FLEXIBLE BULKHEAD GLANDS.

Cases of serious flooding have occurred due to bent shafts or distorted bulkheads causing leakage at the bulkhead glands. To overcome this difficulty two types of flexible glands were introduced which allow for a certain amount of distortion of the bulkhead or shaft or both. The Vickers type consists of a short tube concentric with shaft and secured to the bulkhead at one end by a spherical joint. The other end carries another spherical fitting containing a white metalled bearing which fits into the shaft. Owing to its length there is not always sufficient space to fit the Vickers type. The John Brown type consists of a sliding fitting on to the bulkhead, which is free to slide in any direction parallel to the bulkhead, containing a spherically mounted white metalled bearing which fits on the shaft. Although neither of these two glands is entirely watertight and may be expected to leak at the rate of at least 20 gallons/hour, this rate of leakage should not be appreciably increased under distorted conditions. Satisfactory shop trials have been carried out with these glands but up to date no experience of their efficacy under damaged conditions has been obtained.

SCALE REDUCTION BY STARCH INJECTION.

Over 200 sets of equipment for injection of starch into evaporator feed as detailed in A.F.O. 3981/44 have now been supplied. The few reports received so far indicate that beneficial results in the form of reduction of maintenance work and higher outputs of plant are being obtained without frequent changing of coils.

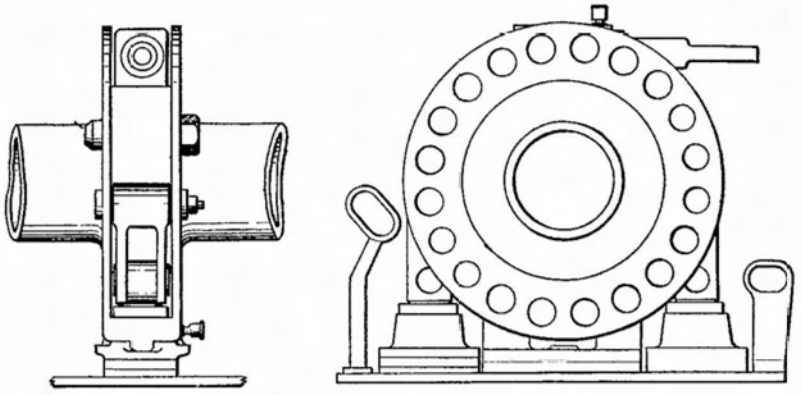
A recent report from an aircraft carrier showed that outputs of over 75% of the normal rated capacities of the evaporators were being obtained 4,000 hours after the coils were descaled. This ship carried out trials with quantities of corn starch and boiler compound varying from those given in the fleet order.

Trials were made with 2 lb. of corn starch plus 1 lb. of boiler compound in 20 gallons of fresh water at 180°-200° F., 1 lb. of corn starch plus 1 lb. of boiler compound in 20 gallons of fresh water and 1 lb. of corn starch only in 20 gallons of fresh water. In each case the mixture was injected at a rate of 5 gallons per hour for a plant output of 7 tons per hour. Best results were obtained by the use of 1 lb. of corn starch only in 20 gallons of fresh water. It was concluded that higher proportions of starch gave an excess which tended to form a non-conducting coating on the coils.

Trials were also made with potato starch with and without boiler compound as above. Ships' officers concluded that potato starch was better than no starch at all but not nearly so efficacious as corn starch. Experiments to determine the best mixtures and quantities are probably necessary for each size of plant and at different operating conditions. Results of such experiments would be of interest to E. in C. Department.

SHAFT LOCKING GEAR.

The usual brake or shaft holding gear which depends entirely on friction is only capable of holding a shaft up to a speed of about 12-14 knots. The damage which can be caused to bulkheads by a severely bent shaft with a propeller on the end as in the case of the *Prince of Wales* is considerable and



POSITIVE SHAFT LOCKING GEAR

the positive locking gear was introduced to enable one or more shafts to be held while the remainder developed their full torque.

The gear, illustrated above, consists of two stout rings fixed to any convenient shaft coupling by means of the coupling bolts. For convenience the rings are made in halves and welded together in place. The rings are greater in diameter than the shaft flanges and are provided with a number of equally spaced holes which are clear of the flanges as well as the necessary holes for the coupling bolts to pass through. Two pins are provided which can be fitted into these holes and can be connected to a strong bracket on the ship's structure by means of adjusting screws which have sufficient scope to allow a pair of holes to be used no matter in what position the shaft may stop.

