AUTOMATIC WATCHKEEPING UNIT FOR LUBRICATING OIL CENTRIFUGE

BY

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'Chief, I've had to stop the lub. oil separator, it's discharging oil into the bilge.'

This tale of woe has been heard, and the situation dealt with accordingly, in every ship in which the writer has served during the past twenty-eight years. The usual causes of this malfunction seem to be:

(*a*) Loss of water seal

(*b*) Excessive sludging of bowl

(*c*) Excessive throughput of oil.

The lubricating oil centrifuge is not, as a rule, a very conspicuous piece of machinery and is usually sited in an obscure position in the compartment which is not under the constant supervision of the watchkeeper. This means of course that by the time the oil loss is noticed, it is possible that a fairly considerable quantity has already been lost. Apart from the actual loss of perfectly good lubricating oil, additional problems arise; e.g., fire hazard from the presence of oil in the bilges and the problem of disposal, bearing in mind the terms of the 'Oil in Navigable Waters Act'. With these facts in mind, the writer gave a certain amount of consideration to devising some means whereby, in the event of malfunction, the centrifuge could be stopped automatically and, at the same time, a warning could be given.

APPENDIX—A SHORT BIBLIOGRAPHY

B.S. 3763 : 1964	The International System (SI) Units.
B.S. 350	Conversion factors and tables. Part 1 : 1959 Conversion factors. Part 2 : 1962 Detailed conversion tables.
B.S. 1957 : 1963	Presentation of numerical values (fineness of expression; rounding of numbers).
PD 5686	The Use of SI Units Issued by the British Standards Institution and obtainable from B.S.I. Sales Branch, 2 Park Street, London, W.1., price 1*s.* each post free.
Changing to the Metric System	Prepared by the National Physical Laboratory (Ministry of Technology) and published by H.M.S.O. Price 3*s.* 6*d.* net.

British Standard Handbook No. 18—*Metric Standards for Engineering*—obtainable from the B.S.I., price 60*s.* plus 3*s.* 6*d.* postage and packing. Due for publication at end of March, 1966.

