Abstracts of the Technical Press

Neither The Institute of Marine Engineers nor The Institution of Naval Architects is responsible for the statements made or the opinions expressed in the following abstracts.

Factors Affecting Powering.

One of the features observed in the propulsion of modern vessels is the high standard of performance obtained by ships equipped with high-speed engines, despite the generally accepted fact that large propellers running at a relatively low speed are more efficient than fast-running screws of smaller size. In accordance with this theory several vessels were equipped with large slow-speed engines with the object of securing a high propulsive efficiency, but the results obtained were somewhat disappointing. Subsequent experience with ships of the same size fitted with engines developing their maximum power at a much higher rate of revolutions, showed that better propulsive results could be obtained under such conditions. The probable reason for this apparent paradox lies in the lower mechanical efficiency of the larger and heavier types of slow-running Diesel engines. Another factor which favours the adoption of higher revolutions is the fact that the weight of machinery per h.p. developed diminishes as the number of r.p.m. increases. From experience it appears that in the case of ships of the fast cargo liner type efficient propulsion can be assured when the revolutions are from 110 to 120 per minute, an increase beyond this rate being of doubtful value because any gain which might accrue so far as weight saving is concerned would be more than offset by loss in speed for a given power.—*"Shipbuilding and Shipping Record", Vol. LXIV, No. 24, 14th December, 1944, p. 559.*

Protection of Condenser Tube Ends.

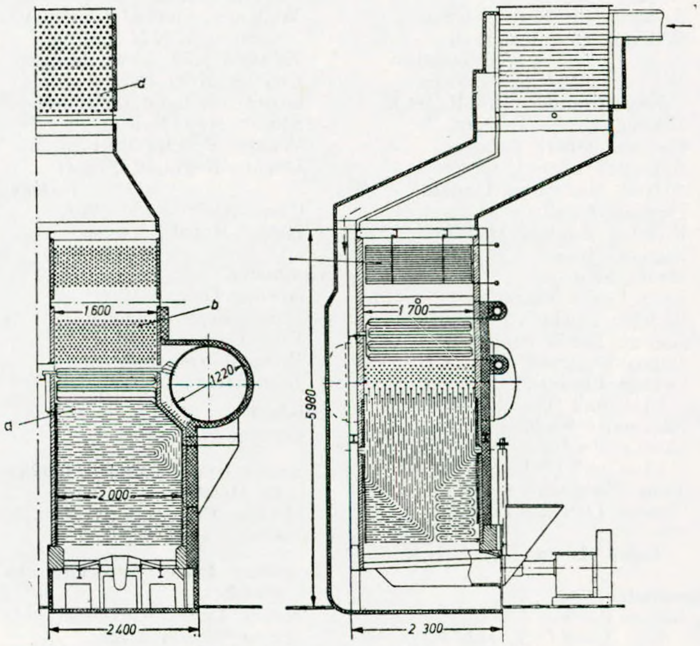
An improved form of protector for the inlet ends of condenser tubes has been developed and placed on the market by a firm in Hamilton, Ont. These protectors are claimed to afford complete protection to the tube ends against the destructive effects of air erosion and sand abrasion, and are moulded in a hard bakelite material which is unaffected by temperatures up to 275° F. and is resistant to the effects of air impingement and contaminated circulating water. The protectors, which fit inside the inlet ends of the tubes, are securely cemented in place and provide a bell-mouth Venturi entrance for the circulating water. They are made to fit tubes of the following sizes: $\frac{5}{8}$in., 16 and 18 gauge; $\frac{3}{4}$in., 16 and 18 gauge; $\frac{7}{8}$in. and 1in., 18 gauge.—*"Canadian Shipping and Marine Engineering News", Vol. 16, No. 2, September, 1944, p. 47.*

Fast Cargo Steamer for Heavy Lift Duty.

One of the latest additions to the series of British cargo vessels specially designed to handle and transport heavy and bulky items of cargo, is the single-screw s.s. "Empire Viceroy", 9,750 tons d.w., which, like several earlier ships of this type, was built by Vickers-Armstrongs, Ltd. She is a single-decker with three exceptionally large cargo holds and propelling machinery aft. The upper deck is specially strengthened for the carriage of heavy deck cargo and the derricks are capable of dealing with lifts up to 120 tons. Oil fuel cross bunkers are built between Nos. 1 and 2 holds and between No. 3 hold and the machinery space, some of the D.B. tanks being likewise available for the carriage of oil fuel when not filled with water ballast. Boiler feed water is carried in the D.B. tanks under the main machinery space, separated by a cofferdam from the O.F. tanks. A portion of the after cross bunker is arranged to hold Diesel oil for the ship's generator engines. The propelling machinery consists of a set of Parsons turbines, built by Richardsons, Westgarth & Co., Ltd., comprising one H.P., one I.P. and one L.P. turbines working in series and driving the single propeller shaft through D.R. gearing. The H.P. and I.P. ahead turbines are of the all-reaction type with end-tightened blading, while the L.P. ahead turbine is of the all-reaction type with radial-clearance blading and "coned" cylinder. The H.P. astern turbine is incorporated in the I.P. turbine casing and consists of a three-row impulse wheel, while the L.P. astern turbine, also consisting of a three-row impulse wheel, is in the after end of the L.P. ahead turbine casing. The main condenser is of the regenerative type and is slung under the L.P. turbine casing, with spring supports to relieve the load on the latter. Steam at a pressure of 430lb./in.² and 750° F. total temperature is supplied by two Foster Wheeler boilers arranged for oil firing under the open-stokehold forced-draught system. The drums of these boilers are of welded construction and a 4,000-lb./hr. desuperheater is fitted in each steam drum. There is also an oil-fired Cochran vertical boiler which supplies steam at a pressure of 100lb./in.² for the heating system and for main boiler make-up feed purposes. The closed feed system for the main boilers includes motor-driven condensate-extraction pumps and two Weir's steam-turbine-driven main feed pumps, in addition to two steam-driven auxiliary feed pumps of the vertical type. An evaporating plant provides main boiler make-up feed at the rate of 4,000lb./hr. of steam at a pressure of 100lb./in.² when supplied with desuperheated steam at a pressure of 230lb./in.². The feed water for the evaporator is taken from the F.W. tanks in the double bottom and discharged to the evaporator by the donkey boiler feed pump. There is also a 35-ton salt-water evaporator fed from the sanitary pump discharge, the vapour being led to the auxiliary condenser. The remainder of the auxiliaries, which include a 250-ton ballast pump and 8,000-g.p.m. centrifugal circulating-water pump, are motor driven. Electric current at 220 volts is supplied by three 175-kW. d.c. generators driven by National oil engines. There is also a hand-started 10-kW. Diesel-driven generator and air compressor for emergency service.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,371, 7th September, 1944, p. 7.*

Danish Cargo Steamer with Stoker-fired La Mont Boilers.

A description of an interesting vessel completed some little time ago by the Elsinore Shipbuilding and Engineering Co., was published soon afterwards in the Danish periodical *Tidskrift for Maskinvaesen* and subsequently appeared in the German *Schiff und Werft.* The vessel in question was the cargo steamer "Concordia", 2,950 gross tons, belonging to the D.F.K. Company of Copenhagen. She is a single-screw ship 315ft. in o.a. length, with a breadth of 46ft., a depth to main deck of 21ft. and a d.w. of 4,100 tons. The cargo capacity of the holds is 206,000 cu. ft. The propelling machinery consists of a triple-expansion engine of the reheating type developing 1,750 i.h.p. and giving the vessel a service speed of 12 knots. Superheated steam from the boilers at a temperature of 750° F. is passed through a reheater arranged between the H.P. and M.P. cylinders and is cooled to about 610° F. before entering the H.P. receiver. The heat given up by this steam in the reheater raises the temperature

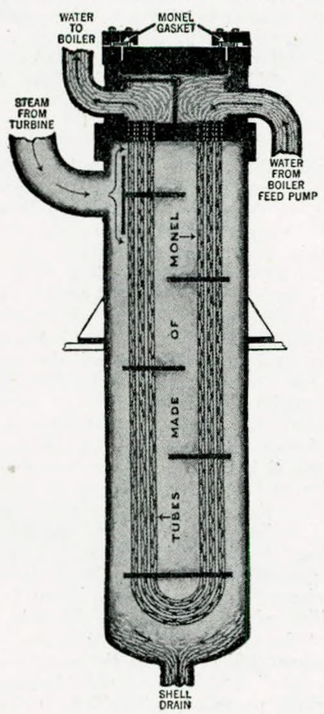


La Mont boiler of s.s. "Concordia".
(*a*) generating tubes; (*b*) superheater; (*c*) economiser; (*d*) air preheater.

of the steam leaving the H.P. cylinder to about 535° F. before it enters the M.P. valve chest. The normal vacuum maintained under service conditions is 27½in. The water level in the condensate tank operates a float-controlled duplex valve which admits softened water from a D.B. tank when the level is low and allows condensate to flow to the steam ejector when the level is too high. The boiler feed-water regulators are of the Hanneman type and there is also a differential regulator to control the steam supply to the feed pumps, thereby ensuring the maintenance of a constant pressure in their discharge system. Steam at a pressure of 225lb./in.² and final temperature of 755° F. is generated in two stoker-fired La Mont forced-circulation boilers, each of which has a capacity of 4½ tons/hr. The construction of one of these boilers is shown in the accompanying sectional diagrams. The heating surface comprises 930ft.² of evaporator tubes, 600ft.² of superheater tubes, 620ft.² of economiser tubes and 550ft.² of air-preheater tubes. Air leaves the preheater at 210° F. Each boiler has its own motor-driven circulating pump, and there is also a single turbine-driven stand-by pump common to both boilers. The generating tubes surround the combustion chamber and are led through the evaporator nests, an arrangement which does away with the need to run the circulating pump in harbour when fires are banked. It also allows the boiler to be warmed up slowly without using the circulating pump. Experience in service with this arrangement has been satisfactory. The boilers are coal-fired by motor-driven semi-automatic Dano underfeed-type stokers. The grate loading amounts to 35-37lb. of coal/hr. per ft.² of grate area. Secondary air inlets are provided to improve combustion. The steam-driven F.D. fan, common to both boilers, can deliver air at the rate of 9,000 cu. ft./min. against a 10-in. head of water. Chemically softened fresh water is used for make-up feed purposes. The total weight of the complete boiler installation is 52 tons, which represents a saving of about 90 tons on that of a corresponding cylindrical boiler installation. On trial the "Concordia's" coal consumption worked out at 1·1lb./i.h.p.-hr. and the mechanical stokers proved highly satisfactory, the CO_2 content of the flue gases being only from 12 to 14 per cent.—*"The Marine Engineer", Vol. 67, No. 809, December, 1944, pp. 552-553.*

Feed Heating Exceptional.

