TECHNICAL ABSTRACTS

The following abstracts are reproduced from the ' Journal of the British Shipbuilding Research Association,' Vol. 8, Nos. 9, 10, 11.

SHIP RESISTANCE AND FLUID MOTION

Why Ships ' Squat '. *Ship's Bulletin*, **33** (1953), p. 16 (May–June).

This article reviews investigations made at the U.S. Navy Model Basin and elsewhere into the increase of draught which is observed when ships steam in a narrow channel in shallow water. It is shown that the passage of the vessel causes a depression of the water level in the water immediately surrounding the ship ; the ship as a result ' squats ' or floats at a level below the level of the undisturbed water. Relations between the ' squat ' and speed are shown, the rate of increase of ' squat ' becoming greater at higher speeds. In general, the ' squat ' for any given speed varies inversely as the depth of water under the keel. It is also shown that for a given power the speed of a vessel decreases with a decrease of depth under the keel. For ocean-going ships of about 10,000 tons d.w. this effect is quite marked for depths of 25 ft or less under the keel.

PROPELLERS AND PROPULSION

The Costa Propulsion Bulb. *Motor Ship*, **34** (1953), p. 162 (July).

The United Baltic Corporation's new motor ship, the 2,500-ton *Baltic Exporter* was provided with a Costa propulsion bulb fitted to the rudder. Sea trials of the ship were undertaken in ballast condition, first without the bulb, and then with it. Details of these are given. The tests show that a 2–3 per cent gain in speed can be obtained by the use of the bulb. With the bulb, there is a reduction in the r.p.m. because the propeller operates in more compact water, and this can be considered an advantage to the whole machinery installation. The results suggest that the gain in speed is greater at lower speeds, as at 18 knots the advantages of the bulb tended to diminish.

See also Abstract No. 7583 (June 1953).

BOILERS AND STEAM DISTRIBUTION

A Dry Cleaning Method of Soot Removal from Heating Surfaces. *Engineering and Boiler House Review*, **68** (1953), p. 242 (Aug.).

The Broman Steel Shot Cleaning System is described. In this system, steel shot are distributed by rotating spreaders which are located just above the surfaces to be cleaned. The shot fall by gravity, and in their passage across the heating surfaces remove any scale or ash deposits. The shot and the dislodged deposits fall into a hopper and are thence carried to a separator, the shot returning for further use in the cleaning process.

The system was originally developed for use in chemical plants but it has been adapted for use in boilers. The use of shot cleaning for two periods of twenty minutes each every 24 hours has been found to keep a boiler plant burning heavy oil free from deposits. It was previously necessary to shut down this plant every three weeks to enable external cleaning to be done manually.

See also Abstract No. 7157 (Feb. 1953).

Boiler Cleaning by Air. *Shipping World*, **79** (1953), p. 165 (26 Aug.).

The Babcock-Diamond air-puff soot blower is now being manufactured in this country by Dewrance, Ltd. for Babcock & Wilcox. This system employs air at 125 lb/sq in and it is so arranged that each of the blower elements produces in turn a series of ' puffs ' of one second duration. During the ' puff ' the blower is rotated through $17\frac{1}{2}°$; it then remains stationary for one minute while the air receiver is recharged, and then blows again and again rotates. This is continued until the blower has completed 360°, when the next blower in the sequence operates similarly. After the last blower has been operated, a whistle blows until the air supply is shut off by the operator. The blowing cycle is spread over 3 to 4 hours, according to the number of blowers ; there is thus no soot nuisance on deck or disturbance of boiler operating conditions. The use of air instead of steam affords a valuable saving of feed water and shows a thermal gain over a steam system.

See also Abstract No. 7405 (April 1953).

GAS TURBINES

Further Research on Marine Gas Turbines. *Oil Engine and Gas Turbine*, **21** (1953), p. 66 (June).

