Abstracts of the Technical Press

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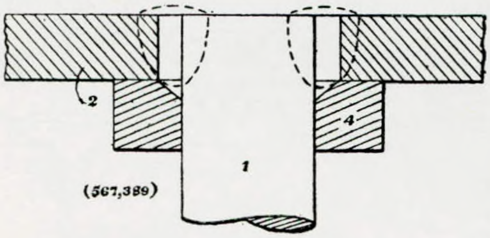
Securing Boiler Stays.

An improved method of welding boiler (and similar) stays has recently been developed and patented by Richardsons, Westgarth & Co., Ltd. Referring to the accompanying sectional diagram, the end of the stay (*1*) is passed just through a hole in the plate (*2*) so that the extremity of the stay is approximately flush with the outer surface of the plate. The hole in the plate (*2*) and the end of the stay (*1*) are both cylindrical, the hole being made slightly larger than the stay to provide an annular clearance round the latter. A chamfered copper backing bar (*4*) is clamped on to the stay against the inner surface of the plate and this closes the inner end of the annular clearance. The weld is effected in this clearance which is filled with weld metal. The weld extends right through to the inner side of the plate and completes the continuity of the plate through the stay. In a slightly different process, the hole in the plate (*2*) and the end of the stay (*1*) are both cylindrical, but the stay fits closely in the hole. The end of the stay, however, projects only a short distance into the hole so that a cylindrical recess is left in which the weld metal is deposited. A copper backing bar is again clamped in place and heavy-gauge welding rods taking a high current are used to fuse right

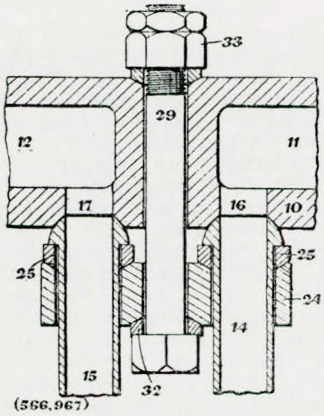


(567,389)

through the stay to the back of the plate. The filling of the recess is then completed. By using an automatic welding machine with heavy-gauge welding rods the weld can be completed in a single operation, the process being of the submerged-arc type. The distance which the stay projects into the hole depends on the type of electrodes used for the welding. The method has been found particularly suitable in practice for boiler stays such as the short stays which support the adjacent plates of two combustion chambers in Scotch boilers. An advantage claimed for this method of welding is the ease with which the welding operation can be carried out, in addition to which it allows the stays to be put quite close to obstructions, such as the combustion-chamber wrapper-plate, without impairing the ease of welding or the ease of inspecting the weld. Since the stay does not protrude from the plate, there is a consequent elimination of any burning of the stay, such as commonly occurs when the end of the stay faces into a combustion chamber. The method is also claimed to provide an intimate connection between the plate and the stay, thereby ensuring a good heat transfer.—*"Engineering", Vol. 160, No. 4,152, 10th August, 1945, p. 120.*

Improved Form of Joint Between Tubes and Headers.

The new British patent covers an improved type of joint between the tubes and headers of watertube boilers. This joint is claimed to allow a maximum of freedom for the tube end to bed into the header port. Referring to the accompanying sectional diagram, the header (*10*) contains two chambers (*11*) and (*12*), separated by a web, one for saturated steam and the other for superheated steam. Two ends (*14, 15*), of a superheater tube are aligned with the ports (*16*) and (*17*), respectively, each tube end being forged to form a spherical head ending with a flat rear surface. The ports (*16*) and (*17*) are countersunk with a cone angle of 90°. The tube ends pass through holes in a clamp (*24*), the holes being large enough to permit some relative lateral movement between the clamp and the tubes. Between the tube heads and the clamp are washers (*25*), each of which beds at one end against the flat surface of the back of the tube head. A part-spherical surface of the washer engages a countersunk end of the hole in the clamp (*24*). The bore of each washer (*25*) is larger than the external diameter of the tube ends. The header (*10*) and clamp (*24*) are drilled to take a tightening bolt (*29*). The mouth of

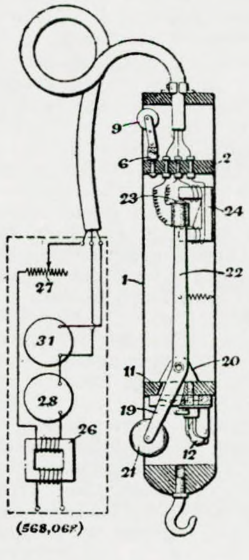


(566,967)

the hole in the clamp is countersunk and under the head of the tightening bolt is placed a washer (*32*) having a spherical surface to fit into the countersink. A similar arrangement of conical and spherical seatings is adopted between the lock nuts (*33*) and the header (*10*). Thus as the clamp (*24*) is tightened, all the component parts of the joint settle themselves freely in position.—*"Engineering", Vol. 160, No. 4,151, 3rd August, 1945, p. 100.*

Measuring Internal Diameters.

A new British patent covers the design for a device which is primarily intended for measuring the internal diameters of tubes which in the ordinary way cannot be easily gauged, such as boiler or air-heater tubes, to find out whether there has been any internal corrosion. The construction of such an instrument is shown in the accompanying sectional diagram. A short tube (*1*) houses an upper insulating disc (*2*), which carries three terminals and three pairs of pillars (*6*), each pair of pillars supporting a swinging arm carrying a steel guide roller (*9*). The rollers project through apertures set at 120° around the tube, whilst the swinging arms are spring-loaded outwards. Towards the lower end of the tube (*1*) is a second disc (*11*), which carries on its underside two steel rollers (*12*) at an angle of about 90° to each other and projecting through apertures in the tube. These rollers are adjustable transversely on the disc (*11*). One arm (*19*) of a lever, pivoted in brackets



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(*20*) mounted on the upper face of the disc (*11*) passes through an opening in the wall of the tube and carries a steel roller (*21*) set equidistantly from the two rollers (*12*). The opposite arm (*22*) of the lever (*19*) carries an armature (*23*) which is located between the poles of an alternating-current electro-magnet (*24*), supplied with current through a transformer (*26*), a controlling resistance (*27*) and an ammeter (*28*). The coil on the armature (*23*) is connected to a sensitive voltmeter (*31*). To gauge the interior of, say, an air-heater tube, the instrument tube (*1*) is inserted in the latter and is positioned by the two sets of rollers, the armature (*23*) taking up a position determined by that of the roller (*21*), which in turn is determined by the internal diameter of the tube being gauged. The reading on either the voltmeter or the ammeter is kept constant, and the diameter is recorded on another meter, which may be calibrated directly in inches.—*"Engineering", Vol. 160, No. 4,153, 17th August, 1945, p. 140.*

U.S. Gas Turbine Tested.

The experimental gas turbine for marine service under construction by the Elliott Co. in association with the U.S. Navy Bureau of Ships, recently underwent a series of tests which are reported to have been very successful. It is stated that operating temperatures of 1,400° F. can be used for marine gas turbines with a thermal efficiency of 32 to 34 per cent. With secondary surface-type heat exchangers placed athwartships, the plant can be installed in a space 16ft.×12ft.×12ft., which is less than one cu. ft. per h.p. The total machinery weight will, it is said, amount to less than 20lb./h.p. The total machinery weight will, it is said, amount to less than 20lb./h.p.

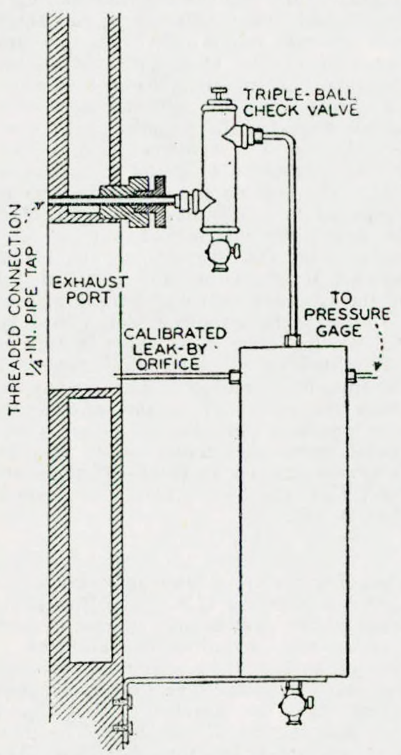
The question of using coal instead of oil as a fuel for combustion turbines is also under consideration, and Professor C. R. Soderberg, of Massachusetts Institute of Technology, who is also consulting engineer to the Elliott Co., has stated that the problem may soon be solved either by the direct burning of powdered coal, the burning of gas from coal or oil from coal. The executive vice-president of the Elliott Co. has expressed the opinion that combustion turbine power plant for commercial use is likely to become available in about two years time.—*"The Shipping World", Vol. CXIII, No. 2,721, 8th August, 1945, p. 147.*

Submarine Diesels for Merchantmen.

The mass production of German submarines has resulted in the existence of a very large number of Diesel engines, which are either ready for service or in various stages of completion. As British marine-engine builders are likely to be overworked for some time to come, the question naturally arises as to whether these Diesel engines might not be utilised for ship propulsion. After the last war a considerable number of such Diesel engines intended for installation in German submarines were purchased for use in this country, for power station work, etc. One or two were also fitted in yachts, where the conversion was not made as carefully as it should have been. These Diesel engines were, of course, of a less highly-developed design than those of the present day, but even so, a number of them were installed in Hamburg-Amerika cargo vessels for the Far Eastern service, the engines being arranged to drive the propeller shafts through reduction gearing. The vessels equipped with this machinery proved reasonably satisfactory in service. Two of them were re-engined in 1939, their geared Diesels being replaced by five Diesel-driven generators and a propulsion motor. Diesels of the submarine type could, of course, be made tolerably satisfactory for electric drive, although this system of transmission is open to the objection that the provision of the necessary electrical equipment would involve a considerable delay at a time when rapid delivery will be of the utmost importance. It has also been suggested that submarine Diesel engines, if appreciably derated, might be suitable for re-engining Liberty ships, if employed in conjunction with the Bowes drive.—*"The Marine Engineer", Vol. 68, No. 817, August, 1945, pp. 398-399.*

Measuring Diesel Engine Cylinder Pressures.

