REMOVAL OF PROPELLERS BY BLASTING.

For propellers which proved difficult to remove from propeller shafts in L.S.T. 2 American Repair Bases resorted to blasting off with explosives. Nothing is known of the type and size of the charges used but from the report it had disastrous results on the propeller and could only be used in emergency where the existing propeller was damaged beyond repair and being replaced by a new propeller. Explosives were also used in the removal of the bent inner tact shafts and damaged propellers of *H.M.S. Valiant* in 1944, in an attempt to improve the steering of this vessel to allow of passage through the Suez Canal. The bias to starboard which had been experienced on passage to Suez and which was the cause of the vessel grounding at the entrance to the Canal was attributed to the damaged starboard inner propeller causing a greater drag than the damaged port inner. It was decided to sacrifice both inner propellers together with the " A " brackets and outboard portion of the tail shafts. The vertical arm of both inner " A " brackets was already fractured. The starboard tail shaft was cut through just abaft the stern tube and the horizontal arm of the starboard inner " A " bracket was cut through half way. A substantial charge was then placed under the standing part of the stern casting and touched off. The other half of the " A " bracket arm parted and the tail shaft, " A " bracket and propeller disappeared. The operation was then repeated on the port side.

REPAIR OF BRONZE PROPELLERS BY TIPPING

Because of the large usage of propellers in landing ships where propellers easily become damaged by beaching operations, an economical method of repair was devised by Chatham Dockyard which was capable of being carried out by repair ships or advanced bases.

In most cases the propellers need retipping and from experience it has been found that tips approximately $\frac{1}{4}$ the size of a blade can be " burned on " using brazing metal as the pouring agent. A 7-ft. diameter L.S.T.2 bronze propeller requires about 500 lbs. of pouring metal to effect a satisfactory repair. The resultant header has to be removed and this can be done with pneumatic chisels. Most of the pouring metal can be recovered and with the addition of a suitable proportion of zinc can be used for a number of repairs.

L.S.T.2—PROPELLER SHAFT TROUBLES

After a time on service the keyways for the loose couplings on the propeller and intermediate shafts in L.S.T.2 showed signs of bad wear and attempts were made to build up the keyways by welding.

Unfortunately it was not realised that the shaft material was of high carbon content and not really suitable for local welding repair without normalizing. The keyways were built up and replaced without normalizing and after a period on service the walls of the keyways failed and portions of the propeller shafts broke away inside the couplings resulting in breakdowns.

Another cause of trouble was corrosion of the propeller shaft in way of the stern tube bushes which was attributed to the use of lead based white-metal in the bearings which it was found set up electrolytic action causing corrosion of the shaft and extreme wear down of the white metal. This trouble has been alleviated by changing the composition of the whitemetal in the stern tube bearings.

THE PRESERVATION OF SHIPS IN RESERVE

A most interesting pamphlet has just been received from U.S. Bureau of Ships in which the Americans have laid down their standards for putting their surplus ships into a state of preservation. It is most interesting in that it introduces the use on a large scale of the process of preservation by de-humidifying which has been so extensively used during the war for small items of machinery, and spare parts.

In the application of this principle to the preservation of ships, all the compartments, after being dried out as well as possible, are sealed up with either a static dehumidifier or a dynamic dehumidifier. The latter one is the interesting scheme since it involves fitting air conditioning machines which will automatically maintain the air in the compartments at a given humidity. This is a vast undertaking when it is realised there are thousands of ships to deal with and many and varied compartments in most. It could be argued that the cost would be too high, but it is a small sum when compared with the capital cost of the ships. The ships may be required in the next ten or twenty years, and evidently the Americans consider the expenditure worth while as an insurance against the uncertain future.

The question immediately arises as to whether we should do likewise. A committee has been appointed to study the whole aspect of care and maintenance and we must not here prejudice their findings, but it can be said that our problems are not exactly comparable with those of the Americans. We have a temperate climate while they have a climate with extremes of temperature. Under the latter conditions ships and air are continually expanding and contracting, and moisture is being condensed and re-evaporated, and so on. It is something for us to think about because ships in these days are very different from those after the 1914-1918 war. To-day we have so many instruments, etc., which can and will deteriorate rapidly, putting a ship into C. & M. is a more complicated and expensive business than it was in 1919.

RETUBING OF MAIN CONDENSERS BY SHIP'S STAFF

(*From a Correspondent*)

The article in *Papers on Engineering Subjects No.* 18 on the above subject recalls to mind a similar undertaking carried out in *H.M.S. Iron Duke* in 1917, in the Firth of Forth. The tubes, which were the original set, were of ordinary brass and frequent failures caused considerable uneasiness to the Admiral in Command of the Squadron.

At that time, refits were of two weeks' duration and took place every nine months at Invergordon. As it was not possible to take a ship in hand out of routine, it was decided to retube all four main condensers by ship's staff with assistance lent from the Fleet. Only two condensers were taken in hand at a time, the engines belonging to the condensers in hand being at ten hours' notice while the other engines were at the usual four hours' notice. Tubes and grommets were obtained from Rosyth Yard and work proceeded in watches, the four condensers being completed in ten days during which time 38,000 tubes were removed. The grommets were soaked in boiled oil as usual but not for any specially long time. A stoker was given a bag of grommets and a tin of oil and it was his job to produce a soaked grommet when required.

