AN EJECTOR VACUUM CLEANER FOR SOOT REMOVAL

by

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The need for a mechanical suction method of cleaning boilers externally is a long felt one and has been covered in the case of capital ships by the soot removal plant described in Vol. 2, No. 2, of the *Journal of Naval Engineering*.

During the spring cruise of H.M.S. *Devonshire* in the West Indies, experiments were carried out to produce a smaller and simpler device which would achieve comparable results. The following is a description of the plant evolved with a diagrammatic sketch of the layout. It is pointed out that the apparatus had to be made from material available on board and does not, in consequence, represent the best possible.

Description of Apparatus

The apparatus consists of

(i) Pre-Collector or bulk Soot Collector,
(ii) Two-Stage Air Ejector,
(iii) Operators Nozzle,
(iv) Dust Bag,
(v) Hose.

The Pre-Collector or Soot Collector consists of a welded steel cylinder of $\frac{1}{16}$-in plate, 4 ft by 1 ft diameter, having a 2-in inlet and outlet pipe, with a 1 ft deep baffle between the inlet and outlet.

The baffle is welded to the top cover and is a neat fit in the cylinder. The bottom of the cylinder is coned from 1 ft to 4 in and fitted with a steel faced flange $\frac{1}{4}$ in thick. The bottom orifice is sealed by a swivelling blank flange secured by a butterfly nut. Two small eye-bolts are welded to the top cover so that the apparatus can be suspended from a grating.

Two-Stage Ejector. This is an old boiler water de-aerator model and is secured to the outlet flange of the pre-collector. It works on an air pressure of 100 lb/sq. in. and produces a vacuum of 18-in on a closed circuit.

Operators Nozzle. Various types of nozzles have been made to compete with different types of work and to get into awkward corners. The only stipulation is that all of them must be " nozzled ".

Dust Bag. This is shown in the sketch.

Hose. A 2-in suction type of hose wire wound internally. This type of hose was not available on board and Pattern 405 L.P. air hose has been successfully used.

The apparatus is fairly compact, the present measurements being approximately 4 ft by 2 ft by 1 ft excluding the nozzle and hose, and could be easily stowed in the smaller classes of ships. In its present form it is considered to be rather heavy due to the weight of the ejector casting ; even so, one man can lift the apparatus and only two are required for transportation. Rigging is