An article in a recent issue of *Inca* (U.S.A.) describes the high-pressure high-temperature boilers and feed-water heaters now employed in certain American power stations. In the case of the Providence, R.I., power station of the Narragansett Electric Company, a single high-pressure boiler supplying steam at a pressure of 1,225lb./in.² and temperature of 915° F. to a 50,000-kW. turbo-alternator, installed about two years ago, generates more than three times the steam previously obtained from the eight low-pressure boilers which formerly supplied the station's original 15,000-kW. turbo-alternator. The boiler feed water is preheated to 400° F. in a heater supplied with steam bled from the turbine at a temperature of 700° F. The feed water passes through the tubes of this feed-water heater at a pressure of 1,300lb./in.² in the manner shown in the accompanying sectional drawing. The tubes are made of Monel metal in order to withstand the high pressure and temperature employed and because of the corrosion-resistant properties of this material. Similar feed-water heaters are installed in a power station of the Indiana and Michigan Electric Company and the Oswego plant of the Central York Power Corporation. In the former case, the boiler pressure is 2,500lb./in.² and the feed heater passes 550,000lb./hr. of water at temperatures ranging from 353° to 490° F., the delivery pressure to the boiler being 3,200lb./in.². The steam temperatures inside the shell and around the tubes are as high as 637° F., whilst pressures are of the order of 700lb./in.². At the Oswego plant, feed heaters of this type are operating with a water pressure of 2,000lb./in.² in the tubes, at a temperature of 450° to 485° F. The steam pressure on the outside of the tubes is 600lb./in.². A recent examination of all three plants (after more than two years of continuous service) showed that the tubes of these rather exceptional feed heaters were still in perfect condition.—*"The Marine Engineer", Vol. 68, No. 810, January, 1945, pp. 52-53.*



High-temperature feed-water heater with Monel tubes.

Preventing Tube Erosion in Condensers of Turbines.

Erosion of the tubes in the upper bank where the steam enters the condenser is mainly due to the moisture in the turbine exhaust, steam being thrown off the last-stage wheel either directly on to the tubes or collected along the edge of the exhaust flange and then re-entrained and blown against the tubes below. This type of tube erosion has recently become more noticeable for four different reasons. The first is that the reduced number of stages in some turbines does not provide so many opportunities for the ejection of moisture from the expanding steam, and more moisture is therefore carried through the last stage to the condenser. Secondly, the use of partial admission control instead of steam by-passing on overload results in an appreciably greater moisture content at high loads than with earlier designs. A third factor is that high steam velocity through the condenser neck increases the pounding effect of the water drops against the tubes, and a fourth that longer hours of operation at high loads causes the exhaust to the condenser of more steam having a high moisture content. Details of the preventive measures taken by the Detroit Edison Co. to minimise condenser-tube erosion are given in a recent report by the Prime Movers Committee of the Edison Electric Institute. In this it is stated that gradual erosion of the upper row of tubes appears to have taken place over a number of years and that only recently have some tubes been actually punctured. Erosion is caused not only by the moisture thrown off the last wheel directly on to the tubes, but also by leakage from

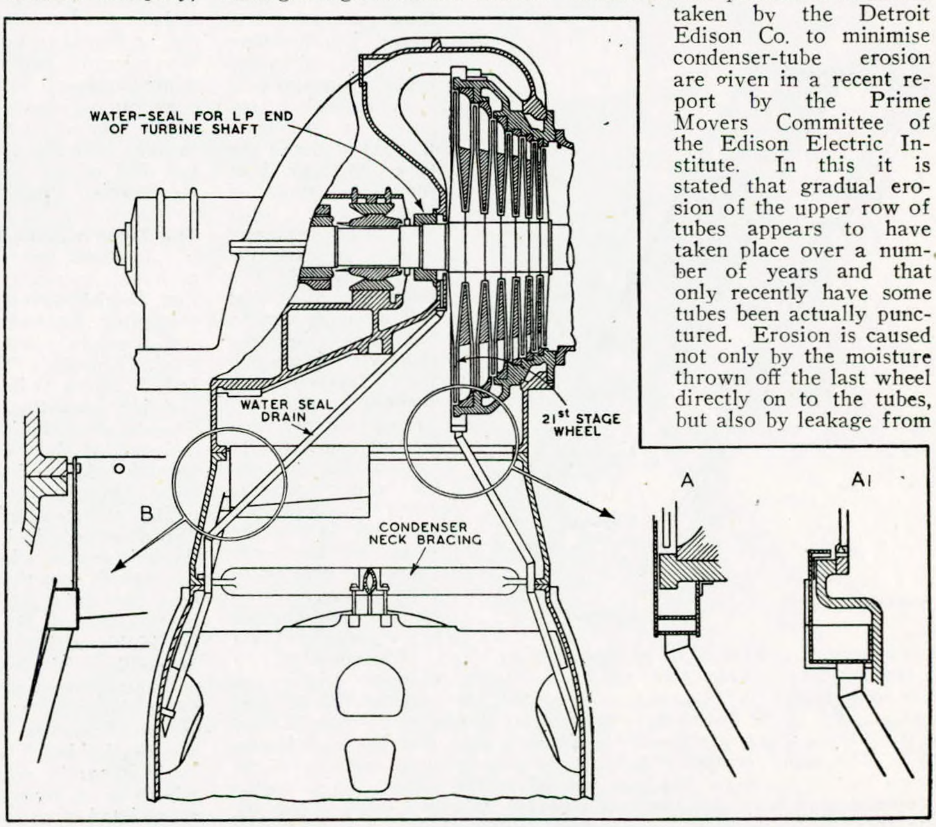
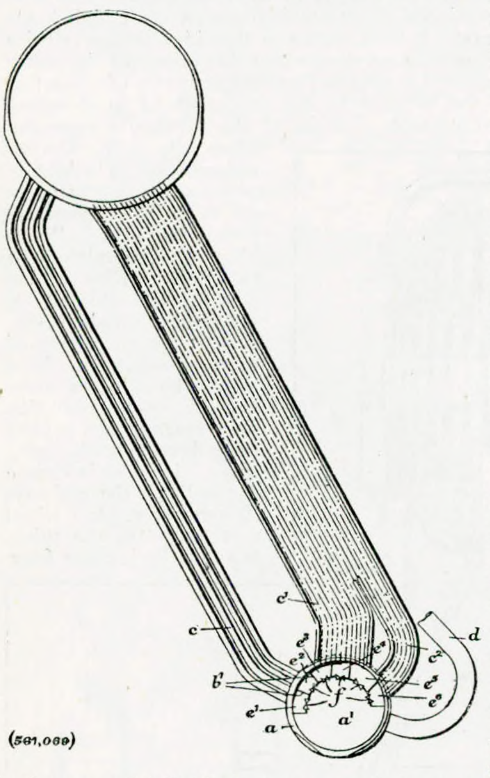


FIG. 1.—*Moisture catchers for minimising condenser-tube erosion.*

the water seal of the L.P. end of the turbine shaft. The erosion occurs directly below the last-stage wheel and also below the rear edge of the turbine exhaust flange. The provision of draining arrangements and deflectors was deemed to be essential for preventing further loss of tubes, and three separate systems were accordingly installed for this purpose. In one, drains are led from the L.P. water seal to the condenser wall to clear the tubes; in another, a horseshoe trough is fitted around the rear half of the turbine exhaust flange (B in Fig. 1) which is likewise drained to the condenser wall. An improved and preferred system consists of a baffle plate fitted completely around the periphery of the last turbine wheel, A or alternatively A^1, so placed as to deflect moisture thrown off the last-stage wheel into a circular trough, without appreciably impeding the steam flow. An exhaust flange trough is considered to be desirable, though not essential, if a peripheral baffle is fitted. The trough and baffle are fabricated from copper-bearing steel. The peripheral baffle is modified where feasible by welding an internal rim or flange to the plate to skim moisture off the circumference of the exhaust stream.—*V. Walker, "Electrical Review", Vol. CXXXV, No. 3,497, 1st December, 1944, pp. 787-788.*

Improvements in Foster Wheeler Boilers.