It is usually convenient to use the coupling at which the friction brake is fitted and to use the friction brake seating to secure the lower end of the adjusting screws which are fitted on each side of the shaft so that one is in tension and the other in compression when a torque is applied to the shaft.

The intention is that the shaft it is desired to lock should be held by astern steam while the friction brake is applied. The locking gear can then be applied in a few minutes no matter in what position the shaft is stopped. It may be found, however, in one or two cases that the presence of existing fittings has prevented these conditions being entirely realised and it may be necessary to turn the shaft before the locking gear can be applied.

AIRCRAFT LUBRICATING OIL SYSTEM IN CARRIERS.

In all new aircraft carriers provision is made for the distribution of two grades of aircraft lubricating oil to positions in the vicinity of the access to hangers and to the flight deck. The oil is carried in bulk in the aircraft lubricating oil stores, where a motor driven pump of 1,000 gallons per hour capacity, an air loaded accumulator and air reservoir are provided for each grade of oil.

For filling the storage tanks two deck connections, one for each grade of oil, are provided on the flight deck through which the oil is pumped from barrels into the tanks by means of air driven portable pumps. Suction from the barrels is obtained via spills inserted in the barrels and connected to the pump by No. 1 hoses. Delivery from the pump is through a hose connected to the deck fitting by a swan-neck piece. Filters are fitted in the filling lines to the tanks. On the weather deck, deck connections are provided port and starboard for filling the storage tanks direct from lighters by hose.

The 1,000 gallons per hour pump takes suction from the storage tanks and discharges to the delivery line through an Auto-Klean strainer. The delivery line is open, through a S.D. valve, to the oil side of an air-loaded accumulator which is fitted with a piston and rod. The piston rod carries a tappet which operates stop and start switches controlling the motor of the pump. When the accumulator is fully charged the motor stops. On the other hand when oil is drawn off, the tappet operates the switch at a pre-determined level, the pump is started and maintains supply until demand ceases and the accumulator is again full. By this means oil is always available at all hangar and flight deck oil servicing positions.

The pump motor is provided with local control and also with remote stop switches fitted at the hangar control positions. Each oil service position for hangars is fitted with a spring push valve in series with a S.D. valve for each grade of oil. Under the draw off valves is a trough which drains to a dirty oil tank. Storage tanks and the delivery pipe system are steam heated.

Delivery and filling pipes are so arranged that they can be drained back to the storage tanks. Dirty oil tanks are provided as necessary to take the drainage of dirty oil from the troughs at the servicing position. The dirty oil is drawn from the aircraft in cans and poured into the troughs. Each dirty oil tank is pumped out by a semi-rotary hand pump to a deck connection from which it can conveniently be discharged into barrels or directly overboard to a lighter.

PLUMMER BLOCKS.

The self-lubricating plummer blocks of the Michell type generate very little heat and can normally be kept cool by air provided that reasonable ventilation is provided. The need for increased watertight integrity has, however, reduced the amount of ventilation that can be accepted in certain compartments and in these cases it has been necessary to provide water cooling in addition. This water cooling provides a large margin and although in some cases it is unnecessary, it will enable a plummer block to continue to work satisfactorily under adverse conditions such as hull distortion or a slightly bent shaft.

ELECTRIC GENERATING MACHINERY.

The proper balance between the proportion of generators which should be steam and diesel driven is difficult to determine. A preponderance of diesel driven generators increases the maintenance to unacceptable limits in war time, but on the other hand lack of diesel electric power is a serious disadvantage from damage control considerations.

Unfortunately space rarely admits of adequate provision being made for a duplication of electrical requirements from steam and diesel sources. All that has been possible so far is to fit emergency diesel sets as high up in the ship as possible and of comparatively small power. In new construction it has been possible to provide space for the installation of emergency sets of somewhat greater output.

FIRE AND BILGE PUMPS

The policy of providing only electrically driven pumps for fire and hull purposes has been criticised and provision is now made for one F. & B. pump in each main machinery compartment to be steam driven. This provision is being made retrospective.

RUBBER LINED BEARINGS FOR "A" BRACKETS.

For all new construction of cruisers and above rubber lined bearings have been approved for 'A' brackets. In this bearing, standard segments of 'Cutless' rubber, are fitted in lieu of lignum vitæ. The segments are accurately moulded to gauge within fine limits and consist of a lower layer of hard rubber to which is welded the upper layer of softer rubber.

The main reasons for adoption of 'Cutless' rubber 'A' bracket bushes are:—

(1) The bearings have much longer life than lignum vitæ or white-metal bearings and have been found more durable in sandy or muddy waters.