An article in a recent issue of *Power* deals with various simple and robust forms of indicators which enable engine operators to detect faulty combustion, defective setting or action of valves, uneven division of load between cylinders, and other troubles, by measuring the pressures at the end of compression and at the peak point during the combustion period. These pressures are more or less definite indices of satisfactory conditions of operation, though the optimum values depend on various factors, particularly the engine speed. Typical pressure indicators of this class are described. One comprises a pressure gauge with a pressure chamber to which gas from the cylinder is admitted through a poppet valve in the connection which screws into the indicator cock. When the lift of the valve is limited to a few thousandths of an inch, the gauge indicates the peak pressure, but if the adjusting screw is set to allow a slightly greater valve lift, the gauge shows the variations in firing pressure as the load changes. Another device, which also screws on to the indicator cock, employs a piston, the spring load on which is adjusted by turning a sleeve. So long as the cylinder pressure exceeds the spring load, the piston closes an electric contact at each stroke and causes a neon lamp to flash. When the lamp no longer flashes, the position of the adjusting sleeve is read on a vernier scale calibrated in lb./in.². The cylinder pressure can thus be read to within 2lb./in.² over a range from 50 to 1,500lb./in.². Both the devices described measure either the peak combustion pressure or, if fuel injection is cut off, the compression pressure. The accompanying illustration shows an arrangement used to determine the release or pre-exhaust pressure. A tapped connection, similar to that for a cylinder lubricator, leads from a point in the cylinder wall near the exhaust port, to a check valve, and so to a pressure chamber connected to a pressure gauge. An adjustable leak-by orifice on the pressure chamber enables the gauge to follow changes in the release pressure as the load decreases.—*"The Power and Works Engineer", Vol. XL, No. 470, August, 1945, p. 191.*



Device for indicating cylinder pressures.

Sulzer Engine Fuel Injector and Pump.

A British patent recently granted to Sulzer Bros., Winterthur, covers a new design of combined fuel injector and pump for oil engines, of which a sectional diagram is shown in Fig. 3. At each stroke of the plunger only a part of the fuel delivered by the pump is injected into the cylinder, while the remainder is returned past a control device. The pump plunger (*1*) is driven through a roller guide (*2*) by a cam on the camshaft (*4*) and the cylinder (*5*) of the pump is connected to a fuel tank (*6*) by a supply pipe (*7*) and return pipe (*8*). The pump discharges the fuel past a valve (*16*) and through a hole (*9*) to the nozzle (*10*). During the suction stroke, the fuel is delivered by a feed pump (*13*) through the pipe (*7*) past a valve (*14*) into the pump chamber (*15*). When the return passage (*17*) is in connection with the pipe (*8*), the fuel delivered in excess flows back to the tank. If the oblique edge (*21*) of the plunger shuts the connection, the fuel discharged to the injection nozzle (*10*) is subjected to pressure. The fuel needle (*21*) is then lifted and injection takes place. Adjustment is effected by rotating the pump plunger by a regulating rod (*26*). The fuel delivered through the nozzle chamber, before injection takes place cools the nozzle and the needle (*21*). An overflow valve (*24*) is provided.—*"The Oil Engine", Vol. XIII, No. 148, August, 1945, p. 104.*

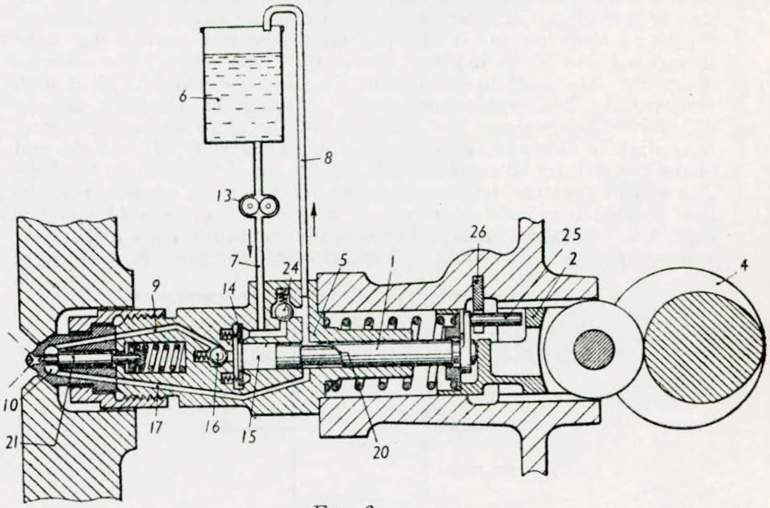


FIG. 3.

Diesel Valve Timing.

The taking of accurate indicator diagrams from the cylinders of high-speed Diesel engines is not always practicable owing to the fact that at high speeds the inertia effects of the moving parts—particularly the linkage of the pencil mechanism—may introduce serious errors. Because of this, optical and cathode-ray indicators have been developed, but the relative complexity and high cost of these instruments militates against their use for routine purposes on board ship. As an alternative the circle diagram is available for determining the correct timing of the opening and closing of the fuel, the air and the exhaust valves, or the opening and closing of the ports in the case of a two-stroke engine. This diagram is prepared in the designing office and shows the exact position of the crank at the instant of the beginning and completion of the various events in the cycle which are considered by the designer to yield the best performance of the engine. The circle diagram suffers from the disadvantage that it cannot be used to determine the i.h.p. and that the engine must be at rest for the timing to be verified, but it is obviously far more accurate than is the indicator diagram.—*"Shipbuilding and Shipping Record", Vol. LXVII, No. 8, 23rd August, 1945, p. 171.*

Modern Continental Steam Engines.

During the past 10 years or so the high-pressure reciprocating steam engines built by Sulzer Bros., Winterthur, have achieved a well-deserved reputation. Other makers of such engines were the Meer Engine Works, of München - Gladbach, who developed a design on the uniflow principle in which exhaust took place through ports at the mid-portion of the cylinder, the ports being covered and uncovered by the

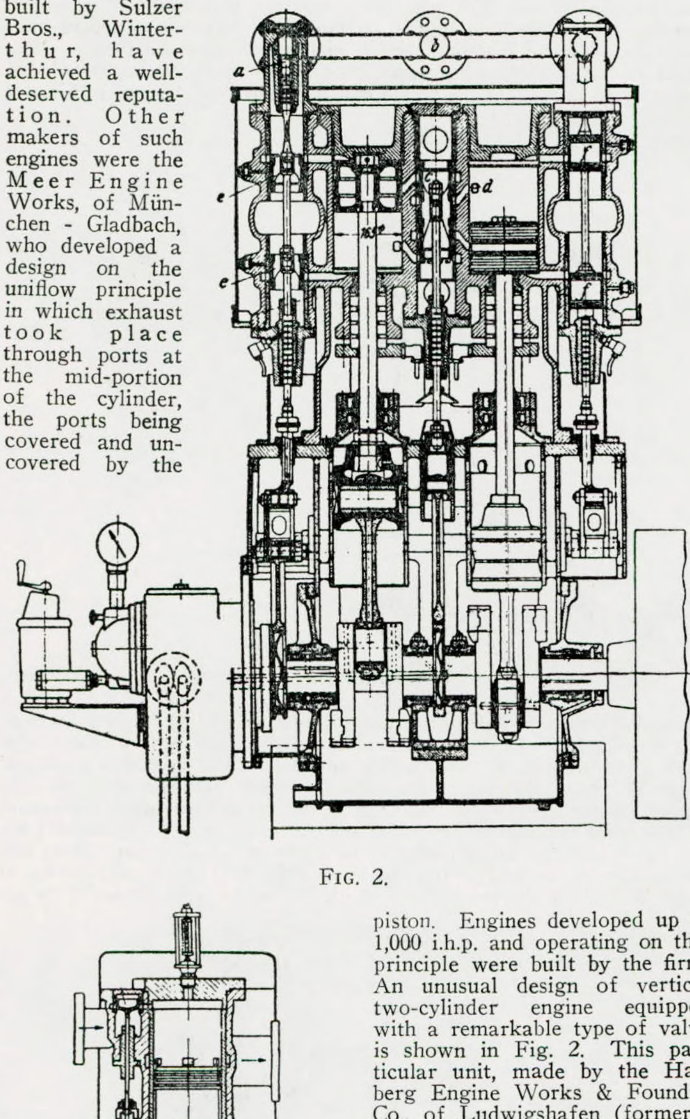


FIG. 2.

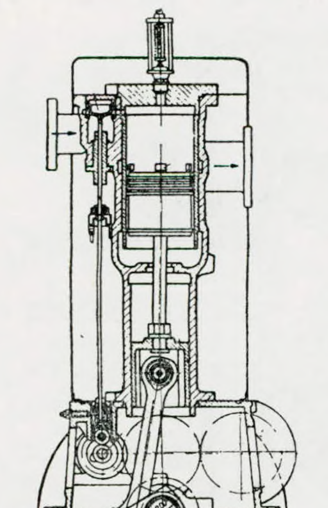


FIG. 5.

piston. Engines developed up to 1,000 i.h.p. and operating on this principle were built by the firm. An unusual design of vertical two-cylinder engine equipped with a remarkable type of valve is shown in Fig. 2. This particular unit, made by the Halberg Engine Works & Foundry Co., of Ludwigshafen (formerly the German works of Sulzer Bros.), is rated at 140 i.h.p. at 600 r.p.m. when supplied with steam at a pressure of 240lb./in.^{2} and temperature of 622° F., the back pressure being 7·1lb./in.^{2}. Engines of this design were built for outputs of 150 to 500 i.h.p. with speeds varying from 750 to 375 r.p.m., and having a cylinder bore of 6·5in. and piston stroke of 5·9in. The engine frame is of welded construction. Each cylinder has a separate inlet valve, but the exhaust valve is common to both cylinders. The efficiency of this engine is claimed to compare very favourably with that obtained by the use of poppet-valve gear. Yet another interesting type of vertical two-cylinder reciprocating engine with piston valves was built by Borsig, the back pressure being adjustable within very wide limits. An 800-i.h.p. unit of this type was built to run at 300 r.p.m. with steam at 165lb./in.^{2} pressure and 662° F. temperature. The cylinders have a bore of 16·14in. and a stroke of 16·54in. In order to secure perfect guidance of the piston, tailrods are provided. Several attempts have been made by various engine-builders to achieve high engine speed with single-acting engines by following the design principles of I.C. engines, and to make the fullest use of such features, the employment of trunk-type pistons were also attempted (Fig. 6).

