

ARALDITE CASTING

THE REJUVENATION OF AN ELDERLY DOCK PUMP

BY

C. J. LOOKER AND K. COCHRANE

During the planning of the modernization of the Dock Pumping Station at Gibraltar anxiety was felt about the condition of the north main pump which, during the first stage of the programme, would alone carry the burden of dock pumping for about eighteen months. This centrifugal pump, which is 60 years old, is driven by a reciprocating steam engine at a design speed of 120 revolutions per minute. It was known that the clearances of the impeller sealing rings were excessively high, the result being that the pump discharge could not be maintained at six feet above sill unless boiler pressure was increased and the engine speeded up considerably. During the previous year the times for pumping had been steadily increasing, so it was decided to lift the impeller to investigate the possibility of repair.

The investigation revealed that, due to erosion, the design clearances of 1/64-inch for both upper and lower sealing rings now measured from between 1/2-inch to 1 inch at various points on the periphery (See FIG. 1). Fortunately however, measurement of the impeller rings showed that these were both circular and concentric. The impeller is nine feet in diameter which prevented it, or the directorate casting, being removed from the well without previous removal of the complete engine, pump shaft and support brackets. For reasons of time and expense this removal could not be undertaken and a means of repairing *in situ* had to be found.

It was decided to try to build up the directorate casting in way of the erosion with Araldite to restore the correct clearances. One disadvantage of this method was that the cast material could not be machined *in situ* and any finishing of the casting would have to be done by hand. After much discussion it was decided to bind the periphery of the impeller with waterproof tape to a thickness of 1/64-inch and to place it in its running position to act as the core of the casting. FIGS. 2 and 3 show the arrangements used for casting the Araldite.

As a result of previous experience of Araldite castings in Gibraltar, the mixture used for the casting was :

Araldite Epoxy Resin	—	64 parts
Araldite Hardener	—	8 parts
'Smooth On' Iron Cement	—	1 part

To overcome the conditions at the bottom of the 60-foot well while the casting was setting, a tarpaulin shelter was built over the work. The culverts were then pumped right down to provide a continuous air flow from the docks over the work and up the well. The pouring was successfully completed within the time limit of seven hours imposed by the hardening of the Araldite, and the casting was allowed to set for 48 hours.

The impeller was then lifted without difficulty and the waterproof tape removed. The casting was found to be in perfect condition and no hand finishing was required. On replacing the impeller in the running position the clearances of the seating rings were checked and found to be within 0.010 in. of the designed value. After the pump shaft had been reconnected, and the engine and pump turned by hand, a trial was carried out by pumping No. 1 dock. The pumping time for emptying the dock with the repaired pump was 9 hours and 45 minutes compared with 14 hours and 30 mins. before repair. This improvement in pumping time resulted in a saving of ten tons of coal and the