A recently published patent granted to Foster Wheeler, Ltd., and Mr. W. Sampson, of London, covers improvements in the design of watertube boilers having upper and lower drums connected by water tubes. In such boilers the circulation is upwards from a lower drum through some of the tubes to an upper drum, and downwards from an upper drum to a lower drum through one or more other tubes which may be heated or unheated. To maintain safe working, especially in highly rated boilers having high rates of heat liberation in the combustion chamber, sufficient water must flow up any riser tube to prevent overheating due to the complete or partial evaporation of the water before it reaches the end of the tube. As the tubes are often of different diameters and have widely varying rates of heat input, there are wide variations in the amount of steam formed and therefore in the flow of water required at the inlets of the tubes to prevent failure of the tubes generating more steam; *e.g.*, those adjacent to the combustion chamber require a larger flow of water than those generating less steam. The pressure head required in the lower drum must be great enough to ensure an adequate flow of water in the tubes of high heat input, and those of lower heat input may, in consequence, receive an excessive flow of water. The patentees claim that this difficulty can be overcome in the manner shown in the accompanying sectional diagram. Means are provided in the drum (*a*) to control the amount of water flowing from a common chamber (a^1) in the drum to the riser tubes or groups of riser tubes (c, c^1, c^2) by forming pockets (e^1, e^2, e^3, e^4, e^5, e^6) in the way of individual or groups of riser tubes. The chamber (a^1) is connected by a downcomer (*d*) to the steam and water drums; the downcomer may be regarded as unheated but may be heated, and instead of a single downcomer a group of downcomers may be provided. The pockets are formed by fitting a plate member with baffles (b^1). The member may be held in position by direct welding to the drum (*a*) or by angle brackets welded to the latter. Each pocket communicates with the common chamber (a^1) through orifices (*f*), the area of the orifices of the several pockets being chosen so that the flow of water to the several pockets from the chamber (a^1) is sufficient to prevent overheating of the tubes connected to them, but the flow through any pocket does not materially exceed that required for this purpose.—*"Engineering", Vol. 158, No. 4,119, 22nd December, 1944, p. 500.*



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Chemical Treatment of Feed Water for Marine Boilers.

Some time ago, the British Standards Institution, at the request of Lloyd's Register of Shipping, set up a committee to investigate the possibilities of evolving a standard method of chemical treatment of feed water for marine boilers. Severe conditions imposed by the war have frequently caused trouble and delay, particularly in cargo steamers, due to leaky tubes, distorted furnaces and other defects caused by bad boiler feed water. The defects have, in most cases, been developed as the result of accumulation of scale caused by the longer voyages and reduced facilities and time for the internal cleaning and repair of ships' boilers, as well as by the dearth of replacement tubes at ports abroad. The committee's research work took longer than was expected as a great deal of information had to be sifted and many points of view reconciled, but the results of the investigations have now been embodied in a draft standard method of chemical treatment of the feed water recommended by the committee. Details of this treatment are given in three data sheets published by the British Standards Institution, the first of which is: *Boiler Water Treatment Type 1*, for marine boilers (watertube and Scotch) using make-up feed consisting of evaporated sea water or evaporated fresh water or unevaporated soft fresh water with a total hardness of less than 70 p.p.m. (5 gr. per gall.) as calcium carbonate; *Boiler Water Treatment Type 2*, applicable to all marine boilers (watertube and Scotch) using make-up feed consisting of unevaporated fresh water of a hardness exceeding 70 p.p.m. (5 gr. per gall.) as calcium carbonate; and *Boiler Water Treatment Type 3*, for Scotch marine boilers fed with unevaporated sea water or for other boilers, when, in emergency, the feed is contaminated by sea water to such an extent as to make the density of the boiler water exceed half a thirty-second (15,000 p.p.m.).—*"Lloyd's List and Shipping Gazette", No. 40,522, 15th November, 1944, p. 15.*

Canadian-built Marine Steam Turbines.

Although reciprocating steam engines for ships have been manufactured in Canada for many years and Canadian-built marine Diesel engines of moderate powers became available during the past year, the construction of high-powered marine steam turbines was never attempted in the Dominion until quite recently, when it was decided to have the Parson turbines of the Tribal class destroyers now fitting out at Halifax, N.S., built by J. Inglis & Co., Ltd., Toronto. This firm already manufacture Yarrow boilers, Scotch marine boilers, triple-expansion engines, various types of pumps for marine service, evaporators, condensers and other marine equipment. The shop trials of the first set of turbines to be completed by the firm were reported to have been highly satisfactory and they are now installed on board the first of the new destroyers.—*"Canadian Shipping and Marine Engineering News", Vol. 16, No. 3, October, 1944, p. 56.*

The Turbo-electric Drive.

The loss, two years ago, of the 20,000-ton P. & O. liner "Viceroy of India", was recently announced. She was built in 1929 and was the first British vessel of her size to be equipped with turbo-electric propelling machinery, although several smaller turbo-electric ships had previously been built in this country, among them the United Fruit Company's "San Benito" of 3,650 gross tons. The "Viceroy of India" was a twin-screw vessel with a designed speed of 21 knots and her propelling machinery had a rated output of 17,000 s.h.p. Shortly after she had been put in service, the P. & O. Company took delivery of five new passenger and cargo liners of the so-called "Strath" class, of which two—the "Strathnaver" and "Strathaird"—were likewise equipped with turbo-electric propelling machinery, whilst the remaining three—the "Strathallen", "Stratheden" and "Strathmore"—had geared turbines. It was stated at the time that the only reason why turbo-electric drive had not been installed in all five vessels was that the capital cost of this type of machinery would have been substantially higher than that of geared turbines, since the performance of the "Viceroy of India" in service was already proving highly satisfactory. She used to do 17 knots from London to Marseilles with only one turbo-generator running at its designed load and therefore at maximum efficiency, to supply the current for both propulsion motors. The flexibility of the drive gave the ship a high degree of manœuvrability, whilst the cost of maintenance and repairs was negligible. The junior engineer officers liked the machinery because it rarely required "field days" and they could therefore get ashore on most days at the various ports of call. This was greatly appreciated when the ship was engaged on pleasure cruises for which, incidentally, the turbo-electric machinery was found to be particularly economical. Although the theoretical efficiency of the turbo-electric drive is said to be only 95 per cent. as against 98 per cent. where mechanical gearing is used, the relative merits of the two systems of transmission still remain to be decided. According to reports published some time ago on the experience obtained with the two German ships "Scharnhorst" and "Gneisenau", which were identical vessels except that one had turbo-electric drive while the other had geared turbines, the electrically-propelled ship was 15 per cent. more economical than the other vessel. The P. & O. Company must have a wealth of data covering the operation not only of their turbo-electrically-propelled vessels but also of their geared-turbine ships. Perhaps when times are more propitious it may be found possible for one of the company's engineers to analyse this data with a view to preparing and publishing a suitable report of such an analysis.—*"Shipbuilding and Shipping Record", Vol. LXIV, No. 24, 14th December, 1944, p. 560.*

Standard American Ships.

The accompanying table gives some particulars of the numbers and approximate cost of the various types of standard cargo vessels built or building for the U.S. Maritime Commission. The totals are no doubt subject to some modification, and as it was originally intended to build 1,131 Victory ships, it may be anticipated that several hundred further vessels of this class will be laid down if the war continues. The average cost of the various types of cargo vessels given in the table is that which was published quite recently in the U.S.

Type.	Tonnage. D.W.C.	Tonnage. Gross.	Speed, knots.	Numbers. Built.	Numbers. On order.	Numbers. Total.	Cost. Total.	Per d.w. ton.
C-1	7,300	5,100	14	180	74	254	$1,700,000	£57
C-2	9,700	6,085	16	137	40	177	$3,000,000	£80
C-3	12,500	7,800	16½	130	77	207	$3,700,000	£75
Victory	10,500	6,700	15	90	430	520	$2,650,000	£62
Liberty	10,500	6,700	10-11	1,900	150	2,050	$1,900,000	£45

—*"The Motor Ship", Vol. XXV, No. 298, November, 1944, p. 252.*

Greater Accuracy in Cylinder Liner-wear Measurement.

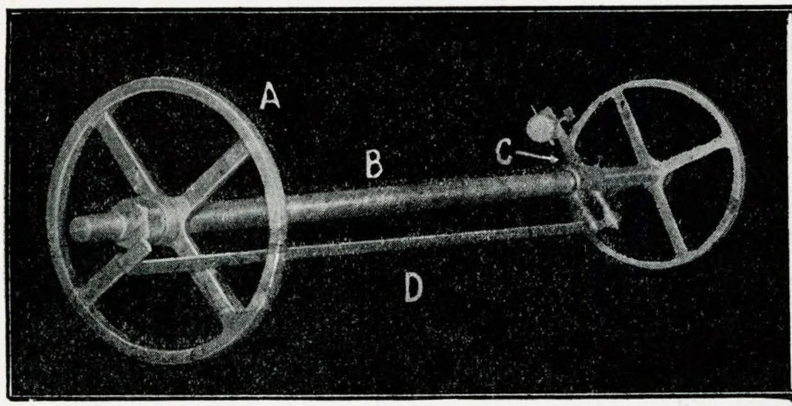
An ingenious device for use with a dial gauge for measuring the wear of oil engine cylinder liners has been developed by a well-known marine engineer in this country who has made a special study of Diesel machinery. He claims that this device provides an absolutely rigid support for the dial gauge and allows it to travel along the true axis of the liner throughout the zone in which measurements are to be made, even when the liner is several feet in length. As may be seen from the accompanying illustrations, the dial gauge is mounted on a carrier (C) which can be moved axially up or down the liner on a machined tube (B). The sleeve of this carrier has six contact screws—three at each end—which enable it to revolve around the tube in a truly concentric manner, the tube being machined and finished to a high degree of accuracy. The six-point contact not only gives exactitude of operation, but also permits the degree of "grip" on the tube to be set to any desired value, so that the carrier remains stationary at any point. At each end of the line a four-spoked wheel (A) is provided to register accurately in the bore of the liner, for which purpose the wheel rim is turned to a conical form to ensure concentricity. The complete assembly is firmly located in the liner to be measured by tightening a nut on the end of the tube. The procedure to be followed when inserting the various parts of the device is to insert a wheel in one end of the liner and then to pass the central tube through the wheel. The gauge carrier is then mounted on the tube, and finally the wheel at the other end is placed in position, and the entire assembly secured by the end nut. In operation, a hook-ended rod (D) is inserted between the spokes of the wheel at either end of the liner, and engaged with the carrier. This may then be moved in any desired stages axially along the liner, and rotated so that readings may be taken at points 90° apart, or at any smaller angle desired. Marks on the tube show the various points at which readings should be taken, so that no "location" measurements along the liner need be made during the operation. The amount of wear at any point is shown by a gauge reading, after the initial zero setting has been made when the gauge pointer is in contact with an unworn portion of the bore beyond the zone of piston-ring travel. In a ship or power station having engines of various cylinder bore sizes, only a pair of wheels to suit each liner diameter need be provided; the rest of the equipment is unchanged, and the carrier gives a wide range of adjustment of gauge positions.—*"The Oil Engine", Vol. XII, No. 140, December, 1944, p. 201.*