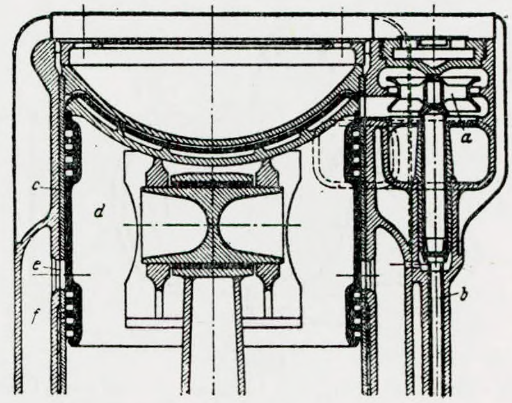


FIG. 6.

It was suggested that a special advantage of such a design would be the elimination of the piston-rod glands which are liable to give trouble in high-speed double-acting engines, but the wisdom of halving the cylinder output by resorting to the single-acting design, to say nothing of incurring the risk of water and oil leakage past trunk-type pistons, is open to question. It is therefore not surprising that very little has been heard of the actual introduction of trunk-type pistons for steam engines. The only serious proposal of recent times appears to have been the Lentz design of radial marine steam engine which received a good deal of publicity in the German technical press in 1940 (*described in abstracts in* TRANSACTIONS, *p. 125, August, 1940, and p. 17, March, 1941*). The M.A.N. "steam motor" shown in Fig. 5 appears to be a most reliable small vertical s.a. unit suitable for service where a simple but efficient small high-speed engine is required that demands a minimum of attention. The two-cylinder unit of this design illustrated has a continuous output of 145 i.h.p. at 1,000 r.p.m. when supplied with steam at 215lb./in.^{2} pressure and 570° F. temperature. The cylinders have a bore of $7\frac{1}{2}$in. and a stroke of $7\frac{7}{8}$-in. Steam admission is controlled by camshaft-operated piston valves, while the exhaust ports in the cylinders are operated by the pistons themselves, *i.e.*, the unit works as a s.a. uniflow engine. Proposals have also been made to solve the high-speed problem by increasing the number of engine cylinders in analogy with I.C. engine design, but the construction of small steam engines with 4, 6 or more cylinders is likely to remain an entirely uneconomical proposition. Attempts to employ shaft governors for high-speed engines have proved disappointing due to the fact that the effects of the forces of

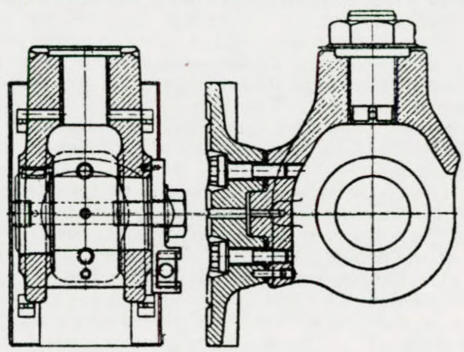


FIG. 7.

inertia of the governor system and its mechanical linkage become an important factor at high speed which makes accurate computation of the governor characteristics a difficult problem: while the carrying out of adjustments on the test bed or *in situ* is liable to be an expensive matter. Continental engine-builders therefore tend to employ oil-pressure-actuated control gear in which the actuating impulse is supplied by a small flyball-type governor. This oil-pressure control may operate either on the principle of variable-pressure control or on that of variable-quantity control, servo motors being used in either case. Very little has been done in regard to the use of light alloys for the moving component parts of reciprocating steam engines, but German designers have developed a crosshead in which light-alloy slippers are combined with a block made from a steel casting (Fig.7). This type of slipper is reported to work very well in conjunction with well-lubricated cast-iron guides. A German design of light-alloy eccentric strap is shown in Fig. 8. It will be noted that

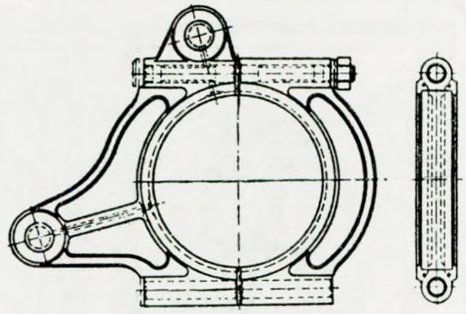
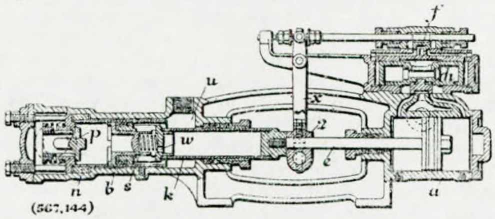


FIG. 8.

there is no whitemetal lining, this being considered superfluous in view of the good running qualities of light alloy on cast iron.—*"Boiler House Review", Vol. 59, No. 8, August, 1945, pp. 206-211.*

Reciprocating Pump.

A new British patent secured by a well-known firm of pump manufacturers in the Midlands, covers an improved design of small-size steam-operated pump which is primarily intended for use as a boiler feed pump. Referring to the accompanying sectional diagram,



it may be seen that a single casting is used to house the steam cylinder (*a*), the coaxial pump cylinder (*b*) and an intermediate part which can serve either as a bed or as a bulkhead bracket. A slide valve (*f*) controls the steam cylinder ports through an intermediate shuttle valve (*h*). The pump cylinder or barrel is provided with a liner in which the piston end of a tubular plunger (*k*) reciprocates. The plunger works through a gland and is connected to the end of the steam piston rod (*e*). A collar (*n*) on the liner is held against a shoulder at the lower end of the cylinder and the outside diameter of the liner is made rather less than the inside diameter of the pump barrel, so as to leave an annular clearance space between them. The end of the liner carrying the collar (*n*) is closed by a valve plate carrying a hollow spring-loaded suction valve (*p*), and the valve plate and liner are held in position by set screws in the cover plate closing the pump barrel. The space between the cover plate and valve plate forms a suction chamber. The piston end of the plunger (*k*) is hollow and carries a spring-loaded delivery valve (*s*). Openings in the piston wall form discharge ports through which water is pumped to a delivery chamber (*u*) formed by the adjacent end of the pump barrel (*b*). The main body of the hollow plunger (*k*) serves as an air chamber for smoothing out pressure pulsations in the delivery chamber (*u*), the connection to the air chamber being by a port (*w*) at the back of the delivery valve (*s*). The slide valve (*f*) is operated by a lever (*x*), which is pivoted on a bracket bolted to the valve chest of the steam cylinder. One end of the lever pivots on a coupling piece (*2*) on the piston rod and the other end lies between adjustable collars on the slide-valve rod. The steam cylinder is double-acting and the pump maintains a substantially even output.—*"Engineering", Vol. 160, No. 4,151, 3rd August, 1945, p. 100.*

Cargo Liners for the Anchor Line.

The Anchor Line recently took delivery of the 10,000-ton motor cargo liner "Egidia" from Lithgows, Ltd., who are now completing a sister ship, the "Elysia". The "Egidia" is a single-screw closed shelter-decker of 11,660 tons d.w.c., with three complete decks and six cargo holds, four of which are forward of the machinery space. The total cargo capacity (bale) is over 636,000 cu. ft. Over 2,000 tons of fuel oil can be carried in the D.B., wing and deep tanks, whilst the fresh-water tanks hold 535 tons. There is accommodation for 12 passengers (temporarily increased to 36) in eight staterooms and two private suites. The propelling machinery consists of a 6-cylr. Barclay, Curle-Doxford engine of standard design, the cylinders having a diameter of 670 mm. and a piston stroke of 2,320 mm. The rated output of 6,800 b.h.p. is attained at 116 r.p.m., giving the ship a speed of 16 knots, but the vessel can maintain a sea speed of 15 knots

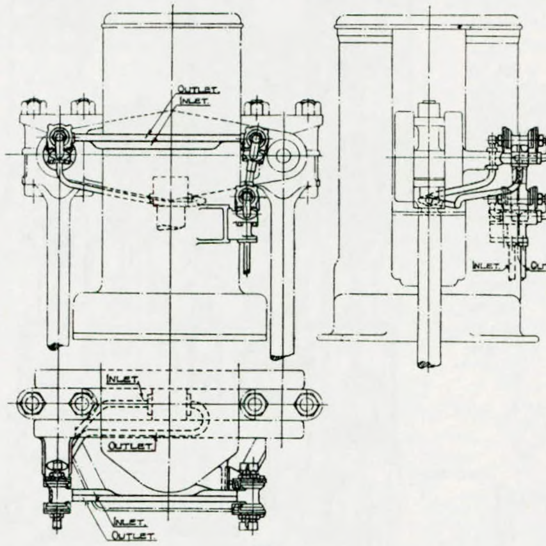


FIG. 1.

in loaded condition with the engine running at 110 r.p.m. and developing 6,000 b.h.p. It is stated that the daily fuel consumption under such conditions is 30 tons for all purposes. The engine is equipped with the new Barclay, Curle piston-cooling arrangements for the upper pistons. Details are shown in the accompanying illustrations, Fig. 1 being a sectional elevation and plan, and Fig. 2 a sectional view of the inlet and outlet connections. The distilled water enters the pistons and cylinders of the engine at 125° to 130° F. and leaves at 145° F., whilst the sea-water cooling circuit is approximately 5 per

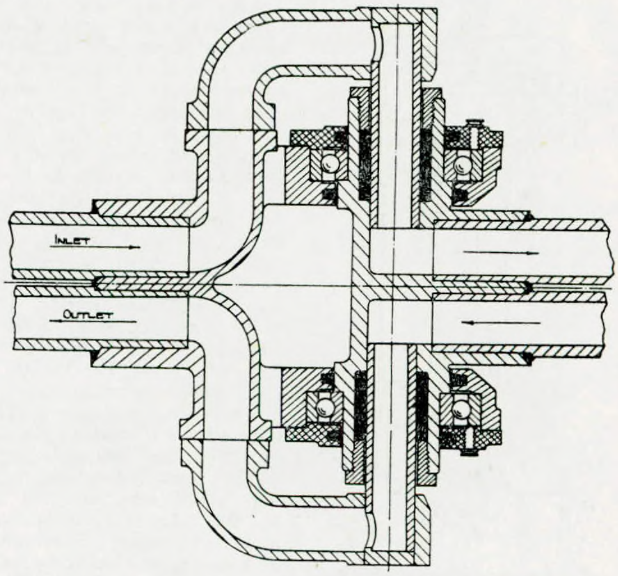


FIG. 2.

cent. lower in temperature. An exhaust-gas and oil-fired Cochran boiler supplies steam for domestic and heating purposes, but electricity is used for driving the deck machinery and E.R. auxiliaries, direct current at 220 volts being supplied by three 210-kW. generators direcly driven at 600 r.p.m. by 7-cylr. Allen Diesel engines. A 15-kW. Lister emergency generator set is also provided. The "Egidia" is now on her maiden voyage.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, pp. 146-154.*

Peace-time and War Service of Motor Liner "Reina del Pacifico".

