TECHNICAL ABSTRACTS

The following abstracts are reproduced from the "Journal of the British Shipbuilding Research Association," Vol. 8, *Nos.* 1, 2, 3.

PROPELLERS AND PROPULSION

Reaction Propeller. *World Shipbuilding*, **2** (1952), p. 151 (Nov.).

A patent has been granted for a Spanish propeller with hollow blades, the insides of which are formed as turbine-rotor surfaces. Water under pressure is forced via a hollow shaft through the passages in the blades to discharge through slots in the trailing edges, and so drives the propeller by reaction.

Twin-Screw Ships with Variable-Pitch Propellers. *Motor Ship*, **33** (1953), p. 445 (Jan.).

A patent has been granted for an arrangement of variable-pitch propellers in a twin-screw ship in which the screws, driven by non-reversible Diesel engines, rotate inwards for both astern and ahead motion of the ship. If, as is usual in twin-screw vessels, the propellers rotate outward for motion ahead, the steering during astern motion is stated to be unsatisfactory. The present arrangement ensures efficient steering astern as well as ahead.

WELDING AND OTHER METHODS OF CONSTRUCTION

Preconstruction Methods in Destroyers of the Royal Netherlands Navy. MUNTER, K. DE. *Paper read at the Plenary Session of the International Institute of Welding, Gothenburg*, Sept. 1952.

Electrically-welded ships' hulls may be made much lighter than the corresponding riveted constructions, provided that they are designed purely for welding and are not simply modifications of riveted hulls. This paper describes prefabrication methods adopted by the Dutch Navy for the hulls of welded destroyers. The Author gives some data on the chemical composition and strength requirements of the weldable low-alloy steel used in the construction, and then describes and illustrates the subdivisions of the hull and their assembly. Some constructional details are described and shown in sketches. Whenever possible, the crossing of the joints was avoided, and all corners of deck openings were well rounded off. The break of the forecastle was designed with particular care ; it had large radii of rounding off in a longitudinal direction and the upper side was also rounded off perpendicularly to the plate surfaces.

The data are somewhat restricted for security reasons.

Welding in Marine Engineering. PEMBERTON, H. N. *Proceedings, Institution Mechanical Engineers, Twenty-fifth Thomas Lowe Gray Lecture, read* 9 Jan. 1953.

The history of welding as applied to marine engineering is traced from the first example of hammer-welded boiler seams in 1870 up to the present day.

A survey is then made of the present uses of welding in the construction of marine-engineering equipment. Drums for marine boilers can be entirely welded, but the size is limited by that of the furnaces for the heat treatment necessary for relieving the stresses in the welds. Piping and piping layouts may be of welded construction, and fittings are specially manufactured for fabrication by units.

In the construction of Diesel engines, the use of welding for bedplates and other assemblies gives freedom of design and saving of weight. Welded construction is used extensively for large gearing, propellers, refrigeration plant, and dredgers. Research is needed to find the weldability of the alloy steels used in high-temperature installations, especially gas turbines, and to develop welds that will stand up to the high temperatures over a long period of time.

The paper concludes with a description of the application of welding to the repair of shafts, boilers, and crankshafts. The dangers of undesirable application of welding are emphasised, particularly the unauthorised use to cover up bad workmanship in the machinery, and examples of serious failure from this cause are cited. It is necessary to control all work strictly by radiographic means.

Many sea-going engineers are capable of carrying out welding repairs, and ships are often equipped with welding apparatus to enable repairs to be carried out at sea or in ports with poor facilities.

The paper is illustrated by diagrams and photographs.

SHIPBUILDING (GENERAL)

Four Ways of Building Plastic Boats. ALFERS, J. B. *Modern Plastics*, **30**, No. 3 (1952), p. 102 (Nov.).

The United States Defence Department has developed methods of making small boats out of plastics. Four methods of moulding hulls are described. Two involve a single mould : the hand lay-up and bag methods. Two involve two matching moulds : the injection and matched-die methods.

In the hand lay-up method, glass, wetted by a resin, is laid layer by layer in a mould (male or female) and pressure is applied by rolling and squeegeeing.

In the bag method, the plastic is compressed by a flexible pressure member, usually a bladder, operated by compressed air.