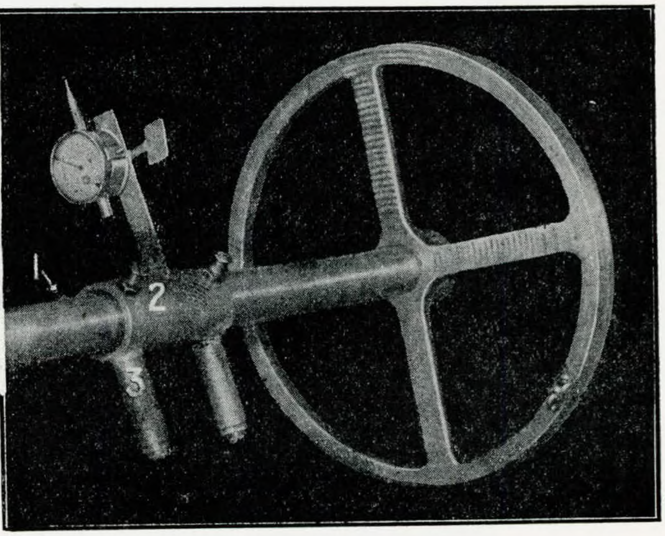
Gas Turbine Cycles.

One of the latest developments in connection with gas turbines is a proposed improvement on the constant-pressure cycle turbine. Instead of an open cycle in which the products of combustion go through the turbine and out at the exhaust, it is suggested that the products of combustion should not be passed through the turbine at all, or if they are, that they should not go direct to the exhaust. A well-known Swiss engineering firm have put forward a cycle in which the external combustion of the fuel is made to heat compressed hydrogen, causing a rise in temperature. The hydrogen then passes to the turbine, where it expands: it thereupon goes to a compressor, whence it again passes through the heating chamber and the cycle is repeated. Hydrogen is used because of its relatively high specific heat. In another closed cycle which is being developed by an American firm, the products of combustion pass through the turbine in the conventional way, but instead of being exhausted directly to the atmosphere, they are led into a compressor. The gases still contain a large percentage of excess air owing to the necessity for keeping the temperature within working limits, and sufficient additional air is added to the mixture from an independent compressor to keep the system in balance. It is claimed that by using the closed cycle, the inlet pressure to the turbine can be substantially increased, so that for a given power output the size of the installation is considerably reduced.—*"Shipbuilding and Shipping Record", Vol. LXIV, No. 23, 7th December, 1944, p. 535.*

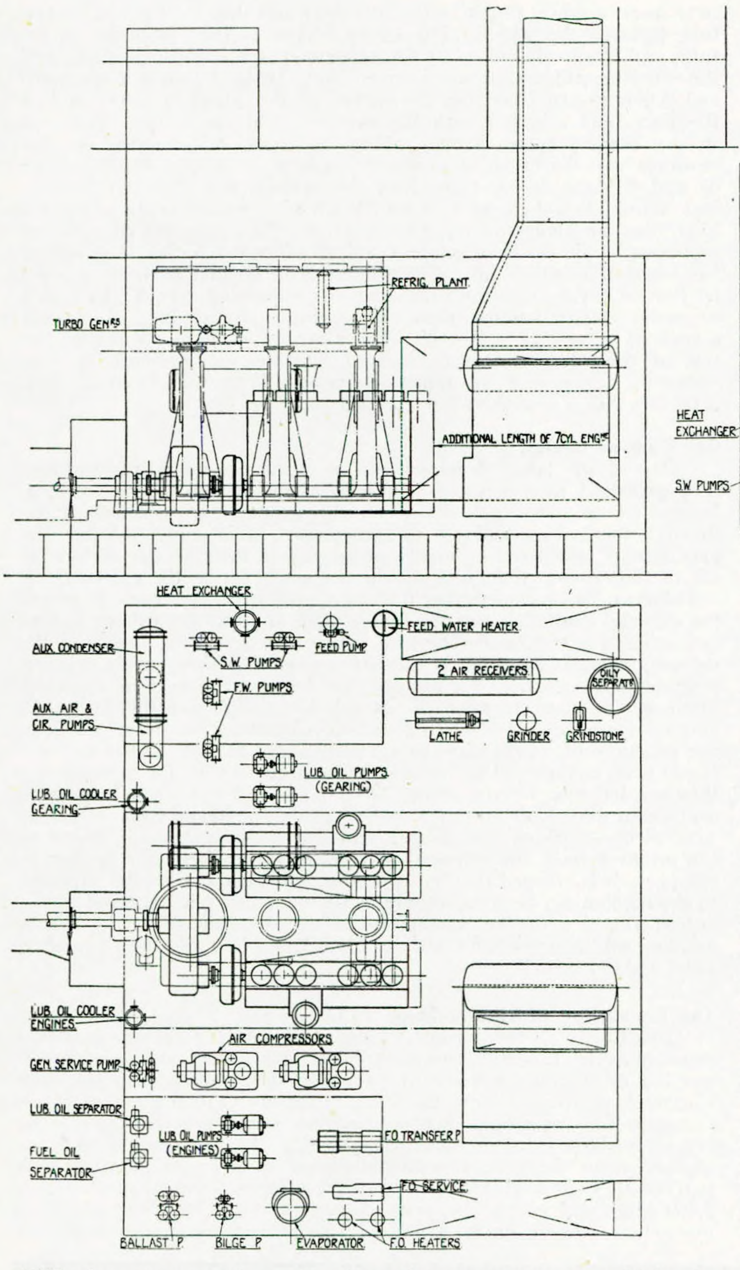
The Conversion of Liberty Ships. (1).

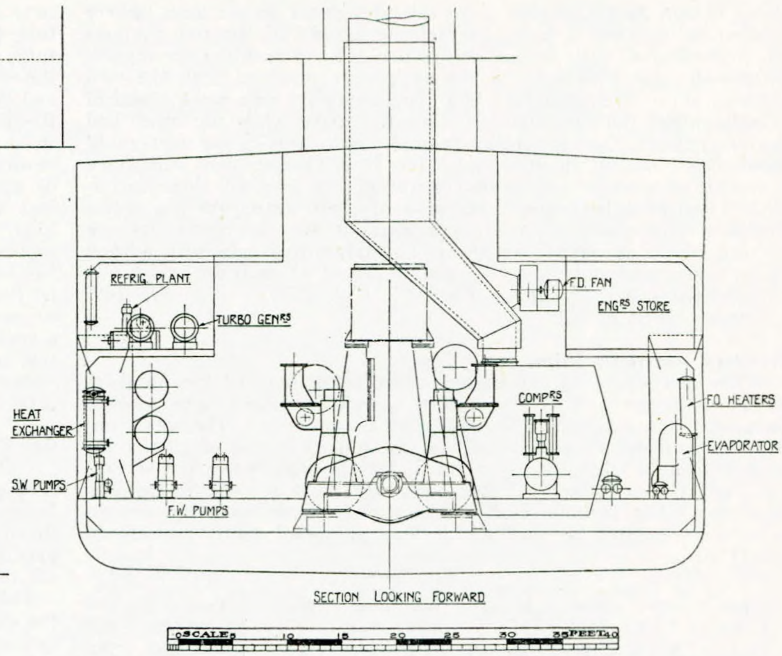
Practically all the various schemes put forward for the post-war re-engining of Liberty ships with Diesel machinery envisage direct-coupled oil engines running at propeller speed, or oil engines with electric transmission, but the writer suggests that a good case can be made for the employment of medium-speed engines driving the propeller shaft through reduction gearing. The accompanying illustration shows the general arrangement of such an installation, with two 6-cylr. Ruston Hornsby four-stroke engines developing altogether 2,800 s.h.p. and giving the vessel a service speed of about one knot more than the 11 knots which are at present obtainable with the





Liner-wear measuring device. The figures in the right-hand view indicate how three-point contact with the tubular member is obtained.





Arrangement of two 6-cylr. Ruston Hornsby engines in existing machinery space of a Liberty ship.