The Pacific Steam Navigation Co.'s quadruple-screw motor liner "Reina del Pacifico" recently completed 1,065,000 sea miles since leaving the builders' (Harland and Wolff) Belfast yard in 1931. Approximately one-third of this mileage was covered during the 5½ years of war, throughout which the vessel was employed as a troop transport, carrying 150,000 British troops. She has a register of about 17,700 gross tons and is equipped with four sets of Harland-B. & W. s.a. 4-stroke Diesel engines of the trunk-piston type, supercharged on the Büchi system. Each engine has 12 cylinders, 630 mm. in diameter, with a piston stroke of 1,200 mm. The total power developed is 22,000 b.h.p., but as the ship can do 18 knots on 17,000 b.h.p., and a higher speed is not normally required, there is a good reserve of power and the propelling machinery operates under favourable conditions. As against this, the auxiliary machinery has frequently had to operate under very arduous conditions. Forward of the main engine room is an auxiliary-machinery room containing four 350-kW. Diesel generating sets, and all these are running for over 50 per cent. of the time. The engines are 6-cylr. Harland-B. & W. unsupercharged 4-stroke units with cylinders 330 mm. in diameter, the piston stroke being 680 mm. Aft of the engine room there is a refrigerating-machinery space containing three motor-driven CO_2 compressors. This plant has always worked satisfactorily, although the conditions have been such that for periods of about three weeks the sea-water temperature may not have been below 88° F. There are three Clarkson thimble-tube boilers in the ship. Two of these take the exhaust gases from the discharge side of the turbo-blowers of the main engines, whilst the third takes the exhaust gases from the auxiliary Diesel machinery. These three boilers are able to generate all the steam required for domestic purposes without the use of oil burners at speeds over 14 knots, but at lower speeds the exhaust-gas heating has to be supplemented with oil-firing. The only renewals that have been required for these boilers during the whole 14 years' service of the ship are five rows of tubes. The fuel expenditure at 18 knots, with the main engines running at 125 r.p.m. and developing 17,000 b.h.p., works out at 0·37-0·38lb./i.h.p.-hr. The lubricating-oil consumption is 80 gall. per day for all purposes, including 12 gall. per day of cylinder oil. This consumption for an installation consisting entirely of trunk-piston engines with 48 main and 24 auxiliary cylinders, cannot be regarded as unduly high. There are 10 centrifugal purifiers, including five Sharples machines for dealing with the fuel oil in the main engine room. Three De Laval purifiers are installed for the lubricating oil and two more Sharples machines for the auxiliary-engine crankcase oil. The fresh-water consumption of the ship under present conditions amounts to 100 tons per day. Between four and five years ago the renewal of the main-engine cylinder liners and jackets was commenced. Liner renewals were governed by the occurrence of external erosion and not by the cylinder liner wear. Due to the effects of salt-water cooling, considerable erosion has taken place where the bottom of the jacket is jointed by rubber rings on to the cylinder liner, and where this erosion has been excessive, the rings have been unable to withstand the circulating-water pressure, with the result that leaks have developed. As and when the opportunity has occurred, both the liners and jackets have been renewed on those cylinders where this trouble had arisen. So far 21 liners and jackets have been replaced out of the total number of 48 main-engine cylinders. The renewal of the liners will, however, soon have to be considered from the more normal aspect of internal wear, as some of them have worn nearly 5 mm. in the bore. A dozen pistons have been renewed, due to either wear or distortion. The wear has been normal for trunk-piston engines, but the distortion arose when some of the gudgeon pins which were too tight in their housings, were withdrawn. On the other hand, some of the pins have been slack, making it necessary to grind the housings and fit oversize gudgeon pins. Only two cylinder covers have been replaced, one having developed a small blow-hole in a fillet adjacent to an internal rib, which it proved impracticable to plug. The damage to the other cover was the result of an accident (in 1937) to the P. wing crankshaft, which arose from an accumulation of fuel oil in one of the cylinders that exceeded the clearance volume. The ship had anchored for a few hours at a West Coast South American port, and on starting, a heavy knock was heard in one of the after cylinders of the P. wing engine. An examination revealed that a fuel-valve spindle had remained in the open position while the engine was stopped, with the result that fuel oil under a pressure head had dribbled into the cylinder. The cylinder cover, piston, connecting rod and crank were badly damaged, the crank webs having turned on the shaft journals and the shaft running slightly out of truth. The ship completed the voyage to Liverpool at over 17 knots on three engines and subsequently proceeded for repairs to Belfast, where a new section of crank shaft for the P. wing engine was made and installed within two months. The ship's fastest run during the war was 498 miles in 24 hours, representing a speed of over 20 knots. At the present time the "Reina del Pacifico" is still in service as a troopship.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, pp. 160-161.*

The German Destroyer "Z 38".

The Narvik-class destroyer "Z 38" is one of four German destroyers recently brought over to this country. She is a vessel of exceptional size, power and speed, and might well be classed as a light cruiser instead of as a destroyer or flotilla leader. The ship was built by the Krupp Germania Yard at Kiel, and was completed in March, 1943. She is 410ft. in length, with a draught of 18ft. and appears to have a displacement of some 3,000 tons. The armament includes four 5-in. guns, two of which are in a twin turret forward and two in single mountings aft. The six 21-in. torpedo tubes are of the triple mounted type. The mine-rails on the upper deck will accommodate 80 mines. The propelling machinery consists of two sets of S.R. geared turbines in two engine rooms, of which No. 1 (starboard) is forward of No. 2 (port). Steam at a pressure of over 1,000lb./in.^{2} and 896° F. total temperature is supplied by six high-pressure natural-circulation watertube boilers of the Wagner type arranged in three boiler rooms. The boilers are of the double-ended 3-drum type, with a small steam-collecting drum above the steam drum. Each boiler is fired by two Saacke rotary oil burners, one at each end. The main body of the burner unit, operated by compressed air, rotates at 5,000-6,000 r.p.m., the oil fuel being discharged in the form of a finely atomised cone. The boilers work on the closed-stokehold system of forced draught. When the turbines are developing their normal power of about 70,000 s.h.p. and the propellers are turning at approximately 390 r.p.m., the steam pressure in the boilers does not exceed 1,100lb./in.^{2}, although any pressure up to 100 atm. (1,470lb./in.^{2} can be maintained if required. The full speed of the ship is 37-38 knots, but she can steam at 33 knots on four boilers and at 21 knots on two boilers. At 36 knots the fuel consumption is stated to be about 30 tons/hr. The economical speed is 17 knots (on two boilers), when the fuel consumption is 5 tons/hr. The total oil-fuel capacity is 1,820 tons. Oil, including turbine oil, is carried in D.B. and wing tanks, there being over 40 tanks in all. Each set of turbines comprises an H.P. ahead, an M.P. and an L.P. turbine, the latter being of the double-flow reaction type, with an underslung regenerative-type condenser . The H.P. and M.P. ahead turbines are of the impulse type and drive the main gear-wheel through pinions and idlers. H.P. and L.P. astern turbines are provided, the full speed astern being 220 r.pm. Each engine room contains two turbo feed pumps and an extraction pump, the feed pumps being of different sizes to suit various steaming conditions There is also an auxiliary turbo feed pump in each boiler room. The turbines and gearing are lubricated by a steam-driven rotary oil pump, with motor-driven auxiliary pumps for stand-by use. No. 2 engine room also contains a 250-kW. 230-volt turbo-generator which runs at 3,000 r.p.m. and a Diesel-driven generator. The latter is similar to three others installed in a Diesel room between Nos. 2 and 3 boiler rooms. These generators are 80-kW. machines direct-coupled to 6-cylr. M.A.N. four-stroke Diesel engines developing 123 b.h.p.. at 750 r.p.m. The engines are sea-water cooled. The steering gear is all-electric, the twin rudders being operated by a transverse drag link with power supplied by an electric motor, a second one being provided for stand-by duty. The bridge steering arrangements consist of a horizontal transverse bar, either end of which is depressed by the helmsman according to which way it is desired to turn the helm. Automatic controls of every kind are fitted throughout the ship and more reliance is apparently placed on these than would be considered desirable in a ship of the Royal Navy. During the latter part of the destroyer's passage from Wilhelmshaven to Portsmouth via the Humber, the whole of her machinery was operated by British engine-room artificers and stoker ratings, who quickly accustomed themselves to the E.R. conditions and unusual equipment.—*V. D. Wethered. "The Marine Engineer", Vol. 68, No. 817, August, 1945, pp. 405-408.*

Thirty Refrigerated Supply Ships.

During recent operations in the Pacific, the "Fleet Train" of the U.S. Navy included 30 small oil-engined refrigerated cargo vessels built during the past year in Pacific Coast yards. The design and dimensions of these craft are almost identical with those of the standard type of Tuna clipper, and it is claimed that they can be converted into fishing vessels in three days, if required. All the ships are constructed of Douglas fir with double fir framing and thick planking, and a one-piece keel. Their length b.p. is 128ft., with a beam of 29ft. and a draught of 12·9ft. There are four steel-lined wells and six wooden wells, the former being capable of use for dry or refrigerated cargo or fuel. Up to 250 tons of refrigerated cargo can be carried. There are two 16-ton fuel tanks forward of the engine room, aft of which are the 10 refrigerated cargo wells with access to the main deck through hatches. The shaft tunnel runs between these cargo wells and contains the refrigerating plant and various pumps. The propelling machinery consists of a 560-h.p. Union Diesel engine with fresh-water cooling. Electric current is supplied by two 125-kW. generators driven at 550 r.p.m. by Union Diesel engines. The complement of each vessel numbers 25 officers and men.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, p. 169.*

Wooden-hulled Minesweepers for Destroying Magnetic and Acoustic Mines.