The matched-die high-pressure method has been proposed but not yet used for boat hulls. It is a repetitive method using a pair of matched moulds operated by a press.

The injection (Marco) method makes use of a pair of matched moulds of rigid, airtight construction. The glass fibre is laid in the mould, the assembly is sealed, and resin is drawn into the assembly by a vacuum pump. This method has been successfully used in the production of some two hundred 12-ft wherries, and several 26 ft whalers and 36-ft landing craft.

MATERIALS : STRENGTH, TESTING AND USE

The Effect of Shot Peening on the Fatigue Life of Steel. COOMBS, A. G. H. *Engineering*, **174** (1952), p. 545 (24 Oct.), and p. 580 (31 Oct.).

In modern engineering practice, shot-peening has become an effective method by which the fatigue strength of metal may be increased. Under the impact of the pellets, the surface layers of the material are caused to flow plastically, while the bulk of the material remains elastic. Compressive residual-stress systems of high orders are induced in the surface layers, while the relatively low balancing tensile stresses are spread over the core.

The experiments described in this paper form part of a research programme carried out at Nottingham University to investigate the effect of shot velocity, size, and energy on the penetration of the shot-peening effect. A number of heat-treated bars of spring steel were shot-peened, and then subjected to a polishing treatment which removed, in various degrees, the surface layers of the specimens. The bars were then tested in fatigue at constant stress, and the fatigue life was plotted against depth of removed material.

As the material was polished off, the fatigue life increased to a maximum and then decreased again to values similar to those found for un-peened polished specimens. The improvement of fatigue strength persisted to layers lying below the deepest pitting marks initially left by the shot. It is evident that shot-peening followed by the polishing off of peening marks is advantageous. Another important fact demonstrated by the tests is the detrimental effect of over-peening and the need for careful control of the peening process.

Recent Developments in the Machinability of Steel. WOLFE, K. J. B. *Institute of Mechanical Engineers, paper read* 21 Nov. 1952.

A description of the term " machinability " is given, and it is shown that the behaviour of the metal being machined, called " true machinability," and also the conduct of the tool, known as " cutability," are separate and distinct factors in the metal-cutting process. The action of cutting fluids is shown to be a modifying factor.

Recent work in the field of true machinability is described ; this includes a study of the effect on this property of hardness, rate of work-hardening, microstructure, manganese segregations, and the size of lead globules. The effects on surface finish of speed in turning, and some points of interest that arise under conditions of intermittent cutting, such as when shaping, are included.

Under new work on " cutability " is mentioned the modifying effect on that property of surface austenite, produced by grinding, and metallic segregations, as shown by micro-radiography. A general description is given of the properties and performance of milling cutters produced by a casting process. Developments in the field of cutting fluids are noted.

Future trends in the development of all the important fields of machinability are especially discussed, in view of the present alloy shortage. The use of ceramic materials and low tungsten and molybdenum high-speed steels as cutting-tool materials is mentioned, and also the application of new cutting techniques, such as the hot-spot and electro-erosion methods. Suggestions are made for improvements in both machining stock and cutting fluids.

Non-Destructive Testing of Materials. *Shipping World and Shipbuilding*, **127** (1952), p. 407 (19 Nov.).

Of the three commonly-used non-destructive methods of flaw-detection—X-ray, supersonic, and magnetic—the magnetic method has the advantages of simplicity, quick results, and low capital outlay. Research into magnetic flaw-detection by the Manchester Oil Refinery, Ltd., which had already produced an electro-magnetic flaw-detection ink called "Supramor" for magnetisable metals, and a fluorescent ink, "Glomor," for non-magnetisable materials, has now added a new fluorescent magnetic ink called "Lumor" for testing magnetic materials only. Its application is easy and can be extended to various objects without damaging their surface. The object is magnetised and smeared with ink; then under ultra-violet light the flaws, which may be as much as $\frac{1}{4}$ in under the surface, become clearly visible. The ink is supplied in two grades; one has a petroleum base, and the other has a non-petroleum base and may be safely used on rubber-bonded steel or cast iron.

BOILERS AND STEAM DISTRIBUTION

Steam Air Heaters for Marine Watertube Boilers. GLASS, W. J. S. *Transactions Institute Marine Engineers*, *paper read* 11 Nov. 1952.