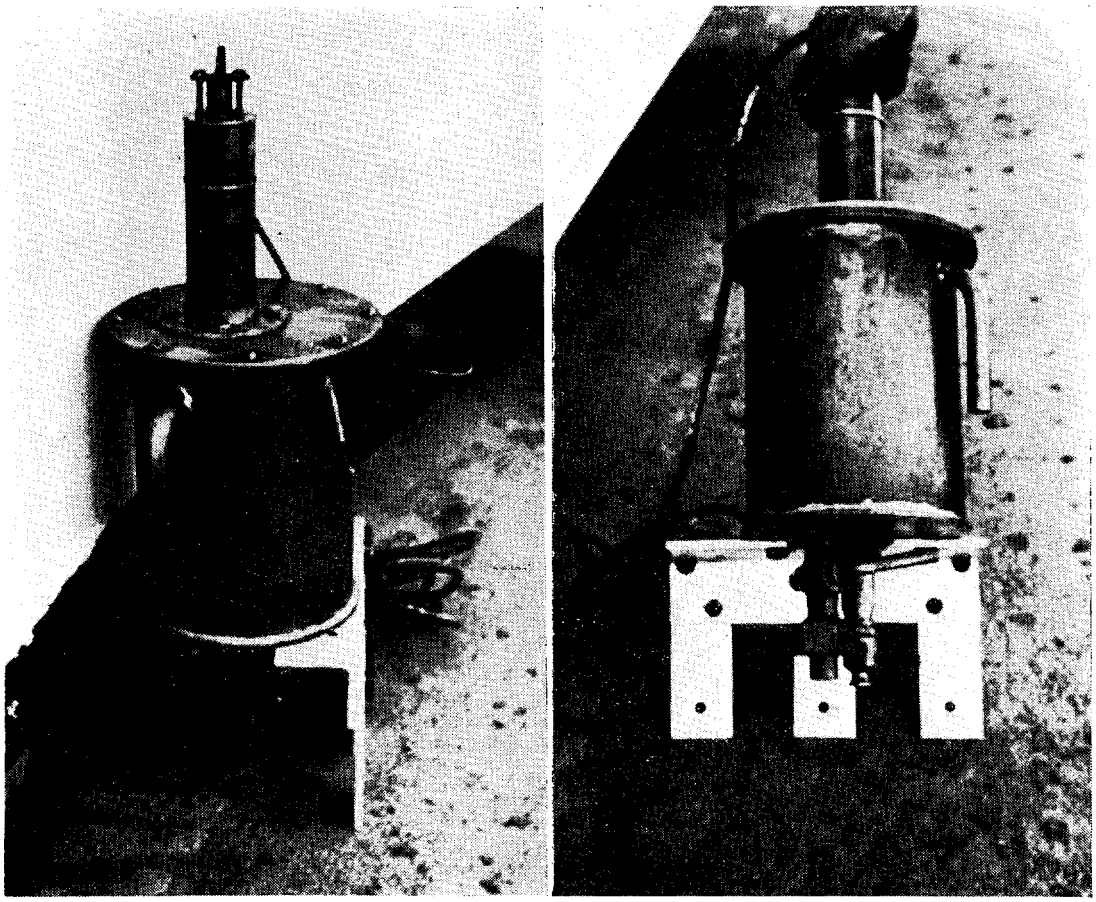

FIG. 1—TWO VIEWS OF THE COMPLETED 'WATCHKEEPER' WITH SUPPORTING BRACKETS

In this ship, H.M.S. *Barrosa*, with the turbine gland evacuation system in working order, there is never very much water present in the lubricating oil drain tanks. A 'speedy' moisture test normally registers 'nil', and it has been found that after a period the centrifuge will lose its water seal through evaporation, the water throughput being insufficient to maintain it. It is, of course, still necessary to run it for the removal of solid impurities. The loss of water sealing means that oil will be discharged with any impurities through the lower discharge of the centrifuge, thus increasing the total outflow, and it was felt that use could be made of this fact to actuate an 'automatic watchkeeper', if one could be devised.

The burning of a certain amount of midnight oil, plus odd scribbles on the back of redundant copies of H.M.S. *Barrosa* 'Daily Orders', eventually produced the design for the 'automatic watchkeeper' fitted in this ship and which, in the light of experience, seems to be reasonably successful.

As a starting point, the writer decided that the following requirements were mandatory in the automatic-watchkeeper design:—

(*a*) It must stop the purifier in the event of oil being discharged to bilge, keeping it stopped until the gearing-room watchkeeper could attend to it, and at the same time illuminate a warning lamp.

(*b*) It must be of fairly simple construction, using materials readily available, and within the capacity of the ships staff to manufacture.

(*c*) It must be simple to operate and reasonably reliable.

The first step in the construction appeared to be the acquisition of a switch suitable for the purpose of stopping the motor and illuminating the warning lamp. The only type suitable for the job seemed to be the yoke and contact