The motor minsweeper (M.M.S.) "176" is one of a large number of such craft built during the war for the purpose of dealing with the magnetic and acoustic mines laid by the Germans. The vessel has a stout wooden hull 120ft. in o.a. length, with a beam of 22ft., a draught of 8ft. 6in. forward and 9ft. aft. She has a displacement of 200 tons and a speed of 10-10½ knots. The complement is two officers and 18 petty officers and men, including two enginemen and two stokers. The propelling machinery consists of an 8-cylr. Crossley engine, but Harland-B. & W. engines are installed in many other minesweepers of the same class. The engine cylinders have a bore of 10½in. and a piston stroke of 13½in. The output is 480 b.h.p. at 235 r.p.m., with a b.m.e.p. of 69lb./in.^{2} and a mean piston speed of 530ft./min. The average running time between refits amounts to 3,000 hours, and the practice at the expiration of this period, is to draw the pistons and adjust the air starting valves. The fuel control wheel is equipped with a chain-operated control worked by a duplicate wheel on the bridge, which is used during minesweeping. The engine-driven auxiliaries comprise a scavenging-air pump, circulating-water, bilge and lubricating-oil pumps, as well as an air compressor. The daily fuel consumption of light Diesel oil is 180 gallons for all purposes, while the lubricating-oil expenditure for the main and auxiliary engines amounts to 30 gall. a week. There are two fuel tanks forward of the engine room with a total capacity of 7,500 gall. and an emergency tank aft holding 350 gall. Although there are three auxiliary sets, only one is required for the ordinary service of the ship. The others are provided for charging the 200-cell battery which supplies the mine-exploding cables. The ship's set comprises a 28-b.h.p. twin-cylinder Crossley engine running at 1,000 r.p.m. and driving a dynamo, a general-service pump which can be used for supplying circulating water to the main engine if necessary, and a 2-stage air compressor of 26 cu. ft./hr. capacity. The two additional sets are 54-kW. generators driven at 1,600-r.p.m. by 6-cylr. Gardner Diesel engines rated at 67 b.h.p. Current is supplied at 220 volts throughout the ship. There is a powerful motor-driven anchor windlass on deck, which can also be used as a mooring winch.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, pp. 164-167.*

Drawbacks of the Shelter-deck Type of Vessel.

During the past six years practically all the cargo vessels built by British and American shipyards have been shelter-deckers, to the exclusion of the full-scantling, poop, bridge and forecastle ship. The open shelter-decker is eminently suitable for the carriage of cargoes having a stowage rate of about 60 cu. ft. to the ton, and by making the fullest use of the inconsistencies in the tonnage laws it is possible to attain a very low ratio of gross and net tonnage to deadweight. On the other hand, the open shelter-decker is not really suitable for the grain trade and definitely unsuitable for the coal trade. The second deck in the shelter-decker necessitates the fitting of a complicated system of hatch feeder trunks to the holds when grain is carried, and some regulations insist that grain should be carried in bags when it is stowed in a 'tween-deck space. Similarly, a second deck adds greatly to the cost of loading and trimming coal, and, in addition, the cubic capacity available in a shelter-decker is not required for a coal cargo stowing at the rate of something like 45 to 50 cu. ft. to the ton. Additional deadweight can, it is true, be obtained by closing the tonnage opening and thus gaining the increase in draught of some 18in. allowed by the present emergency, but this will involve a great increase in the gross and net tonnages when normal conditions are reverted to. The three-island vessel also benefits under the present tonnage regulations in that the erections are exempt from tonnage measurement if certain types of closing appliances are fitted to their end bulkheads. The present lack of full-scantling ships will enhance the value of this particular design, more especially as deadweight cargoes are likely to be available in quantity for some time to come. It is reported that several of the large cargo liners which are being ordered at the present time are to be vessels of full-scantling type.—*"Fairplay", Vol. CLXV, No. 3,250, 23rd August, 1945, p. 342.*

Speed Trials.

Speed trials are run to satisfy the shipowner that his requirements have been met, and to obtain data for the builders. In the past, however, sea trials of cargo ships often showed little more than that the engines could turn at the designed revolutions without anything going wrong, because they were run with the vessel in light condition. To secure any really important information, the trials must be run at fairly deep draughts, and this, except in the case of tankers, which can be ballasted easily, is generally difficult to arrange. The increased water-ballast capacity of modern cargo vessels has brought about a slight improvement in the position, but even here it is difficult to obtain sufficient immersion of the propeller to give consistent results. Deep immersion of the propeller in itself does not lead to high efficiency, but it does prevent the blades from breaking surface and drawing down air in a slight seaway, with a consequent loss of propeller efficiency. It has been suggested that where circumstances have not made it possible to arrange for a loaded trial when the ship is delivered to the owners—and the diminution in the number of outward coal cargoes has reduced the chances of obtaining a deep trial draught in a convenient way—the trials should be carried out at a later date when an opportunity occurs to determine the speeds and powers in the loaded condition. There are obvious difficulties in arranging for trials of this kind, but it would in many cases be well worth the trouble, and would have the additional advantage that the machinery would be run in by that time. Furthermore, such trials would lead to the interest taken by the shipbuilder in the ship being extended beyond the date of delivery. The contention sometimes put forward that where the requisite data for speed purposes has been ascertained by model tank tests, any subsequent systematic series of runs over the measured mile is a waste of time, is a complete fallacy. The tank tests merely ensures the correctness of the hull form and, possibly, that the propeller is reasonably efficient, but in most cases little else. In fact, generally speaking, all that is known is the power required to tow the bare hull, which is known as the *E* (effective) h.p., and from this the i.h.p. or power required to propel the hull, must be estimated. This can only be done with accuracy if a variety of trial results are available for analysis, as there are many losses which cannot be determined precisely. Obviously, results derived from first-hand information, such as are obtained by means of sea trials carried out in the loaded condition, are of more value in the case of a new design than any calculated or estimated data of the kind referred to.—*"Fairplay", Vol. CLXV, No. 3,247, 2nd August, 1945, p. 250.*

Floating Machine Shops.

The U.S. Navy has converted a number of modern cargo steamers and motorships into floating repair shops for service at advanced bases and with sea-going ships. These repair ships have separate shops for dealing with I.C. engines and general repairs, as well as machine shops, electrical, fitting, sheet-metal, coppersmiths', blacksmiths', welding, pipe, radio-repair and instrument-repair shops. Other equipment includes plate-bending rolls, shears, a heat treatment furnace and a brass-melting furnace. A powerful winch is installed at the stern of each repair ship for towing disabled vessels, and large motor launches are provided for transporting repair parties and materials to and from the warships. The repair ships have accommodation for crews removed temporarily from vessels under repair, as well as extensive hospital facilities. Various structural alterations had to be made in the ships adapted for service as repair ships. Masts were strengthened to take 25-ton and 10-ton derricks, and additional generators were installed. A 350-kW. generator provides current for the ship's repair shop services, whilst two 60-kW. and one 100-kW. generators are available for supplying current to ships alongside. There are three air compressors for the 100-lb. and 600-lb. air-pressure systems. The engine-repair and machine shops are equipped with 3-ton overhead travelling cranes, whilst monorail hoists of 1 to 3 tons' capacity are provided in the smaller shops. Ample storage space is available for steel plates, bars, pipes, timber, etc. Turbo-driven and Diesel-engine-driven fire and salvage pumps are provided in each repair vessel. The ship's complement of 600 officers and men includes all the skilled personnel required for operating the various repair shops.—*"The Engineer", Vol. CLXXX, No. 4,674, 10th August, 1945, p. 109.*

The Coasting Motor Vessel "Adaptity".

The fleet of F. T. Everard & Sons, Ltd., was recently increased by the delivery of the motor coaster "Adaptity", built by the Goole Shipbuilding and Repairing Co., Ltd., and engined by the Newbury Diesel Co., Ltd. The vessel has a d.w. capacity of 1,193 tons, with an o.a. length of 200ft., a beam of 33ft. and a moulded depth of 13ft. 11in. The loaded speed is 10·5 knots, as against 10·6 knots when the ship is in light condition, a remarkably small difference. The propelling machinery, which is placed aft, comprises a 600-b.h.p. oil engine, electric current and compressed air being supplied by two auxiliary engines of 40 b.h.p. and 20 b.h.p. The anchor windlass, capstan and 2-ton cargo winches are motor-driven, as is the telemotor-controlled steering gear. The "Adaptity" is claimed to be the first motor vessel of her class, designed for tramping service, to have a separate cabin for every member of her crew of 12. A sister ship, the "Actuality", will shortly be completed by the same builders.—*"The Engineer", Vol. CLXXX, No. 4,675, 17th August, 1945, p. 135.*

Steam Trawlers for South Africa.

Two steam trawlers have been built for Irwin & Johnson (South Africa) Ltd., Cape Town, for service in South African waters by Hall, Russell & Co., Ltd., Aberdeen. The new vessels, which are 160ft.×28ft.×15ft., are equipped with triple-expansion engines supplied with steam at 220lb./in.² pressure by a coal-fired Scotch boiler operating with forced draught. The air, circulating-water, feed bilge and general-service pumps are independently driven, and electric current at 110 volts is generated by a 10-kW. dynamo. The steam-operated steering gear is of the direct telemotor-controlled type. A steam and hand windlass is installed on the forecastle deck and a powerful steam-driven trawl winch is fitted amidships. The new trawlers have a bunker capacity of 186 tons, carry 82 tons of reserve feed water in their D.B. tanks and about 1,200 gall. of domestic fresh water. The capacities of the insulated fish room and offal room are 8,000 cu. ft. and 2,600 cu. ft. respectively, and there are liver tanks of 270 cu. ft. Comfortable living quarters are provided for a crew of 31.—*"Shipbuilding and Shipping Record", Vol. LXVI, 16th August, 1945, pp. 159-160.*

New Type Port Fireboats in Operation.