The Author first points out the difficulties connected with gas air heaters. In such heaters having vertical tubes, large amounts of sooty deposits often settle on the top of the tube plate, which, when combined with moisture, choke up and corrode the tube ends and make frequent cleaning necessary. To prevent the gases from condensing on the metal, the heaters should be by-passed during periods of light steaming; but the arrangements designed for this purpose are often unsatisfactory. Gas air heaters with horizontal tubes are easier to clean and have a longer life, but they are considered to be more liable to fire.

In view of these difficulties, steam air heaters offer several advantages, mainly because both the air and the steam are clean. Also, while the rate of heat transfer from the metal to the air outside the tubes is the same in both cases, the corresponding rate of transfer from the condensing steam to the metal of the bore is considerably higher, and the overall rate of heat transfer is about doubled. If the outside surface of the tubes is extended by metal gills, the overall coefficient may be several times greater, so that the size of the air heater can be reduced. Compact design is further facilitated by the fact that no provision for cleaning need be made, and closely-spaced small-diameter tubes can be used. The tubes can be of non-ferrous metal, thus avoiding corrosion; but even with steel tubes, corrosion is not likely to be a problem. The steam air heater should be used in conjunction with an economiser.

Some details are given of the steam air-heater arrangement installed in five 28,000-ton American tankers (see Abstract No. 3223, Jan. 1950), which has given trouble-free service for the past three years. In a British development of air preheating by steam, there are two heaters in series and a two-temperature feed system. Details of various possible arrangements are given.

Some data are also given on steam air heaters for marine use now being produced in Britain. The cost of these units is approximately half that of gas air heaters of equivalent capacity, and their maintenance should be negligible. Graphs are shown relating the cost, draught loss, and outlet temperatures for two 66,000-lb/hr boilers, with the number of rows and tubes.

See also Abstract No. 164, June 1946.

The Thickness of Tubes for Watertube Boilers. CRANCHER, D. W. *North East Coast Institution Engineers and Shipbuilders, paper read* 30 Jan. 1953.

From a comparison of the thickness of boiler tubes required by different classification societies both in this country and abroad, it is clear that there is a wide difference of opinion concerning the optimum thickness of tubes for any particular diameter and pressure.

The purpose of this paper is to examine the factors affecting the thickness of boiler tubes and to suggest a rational approach to the problem. Tube stresses and heat transfer are considered, including non-uniform heating such as occurs in tubes subject to furnace radiation. The rules of the principal classification societies are briefly reviewed, together with other published work.

In a new approach to the problem, the Author defines the optimum thickness as that which will permit the maximum heat-absorption rate, for a given working pressure, without exceeding a safe working stress. This idea is developed at some length, one of the most important conclusions being that the optimum thickness occurs when the pressure and thermal stresses are equal, i.e. the total stress is twice the pressure stress. A simple design formula based upon this conclusion is suggested.

The work was carried out for the British Shipbuilding Research Association.

There are a number of references.

GAS TURBINES

The Boeing Gas Turbine. *Motorship*, **37**, No. 11 (1952), p. 24 (Nov.).

Some data are given of the Boeing Model 502 gas turbine, which is being developed for naval use. The data are based mainly on an experimental installation on a road truck and on a subsequent installation on board a U.S. Navy personnel boat. This model is also manufactured for use as a prime mover for electrical generators on board minesweepers.

The main particulars of the engine are :—

Length, width, height	40 in, 23 in, 22 in.
Maximum power	200 b.h.p. at 3,000 r.p.m.
Continuous power	175 b.h.p. at 2,750 r.p.m.
Weight, without accessories	200 lb.
Fuel consumption	1.3 lb/h.p.-hr.

The turbine will run on petrol, kerosene, jet fuel, or Diesel oil. It is expected that the high fuel consumption will be reduced by 35-40% without too much difficulty.

The engine is made up of two sections, namely the gas-producer section and the power section. The power section has a single axial-flow turbine wheel which drives the output shaft through a double planetary reduction gear. The compressor is centrifugal, single-stage. The operating temperature is 1,400°-1,500°F and the speed of the turbine wheel 36,000 r.p.m. The engine will run for 200 hrs without attention to the burners, and for a considerably longer period with minor attendance.