2,300-s.h.p. steam engine. An alternative arrangement would be the installation of two 7-cylr. engines of similar type, with a combined output of 3,280-s.h.p. This would give a further increase in speed and still come well within the machinery space available. The total weight of the two 6-cylr. engines, including that of the thrust block, engine fittings, reduction gears (23 tons) and Vulcan-Sinclair couplings, would be 132 tons or 105lb./s.h.p., whilst the corresponding figures for an installation comprising two 7-cylr. engines would be 146 tons and 100lb./s.h.p. The service powers of these engines are developed at a b.m.e.p. of 110lb./in.^{2}, but as this figure can be increased to 120-130lb./in.^{2} when required, an ample reserve of power is available. The fuel consumption of the two 6-cylr. units would amount to 11·8 tons per 24 hours for all purposes, whilst that of two similar 7-cylr. engines would be 13·7 tons. At the present time the fuel consumption of the Liberty ships is reported to be 1·2lb. of boiler oil per s.h.p.-hr. or say 29 tons per day. Assuming an average price of 45s. per ton for boiler oil and 70s. per ton for Diesel oil, the comparative fuel costs per 24 hours steaming work out at £65 with the present steam engines, at £41 with the 6-cylr. oil engines and at £48 with the 7-cylr. oil engines. The existing machinery space is more than sufficient for the Diesel engines and a considerable amount of head-room space would actually become available for other purposes. As shown in the illustration, one of the existing boilers is retained in its present position, but a more economical arrangement would be an exhaust-heat boiler, also suitable for oil firing, for use at sea, supplemented by an oil-fired donkey boiler for harbour service.—*O. Wans, "The Motor Ship", Vol. XXV, No. 299, December, 1944, pp. 274-275.*

Sulzer Opposed-piston Engine with Exhaust-gas Turbine.

An arrangement comprising an opposed-piston oil engine operating in conjunction with an exhaust-gas turbine, recently developed and patented by Sulzer Bros., Winterthur, is shown in Fig. 2. The pistons (*1, 2*) drive the shafts (*7, 8*) on which gear-wheels (*9, 10*) engage a central pinion (*11*) on the main shaft (*12*). The exhaust ports are controlled by the left-hand piston (*1*). Two exhaust-gas manifolds (*28, 29, 30, 31*) are arranged on each side of the engine for the two exhaust passages (*20, 21*): all four exhaust pipes are led to the exhaust-gas turbine (*16*). In this way the exhaust impulses of the various cylinders can be distributed so that the exhaust-gas pressures from one cylinder will have a negligible influence on the exhaust from the others. The covers (*24, 25*) for closing the exhaust passages (*20, 21*) are fitted with additional pieces (*26*) which fit close on the cylinder liners. The exhaust ports (*32*) are not distributed over the whole periphery of the cylinder liner, but are grouped together facing the exhaust passages, thus giving steadiness to the flow of the exhaust gas and prevent-

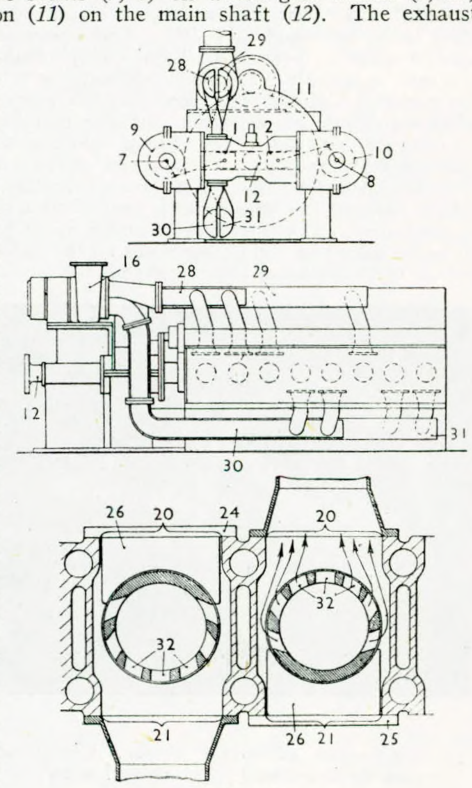
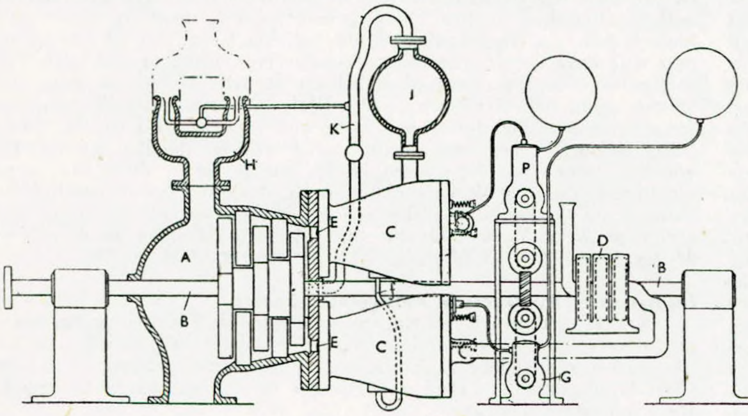


FIG. 2.

ing eddies.—*"The Motor Ship", Vol. XXV, No. 300, January, 1945, p. 350.*

An Internal-combustion and Steam-turbine Combination.

A new British patent covers an arrangement, shown in Fig. 3, comprising an internal-combustion turbine having the combustion chambers surrounded by jackets into which water is sprayed. The steam generated is delivered to the turbine and assists in driving it, or, as an alternative, a steam turbine may be employed. Four or more combustion chambers (*C*) are arranged symmetrically at one end of the turbine (*A*). Air is supplied by a compressor (*D*) which is driven by the turbine shaft (*B*) and fuel is delivered by a pump (*P*). The outlet to the turbine is controlled by a valve (*E*) fitted to each combustion chamber. The shaft (*B*) drives a pump (*G*) which discharges water, in the form of an atomised spray, to the jackets (*F*), shown in the small diagram on the right. Each jacket is connected to a steam receiver (*J*), so that the steam in all the jackets may be accumulated and supplied through the pipe (*K*) to the turbine. The exhaust from the turbine is led into a condenser (*H*) fitted with steam injectors supplied from the receiver (*J*).—*"The Motor Ship", Vol. XXV, No. 300, January, 1945, p. 350.*



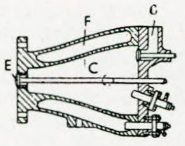


Fig. 3.

Twin-screw Motorship for Bibby Line.

The latest addition to the fleet of the Bibby Line is the twin-screw passenger and cargo liner "Herefordshire" of 8,400 gross tons, which, like all the ships constructed for this company since 1920, is equipped with Diesel engines. She bears the same name as a twin-screw steamer of slightly smaller tonnage which was broken up 10 years ago after having given her owners good service for nearly 30 years. The new "Herefordshire", built and engined by Barclay, Curle & Co., Ltd., Glasgow, is primarily a cargo liner, but has accommodation for 12 passengers in four single- and four double-berthed cabins at the forward end of the deck-house. Up to 10,000 tons of general cargo can be carried in the five holds and 'tween decks and the cargo-handling equipment comprises one 50-ton, one 20-ton, two 12-ton, two 10-ton and ten 7-ton derricks, served by 16 electric winches. The anchor windlass is likewise motor driven, whilst the steering gear is of the electro-hydraulic type. The accommodation for the ships' officers, including 10 engineers, is arranged at the after end of the deck-house and on the main deck below, while the 67 members of the native crew are berthed under the poop. The D.B. fuel tanks have a capacity of 1,000 tons. The propelling machinery consists of two 4-cylr. Doxford engines of standard design, one of which exhausts through a waste-heat and oil-fired Cochran boiler with Sinuflo tubes. Under normal conditions, the exhaust gas from the one main engine enables the boiler to generate more than enough steam for the evaporating and distilling plant to produce 25 tons of fresh water per day, in addition to providing steam for heating and cooking. Electric current at 220 volts is supplied by three Diesel-driven generators with 250-b.h.p. 5-cylr. Allen-B. and W. engines. These are directly coupled to the generators and run at 400 r.p.m. The refrigerating plant, comprising two motor-driven NH_3 compressors, is located in a compartment off the engine room and serves four insulated rooms for refrigerated cargo and ship's provisions. The "Herefordshire" is commanded by Capt. T. J. A. Thomson, and her chief engineer is Mr. R. Yates, who stood by the ship while she was building.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,365, 31st August, 1944, p. 2.*

Henderson Line's New s.s. "Pegu".

One night in November, 1939, during a gale, the Henderson passenger and cargo liner "Pegu", of 8,183 tons gross, ran on one of the retaining walls at the entrance of the Mersey, while inward bound from Glasgow to load cargo for Burma. The ship broke her back on the wall, and part of her wrecked hull remains in view to this day. Her name is now borne by a new ship of the British and Burmese Steam Navigation Co., Ltd., which is managed by P. Henderson & Co. The new "Pegu", like her predecessor, was built at Dumbarton by William Denny & Bros., Ltd., but whereas the "Pegu" of 1921 had accommodation for 150 passengers, her successor of 1943 carries only 12. The new "Pegu" is a single-screw closed-shelter-deck steamer of 7,838 gross tons and about 10,500 tons d.w., with two complete decks and five large cargo holds. There are 14 cargo derricks for lifts of 3, 5 and 10 tons, in addition to a 50-ton derrick at No. 2 hatchway and a 30-ton derrick at No. 4 hatchway. They are served by 12 winches, some of which are electric. The passenger accommodation comprises two double- and eight single-berth staterooms, in addition to a dining saloon and lounge. The tanks in the double bottom are arranged for the carriage of fuel and water ballast and there is a deep tank in No. 3 lower cargo hold. The propelling machinery consists of a set of Parsons S.R. geared turbines, supplied with steam by two Foster Wheeler boilers fitted with superheaters and economisers. The boilers have a working pressure of 450lb./in.^{2} and are arranged to burn oil fuel on the open-stokehold forced-draught system.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,371, 7th September, 1944, p. 2.*

Small Tanker "Empire Commerce".

