

FIG. 1. INSIDE FACE OF INSPECTION DOOR SHOWING FOAM COLLECTOR AND SUCTION PORT

EBULLITION CONTROL OF WEIR'S EVAPORATORS

BY

ENGINEER SUB-LIEUTENANT C. G. RALEIGH, R.N.

The evaporators fitted during the modernization of H.M.S. *Victorious* were of standard Weir's design, three sets having a nominal output of 7.5 and one set 4.2 tons per hour. All sets consisted of two shells in single effect, with alternative superheated steam or closed exhaust supply to the coils. A supplementary valve was also fitted to the exhaust line in order to make up for fluctuations in exhaust pressure with superheated steam.

During acceptance trials the evaporators failed to attain stable conditions at designed output for more than a limited period and, in an endeavour to increase outputs, apron plates were fitted across the main door faces to increase circulation. Orifice plates of $\frac{7}{8}$ in. diameter were fitted to the superheated steam valves to the coils of the three large sets.

Before the first 1,000 running hours had been completed it became evident that an orifice of $\frac{7}{8}$ in. diameter was too great and after calculation, trial and error, orifices of $\frac{3}{4}$ in. were fitted. These produced stable conditions throughout the 'life' of the coils, with a reduced output of 6.8 tons per hour.

The next step was the fitting of overflow weir control in the brine system. The existing brine suction was blanked at the external strainer box and a 3 in. diameter suction pipe fitted between the main door inspection cover (the

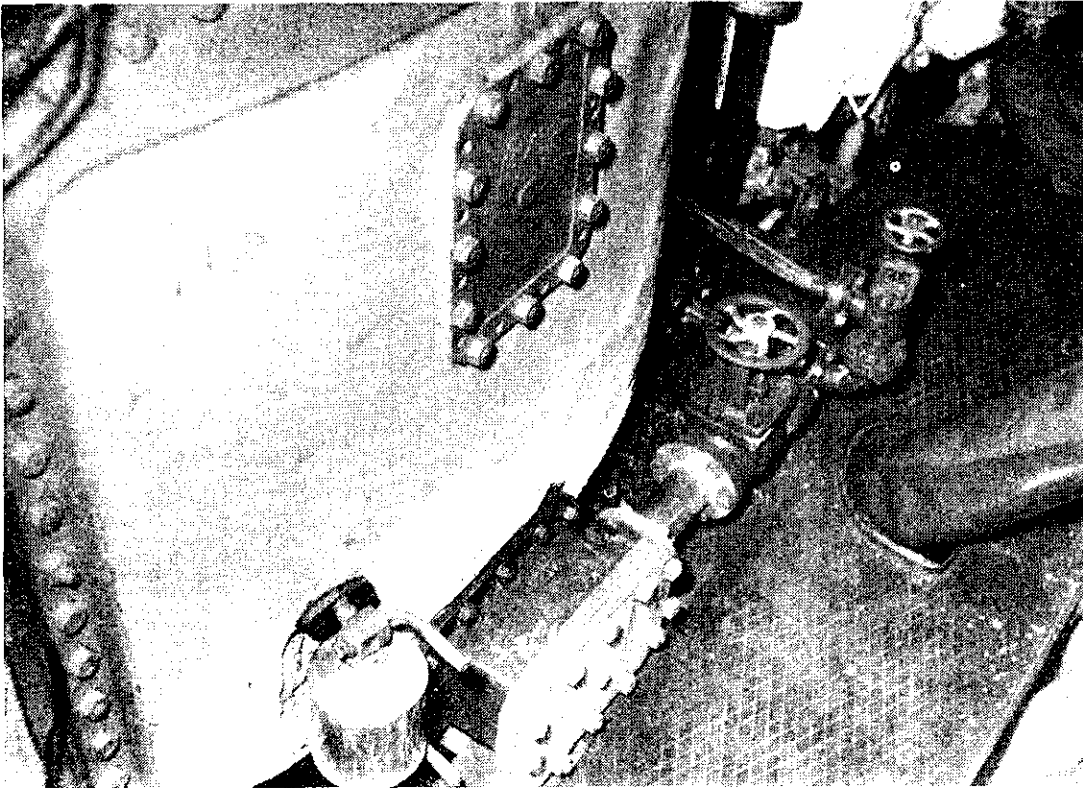


FIG. 2 - ORIGINAL ARRANGEMENT OF BRINE SYSTEM

centre of which was ten inches below the top coil) and the distance piece separating the strainer box from the brine valve.

For an initial trial a 3½ in. internal pipe was fitted, at 45 degrees to the inside of the inspection door, which was pierced by a 3 in. diameter hole, the upper end of the pipe being level with the top coil. The set was then steamed for 24 hours using compound.

From the readings taken it was established that it was not possible to maintain a density below 30 degrees without an unacceptable rise in water-foam level. This was due to the combination of : --

- (a) The internal pipe inlet end being too high
- (b) The cross-sectional area of the internal pipe being too small to collect and separate sufficient foam.