The troubles encountered in service were wheel distortion and rubbing, blade damage and cracking due to small foreign objects, and blade and disk vibration. The determination of the proper nozzle area also proved to be a difficulty. Considerable progress has been made in overcoming these troubles.

The Use of Residual Fuel Oils in Gas Turbines. DRAPER, P. *American Society Mechanical Engineers. Paper No.* 52-A-127, *read at Annual Meeting, New York,* 30 Nov.-5 Dec. 1952.

The major difficulty experienced in the combustion of heavy residual fuel oils in gas turbines is that of ash deposits on the turbine blades. This deposition occurs with all types of unrefined fuel oils.

In the course of work on the forms in which the major components of fuel-oil ash appear after combustion, a set of conditions was discovered in which practically no deposits were built up on turbine blading which would otherwise foul up quite quickly when that particular fuel was used. It was found that the exhaust gas contained carbon particles ranging in size from 5 to 50 microns, which represented a combustion loss of rather less than 1% by weight of the fuel, but which contained a high proportion of the total ash. It is considered that the formation of these spherical carbon particles may result from the following process : if the fuel droplets from the atomiser are of a certain mean diameter relative to a particular combustion chamber, the ligher fuel fractions will be evaporated off when the droplet is projected into the flame zone, but the heavier residual fractions may crack and leave a sphere of hard carbon, which will also contain the ash that has not volatilised. The carbon burns very slowly, and as it reaches the end of the flame it is quenched by the diluting air and thus carries the ash through the turbine in such a form that it cannot stick to the blades. These carbon particles may have a secondary effect in that they act as a mild abrasive for cleaning off any ash particles which have escaped from the carbon matrix and adhered to the turbine blades.

These carbon particles must be differentiated from the fine particles, ranging from 0.01 to 0.1 microns in size, which appear as smoke. These are too small to act as an abrasive, and would not be expected to contain any ash as they are produced by the chilling of combustion in the vapour phase. This carbon is also more sticky, and is therefore likely to adhere to heat-exchanger tubes if not to parts of the turbine itself.

There is a short bibliography.

DIESEL AND OTHER I.C. ENGINES

The Burning of Boiler Oil in Two- and Four-Stroke Cycle Diesel Engines and the Development of Fuel Injection Equipment. ARNOLD, A. G. *Transactions Institute Marine Engineers, paper read* 13 Jan. 1953.

A considerable number of motorships within the Author's experience have been successfully converted to the burning of boiler oil. The Author discusses the results of a number of these conversions, and he also describes one class that is being delivered from the makers equipped to burn this fuel.

The first vessels to be converted were the *Medon* (2,650 b.h.p.) and *Ajax* (8,600 b.h.p.), both fitted with four-stroke single-acting supercharged engines. The combustion was found to be good, the cylinder lubrication presented no lifficulties, cylinder-liner wear was not excessive, and the speed was increased. ɜreat economy was obtained in the running costs ; in six voyages the *Ajax* aved £65,000 on the fuel bill. During 4½ years' running on boiler oil, the nachinery of the *Medon* has performed well ; in that period, 46 compression ings, nine scraper rings, and six complete sets of crankcase diaphragm scraper ›acking have been supplied.

A considerable number of ships fitted with two-stroke double-acting engines ıave also been successfully converted, although it is harder to get good results rom these engines than from those of the four-stroke single-acting type. ᐧourteen vessels of the *Anchises* class fitted with eight-cylinder two-stroke louble-acting opposed-piston engines of 6,800 b.h.p. were converted success-ully to the burning of boiler oil. In these vessels, 75,372 tons of fuel were onsumed in 1951, and the saving on the fuel bill was £195,054. Further onversions are being arranged for the *Glenroy* class, also fitted with two-stroke louble-acting engines.

The main trouble in these two-stroke double-acting engine conversions has ›een an increased number of piston-ring breakages due to greater wear on the ylinder liners. This has been successfully and economically overcome by ›oring out the old liners when their wear exceeded the allowed tolerances, and itting oversize cast-iron pistons.

The ships of the *Bellerophon* class fitted with two-stroke single-acting engines re leaving the maker's yard equipped to burn boiler oil. The *Bellerophon* tself has had two years' service without any major trouble.