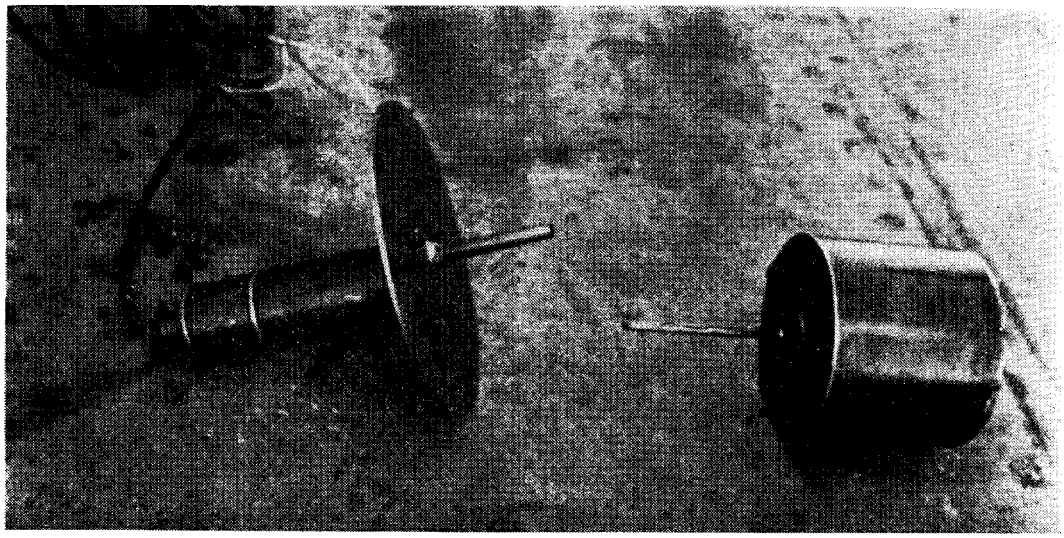

FIG. 3—FLOAT AND FLOAT CHAMBER COVER WITH SWITCH IN HOUSING

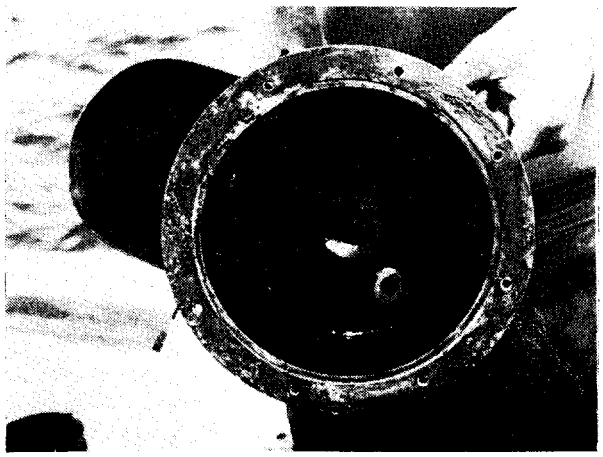

FIG. 2—THE FLOAT CHAMBER INTERIOR WITH FLOAT REMOVED

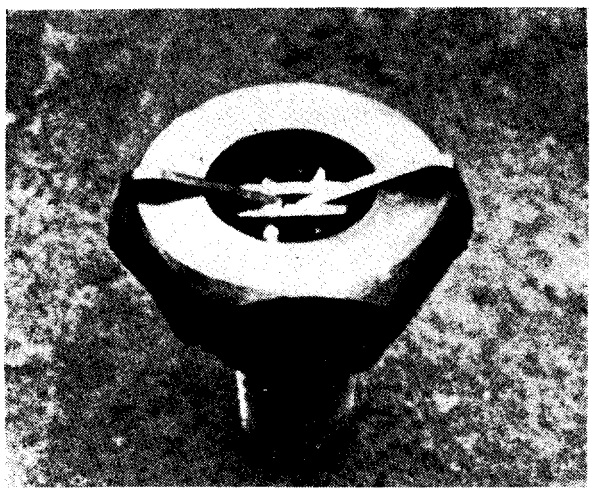

FIG. 4—OIL RETAINING VALVE AND SEAT ASSEMBLY

assembly of a Post Office 3000 Type relay, which was duly produced out of the blue, as it were, by the Marine Engineer Officer. This switch, from a mechanical point of view, seemed ideal as it needs only a very slight push to operate it.

The mechanical side of the watchkeeper consists of the following components:—

(*a*) A circular float chamber containing a copper float and push rod which, when the float rises, actuates the switch

(*b*) A float-chamber drain cock

(*c*) A valve assembly, fitted in the bottom of the float chamber, combining, in series, an oil shut-off valve and a water release valve.

The water release valve is an ordinary vent cock of $\frac{1}{4}$-inch bore, of the type used to vent oil coolers and heat exchangers, etc., and the oil shut-off valve is a mitre valve, the only peculiarity of which is in its method of operation. This mitre valve is sunk into a recess in its housing in the bottom of the float chamber and

pinned into its head are two levers, or toggles, which pivot against the upper edge of the recess so that they lie, when the valve is shut, at an angle of 30 degrees to the horizontal. The valve, when unrestricted, closes by its own weight.

When the float is dropped into the float chamber, it comes to rest on the outer ends of the mitre valve levers, pushing them downwards into the horizontal position, thus lifting the oil shut-off valve off its seat. This is the normal position of the valve with the automatic watchkeeper in operation.

The lower discharge orifice of the centrifuge is led into the float chamber, via a strainer, and the initial setting up of the watchkeeper is as follows:—

With the float-chamber drain cock open, the centrifuge is started in the normal way. When it is running normally, the drain cock is shut, thus bringing the watchkeeper into operation. The water release valve is then adjusted so that it will release just a little more than the amount of water and minor solids normally discharged by the separator, and it is left in this position.

The watchkeeper operates in the following way:—

When oil starts to discharge from the lower discharge outlet of the centrifuge, the increased flow is more than can be released by the water release valve, oil level will rise in the float chamber, and the rising float and push rod will actuate the switch, thus stopping the machine. As the float rises off the shut-off valve levers the valve will drop on to its seat, cutting off all further discharge from the valve assembly. The float will then stay up, keeping the switch in the open position until the fault can be attended to.

To reset the watchkeeper, all that is necessary is to switch off the motor by its own switch, drain the float chamber, and restart the centrifuge in the normal way after the defect has been rectified.

Some slight modifications were carried out to the original design in that both the oil shut-off valve and the water release valve had to be enlarged. The original bores were $\frac{1}{4}$ in. and $\frac{1}{8}$ in. respectively; these have now been enlarged to $\frac{7}{16}$ in. and $\frac{1}{4}$ in. and seem to be satisfactory. It was found by trial and error that, before a certain diameter, these bore sizes should not be critical.