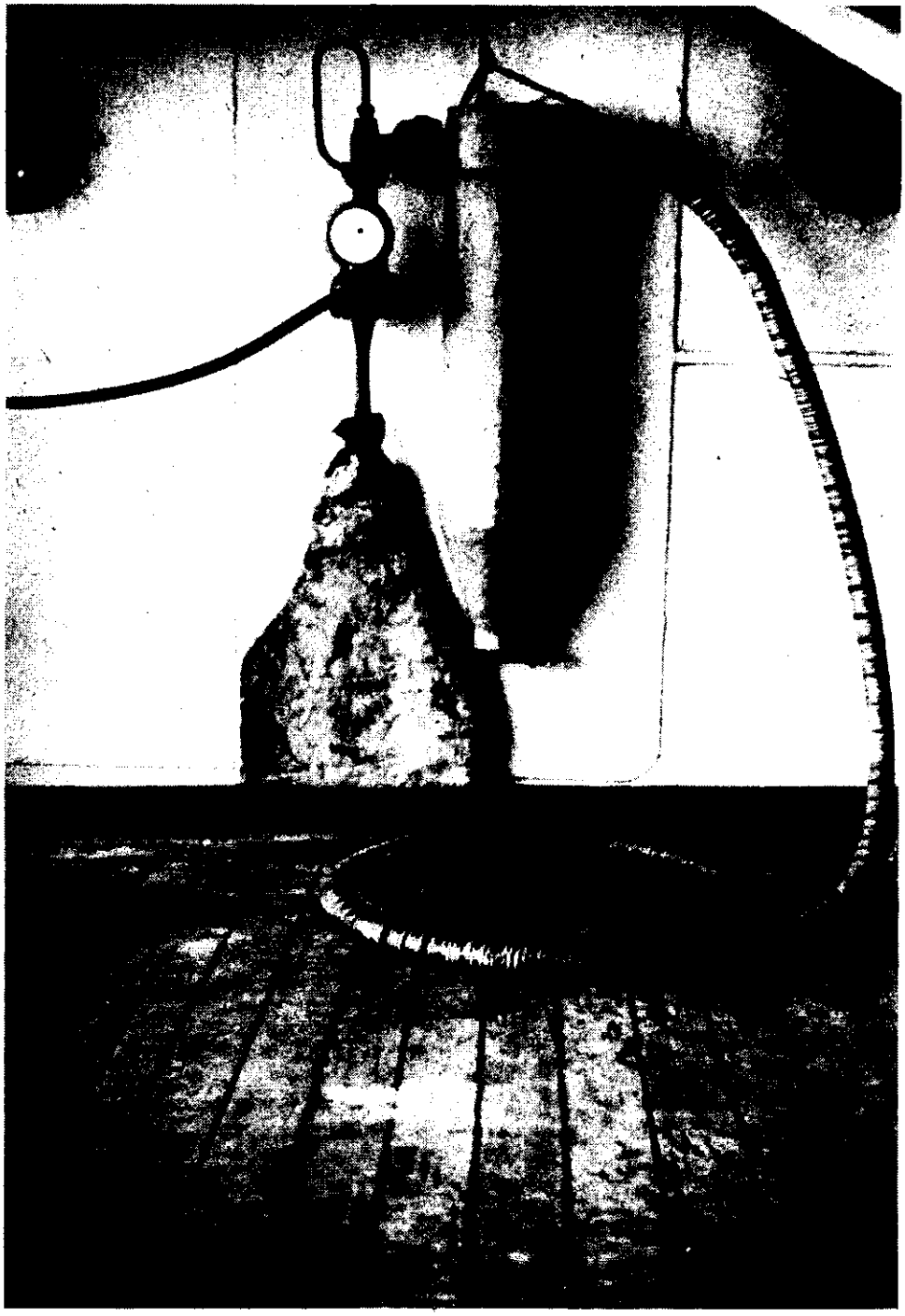

FIG. 1.—THE EJECTOR SOOT REMOVER.

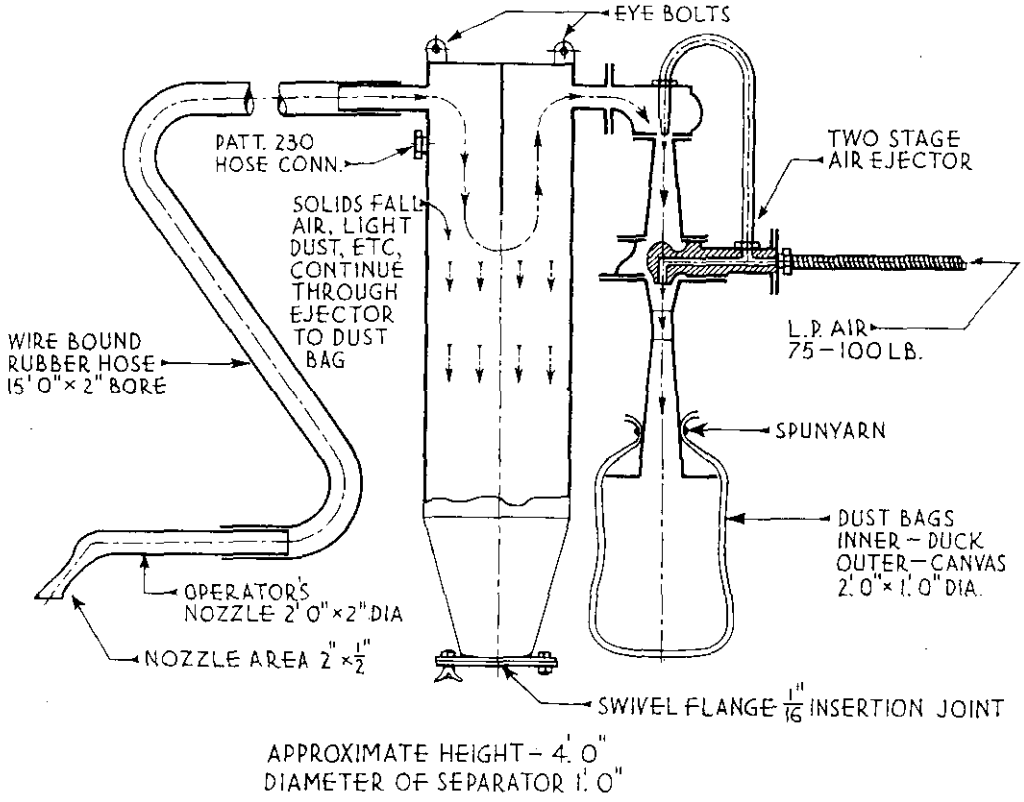

FIG 2.—DIAGRAMMATIC ARRANGEMENT

a simple matter ; one L.P. air hose connection, one jubilee clip and spunyarn being the main essentials. It may be used as a portable apparatus or made a permanent fitting with pipes led to the required compartments.

A soot disposal tank, sprayed by the fire main and with a direct discharge overboard, could be used in conjunction with the plant.

Operation of the Apparatus

Vacuum is raised by the ejector when L.P. air is turned on. Soot, dust, ashes, etc., are then drawn through the nozzle and the hose to the pre-collector.

The baffle, interposed between the inlet from the hose and the outlet to the ejector, separates the air and the solids. Solids fall to the bottom of the pre-collector, air and light dust are drawn through the outlet and ejector to be discharged into the dust bag.

After 15 minutes operation, air is shut off and the pre-collector emptied through the bottom swivel flange. The dust bag is emptied after four hours working.

Other Uses

The apparatus has also been adapted for cleaning ventilation trunking using a Pattern 230 hose and a special nozzle 4 in by $\frac{3}{4}$ in to allow easy access to small trunking. A screwed connection to take Pattern 230 hose has been welded about 2 in from the pre-collector inlet, the 2-in inlet is sealed and ventilation trunking can be effectively " vacuumed ". During boiler cleaning a blank union nut seals the Pattern 230 connection on the pre-collector.

Conclusion

The apparatus, if not the complete answer, is of great assistance in facilitating boiler cleaning as it does collect and confine the soot and dust reasonably quickly and avoids its being blown round the boiler room. With the aid of various shapes of nozzles, the awkward holes and corners can be effective cleaned.

Further experiments are to be made at *Devonshire's* next external boiler cleaning when it is hoped to develop the apparatus for ships where space does not permit the installation of a soot removal plant as fitted in capital ships.