The latest type fireboats, built on the Thames for assembly at their scene of operations, have now been in service after successful trials on the Forth and Clyde. The boats are specially designed for estuarial duties and draw only 3ft. 6in., their length being 52ft. and beam 13ft. A special feature of the design is that the fire-pump suctions are taken from suction-inlet boxes inside the hull, instead of, as in earlier fireboats, through suction hoses slung overboard and liable to damage from collision and scorching. The hulls of the boats were transported to the ports overland and fitted out in three days by men of the S.-E. Fire Force. The pump-room, abaft the fore-deck, contains four pumps, set in pairs, with a total discharge capacity of 2,800-3,600 g.p.m. A central discharge pipe in the pump-room is led to the delivery heads and monitor. The power unit is a 6-cylr. oil engine developing 70-75 b.h.p. at 2,000 r.p.m. and giving the boat a speed of 10 knots. Each boat is provided with foam equipment for dealing with oil fires and carries a crew of one officer and five men.—*"The Dock and Harbour Authority", Vol. XXVI, No. 298, August, 1945, p. 93.*

Oil Tanker "Regent Hawk".

The steam tanker "Regent Hawk", recently completed by Swan, Hunter and Wigham Richardson, Ltd., for Trinidad Leaseholds, Ltd., is a single-screw vessel of 8,169 gross tons, with a d.w. capacity of 12,180 tons. She is 460ft. long b.p., with a moulded breadth of 54ft. and a moulded depth of 34ft. The maximum draught when fully loaded is about 27½ft. The hull is divided into 24 oiltight compartments by two longitudinal and nine transverse bulkheads. The total capacity of the cargo oil tanks is 530,501 cu. ft. There are two pump-rooms, with duplex steam-driven cargo oil pumps and a stripping pump. Electric current is supplied by two generators, one of which is steam operated, whilst the second unit is driven by a Ruston Hornsby Diesel engine. The propelling machinery, which is located aft, consists of a triple-expansion engine with cylinders 24½in., 40in. and 68in. in diameter and a piston stroke of 45in. The engine develops 3,600 i.h.p. at 106 r.p.m., giving the ship a speed of 12 knots, but the normal output at the service speed of 11¼ knots is 3,100 i.h.p. for 100 r.p.m. Superheated steam at a pressure of 220lb./in.² and total temperature of 565° F. is supplied by three oil-fired cylindrical boilers of the single-ended type, with Howden forced draught. A feature of the ship is the excellent accommodation.—*"The Engineer", Vol. CLXXX, No. 4,673, 3rd August, 1945, p. 100.*

Four New American Dredgers with Diesel-electric Machinery.

The Dravo Corporation, Wilmington, Delaware, recently completed four suction dredgers for the U.S. Army Engineers Corps. The vessels have an o.a. length of about 216ft., a beam of 53ft. and a loaded draught of only 12½ft. The propelling machinery consists of two 12-cylr. 950-h.p. two-stroke V-type General Motors Diesel engines directly coupled to two d.c. generators. One of these, rated at 565 kW. 600 v. and shunt wound for separate excitation at 240 v., is used for supplying power to the propulsion motors located in a W.T. compartment abaft the engine room and driving the twin propellers at 190 r.p.m. through S.R. gearing, whilst the second generator, rated at 310 kW. 240 v. and separately excited, is provided for driving the 420-h.p. motor of the twin-suction dredging pump. The 18-in. pump suctions are connected to drag pipes extending from each side of the hull under water and operated by two motor-driven winches. The two 20-in. discharge pipes from the pump run the full length of the eight hoppers, manually-controlled nozzles from these pipes leading into each hopper. Hydraulically-operated doors in the ship's bottom are used to empty the hoppers, the necessary 300-lb./in.² pressure being maintained by a motor-driven centrifugal pump. Auxiliary power is furnished by two 6-cylr. Diesel-generator sets, with one single-cylinder generator set for emergency use. Both the propelling machinery and dredging pump can be operated and controlled from the bridge. The new dredgers have a speed of 13½ knots in light condition and are able to do 11½ knots with a load of 700 cu. yds., the corresponding draught being only 8ft. 2in.—*"The Nautical Gazette", Vol. 135, No. 6, June, 1945, pp. 104-105.*

Cargo Steamship "Empire Malta".

The single-screw steamer "Empire Malta" is one of a class of eight such vessels built in Wm. Gray & Co., Ltd.'s West Hartlepool yard for the carriage of heavy and bulky military cargoes to North Russia. Known as "crane ships" of the so-called "Empire Heinz" class, these vessels form part of a series of similar craft which proved exceptionally useful during the war. The "Empire Malta", which is a typical example of such a vessel, is 312ft.×46ft.×24ft. 9in., with a d.w. capacity of 4,310 tons and a register of 3,539 gross tons. The full-load draught is only 20ft. 10in. The propelling machinery is aft and the capacity of the four cargo holds is 240,000 cu. ft. (bales). The cargo hatches are of exceptionally large size, No. 3 hatch being 40ft. 6in. long and 25ft. wide. The forward and after bulkheads of No. 3 hold have portable sections to P. and S., to afford access to Nos. 2 and 4 holds for the carriage, in the three holds, of locomotives, tanks and other bulky items of cargo too large for Nos. 2 and 4 hatches. The total water-ballast capacity of the peaks, double-bottom and wing tanks (in way of No. 3 hold) is 1,327 tons in addition to which 100 tons of permanent ballast is carried amidships. The cargo-handling equipment includes a 50-ton derrick (75ft. long) forward and an 80-ton derrick (also 75ft. long) aft. The eight steam-driven cargo winches are of the geared type. The propelling machinery consists of a triple-expansion engine with cylinders 20in., 31in. and 55in. in diameter, the piston stroke being 39in. Superheated steam at a pressure of 200lb./in.² is supplied by two oil-fired cylindrical boilers. The service speed of the ship is 11¼ knots on a daily fuel consumption of 15¾ tons.—*"The Shipbuilder", Vol. 52, No. 437, August, 1945, pp. 361-363.*

American Plans for Conversion of Liberty Ships.

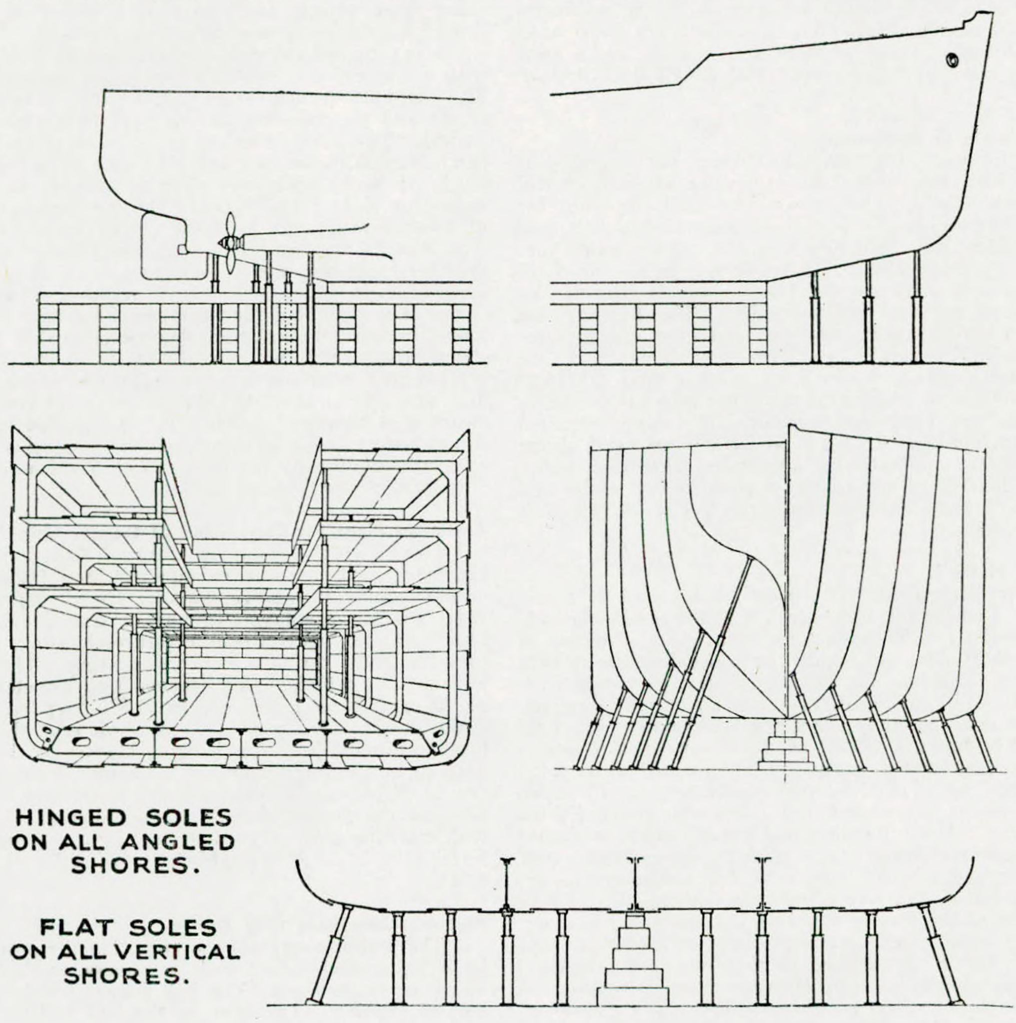
The Union Diesel Co., of Oakland, Cal., have put forward a proposal for replacing the existing oil-fired boilers and reciprocating steam engines of Liberty ships by Diesel engines. The design provides for an installation comprising two 8-cylr. four-stroke Union Diesel engines with Büchi pressure-charging, driving the existing propeller shaft through reduction gearing. These engines have individually cast cylinders 16in. (406mm.) in diameter with a piston stroke of 20½in. (520mm.) and develop 1,500-b.h.p. at 240 r.p.m., or some 2,000-b.h.p. at 320 r.p.m. The camshaft is at the level of the cylinder heads, as is the pressure-charging blower. A converted Liberty ship with such machinery would, it is claimed, have a daily fuel consumption of 13-14 tons of Diesel oil with machinery developing 3,000 b.h.p., whereas the present daily fuel consumption of a Liberty steamship with machinery of only 2,500 i.h.p. is in the region of 25-30 tons of boiler oil.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, p. 155.*

Post-war Merchant Ship Design.