Memory over such a long period does not permit of a detailed description of the happenings, but it was noted that an appreciable number of tubes when withdrawn were found to be without grommets and yet had been tight for some years !

The recent war-time innovation of " Music While you Work " is not so new as one may think. Every day during the ten days that this retubing was in hand, the ship's band came down to the engine room and played selections to stimulate the workers. The introduction of the band into a modern engine room would be a difficult task, but in those earlier battleships with manoeuvring valves and pipes under the starting platform, there was ample floor space. In fact such was the space available that in one ship of this class it was customary for the weekly cinema performance given to the ship's company to be held in the centre engine room.

THE OPERATION OF DISTILLING PLANTS

The quantity of fresh water used for domestic purposes has been steadily increasing during recent years and when ships are at sea for long periods the amount of fresh water used for make up feed also increases. During the war it has generally not been possible to obtain shore water for domestic use and it has therefore been necessary for the whole of the distilling plant in H.M. ships to be almost constantly in use. Particular attention has therefore been given to the best way of operating the plant so that the intervals between laying up, etc., could be extended without the output falling below that necessary to meet the above requirements. The addition of starch and boiler compound to the evaporator feed have proved beneficial in retarding the formation of scale and rendering it more easily removable by the daily blowing down. Investigations are in hand as to whether a more effective compound can be found for this purpose.

With the distilling plants fitted in H.M. ships it has rarely been possible to accept the reduced output obtained when working compound effect and the slight increase in fuel consumption when working single effect has had to be accepted. A procedure for operating evaporators on single effect with a uniform output of about two-thirds of the maximum output has been adapted in some ships. For a steady output of fresh water made, provided the density of the brine remains constant, the weight of steam condensed in the coils will be constant. The amount of opening of the coil steam valve to pass this quantity of steam will always be the same if the boiler pressure remains constant and also the correct setting of the coil drain valve will always be the same for this steady output. The pressure of the steam in the coils will increase as the coils become dirty until it reaches the maximum working pressure when it will become necessary to clean the coils or accept a lower output. By always operating the plant at a uniform output the likelihood of priming is reduced and the correct opening of all valves can be found by trial and adhered to. This method of operating is discussed in B.R. 1333 which is shortly to be issued to all ships.

FAILURE OF TURBINE-DRIVEN PUMPS IN L.S.D.

The turbo ballast and extraction pumps fitted in L.S.D. are driven by vertical turbines geared to the pump. The gearing is of the double helical type and the pinion is splined to prevent any thrust being exerted on the turbine shaft. The turbine disc is supported by ball races situated on either side of the turbine casing just outside the glands, the upper one taking the weight of the moving parts.

A number of turbines of these pumps have failed in service, the first symptom of failure being the blowing of the glands which are fitted with Garlock split ring conical packing (special U.S.A. type). On dismantling the turbine in practically every case it was found that the lower ball bearing had failed or was on the point of failing, and in some cases the cage had fallen out. Further examination showed that there was a clearance between the inner bore of the race and the shaft in some cases as much as ten thousandths of an inch giving rise to considerable wear and indication of chattering on the shaft in way of the bearing. In some cases lubrication had failed and the gear wheel pinion had roughened as might be expected.

It is considered while contributory causes of failure may have been lack of lubrication and excessive water in the turbine due to bad drainage of the system or distortion of the rotor causing vibration, the main factor causing the failure was the clearance on the inner bore of the bearing. The reason for not providing an interference fit for the bearings appears to be the difficulty of assembly and extraction and this applies to the top bearing as well as the bottom. The turbine wheel is made of bronze and force cannot be applied without distorting it. Assembly of both top and bottom bearings is rendered difficult due to the depth of the housing and it would be difficult for the same reason to provide an interference fit on the shaft. The housing being of cast iron is also easily fractured during assembly if much force is used.

In two L.S.D., Weir's turbines were substituted for the American Coppus turbines and this, although costly, is the best answer to the problem. In order to obtain an interference for the lower bearing, in the Coppus turbines, however, Messrs. Skefco Ball Bearing Co. have suggested fitting one of their standard bearings with tapered adjustable liners and modified housing together with improved lubricating arrangements.

GROOVING IN THE HEADERS OF AN ADMIRALTY TYPE SUPER-HEATER

A defect discovered toward the end of hostilities in the headers of Admiralty type superheaters of one cruiser and one destroyer is considered to be unique in boiler experience. Grooves have developed in the bridges between the fully arbored tube holes. As soon as the assessed durability of one year final life expires, the headers will be replaced by new and the defective headers made the subject of metallurgical research. It is suspected that the defect is due to racking stresses caused by expansion forces in the steam inlet connection. The joint of the inlet flange has always been a source of trouble and for this reason, in more recent designs, the steam inlet pipe has been made more flexible.

Wt. 44375/P7294 4M 3/46 KJL/1729 **Gp. 8/5** H