During the war a number of steam-driven oil tankers of 14,650 tons d.w. have been built for the M.o.W.T. by Sir James Laing and Sons, Ltd., Sunderland, in addition to several motor tankers of similar capacity. These vessels have now been supplemented by a series of smaller tankers of 5,000 tons d.w., designed and constructed by the same builders, of which the "Empire Commerce" is a typical representative. The hull is longitudinally framed, with two fore-and-aft bulkheads, forming centre tanks and wing tanks. In all there are 15 cargo tanks with a total gross capacity of 243,401 cu. ft. A hinged signal mast is fitted aft of the bridge structure amidships; otherwise derrick posts take the place of masts, and the W/T aerials aft are attached to the funnel. From forward to aft, the various compartments in the ship are a store-room and chain locker above the fore-peak dry tank, a cross bunker for fuel oil or water ballast, a coffer-dam and pump-room, Nos. 1, 2 and 3 cargo tanks, the main pump-room, Nos. 4 and 5 cargo tanks, a cofferdam, the after fuel cross bunker, machinery space and after peak for water ballast. The main pump-room contains two 250-ton cargo pumps of the horizontal Duplex steam-driven type, together with a 40-ton stripping pump of similar design. Steam heating coils are fitted in the bunker tanks only, but provision is made for fitting them in all tanks, if required, at some future date. The fore-end pumping arrangements comprise a horizontal Duplex fuel-oil transfer pump and a similar water-ballast pump. The deck machinery includes a steam-driven anchor windlass and nine steam-driven winches. The telemotor-controlled steering gear is of the Wilson-Pirrie type. Accommodation for the captain and officers is arranged in the bridge structure amidships, whilst the remaining members of the ship's company—the total complement of the ship numbers 51—are berthed on the upper and poop decks aft. The propelling machinery consists of a three-cylinder Doxford engine of standard type, with lever-driven scavenge, water and oil pumps. Steam for the auxiliary machinery and heating purposes is supplied by a three-furnace cylindrical boiler with a working pressure of 150lb./in.^{2}. The three furnaces are arranged to burn oil on the Wallsend low-pressure system with Howden forced-draught, but the wing furnaces can also be heated by the exhaust gases of the main engine. The electrical requirements are met by one 30-kW. steam generator and one 20-kW. Diesel generator, but in later tankers of this class there are two cylindrical boilers and the generating plant consists of two 30-kW. steam-driven dynamos. The air compressors, ballast, bilge and boiler feed pumps, evaporator, stand-by forced-lubrication pump, general service and oil transfer pumps are of G. & J. Weir's make.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,383, 21st September, 1944, p. 2.*

B.I. Motorship "Canara".

Among the latest additions to the fleet of the British India Steam Navigation Co., Ltd., is the twin-screw motorship "Canara" of 7,024 gross tons, built and engined by Barclay, Curle & Co., Ltd. She is a vessel of the shelter-deck type, designed for the Indian trade and suitable for the carriage of heavy and bulky cargoes. Her five holds have a total cargo capacity of 622,950 cu. ft. (grain), and d.w. of the ship being 9,875 tons on a normal draught. The cargo-handling arrangements include 50-ton and 20-ton derricks in addition to the usual 8- and 5-ton derricks, all of which are served by heavy-duty steam winches. The steering gear is of the two-ram steam-driven hydraulic type. There is accommodation for 12 passengers in single- and double-berth staterooms on the boat deck and lower bridge deck. The ship's officers and European members of the crew are provided with roomy accommodation in a long deck-house on the shelter deck amidships, whilst the Indian personnel are berthed aft in the upper 'tween deck and in a house on the deck above. The propelling machinery consists of two sets of 4-cylr. Barclay, Curle-Doxford engines of standard design with cylinders of 600mm. diameter and a combined piston stroke of 2,320mm. For starting purposes, each engine is fitted with a small two-ram fuel-priming pump driven through gearing by a 2-h.p. electric motor. Overhaul of the engines is facilitated by the provision of small steam-driven turning engines and an overhead electric E.R. crane of 5 tons lifting capacity. Electric current is provided by three 30-kW. steam-driven generators. Two cylindrical multitubular boilers are installed, one being of the composite type with two nests of tubes to take the exhaust from the main engines and an oil-fired furnace for maintaining the steam pressure at low powers. The steam generated by the main engine exhaust gases is ample for all normal requirements at sea. The second boiler, which is slightly larger than the composite one, is oil-fired. All the E.R. auxiliaries are steam driven and include a 390-ton ballast pump which serves as a stand-by to the two engine-driven sea-water pumps, and two 75-ton general service and bilge pumps. The fuel-valve cooling pumps for the main engines, however, are electrically driven.—*"Lloyd's List and Shipping Gazette", No. 40,546, 8th November, 1944, p. 8.*

New Motorship for Ellerman Lines' Fleet.

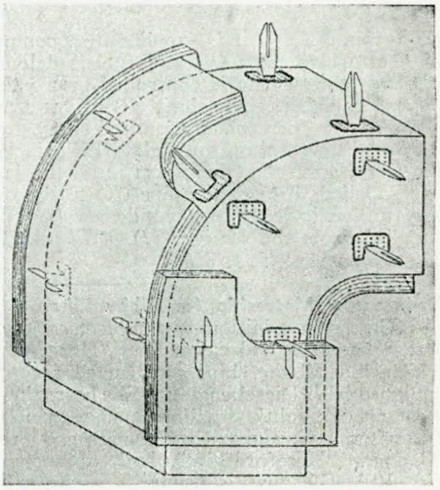
The Hall Line's "City of Chester", delivered in March, 1944, is the first motorship to have been acquired by the Ellerman group of companies during the past 16 years, the only other Diesel-engined vessel in their fleet being the "City of Lille", delivered in 1928. The "City of Chester", which recently completed her maiden voyage of 18,000 miles to South African ports, is a twin-screw vessel of 8,502 gross tons, built and engined by Barclay, Curle & Co., Ltd. The d.w. of the ship is 10,985 tons and the total capacity (bale) of her five cargo holds is 541,750 cu. ft. The cargo handling equipment includes two 50-ton derricks, one each at Nos. 2 and 4 hatches. The cargo winches and anchor windlass are electrically driven, whilst the telemotor-controlled steering gear is of the electro-hydraulic type. Up to 1,514 tons of fuel oil can be stowed in the D.B. fuel tanks and the cross bunker forward of the machinery space, and when necessary, up to 1,586 tons of water ballast can also be carried. The fresh-water tanks have a capacity of 452 tons. As at present arranged, there is accommodation for 24 passengers in five 4-berth and two 2-berth cabins on the upper deck, but after the war only 12 passengers will be carried in double and single staterooms with attached bathrooms. Accommodation for the ship's officers is arranged on the bridge deck, the stewards, petty officers and gunners being berthed aft of the passengers, on the upper deck. The quarters of the native crew are right aft. The propelling machinery consists of two sets of 4-cylr. Barclay, Curle-Doxford engines of standard design, the cylinders being 670mm. in diameter with a combined piston stroke of 2,320mm. A combination oil-fired and exhaust-gas Cochran boiler with Sinuflow tubes, takes the exhaust from one main engine and generates steam for the evaporating plant, fuel-tank heating system and domestic services. The E.R. auxiliaries are all motor driven, electric current at 220 volts being supplied by three 160-kW. Diesel-generator sets. The latter are located on the port side of the engine room and comprise B.T.H. dynamos of the d.c. type directly driven at 510 r.p.m. by 235-b.h.p. 6-cylr. four-stroke Mirrlees Ricardo engines.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,419, 2nd November, 1944, p. 2.*

Contract for First Post-war Passenger Liner.

The Swedish-American Line have placed a contract with the Götaverken for the construction of a twin-screw Diesel-engined passenger ship for their Gothenburg-New York service, to be delivered in April, 1947. She will have an o.a. length of 522ft., a beam of 67ft. and a register of 11,000 gross tons. The displacement will be 13,000 tons and the total d.w. capacity 4,700 tons. The six cargo holds are to have a capacity of 2,500 to 3,000 tons and there will be accommodation for a substantial number of passengers in single and two-berth cabins, mostly with adjoining bathrooms. There will not be any inside cabin for passengers or members of the crew anywhere in the ship. The accommodation, which is to include five large public rooms, will be arranged so that the vessel may carry either one class of passenger or two classes (cabin and third), according to demand. The hull will be of all-welded construction and light metal will be used, as far as practicable, for the superstructure. The propelling machinery is to consist of two sets of s.a. two-stroke Götaverken engines coupled direct to the propeller shafts and developing a total of 14,600 i.h.p. at 110 r.p.m., the service speed of the ship being 19 knots. All the auxiliary and deck machinery, including twelve 5-ton cargo winches, will be motor driven. Electric current will be furnished by five Diesel-generator sets, three of which will have 6-cylr. s.a. two-stroke engines of 360 b.h.p., whilst the other two will have 3-cylr. engines of similar type rated at 180 b.h.p. A refrigerated compartment of 10,000 cu. ft. will provide stowage for frozen meat, fish, fruit, etc. The lifeboat equipment will comprise four hand-propelled boats and four motor-boats, two of the latter being termed "emergency boats". All will be handled by electric winches, which can be controlled by one person. With the speed mentioned, the new ship should take about eight days to reach New York from Gothenburg. She will leave that port on Saturday and arrive at New York early on the following Monday week.—*"The Motor Ship", Vol. XXV, No. 298, November, 1944, p. 239.*

Insulation of Air Ducts in Refrigerated Spaces.

A new method of securing mineral wool felt insulation on ducting or other surfaces found in marine or land refrigerating practice has been introduced by a Cambridge (Massachusetts) firm. The new "Stic-Klip", as it is called, is a tongue or nail on which to impale the insulation. The device can be securely fastened to the base material by cement, nails or welding, and then the insulation is easily pressed on. Two types will penetrate mineral wool felts without tearing, and the prongs of the tongue are then bent close to the surface of the lagging to provide ample supporting area. Another pattern is designed for high-density insulating materials which can only be impaled on a nail; a self-locking speed washer secures the insulation. Stic-Klips can be used for air-cell board, Fiberglas, low-density mineral wool felts and boards, as well as for high-density insulation. They are likewise suitable for use with mastic or canvas-covered lagging, and with cork, rock cork, hair felt, metal-mesh blankets, etc. With an additional steel washer, metal lath, and sound deadener or other secondary finish can be added.—*"Modern Refrigeration", Vol. XLVII, No. 561, December, 1944, p. 312.*



Insulation secured by Stic-Klips.