The author expresses the view that the post-war cargo liner will be a shelter-deck vessel with one house amidships containing all the living accommodation. The hull frames will be fabricated structures, welded together. The form of the hull will be improved by streamlining and special designs such as the Arcform and Maierform will come into more general use. A wide application of light alloys to shipbuilding is not regarded as probable. Improvements in cargo-hatch covers, derricks and winches are suggested, motor-driven winches being favoured by the author. After a brief discussion of possible improvements in living accommodation, heating, ventilation and the design of the bridge structure, the question of speed comes under review. The respective merits of oil-burning steamships and Diesel vessels are briefly discussed, the last-named being favoured by the author, who then goes on to suggest that high speed will be essential because shippers prefer their goods despatched by the most speedy means, the sea time for long voyages, if cut by over a quarter with a consequent saving of running costs for that period, permitting the ship to make at least one extra voyage of three months in two years, the net earnings of which should go a long way towards meeting the higher first cost of the vessel. The saving in sea time would balance the higher fuel and running costs of the machinery. The author then declares that because the 27,000-ton Cunard White Star liner "Britannic's" four B. & W. Diesel engines developing a total of 20,000 b.h.p. give that vessel a service speed of 17½ knots on a daily fuel consumption of 75 tons, it should be possible to drive a post-war vessel of 10,000 tons at 22 knots by Diesel-electric machinery of the same power on a daily fuel consumption of 80 tons (=0·373 lb./b.h.p.-hr.). A brief discussion of the manifold advantages of the Diesel-electric system of transmission is rounded off by a lament that the "adherent" conservatism of the British marine engine designer will probably retard the development of this type of drive for some years.—*Paper by C. A. Hobson, "Journal of the Junior Institution of Engineers", Vol. 55, No. 11, August, 1945, pp. 301-308.*

Tubular Steel Telescopic Type Shores for Shipyard Work.

Tubular steel shores of the telescopic type were introduced about seven years ago and are now used in graving docks all over the world. An improved design, suitable for all classes of shipyard work, has recently been developed and is shown in the accompanying illustration. The advantages claimed for such shores are less handling, simplicity, greater strength and reliability, longer life, less stowage room, no cutting or wastage, less liability to injury, and less risk of fire. They can be used in bilges, holds, 'tween decks, under twin-screw bossing, and to support stems and sterns, in fact, everywhere in a shipyard, where shores are necessary. The shores are made to extend in steps of 6in. and of overall maximum and minimum lengths to suit any shipyard requirement. They are no heavier than wooden shores of similar lengths. These improved steel shores comprise two steel tubes, an outer and an inner, telescoped together, and held in position by a modified bayonet catch. One row of three recessed sockets is welded on to the inside of the end of the outer tube, and rows of keys, shaped to fit these recesses, are welded at intervals of 6in. on the outside of the inner tube. To adjust the length of the shore, the inner tube is withdrawn slightly, and then rotated until the keys clear the sockets, and is then simply pushed in or pulled out as required. The overall length of the shores obtained by the use of the keys is stamped on the tube above each upper key, thereby making it possible to set the shore to the exact length without measurement. In use, the load on the shore prevents the locking keys from disengaging, but a locking hook is fixed as a precaution against movement while the shores are being placed in position. The end of the shore next to the ship is fitted with a hardwood plug, which can be easily renewed, and the end which sits on the ground is fitted with a swivel end to allow the shore to be set to any required angle to support the load. Eyes are welded on to the shore to take ropes and drain holes are drilled to prevent water accumulating inside it. There are no loose parts, the shore being self-contained and quite simple to operate.—*"The Shipping World", Vol. CXIII, No. 2,721, 8th August, 1945, p. 153.*



TELESCOPIC STEEL TUBULAR SHIPYARD SHORES

Michell Bearing Lubrication System.

A recent British patent covers an improved method of lubricating Michell bearings by the provision of a rotating channel engaged

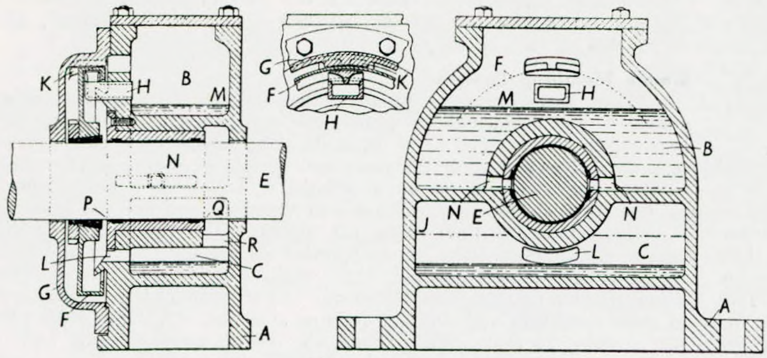
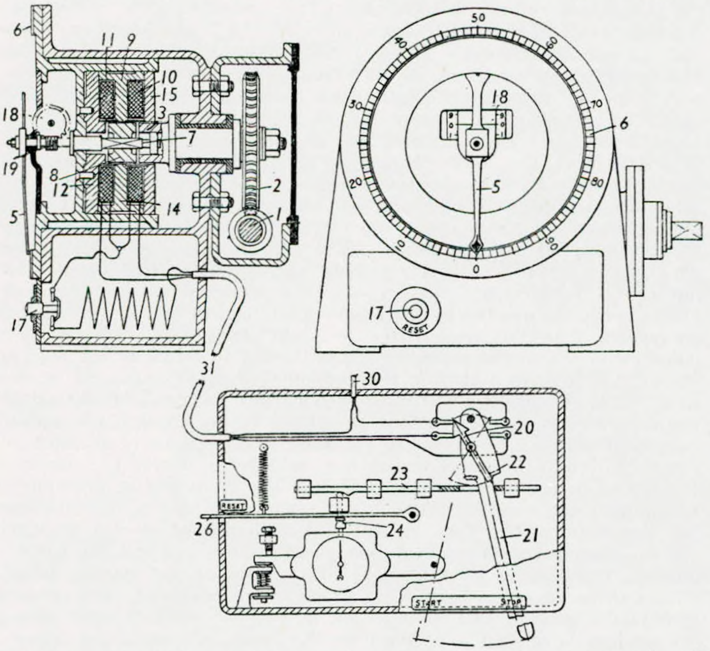


Fig. 4.

by a scraper, as shown in Fig. 4. The oil is transferred to an upper compartment and a constant gravitational head is maintained. The housing (*A*) incorporates a dividing wall which separates the lower compartment (*C*) from the upper one (*B*). The rotating channel (*F*) is fixed to the shaft (*E*) by a split tapered sleeve and a nut. A scoop (*H*) is secured to the housing and forms an outlet for the oil carried round by the rotating channel. When the shaft is stationary, the oil remains at a certain level (*J*) in the lower compartment, but as the shaft begins to revolve, the oil in the bottom of the cover (*G*) is lifted on the outer periphery of the rotating channel, from which it is deflected into the upper compartment by means of the scraper (*K*). The oil in the lower compartment flows through a passage (*L*) into the rotating channel, from which it is led, by means of the scoop (*H*), into the upper compartment. When it reaches a certain level (*M*) the lower compartment is empty, except for some residual oil in the sump. From the upper compartment the oil flows through ports (*N*) to the bearing surfaces, which it leaves at the ends (*P*, *Q*, *R*).—*"The Oil Engine", Vol. XIII, No. 148, August, 1945, p. 104.*

Vickers Revolution Counter for Measured Mile Runs.

The accompanying diagrams show the construction of an improved form of revolution counter for measured-mile runs developed and patented by Vickers-Armstrong, Ltd. With the usual type of

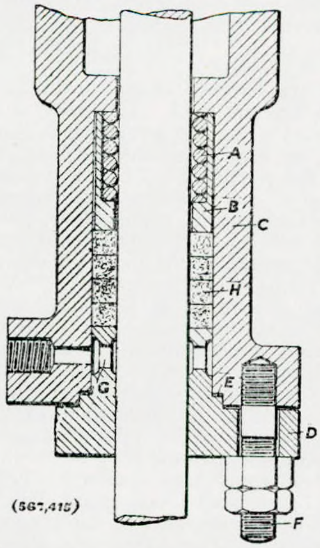


Vickers revolution counter and control unit for measured mile recording.

counter, the figures are continually moving and the time is taken by a stop-watch independently operated by hand, but with the new Vickers counter, the starting and stopping is automatically synchronized with the clock, while the time over which the count is taken may be varied to suit requirements.. Several counters can be operated simultaneously to obtain a record of the revolutions of the corresponding shafts during the same period of time. Referring to the left upper sectional diagram, the worm shaft (*1*) is driven from the main-engine shaft at, for example, one-fifth the engine speed. The worm-wheel (*2*) turns the spindle (*3*) at one revolution per 100 of the main shaft. Moving over a calibrated dial (*6*), the pointer (*5*) is secured to a spindle incorporating a square section (*7*) on which is a sliding armature (*8*). The annulus (*9*) round the armature forms part of an electro-magnet with spaced coils (*10, 11*) connected with opposite polarities, so that each coil destroys the residual magnetism due to the other. A plate (*12*) and the parts (*14, 15*) form the poles of the magnet and the device constitutes a magnetic clutch. When current is passed through the coil (*10*), the armature (*8*) connects the worm-wheel and pointer spindles, so that the pointer moves over the dial. Index drums (*18*) driven by worm gearing (*19*) from the pointer spindle, register the number of complete turns made by the pointer, while a push switch (*17*) is provided to break the electrical circuit and release the pointer for re-setting to zero. The control gear, shown in the lower diagram, includes a two-way switch (*20*) actuated by a lever (*21*) for closing the circuit to either coil of the magnet, the switch-arm being engaged by the projecting pieces (*22*). A sliding cam bar (*23*), inter-locked with the lever, operates the stop-watch control knob (*24*). An independent re-setting lever (*26*) is provided. Leads (*30*) are taken from the ship's mains to the two-way switch, and leads (*31*) connect the switch with the coils of the magnet. The control unit may be placed in the engine room and the lever moved on a signal from the bridge. In a twin-screw ship the pointers of both counters would commence to revolve and the stop-watch would simultaneously be started under the action of the cam bar. On receiving the signal that the run over the measured mile is completed, the control level is moved to the "stop" position and a reading of the revolutions and time is displayed, from which the r.p.m. are calculated. Alternatively, the control unit may be mounted on the bridge and the lever operated immediately the measured mile posts are in line.—*"The Motor Ship", Vol. XXVI, No. 307, August, 1945, p. 175.*

Fluid Pressure Stuffing-box for Pumps.

