FILTRATION BY MEANS OF A PORTABLE FILTRATION AND OIL TRANSFER UNIT

BY

A. G. HINCHLIFFE, ESQ.

Admiralty Engineering Laboratory, West Drayton

It will be generally agreed that oil, whether used as the medium for slewing the Navy's heaviest gun turrets or as a lubricant in the simple gear box, should be clean and free from dirt, scale, grit, swarf and sand, which by their abrasive action shorten the useful life of any mechanical contrivance resulting in premature refitting, or even seizure of working parts.

Full flow filters are provided on some of the more important mechanical installations, but they are not universally incorporated as they restrict flow unless the filter is of very liberal dimensions. If fitted on the suction side of the pump there is a danger of interruption of the oil flow depending on the condition of the filter. If fitted on the delivery side of the pump the filter is subject to the full working pressure and special arrangements are necessary to ensure that no damage occurs when the filter becomes clogged or when starting from cold. For these reasons designers prefer to avoid fitting full flow filters in machinery, unless absolutely necessary.

In static oil systems such as gear boxes, recoil systems, &c., there is generally no definable oil circulation and usually no means of filtration, except perhaps a gauze strainer. Where large quantities of lubricating oil are contained in tanks and reservoirs the oil is subject to contamination from scale and oxides which form in the tanks, and make it desirable for periodic re-circulation through an external filter. Many oil systems are filled and replenished direct from an oil drum with perhaps a gauze strainer in the filling funnel ; the lack of cleanliness of the oil drum is well known, and as long as access to the inside of the drum is by way of a two inch hole, the guaranteed cleanliness of the drum must remain a matter for conjecture.

After consideration of the above, it appears desirable that some portable means of filtration should be available, which can augment the existing arrangements in a ship and be put to the following uses :—

(*a*) As a filtration medium and oil transfer pump when first filling tanks, reservoirs, sumps, gear boxes, recoil systems, &c., from oil drums.

(*b*) For re-circulation of oil which has been in stowage in tanks and reservoirs.

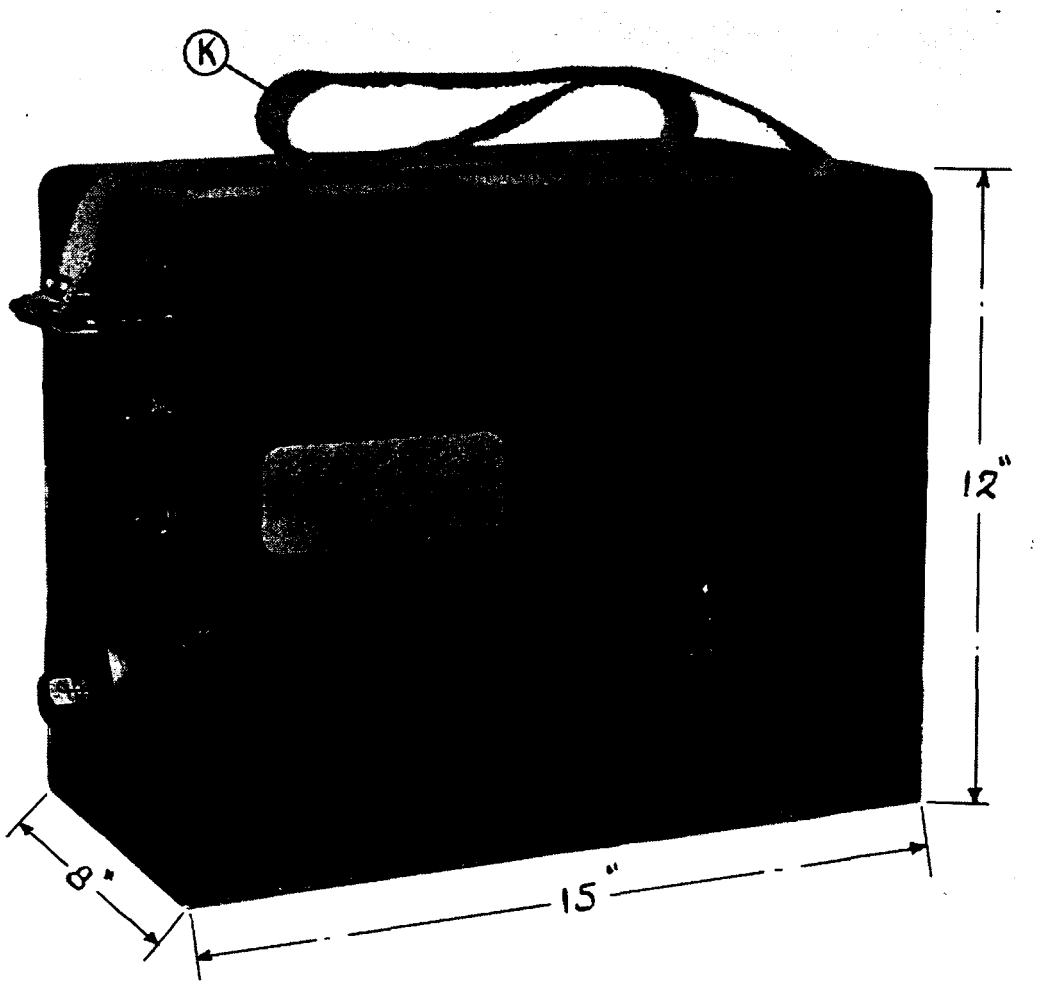
(*c*) For " topping up " any unit requiring oil from a drum.