The Author considers that an efficient valve-cooling system is necessary to ›urn boiler oil successfully. In all cases, the fuel valves were cooled after onversion by an independent circulating system, using Carnea 15 Flushing Oil.

The *Alcinous* and *Ascanius* were successfully fitted with the Kyle Archaouloff njection system (see Abstract 6814, Nov. 1952). The elimination of camshaft ;ear, etc., reduced engine noise considerably, and the pilot injection used educed Diesel knock.

In order to clarify the oil, self-cleaning separators and magnetic filters were itted. The oil used had a maximum viscosity of 1,500 secs. Redwood No. 1 t 100°F.

The Author mentions that an auxiliary engine in the *Anchises* has been onverted to burn boiler oil, and has given good service.

The paper is illustrated by diagrams and photographs.

MACHINE PARTS

Fluid Piston Type Bearings. *Engineers' Digest*, **13** (1952), p. 370 (Nov.).

Latest designs of piston-type bearings include radial bearings as well as louble-acting thrust bearings. The radial bearing consists essentially of three ›r more pockets or pistons spaced around the circumference of the shaft. Each ›iston is a shallow rectangular box with an open end facing the shaft. Fluid ınder pressure is passed through an orifice into each box and exerts an inward adial thrust upon the shaft, holding it centrally in the bearing. In pumps, he special advantage of such bearings is that they can be lubricated by the luid being pumped, although it may have no lubricating qualities in the usual ense and may even be hot and corrosive. Moreover, the bearing may be made ›f materials which are selected purely for their corrosion resistance, and which vould be unsuitable in a conventional bearing. Metal-to-metal contact for hort periods can be tolerated, and foreign particles which would score an ›rdinary bearing need not necessarily affect the operation.

MARINE POWER INSTALLATIONS (GENERAL)

The First Atomic Ship—the Submarine " Nautilus." *Motor Ship*, **33** (1953), p. 395 (Jan.).

In the U.S., it is proposed to build two atomic-powered submarines of 2,500-tons displacement ; the first of these, the *Nautilus*, was laid down at the yard of the Electric Boat Co. in June 1952, and is expected to be launched in 1954. A second similar vessel is stated to be in prospect. According to an American publication, the *Nautilus* will have an atomic pile in which, through nuclear fission, heat will be generated and used to raise steam for a steam turbine coupled to an electric generator supplying power to propelling motors in the normal way. The atomic pile will be of moderate size, shielded by walls of lead several feet thick, and the reaction will be controlled by rods extending into the pile. A coolant, which may be mercury, will be circulated through the pile and will give up its heat to the steam in two vertical heat exchangers. If mercury is used, the mercury vapour will probably drive a mercury turbine, which will be geared to the steam turbine.

INSTRUMENTS AND CONTROL DEVICES

The Desilux Oil Pressure Alarm. *Shipbuilding and Shipping Record.* **80** (1952). p. 742 (4 Dec.).

In Diesel-engine installations it is important that the lubricating oil should be maintained at its correct pressure, and it is advisable that the operator should not have to rely solely on the pressure gauge to ensure safety of the oil supply. The Desilux oil-pressure alarm, briefly described and illustrated in this article, consists of a die-cast bronze cylindrical body fitted with two pipe unions, one connected to an air bottle or other source of compressed air, and the other to the oil circuit of the engine. Inside the body is a diaphragm which moves up when the oil pressure is too low, and thereby opens a ball valve admitting compressed air to the lower part of the body. This air then flows through the hooter which sounds the alarm. The Desilux alarm is manufactured by C. V. Desiderio, London, primarily for use with Diesel engines, but it could be applied to any other purpose in which warning is required of a reduction in pressure.

VIBRATION AND SOUND-PROOFING

Torsional Vibration in Diesel Engines—Some Observations and Practical Aspects. BRADBURY, C. H. *Diesel Engine Users Association, paper read* 20 Nov. 1952.