P.S.N. Co.'s New Cargo Liner "Samanco".

War-time additions to the fleet of the Pacific Steam Navigation Co. include the single-screw motor cargo liner "Samanco" of 8,336 gross tons. This vessel, like her sister ship, the "Sarmiento", was built and engined by Harland and Wolff, Ltd., and has a d.w. capacity of 10,600 tons. There are five cargo holds, with upper and lower 'tween decks, which, together with the main-deck cargo spaces at either side of the engine casing and the compartment under the forecastle, have a total (grain) capacity of 562,650 cu. ft. The double-bottom fuel tanks and the service tanks in the engine room have a total capacity of 970 tons of fuel oil, whilst the ship's fresh-water tanks can hold 256 tons of water. Up to 1,796 tons of water ballast can be carried, if necessary, in the D.B., peaks and deep tanks. The cargo-handling equipment comprises four 10-ton and sixteen 5-ton derricks, in addition to a 50-ton derrick at No. 2 hatch and a 40-ton derrick at No. 4 hatch. There are 10 electric cargo winches, with a motor-driven anchor windlass forward and a warping winch of similar type on the upper deck aft. The electro-hydraulic steering gear is operated by two 35-h.p. motors. The engine room, which is located between Nos. 3 and 4 cargo holds, contains the Harland-B. & W. main engine, which is an 8-cylr. unit of the d.a. 2-stroke type. The output of this engine is such as to make the "Samanco" one of the highest-powered single-screw motorships in the British merchant marine. The cylinders are not of the coverless type, the exhaust pistons being slightly smaller in diameter than the main pistons and driven from the main crankshaft through eccentrics. The eccentric sheaves and balance weights are integral with the cast-steel crank webs. The top and bottom crowns of the oil-cooled main pistons are of chrome molybdenum cast steel, screwed into the C.I. body pieces, with oiltight metal-to-metal faced joints. Six piston rings and one scraper ring are provided at each end of the piston. A C.I. sleeve is used to protect the piston rod from the heat of the combustion gases. Fresh water is employed for cooling the cylinder jackets and covers. The scavenging-air blower comprises two blower units, chain-driven from the crankshaft. Automatically actuated change-over valves in the inlet and outlet passages come into operation when the engine is reversed. The camshaft is also chain-driven from the crankshaft. The main-engine exhaust gases are delivered to a silencer in the funnel, which also contains three silencers for the auxiliary engines and the uptake from the heating boiler. The latter is a small vertical unit of the Nelvin type, and is installed in the S. forward corner of the engine room. The boiler is oil-fired and supplies steam at a pressure of 100lb./in.^{2} to a 1,500-gall. evaporator and a steam-engine-driven auxiliary air compressor, as well as to the fuel-tank heating system. As the whole of the remaining E.R. auxiliaries are motor driven, and as cabin heating and cooking are carried out electrically, the electrical load is heavy. It is dealt with by three 250-kW. 220-volt dynamos, each directly driven by a 5-cylr. two-stroke British-built Polar engine. Two of these generator sets are located on the S. side of the main engine and one on the P. side.—*"The Motor Ship", Vol. XXV, No. 296, September, 1944, pp. 174-182.*

Motor Coaster "Empire Jack".

The coastal motorship "Empire Jack" recently built at Barrow-in-Furness by Vickers-Armstrongs, Ltd., to the order of a local firm of shipowners, is a single-screw vessel of about 730 gross tons with a d.w. capacity of 1,015 tons. She has a long raised quarter deck, a short open forecastle, cruiser stern, raked stem, and semi-balanced rudder. The hull, which is largely of welded construction, is divided into four main watertight compartments, including two large cargo holds. The double-bottom tanks under these, as well as the fore and after peak tanks, are arranged for the carriage of water ballast, whilst fuel oil is carried in the D.B. tanks under the engine room and in a cross bunker between the latter and No. 2 hold. The machinery compartment is located aft. The ship's officers are berthed in a deck-house on the raised quarter deck, whilst accommodation for the crew is arranged on the lower deck abaft and alongside the engine casing. The cargo-handling equipment comprises one 10-ton and two 1½-ton tubular steel derricks served by two electric winches. A motor-driven anchor windlass is fitted forward and electric warping capstan aft. The steering gear is of the combined electrical and hand type. The main engine is a 6-cylr. two-stroke trunk-piston Atlas Polar unit of the direct reversing type. The cylinders have a bore of 340mm. and a piston stroke of 570mm. The engine is of the makers' standard design, being fitted with a crank-driven scavenging-air pump at its forward end and a tandem air compressor. When not required for charging the starting-air reservoirs, this compressor delivers air to the scavenging main. The main engine crankshaft also drives the circulating-water, auxiliary bilge and lubricating-oil pumps, one of the latter being for clean oil and the other for dirty oil. The provision of unusually stiff intermediate and propeller shafts, together with a very light flywheel, reduces torsional vibration in the shaft system. The oil-filled stern tube is fitted with a Newark gland. Electric current is supplied by two 16-kW. 220-volt d.c. generators each driven at 1,000 r.p.m. by a 38-b.h.p. four-cylinder Lister oil engine, which also drives a 75-ton bilge pump of the self-priming type and an air compressor. The bilge pumps and compressors can be clutched in or out as desired. The motor-driven E.R. auxiliaries comprise a stand-by forced-lubrication pump and a fuel-oil transfer pump. Provision has also been made for the installation, at some future date, of a 7-kW. generator which will be driven from the intermediate shaft when the main engine is running and by a small high-speed Diesel engine through a clutch at other times.—*"The Marine Engineer", Vol. 67, No. 806, September, 1944, pp. 362-364, 366 and 370.*

Port Line Single-screw Motorship "Port Macquarie".

Unlike the majority of the motorships owned by the Port Line, the "Port Macquarie" is a single-screw vessel of slightly lower speed. She entered service some months ago and was built and engined by Swan, Hunter and Wigham Richardson, Ltd. The "Port Macquarie" has a register of 9,072 gross and a d.w. capacity of some 10,600 tons. She can carry 8,400 tons of general and refrigerated cargo, 1,700 tons of fuel oil, 385 tons of fresh water and 115 tons of stores, and is flush-decked with a raised forecastle, midship deck-house and poop, having a raked round-nosed stem and cruiser stern. Both welding and riveting were employed for her construction, the butts of the shell plates being welded to their neighbours and the plates riveted to the frames. There are altogether five cargo holds, with upper and lower 'tween decks, the machinery space being between Nos. 3 and 4 holds. General cargo is carried in the five upper 'tween-deck spaces, the top wings abreast the E.R. casing and No. 5 lower hold, the total capacity (grain) of these compartments being 183,940 cu. ft. Refrigerated cargo can be carried in the remaining cargo spaces, which are insulated for this purpose and have a total capacity (grain), of 378,402 cu. ft. The cargo-handling equipment comprises ten 5-ton and four 10-ton derricks, served by 14 electric winches. Provision is made for installing a 50-ton derrick at the foremast at a later date. An electric anchor windlass is fitted on the forecastle and there are two motor-driven capstans on the poop deck. The telemotor-controlled steering gear is of the electro-hydraulic type. The quarters of the ship's officers are arranged in a deck-house on the boat deck and in the mid-ship deck-house on the upper deck, while the crew are berthed aft. The propelling machinery consists of a 6-cylr. Doxford engine of standard design with a cylinder bore of 670mm. and a combined piston stroke of 2,320mm. The distilled water used for cooling the cylinder jackets and pistons is circulated through coolers —a separate one for each system—in a closed circuit, make-up water being supplied by a distiller, when necessary. The steam required for this purpose, as well as for heating the fuel tanks and living spaces, etc., is furnished by a Cochran composite waste-heat and oil-fired boiler located at the after end of the engine room at the level of the cylinder tops. This boiler generates steam at a pressure of 100lb./in.^{2}. Electric current at 220 volts is supplied by three 245-kW. d.c. generators directly driven at 500 r.p.m. by three Ruston and Hornsby four-stroke engines. The refrigerated spaces are cooled on the air-battery system by motor-driven fans, the brine circulated through the coolers being maintained at the requisite low temperature by two horizontal CO_2 compressors each driven by an electric motor of 180 h.p. Provision is made for the addition after the war of gas-detection and ejection apparatus, when fruit will be carried. The E.R. staff of the ship includes eight engineers, three refrigerating engineers, and two electricians, the chief engineer being Mr. W. Gibbs, who has had 18 years' service with the company.—*"The Marine Engineer", Vol. 67, No. 807, October, 1944, pp. 401-403.*

Swedish Motorship of New Design.