This paper describes the work done during 1952 on the original 3,500-s.h.p. gas-turbine set at Pametrada. Results obtained when operating the plant under different conditions are shown graphically. In spite of various material and mechanical difficulties, experience in the operation of the plant on residual fuels was gained. The fuel used was the Admiralty reference residual fuel ' Mothball,' to which was added a solution of magnesium acetate which had proved the most successful of a number of corrosion inhibitors tested. Heavy fouling of the turbine blades resulted, however, and after 84 hours running the swallowing capacity of the H.P. turbine was reduced to 20 per cent and the H.P. compressor surged. The severe fouling of the blading shows the fundamental difference between the prevention of corrosion and the prevention of deposition.

Some details are given of a new single-stage liquid-cooled gas turbine to run at 1,205°C (2,200°F), which is being developed at Pametrada and is sponsored by the Admiralty. The water-cooled casing will be of light alloy lined internally with refractory material. Ceramic nozzle blades will be used and the rotor blades will be liquid cooled. The combustion system has four combustion cans exhausting into a common mixing space. The aim of this is to obtain uniform temperature distribution without having to match the sprayers accurately. Moreover, one or more sprayers may be closed down without detrimental effects. Experimental work is being done on ceramic blades some of which have successfully withstood a stress of up to 2,000 lb/sq in at the temperature quoted. The danger period seems to be when the blades are warming up. The use of hollow blades is being investigated. As an alternative to ceramic nozzles, sweat-cooled blading with air as the coolant is being studied in theory and practice.

See also Abstract No. 6805 (Nov. 1952).

MARINE POWER INSTALLATIONS (GENERAL)

General Considerations in Naval Shipboard Power Machinery Development. JACKSON, I. E. *Journal of the American Society of Naval Engineers*, **65** (1953), p. 287 (May).

The requirements for naval machinery are set out. To the usual requirements of reliability and economy of weight, space, and fuel consumption and the ability to operate under heavy shock and in a damaged listing ship, the author adds the need for interchangeability of parts and a satisfactory system of identification of all parts for ease of supply from distant parts of the world.

The application of the gas turbine to naval use is taking time, while its application in the aircraft world has been revolutionary. Much progress has been made, particularly in Britain, but there are still problems to be solved. The major development problems include :—

(1) The use of heavy residual fuels.

(2) The incorporation of turbine-blade cooling.

(3) Development of a compact heat exchanger.

The possibility of a combined steam and gas-turbine installation is considered.

Nuclear power-plant development has reached the point where adequate design data are available. It now remains to put this into practice, and the U.S.S. *Nautilus* has been laid down to be the first nuclear-powered vessel (see also Abstract No. 7302, March 1953). The use of nuclear reactors for the production of power presents a number of problems, not least among which is the choice of a suitable cooling medium.

A development programme is adequate when it produces results which satisfy specified requirements. The objective must also be reached within reasonable estimates of time, cost, and effort. The considerations which have to be taken into account in planning such a programme are discussed. It is clear that there is no single general-purpose power plant which will meet all naval requirements.

DIESEL AND OTHER I.C. ENGINES

Deltic Engines for Cross-Channel Services. *Shipbuilding and Shipping Record*, **82** (1953, p. 284 (27 Aug.).

It is proposed to install four Napier Deltic marine Diesel engines, developing together 6,900 b.h.p., in cross-channel passenger-cargo ships with twin screws. Although primarily designed to develop 2,500 b.h.p. for use in high-speed craft, each engine would be derated to 1,725 b.h.p. It is thought that if the propelling machinery of a fleet is standardized on a single cylinder size, spares and maintenance problems will be simplified. A saving of 52 per cent space in the engine room will be effected, whilst the saving in weight of propelling machinery is calculated at 343 tons. The engine builders have organized a comprehensive servicing system by which replacement engines can be installed at any suitable dockyard in the world, the operation requiring only 12 hours compared with two to three weeks for overhaul of direct-coupled machinery.

The engines are coupled in pairs through fluid couplings and reverse-reduction gears to the two shafts. Vibration is reduced by the small size of the cylinders, and, since the engine fires every 20°, smooth running is achieved. The cost of the installation is estimated at £21 per b.h.p.

See also Abstract No. 7644 (June 1953).