This paper discusses the torsional vibration of Diesel-engine crankshafts in the light of present knowledge of the subject. Such vibration is due primarily to the action of a periodically varying cylinder torque on an elastic shaft system, which itself has one or more inherent natural frequencies. These frequencies depend on the mechanical properties of the shaft and the number magnitude, and distribution of the attached masses. The cylinder torque is made up of a large number of harmonics, and when the shaft is rotating at a speed such that one of these harmonics synchronises with one of the natural frequencies of the shaft, the system resonates and is said to be in a critical speed. The amplitude of the vibration is then limited only by the amount of damping present in the system, and, if the damping is insufficient, the shaft will break.

The Author explains the modes of vibration of multi-cylinder Diesel-engine shafts, and he plots the normal elastic curve, phase diagrams, and critical-speed spectrum for a six-cylinder Diesel engine. He quotes the best formula for the reduction of an actual crankshaft system to a mathematically equivalent simpler system, and he shows how the natural frequency of the shaft and the normal elastic curve can be found by Gorfinkel's method. Because of insufficient knowledge, the amplitude of vibration in a critical speed cannot at present be calculated accurately, but an approximate formula is given.

The calculation of stresses in the crankshaft is discussed, and some experimental results obtained by strain gauges are presented. These show that the full torque passes through the crankpin. The main points of stress concentration in a Diesel crankshaft are in the fillets where the pin and journal join the webs, and where oilways break through on to the surface. As regards the limiting stresses, well-designed crankshafts can operate indefinitely at 2.5 ton/sq. in. in the shaft. Photographs illustrating typical fatigue failures due to torsional vibration are shown.

The Author discusses damping in Diesel crankshafts, and briefly reviews the work done in this field. It is widely believed that the damping is viscous and largely due to the motion of the journals in the oil bearings. Certain other peculiar effects of this motion are mentioned.

Finally, an American type of silicone vibration damper, which is now manufactured in Britain and shows much promise, is briefly described and illustrated. The beneficial effect of such a damper fitted to an engine is shown on a graph.

CORROSION, FOULING, AND PREVENTION

Cathodic Protection Against Corrosion. PORTCH, G. G., Comdr., R.N.R. (Ret.). *Petroleum Times*, **57** (1953), p. 69 (23 Jan.).

In this general review of the subject, the Author discusses corrosion due to the galvanic action between different metals. The protection of structures against corrosion of this nature by means of an impressed D.C. current or by means of a sacrificial anode is described. The protective current required can be calculated, and the current supplied should not exceed a certain figure, since otherwise free bubbles of hydrogen may form under the protective skin, and have the effect of stripping the paint. Where the resistance of the circuit varies widely, as in an estuary where sea and fresh water alternate or where the area of the structure to be protected decreases as the tide falls, it will be necessary to incorporate special circuits which control the current and maintain it at the required value.

The Work of the Protective Coatings (Corrosion) Sub-Committee. FANCUTT, F., and HUDSON, J. C. *Journal of the Oil and Colour Chemists' Association*, **35,** No. 386 (1952), (Aug.).

The Authors survey the results of twenty years investigations into the efficacy of protective coatings for structural iron and steel, carried out by the British Iron and Steel Research Association. Since 1935, this work has been in the hands of the Sub-Committee mentioned in the title of the abstract, and some details of the organisation and development of this body are given. Its major research items are divided into the following groups :—

Protection by means of Paint. The results of early work show that the method of surface preparation adopted for painting is the most important single factor determining the life of the surface. Specimens with clean unrusted surfaces from which millscale has been removed by picking or sandblasting gave best results. Some details are given of subsequent tests designed to study surface preparation in greater detail. The latest research schemes are concerned with the formulation of priming paints, the use of metallic pigments and lead soaps in priming paints, surface preparation and the formulation of priming paints for application over metallic coatings, and bituminous and tar paints. The tests are not yet completed, but some interim results are given.

Protection by means of Metallic Coatings. In 1940, the Sub-Committee began an extensive investigation in which coatings of aluminium, zinc, cadmium, tin, lead, zinc-cadmium alloy, and lead-tin alloy were applied by a variety of processes to heavy mild-steel plates. Zinc coatings proved superior to aluminium coatings with specimens immersed in sea water, but sprayed-aluminium coatings seemed to be particularly valuable in humid and polluted atmospheres where zinc coatings have often a limited application because of the deliquescence of the zinc corrosion product. Lead coatings gave good results only in an industrial atmosphere where they become covered with a protective sulphate film. Further reports of these tests will be published later.