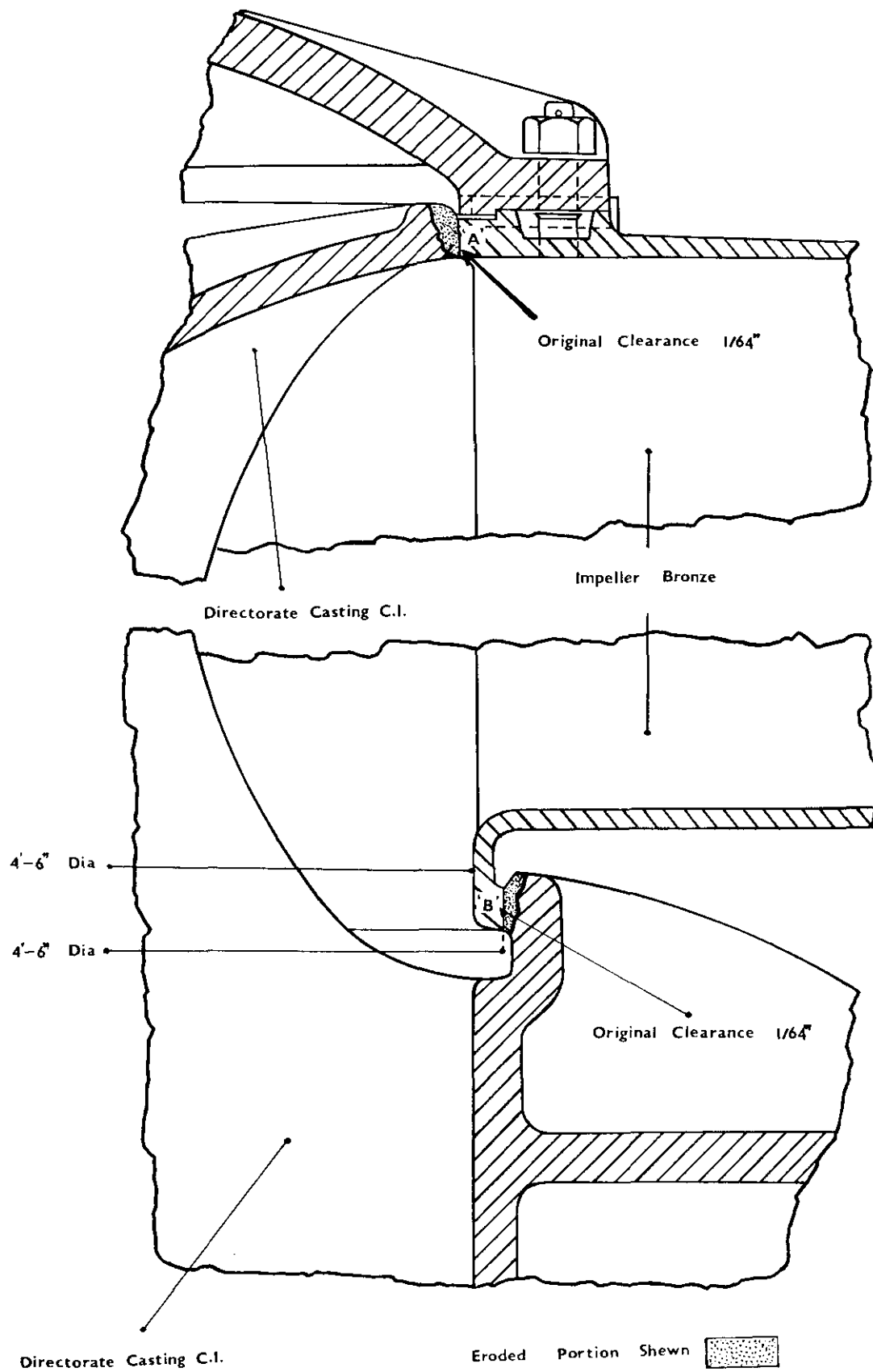


FIG. 1

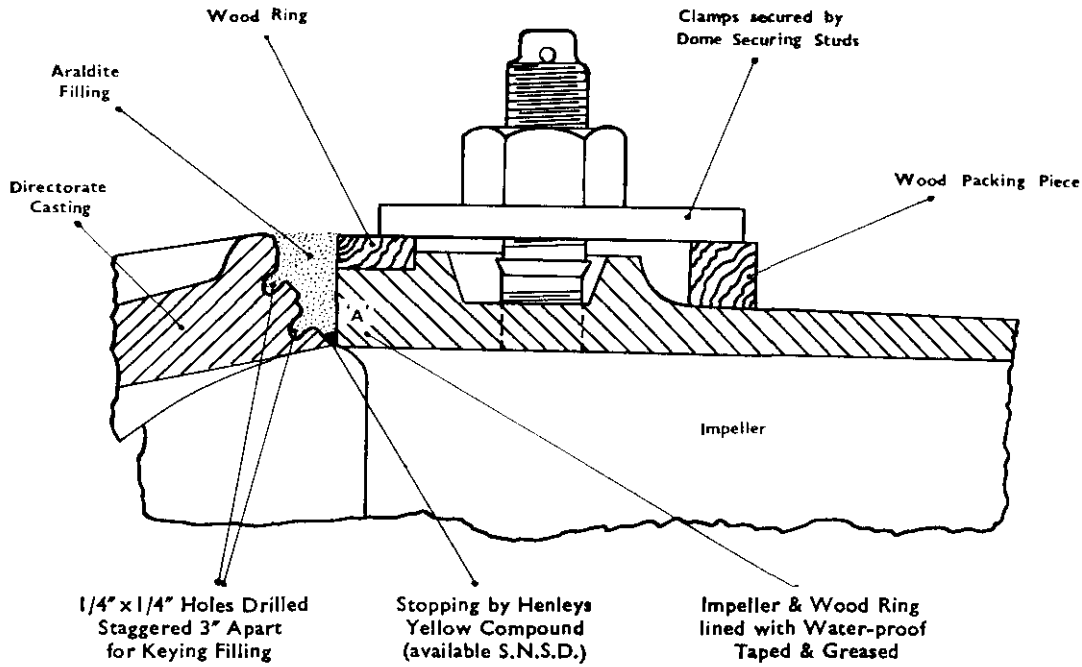


FIG. 2—TOP SEAL

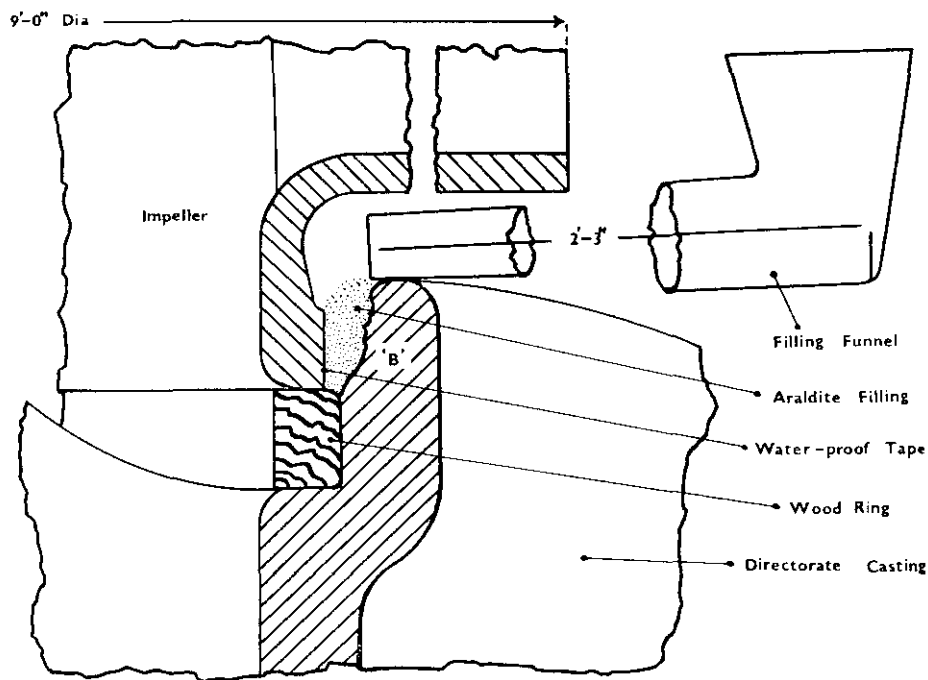


FIG. 3—BOTTOM SEAL

pumping time was almost identical with the original trials 60 years ago. After the trial, the impeller was again lifted to examine the Araldite casting which was found to be in perfect condition.

Excluding the trials, the actual repair occupied ten working days without overtime, and only the normal Dock Pumping Station Staff was employed on this work. At the time of writing, this pump has continued in service for twelve months after repair with no apparent deterioration in performance, to the great satisfaction of those who spent the ten days in the cold, cramped, damp and obnoxious conditions at the bottom of the well. In many ways it is a pity that this 60 year old pump is destined for the scrap heap so shortly after regaining its youth—but such is progress.