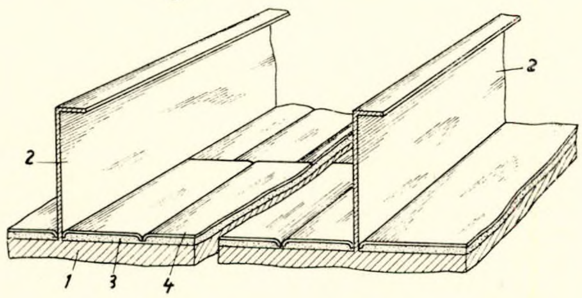


Fig. 2



no corrosion or water impact damage was caused when test plates with very smooth, for example polished, surfaces were used. The invention is carried out by depositing on the surface to be protected a covering layer of small thickness (about 3 to 4 mm.) of preferably organic materials having good adhesive properties and then covering this layer with lining plates of sufficient strength and elasticity to conform to bending of the hull of the ship during travel. These sheets, which have a smooth exposed surface, are so put into place that no gap remains between the covering layer and the lining plates. As lining plates, thin steel plates, preferably about 1 mm. thick, are suitable. Fig. 1 shows part of the bottom (1) of a ship with longitudinal bearers (2). A bituminous covering layer (3) is deposited on the bottom (1) of the ship between the longitudinal bearers (2). A thin plate (4), the edges of which are bent down adjacent the longitudinal bearers, lies flat on this covering layer as a lining plate. Fig. 2 shows the bottom (1) of a ship and longitudinal bearers (2), the covering layer (3) and thin plates (4). The difference between Fig. 1 and Fig. 2 is that Fig. 1 illustrates a single large lining plate or band between the longitudinal bearers, whilst Fig. 2 illustrates a number of small tile-like lining plates with bent down edges.—*British Patent No. 815,849, issued to Hüttenwerk Oberhausen, A.G. Complete specification published 1st July 1959.*

Disengaging Gear for Launching Life Saving Craft

This invention relates to improved disengaging gear for use in launching lifesaving craft such as inflatable life boats, inflatable dinghies, etc. The disengaging gear shown in Figs. 1-3, comprises a tongs device with two jaws pivotally interconnected at their upper ends and spring-urged apart. One jaw comprises two arms (10 and 11) interconnected by a cross plate (12) and the other jaw similarly comprises two arms (13 and 14) interconnected by a cross plate (15). The arms (10, 11 and 13, 14) of each jaw are loaded to swing apart from each other by means of springs (21 and 22). The tongs device is intended to be used in conjunction with a load plate (23) having a hook (24) from which a liferaft or the like can be suspended. The load plate is formed with four holes (25) to receive, each with an easy fit, one of the pins (16) on the jaws. When the loaded liferaft, on being lowered by the launching wire, enters the water, the load on the load plate (23) is released and the springs (18) automatically force the load plate

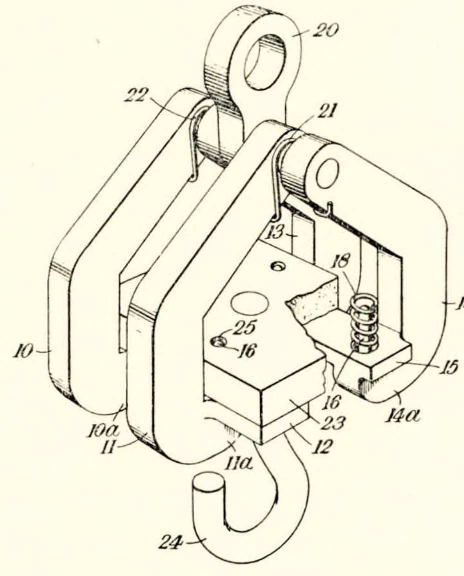


Fig. 1.

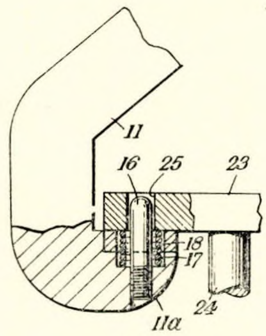


Fig. 2

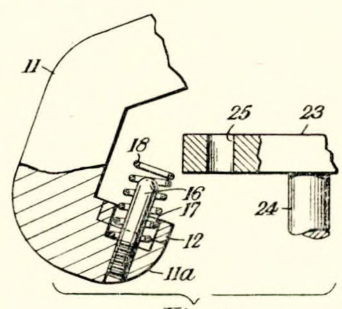
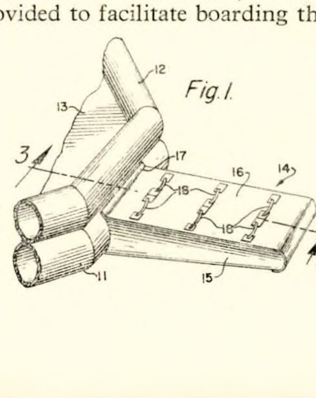