Protection by Miscellaneous Coatings. A limited amount of work on protective coatings other than paints and non-ferrous metals has shown that vitreous enamel is valuable, but its application involves heating which produces distortion of the base plate and other complications ; also, the coating chips easily.

The Authors indicate fields of study in which further research would be desirable, namely surface preparation of metallic coatings for painting, blistering of paint films, phosphate coatings, and plastic coatings.

There are references.

The discussion that followed the paper is summarised.

New Method of Preventing Corrosion. *Motor Ship*, **33** (1952), p. 362 (Dec.).

A rubber-like plastic and self-vulcanising paint, called " Peratol ", has been developed for application to cast-iron or steel engine components or structures on board ship to prevent corrosion. This substance has also been tried as a treatment for the external surfaces of cylinder liners for marine Diesel engines to prevent erosion.

Peratol and similar substances have been applied on the cast-iron end doors of lubricating-oil coolers, and on areas of a propeller where serious pitting had occurred.

OPERATION AND MAINTENANCE

Some Unusual Ship and Machinery Defects, Their Investigation and Cure—A Symposium of Short Papers. *Transactions Institute of Marine Engineers, paper read* 9 Dec. 1952.

The following papers were presented :—

1. *Introductory Cases* (HOLLAMBY, A. E., Comdr. (E), R.N.) deals with defects in steering gears, a turbo generator, and a Diesel generator.

2. *Soot Fire in a Marine Boiler Air Heater and Economiser* (SAMPSON, W.), describes a localized burn-out of some tubes fitted with aluminium gills.

3. *Failure of Superheater Tubes* (SAMPSON, W.). The failures were due to solid concentrations in water, and to bad steam distribution.

4. *Steam Drum Failure* (HARVEY, W. R.) describes blistering and cracking of steam drums thought to be due to overheating.

5. *Complete burn-out of boiler, superheater, and air heater* (HARVEY, W. R.).

6. *Defects in Shafting and Hulls due to Vibration* (Bunyan, T. W., and Hildrew, B.). Three cases are described : one deals with engine-excited hull vibrations ; the second with tail-shaft liner troubles produced by transverse vibration of tail shafts leading to erosion ; and the third with transverse tailshaft vibration due to inadequate propeller aperture clearances.

7. *Machining a Large Crankshaft in Place* (Wheadon, H. J.). Turning a damaged crankshaft, using the engine bedplate as a lathe.

8. *Repair to a Damaged Main Engine Crankpin* (Baker, L.). Turning a damaged crankshaft pin in place.

9. *Temporary Repairs to Main Engines* (Aitkin, A.). Emergency repair to a fractured crankshaft.

10. *Season Cracking in Freon Gas Condenser Tubes* (Baker, L.). Failures due to polluted sea water.

11. *Condenser Defects* (Aylen, Comdr. (E), R.N.). Describes various tests on leaky condensers.

12. *Emergency Action in the case of a Serious Turbine Breakdown* (Wheadon, H. J.). Use of a left-handed propeller driven by the astern turbine.

13. *Stern Gland Packing* (Baker, L.). Failures in several types of stern-gland packings.

14. *Turbo-Feed Pump Defect* (Havergal, C. R., Comdr. (E), R.N.). Defect due to a bent shaft. Damage caused by excessive overheating at one point.

15. *A Repair to a Rudder Pintle Bearing* (Smith, A. F., Comdr. (E), R.N.). An improvised method of machining a worn rudder-pintle bearing.

MISCELLANEOUS

Cutting with Gas-Propelled Abrasives. *Engineers' Digest*, **13** (1952), p. 371 (Nov.).

A new method of cutting with gas-propelled abrasives has been developed, which provides a quick and accurate means for high-precision operation, such as the removal of metallized films from glass and ceramics, drilling thin sections of materials which are hard to work, etching and polishing. The abrasive jet, which normally consists of processed aluminium-oxide powder propelled by any dry inert gas such as carbon dioxide, is directed against the workpiece through a sintered-tungsten nozzle, and cuts the surface without the usual heat generation and vibration experienced with other cutting methods. Although hard and brittle surfaces are cut easily, the jet has practically no effect on resilient or soft materials such as rubber, cloth, and certain types of plastics.