After experimenting with shorter pipes, it became evident that the solution lay in increasing the size of the internal pipe. A letter-box type collector, with a cross-sectional area of 50 sq in. was fitted, the upper end of which was two inches below the top coil.

Further test of the plant showed that the brine density could be controlled at any desired level between 15 and 25 degrees by regulating the feed inflow only and leaving the brine suction valve wide open. The foam level was satisfactory throughout the trial and greater stability was obtained, particularly during heavy rolling of the ship, because the weir was self-compensating for limited variations of steam condition and coil state.

Subsequent examination of the brine system showed a marked reduction in scale deposit in the brine valve and venturi which, in the past, tended to be a cause of frequent trouble : this scale very often being non-acid soluble. Loose scale, which in the original arrangement often found its way through the strainer into the valve and venturi, is now positively excluded.

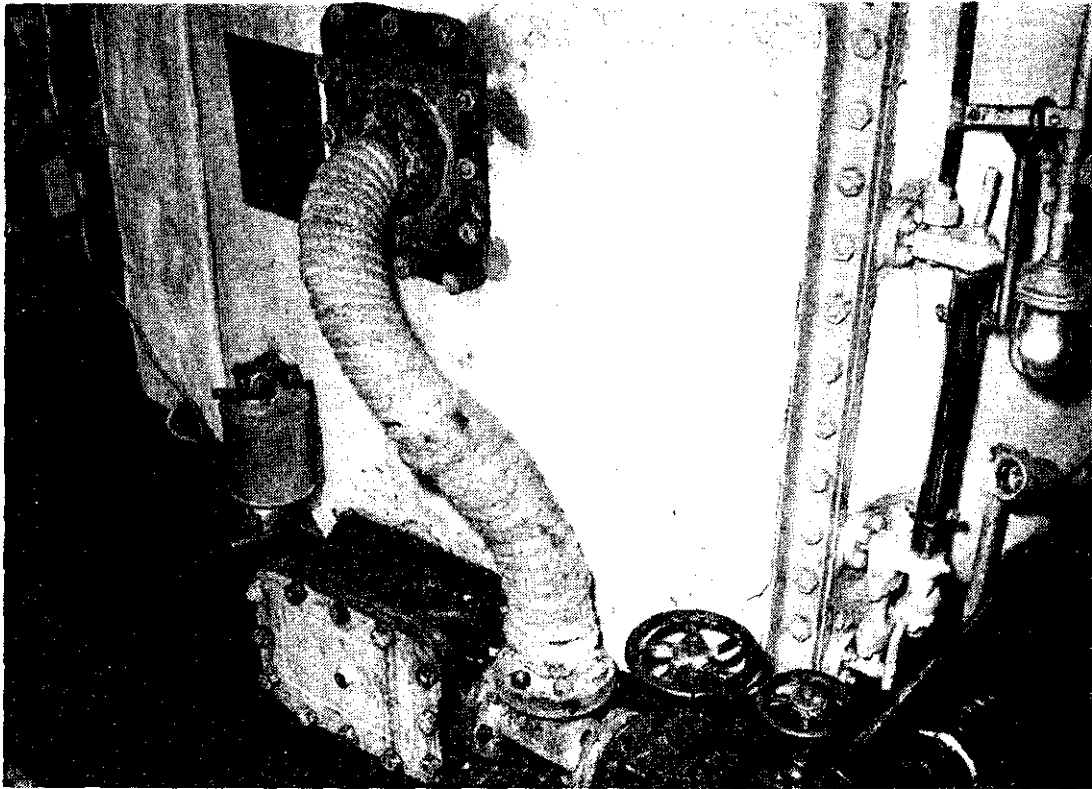


FIG. 3— FINAL ARRANGEMENT OF OVERFLOW PIPE (PARTIALLY LAGGED). THE EXISTING SUCTION WAS BLANKED AT THE LEFT HAND END OF THE 'T' PIECE

This is a comparatively simple modification and in many ships could be carried out by the ships staff. It is understood that new plants going into service are so fitted and, therefore, no patent rights are claimed, for this 'alteration and addition', for which indulgence is begged.

It was, of course, only possible to carry out these trials because the distilling capacity of the ship was really adequate. The most difficult task was convincing enraged watchkeepers that the new system was also for their benefit. However, after an initial period of indignation they settled down very well.

The spirited and tireless co-operation of the Chief Mechanician of the evaporator party, who was enthusiastic from the word go, was of considerable assistance, in carrying out this successful modification.

COMMENT BY D.M.E.

The ingenuity and initiative and the spirit in which this modification was carried out is highly commendable. It is, however, pointed out that the responsibility of such modifications rests with the ship concerned and that the details should be reported to Headquarters.

This particular modification has been incorporated in Type 12 and Type 14 frigates and in all new plants. It was also referred to in the articles 'Water for Warships', by Commander E. G. Griffin (Vol. 9, No. 1) and 'Distilling Plant Research', by Commander L. K. D. Wood, M.B.E. (Vol. 5, No. 3).