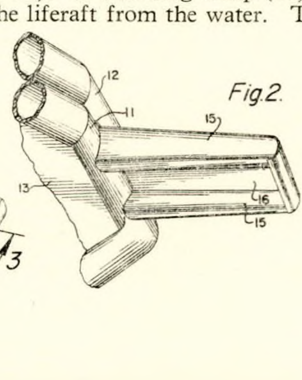
Fig. 3.

upwardly so that the pins (16) disengage from the holes (25), allowing the jaws under the influence of the springs (21 and 22) to swing clear of, and release, the load plate. The liferaft is thus automatically released from the launching wire immediately it rests on the water and the launching tackle can be hoisted without delay for launching another liferaft.—*British Patent No. 815,271 issued to S. Bell. Complete specification published 24th June 1959.*

Boarding Ramp for Liferaft

This invention envisages a boarding ramp of the inflatable type that is attached to a liferaft by an inflatable supporting structure having sufficient strength and buoyancy to maintain the ramp substantially rigid and substantially at water level when boarded from the water. Fig. 1 is a perspective view showing the top side of the ramp and Fig. 2 is a perspective view showing the underside of the ramp. The liferaft comprises a lower inflatable buoyancy tube (11) and a superposed upper inflatable buoyant tube (12). A fabric floor or deck (13) is secured between tubes (11 and 12). A boarding ramp (14) is provided to facilitate boarding the liferaft from the water. The





boarding ramp has a supporting structure comprising a pair of spaced inflatable structural beams (15) attached to the lower inflatable buoyant tube (11). An air-impervious fabric deck member (16) secured to the beams (15) extends from its connexion (17) with the tube (11) along the upper sides of the beams and is carried around their outboard ends and continued for a short distance on the underside. Handles (18) are attached at intervals along the length of the upper surface of the deck (16) to aid survivors to pull themselves on to the ramp.—*British Patent No. 815,638 issued to the Garrett Corporation. Complete specification published 1st July 1959.*

Oil Tank without Bottom

This invention envisages a tank for the storage of crude oil or other liquids which are less dense than, and substantially immiscible with water. Fig. 1 shows a plan view of an oil storage tank in accordance with the invention. Fig. 2 shows a diametral cross section of Fig. 1 and Fig. 3 shows the tank, as in Fig. 2, but charged with oil for storage. A number of pontoons (1) are interconnected by structural units (2) to form a ring to surround the tank wall. On the pontoons are erected framework structures (3), from the inwardly projecting tops of which is suspended a cylindrical wall (4) which laterally encloses a storage zone (5), the bottom of which is open. Covering the top of the storage zone is a roof (6) comprising floats (not shown). The roof floats on the surface of the oil in the storage zone, or of the water there when the tank is empty of oil. The periphery of the roof is joined to the upper edge of the wall by a flexible bellows ring (7) of, for example, oil resistant plastic material which, with the roof (6), completes a substantially gas tight seal over the storage zone. The bellows allows limited vertical movement of the roof consequent on alterations in the depth of oil in the storage zone. From the underside of the roof there is suspended a pipe (8) with at least one orifice (11) adjacent to the top of the storage zone. through which oil may be charged into, or discharged from, the storage zone. The pipe passes under the lower edge of the wall (4) to a pump for effecting charge or discharge.—*British Patent No. 816,440 issued to George Wimpey and Co. Ltd. and N. K. Rose. Complete specification published 15th July 1959.*

Fig.1.

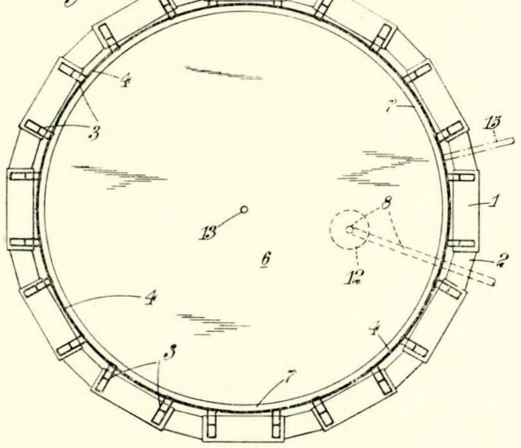


Fig.2.

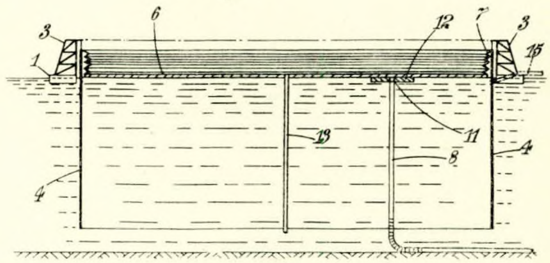
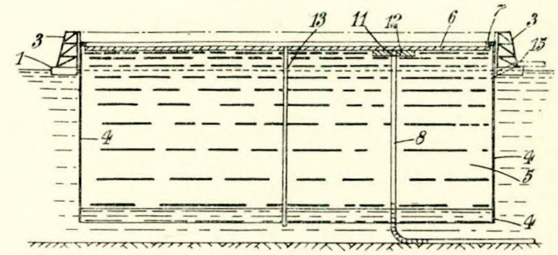


Fig.3.



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