(2) A bearing pressure of 25 lbs. sq. in. can be safely worked to in lieu of about 15 lbs. sq. in. for lignum vitæ. It is at present stipulated that rubber lined bearings shall be interchangeable with lignum vitæ in the event of a deterioration of the rubber supply position. It is not, therefore, possible to take advantage of the permissible increased loading from the design aspect, but, in future, with the satisfactory introduction of synthetic rubber bearing segments, it is hoped to effect an appreciable reduction on the length of 'A' brackets fitted and so obtain an improved flow of water to the propellers.

To obtain a satisfactory bearing great accuracy in machining the grooves in the bush is necessary, *i.e.*, each groove is hand finished to gauge and the bottoms of the grooves must be equidistant from the centre of the bearing within a tolerance of ·002 in order to ensure equal loading on the segments.

The surface finish of the shaft liner also assumes considerable importance and the provision of spiral grooving in the shaft liner for more efficient lubrication of the rubber segments is under consideration.

SETTLING AND SULLAGE SYSTEM.

This arrangement is described briefly in C.A.F.O. 1485/44 and little further comment is necessary, but the following points may be of interest.

The pump used as a settling pump (so called to avoid confusion with the other transfer pumps) is of the Glissard type manufactured by G. & J. Weir, Ltd., Cathcart, and was chosen on account of speed in production. The pump is capable of working with superheated steam and without internal lubrication though a little blacklead should be rubbed on the cylinder walls when opportunity offers.

The piston rings are made of a special Bakelite material and have a normal life of 6-9 months. The later pumps are being fitted with rings of leaded nickel bronze and these rings should last well over a year. Some of the barrels will be found to be chromium plated to reduce wear. To change from the Bakelite to the bronze rings, a new carrier ring is required.

In operation it is intended that boilers should always be steamed on the service tanks, oil being pumped over from the other tanks in the usual order for damage control and stability requirements. Thus any damage to a tank in use or to the suction system involving the introduction of water will only mean a small amount of water being pumped into the service tank before it is discovered that the storage tank or suction pipe is in communication with the sea and therefore no trouble will be caused at the burners. When the damage has been located, the settling pump can be changed to draw from another suitable tank and any water in the settling tank can be drained down to the sullage tank. The capacity of the service tanks is large and is sufficient for at least 8 hours' steaming at high power. Even a small leak from the sea into the service tank need not put this tank out of action as the water can be drained away to the sullage tank.

Test cocks are provided to test for the presence of water and in some ships electrical devices have been installed for detecting water either in pipes or tanks but they have not always been found satisfactory.

EXPLOSION INSIDE A SALINOMETER.

An unusual accident occurred in a ship fitted with the usual type of electric salinometer. On switching on the current, a mild explosion took place inside the apparatus causing the glass to break with resulting facial injuries to the rating who made the switch. The ship's officers were somewhat concerned over this matter and the question of fitting wire netting to the glass of these instruments was discussed.

Owing to the comparatively harmless nature of a salinometer the question also arose in connection with other instruments fitted with glass—should wire

netting be fitted to all voltmeters and ammeters? What about pressure gauges, particularly those indicating pressures of 3,000 lbs./in.? It was even suggested that clocks might be dangerous and should have an adequate guard to prevent the glass from blowing out!

Investigation showed that there was a defect in the cover joint of the salinometer and that a small quantity of salt water had entered (due to drips from the feed pump cooling system) and lain at the bottom of the aluminium alloy box, wetting the brass case of the thermometer which is fitted for temperature correction. Electrolytic action had occurred between the zinc in the brass thermometer case and the aluminium alloy box with the formation of some white sticky zinc salts and a certain amount of hydrogen.

Unfortunately, the amount of salt water present had been just enough to cause the right amount of hydrogen to be released which would cause an explosive mixture. This mixture was ignited by a spark from the relay mechanism which acted when the supply switch was made.

In order to prevent similar accidents salinometers exposed to salt water drips are to be resited. Periodical examination of the instruments must be carried out and joints renewed as necessary.

BREATHING APPARATUS.—PATT. 230.

Connections are now provided in boiler rooms from the L.P. air system so that the boiler room can be still manned by the use of the patt. 230 breathing apparatus when large quantities of smoke either from damaged uptakes or from fires on deck are drawn down by the forced draught fans.

ENGINE ROOM VENTILATION.

Steam driven ventilating exhaust fans are now provided in new construction and the fitting of these has been made retrospective. These ensure that a total electrical failure does not cause a total failure of ventilation.

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