The Götaverken recently launched a combined oil and ore carrying vessel of entirely new design from their Gothenburg yard. This ship, named "Rautas", has a d.w. carrying capacity of about 12,000 tons and differs from earlier vessels of the combined type in that no special rearrangement or re-measurement of the cargo spaces will be necessary when changing over from oil to ore cargo or vice versa. This unusual feature has been made possible by the provision of two longitudinal bulkheads along the entire length of the hull. Amidships, where the cargo holds are situated, a specially deep tank top has been constructed across the hull. This forms a D.B. tank 8ft. deep measured from the base line, and the space between this tank top and the deck is further sub-divided into four separate holds for ore cargo. The spaces between the fore-and-aft bulkheads and the ship's sides are adapted for the carriage of oil cargoes, there being altogether eight cargo oil tanks on each side. This is considered to be adequate sub-division to ensure stability and seaworthiness under all conditions. In order to reduce the distance between the hatches and to bring about a more uniform distribution of the ore cargo, the usual long deck-house amidships has been replaced by a short turret-like structure which carries the navigating bridge and contains accommodation for the master, the pilot and the W/T officers. The remaining officers and members of the crew are berthed aft in a long deck-house which also contains accommodation for a number of passengers. The usual equipment for handling ore cargoes, *i.e.*, derricks and winches, is provided on deck. The propelling machinery, which is located aft, consists of a 6-cylr. s.a. two-stroke Götaverken Diesel engine developing 5,200 i.h.p. at 112 r.p.m. and is designed to give the ship a sea speed of 13½ knots when fully loaded.—*"The Journal of Commerce" (Shipbuilding and Engineering Edition), No. 36,377, 14th September, 1944, p. 8.*

The Coasting m.v. "Supremity III".

The coasting motorship "Supremity III", the latest addition to the fleet of F. T. Everard & Sons, Ltd., is a single-screw vessel of some 2,000 tons gross, built by the Goole Shipbuilding and Repairing Co., Ltd. The d.w. is 2,770 tons and the total capacity of the four cargo holds is 141,310 cu. ft. The hull is divided into nine W.T. compartments by transverse W.T. bulkheads extending to the upper deck from the double bottom which runs fore and aft from the fore-peak tank to the after peak. Up to 567 tons of water ballast can be caried in the fore-peak and after-peak tanks, the double-bottom and the deep ballast tank between Nos. 2 and 3 holds, while the capacity of the fuel tank between No. 4 hold and the forward end of the engine room is 150 tons. The cargo-handling equipment comprises four 2-ton derricks served by four electric winches. An electric anchor windlass is fitted on the forecastle and there is a motor-driven warping capstan aft. The telemotor-controlled steering gear is of the electric type. A raised quarter-deck extends from the after end of No. 2 hatch to the stern of the ship. At the forward end of this deck is a deck-house containing the accommodation of the deck officers, the captain's quarters being on the bridge deck above this house. There is another deck-house aft with accommodation for the engineer officers and members of the crew, the former being berthed forward of the engine casing and the latter abaft it. The general standard of the accommodation provided is superior to that of many ocean-going vessels of greater tonnage. Central heating and constant hot water, refrigerators and three-berth cabins for the crew are among the features which have been incorporated in the ship's living quarters. The propelling machinery is located aft and consists of a 6-cylr. s.a. two-stroke Sirron engine having a rated output of over 1,000 b.h.p. and designed to give the vessel a service speed of 11½ knots. The engine is equipped with the Bryce system of fuel injection and a Bryce hydraulic governor is fitted for giving a wide speed control. The engine-driven auxiliary machinery includes rotary oil pumps and circulating-water pumps. Electric current is provided by two Diesel-driven generators running at 1,000 r.p.m. One of these is a 50-kW. machine driven by a four-cylinder R.N. Diesel engine, whilst the other is a 40-kW. unit driven by a two-cylinder engine of similar type. The motor-driven main and auxiliary air compressors have a capacity of 25 cu. ft. and 11 cu. ft. per minute, respectively, at 400lb./in.^{2} pressure. The "Supremity III" has a war-time complement of 22 officers and men, including three engineers.—*"The Engineer", Vol. CLXXVIII, No. 4,636, 17th November, 1944, p. 392.*

Recent Developments in Medium-speed Two-cycle Oil Engines.

The subject matter of this paper is restricted to 2-stroke oil engines of about 8½in. cylinder bore, with piston and rotational speeds not exceeding 1,300ft./min. and 600 r.p.m. respectively. Defects in earlier designs of such engines are discussed and conventional methods of scavenging are briefly described. Some particulars are then given of recent improvements in scavenging arrangements, the latest and most important of which is considered to be the Kadenacy system of scavenging and supercharging ("superscavenging"). The author deals with this in some detail and gives a number of diagrams and illustrations. The application of high-pressure supercharging to 2-stroke engines is then discussed and the author concludes with some notes on the possibility of operating a 2-stroke oil engine in conjunction with an exhaust-gas turbine.—*Paper by C. B. M. Dale, B.Sc.(Eng.), "Bulletin of the Liverpool Engineering Society", Vol. XVIII, No. 4, November, 1944, pp. 7-35.*

The Conversion of Liberty Ships. (2).

Among the various projects which have been put forward for the re-engining of Liberty ships are several which involve the installation of 4,000-s.h.p. Diesel or Diesel-electric machinery to give a speed of 14 knots. It has been stated more than once in America that the hull design of these vessels is such that they can be operated at 14 knots with reasonable efficiency, so that it is possible that no important modifications to their hulls would be required. Objections can naturally be raised to any plans of this nature, and it is clear that if money and time be spent in re-equipping these ships, it may seem undesirable to scrap them within 5 or 10 years, as might be necessary under any general reconstruction programme; but the overriding problem is that of providing the necessary tonnage for the U.K., Norway and the Netherlands in the intervening period, while these countries are rebuilding their mercantile fleets. The advantages of the conversions suggested are obvious. The Liberty ships burning 30 tons of oil daily would cost about £30,000 p.a. in fuel, assuming an average world price of £4 per ton for boiler oil. As 14-knot motorships they would only consume 14 tons of Diesel oil per day, which, at £5 per ton, would involve a fuel bill of £17,500, representing a saving of £12,500 p.a. in fuel costs and an increase of four knots in the ship's speed. If the respective prices of boiler oil and Diesel oil were proportionately higher the economy would be even greater.—*"The Motor Ship", Vol. XXV, No. 298, November, 1944, p. 255.*

Engineering Training Establishment for the Royal Indian Navy.

A new training establishment for E.R. ratings of the Royal Indian Navy is being established at Poona, and is to be known as H.M.I.S. "Shivaji". It will accommodate 700 trainees and is to include a full-size replica of a ship's engine room, with two sets of turbines, propeller shafts and bridge controls, in which practical instruction will be given.—*"Engineering", Vol. 158, No. 4,115, 24th November, 1944, p. 405.*

Full Employment in British Shipyards.

The speaker prefaced his address by explaining that although it dealt almost entirely with shipbuilding, he wished it to be understood that the word "shipbuilding" included marine engineering and, in some cases, ship repairing. He then gave some statistics relating to the decline in shipping owned in the U.K., actual and relative to the shipbuilding world, between the two wars, and expressed the view that the British mercantile marine should be maintained at a level higher than that of 1939. He also suggested that the trade routes from which the Axis countries had ousted the United Nations before the war should be restored to them, and that the building and owning of ocean-going ships by the Axis countries should be banned as a security measure against future aggression. As regards a recovery of the export of British-built ships (British launchings for export fell from an average of 22 per cent. in 1909-13 to 4·9 per cent. in 1937), the speaker declared that this country should use its position as the world's largest importer to conclude bargains favouring exports. The decline in British construction for foreign owners was largely caused by devices practised by foreign governments beyond the control of British shipbuilders and the whole question had become a serious matter before the war. As to naval construction, the speaker contended that vast sums would have been saved to the country if such construction had proceeded steadily during the inter-war years, instead of being concentrated in the late 1930's and in the war period, when costs had risen so much. He expressed the opinion that though a planned programme is probably a suitable means for the Admiralty of ordering ships, an attempt might be made to improve employment in the shipyards by something more flexible and more quickly operated, and that a step in this direction might be taken by arranging for naval vessels to be repaired or refitted in the shipbuilding districts.—*Presidential address delivered by A. Murray Stephen, M.C., B.A., at the annual general meeting of the Institution of Engineers and Shipbuilders in Scotland on the 3rd October, 1944.*

Ships Damaged Whilst in Ballast Condition.

An article which appeared in the Sydney *Harbour* deals with the future of the 10,000-ton d.w. cargo tramps which have been built in such large numbers in America, Canada, the U.K. and Australia. The causes of the failures which have occurred in some of the all-welded Liberty ships are also discussed, and in this connection it is suggested that most of the failures occur when the vessels are in ballast condition. The explanation given in the article is that the vessel is strained in the loaded condition, but the defects are only exposed when the ship meets the shocks to which it is exposed when tossed about in a heavy sea. It is undeniable that the dynamic stresses met with at sea must be severe, but at the same time, it is not clear why they should be more severe when the vessel is in the light condition than when she is loaded. The whole matter calls for further investigation.—*"Fairplay", Vol. CLXIII, No. 3,206, 19th October, 1944, p. 566.*

Some Recent Technical Developments in Naval Construction.

The paper is divided into four separate parts, the first of which deals with materials and equipment, including the use of light alloys in warships; the grades of steels employed in naval construction; living accommodation on board H.M. ships; fire-fighting equipment; bottom anti-fouling compositions; and the uses of plastics for ships' fittings. Part II is devoted to welding, and includes brief notes on the all-welded minesweeper "Seagull": the resistance of welding to damage as exemplified in landing craft, etc.; examples of extended application of welding to warship construction; and the testing of welds by X-ray. Part III deals with experiment tank work and covers such questions as hull form; propellers; cavitation tunnel work (illustrated by cinematograph film); the value of visual observation and photographs and steering. Part IV concerns underwater attack and protection against it; phenomena attending the explosion of a charge under water: protection against underwater charges, (*a*) in contact with the ship's side and (*b*) not in contact with the ship; damaging effect upon the structure; effect on the ship as a whole, as well as on the machinery, fittings, and personnel.—*Thirteenth Andrew Laing Lecture delivered by Sir Stanley V. Goodall, K.C.B., O.B.E., at a general meeting of the N.-E. Coast Institution of Engineers and Shipbuilders on the 3rd November, 1944.*