A recent British patent granted to G. and J. Weir, Ltd., covers an improved design of fluid pressure stuffing-box for use with high-speed reciprocating-plunger pumps. Experimental research has shown that if a stuffing-box is packed with more than two or three turns of packing, after a period of running, those in excess of two are loose in the box and contribute little to the seal value. The action that causes packing failure may be described as follows: on the discharge stroke of the pump, the discharge pressure presses the packing hard against the gland; under this pressure, the packing contracts in length but spreads laterally, being thus pressed between the stuffing-box and the rod, at the same time leaving a space between the inner end of the box and the packing. This lateral pressure sets up friction forces between the rod and the packing. On the return or suction stroke, the discharge pressure drops to suction pressure, but the friction forces persist, although the axial force on the packing has been relieved due to the fall in fluid pressure. Under the action of these friction forces the inner turns of the packing are drawn back by the return motion of the rod and thus become loose. The inner turns of packing in particular are thus driven axially to and fro in the box and, in the case of high-speed pumps, this action soon disintegrates the packing. The object of the invention is to overcome this trouble by the provision of a stuffing-box in which the packing is axially loaded by a spring fitted in a housing formed in a sleeve which is free to move axially within the stuffing-box, the axial length of the housing being such that the spring cannot be compressed solid. Referring to the accompanying sectional diagram, a compression spring (*A*) is housed within a sleeve (*B*) fitted within the inner end of a stuffing-box (*C*). The sleeve (*B*) is free to slide in the stuffing-box (*C*). The axial length of the housing presented by the sleeve (*B*) is such that if the packing (*H*) seizes on the rod, the spring (*A*) cannot be compressed solid. The gland (*D*) is non-adjustable and is fitted with a joint ring (*E*) to ensure that there is no leakage at the outer diameter of the packing. The gland (*D*) and gland studs (*F*)



(567,415)

are of such a length that, when the full number of turns of packing are inserted in the stuffing-box with the spring fully extended, the gland will enter the box by from ⅛in. to ¼in. with full nuts on the gland studs. This arrangement is claimed to ensure convenient and rapid packing of the stuffing-box. The gland is provided with a leak-off connection (*G*).—*"Engineering", Vol. 160, No. 4,154, 24th August, 1945, p. 160.*

Strain Measurement During Ship Welding.

A paper by W. V. Bassett on "Practical Electric-Resistance Strain-Gauge Procedures for Structural Tests on Ships", which are said to have given results accurate within ±500 lb./in.^{2}, was published in the May, 1945, issue of the *Bulletin of the American Society for Testing Materials.* The two fundamental test methods are: (*1*) to observe changes in strains due to operations producing strains in the structure, and (*2*) to measure relaxation of plugs trepanned or cut out from the structure after the operations are complete. The trepanning method has several advantages for shipboard work. For the accuracy required in structural tests, the resistance strain gauge and associated equipment are stated to be quite satisfactory as regards calibration and response. The versatility and convenience of the electric-resistance strain gauge make it particularly suitable for a variety of applications. In the form now most widely used it is also known as the bonded-wire strain gauge, which operates on the principle that the resistance for a metal wire changes with the strain to which it is subjected. The gauge consists of a length of alloy wire about 0·001 in diameter, bonded to thin paper in a pattern to provide a total length subjected to strain equal to several times the gauge length. When the gauge has been cemented to a structural member, the wire is rigidly constrained to undergo the same relative tensional or compressive change in length as the material to which it is attached. The somewhat small resistance changes due to strain can be conveniently and accurately measured by a suitable adaptation of the Wheatstone bridge circuit. The cement bond between the gauge and the metal can follow even plastic strains. Sources of error in structural welding tests are local strain effects, creep in the cement, insulation leakage, poor electrical connections, and temperature effects. These errors are minimised by suitable gauge distribution, cementing and waterproofing techniques, rugged wiring and connections, and correct temperature compensation. On outdoor work it is preferable to make strain readings at night when temperatures are more stable. Wiring problems have been eliminated on several projects by devising a mercury pool connector for making contact directly with the gauges. Several other devices and procedures have been developed to improve reliability of strain gauge readings and calculations. In the investigation resistance strain gauges have been applied to the study of welding stresses in sub-assemblies, ships under construction, and completed ships, as well as structural models. Launching stresses have also been measured.—*"Mechanical World", Vol. 118, No. 3,058, 10th August, 1945, p. 158.*

Spiral Welds in Pipes and Drums.

An article in a recent issue of the *Brown Boveri Review* and reprinted in *Combustion,* points out that in weld calculations, it is usual to assume a higher joint efficiency along the weld than perpendicular to it. On this assumption, inclination of the weld in the direction of stress should increase the permissible loads, and some firms have adopted spiral welds in pipe lines and drum construction for this reason. Tests on tensile bars and model drums show, however, that it is only with relatively low joint efficiencies and very small angles between the axis of the weld and the direction of the stress that any substantial increase in load can be carried. With a joint efficiency of 100 per cent., *i.e.,* a joint of at least the same strength as the parent metal, there is no justification for inclining the weld because the material ultimately breaks outside the weld and failure is therefore determined solely by the properties of the parent metal. On the other hand, with low joint efficiencies there may be a considerable gain in using a weld at an inclination to the direction of stress. It is only in the case of very low joint efficiencies, such as may occur where steels of high strength and poor weldability are employed, that any practical advantage can be obtained. Tests indicate that in the case of statistically stressed welds, slight defects such as pores or even slag inclusions have little effect on the strength under the conditions of testing employed.—*"The Power and Works Engineer", Vol. XL, No. 470, August, 1945, p. 191.*

The Proper Care of Lubricating Oil in Service.

This paper comprises a series of notes contributed by the Marine Lubricants Committee of the Petroleum Board on the handling of the three main types of lubricating oils used on board ship. These are classified as oils used with open reciprocating steam engines, turbine and enclosed crankcase oils, and Diesel crankcase oils. The notes cover the effect on such oils of heat and oxidation, cleaning, "laundering", suppliers' services, flushing, correct grading and package marking.—*"Transactions of the Institute of Marine Engineers", Vol. LVII, No. 6, July, 1945, pp. 77-79.*

Simple Metalling Devices.

When renewing the whitemetal bearings of a vertical pumping engine it was decided to save the time usually spent in scraping and bedding-on by using a press instead. The shells were cast in two separate halves and after the faces had been filled up square, they were soldered together and set up in a lathe in which the outer diameter of the complete bearing casting was trued up to suit the housing. A split clamp was then made for gripping the two halves of the bearing and holding them firmly together during the process of boring the internal diameter, which was made 0·010in. smaller than the actual diameter of the shaft journal. As it happened, the latter was in good condition and did not require attention. A taper steel plug was suitably hardened and ground, the bottom portion being 0·010in. smaller than the journal diameter, while the top portion was made to the exact size of the journal diameter. At the smaller end was a turned shank for use as a guide. The bearing, still gripped in the clamp, was then placed on a block on the table of a hydraulic press, at such a height that the plug could be pressed fully through the bearing. The action of forcing the plug through in this manner resulted in the production of a perfect surface, the whitemetal being compressed so as to increase its durability. A very small amount of fitting was needed, and the life of the bearing was increased considerably, warranting the adoption of the process for remetalling all the bearings in the engine. It is suggested that the employment of this method in works engaged on the assembly and production of machinery using whitemetal bearings would be advantageous, as standard size plugs could be made for the various diameters, one workman being appointed to do this work, which requires no special skill.—*"Mechanical World", Vol. 118, No. 3,057, 3rd August, 1945, p. 131.*

Babcock and Wilcox Engineering Training Scheme.

A brochure recently issued by Babcock & Wilcox, Ltd., gives particulars of the firm's scheme for training graduate engineers and student apprentices. A selection committee is responsible for the recommendation of young men for vacant appointments on the company's staff at home and abroad, and this committee is also the governing body for the training scheme. University graduates are classified either as graduate engineers, home, class "H", or overseas, class "O". An education officer in charge of the scheme and temporarily resident at Renfrew, interviews all class "H" graduate engineers and student apprentices. He will also periodically visit universities and technical colleges, and, in conference with engineering professors, will interview prospective engineering students. Graduate engineers, class "O", however, are appointed on the strength of recommendations from their own universities, or whenever possible, after an interview with the local representative of the company, who then reports to the education officer. Once a candidate is accepted, the selection committee direct the policy regarding his course of training and act in an advisory capacity during the time he is in the employ of the company as an apprentice. The training scheme covers three periods, the first of which is a probationary one of at least six months' duration. Written progress reports are rendered to the education officer every six months by the shop superintendent and by the student concerned. At the end of the probationary period the education officer will advise the selection committee as to whether the student shows sufficient aptitude for the section of industry covered by the firm, while the student will have seen enough of the fields served by the company to decide whether he wishes to go through the special course of training provided by the scheme. Until the expiration of the probationary period a young man will be at liberty to withdraw from the training course if he so desires, but thereafter he is required to complete the course. If the student appears to have a little aptitude for the work of the firm, it will rest with the selection committee and the student concerned to decide whether he is to specialise in production, engineering or sales. If at the end of the course, which covers three years (including the probationary period) in the case of graduate engineers and four years in that of student apprentices, the student is offered a position on the company's staff and accepts this, he will enter the third period of training which consists of one year spent with one of the firm's allied companies abroad. Student apprentices entering the training scheme after leaving school will be expected to qualify for the Higher National Certificate and, in the case of those showing special aptitude, for a university degree. Facilities for both are available at the Paisley Technical College, and special lectures on the products of the firm will be given in the works' lecture rooms. Four scholarships per annum for trade apprentices who have attained matriculation standard will also be awarded by the selection committee, to enable them to receive the full benefit of transfer to the student apprenticeship course.—*"Engineering", Vol. 160, No. 4,152, 10th August, 1945, p. 108.*