(*d*) For re-circulation of oil in sumps, &c., after the " run in period " of a new machine.

(*e*) As an auxiliary external filter to supplement a main or by-pass filter. (*Note :* Filtration could then continue although the main engine was idle.)

(*f*) As an emergency transfer pump.

When considering a portable filtration equipment, one is inclined to think of the orthodox filtering installations consisting of motor, pump, filters,



PORTABLE FILTRATION AND OIL TRANSFER UNIT

A—Illuminated Spinner.
B—Remove for access to Filter (similar for Strainer at opposite end).
C—Delivery Connection (at rear of Cabinet).
D—Suction Connection (at rear of Cabinet).
E—Red Dial Lamp.
F—Electric Plug.
G—Fuses.
H—Air Vents (back and sides).
J—On/Off Switch.
K—Carrying Strap.

pressure gauges, manometers, &c., all mounted on a cast iron bed plate and probably bathed in oil, dirt and grease. Such an installation would be heavy and cumbersome and certainly not a desirable item to carry up and down ships' ladders, especially in a seaway. It appears essential that any proposed filtration unit must be *really* portable, and its use should be as congenial to the operator as say, connecting the domestic vacuum cleaner. Otherwise it may become a " white elephant."

The Portable Filtration and Oil Transfer Unit devised by the A.E.L. would meet the above filtration requirements. In this unit the oil is circulated by pump suction through a gauze strainer and fluid flow indicator to a motor driven pump which discharges it through a filter. The equipment is as illustrated and is capable of filtering lubricating oil at a rate of over 120 gallons per hour. Its size is $12 \times 15 \times 8$ in., and weight approximately 50 lb. (excluding the hoses). The unit embraces a 3 in. diameter gauze strainer and a filter of about 100 sq. in. in area, either of which can be withdrawn or inspected by unscrewing

one $\frac{1}{2}$-in. bolt. The filter is removed together with a thin metal housing which collects all dirt accumulated during filtration and facilitates easy cleaning or renewal of the filter material. The spinner of a flow indicator is visible on the front of the unit and should be observed to ensure it is spinning when the unit is in operation.

Should flow cease due to the filter becoming blocked, the spinner stops and a relief valve set at 25 lb./sq. in. comes into operation and discharges back to suction. A red indicator lamp shows when the unit is switched on, and the spinner is illuminated so that it is easily visible in dark places. The suction lift of the unit is about 10 ft. and a delivery pressure up to 25 lb/sq. in. can be obtained. The unit is self-priming and the 220 volt D.C. motor is protected by two fuses accessible from the outside. On removing the front panel the whole filtering mechanism can be easily inspected or dismantled.

The suction and delivery hoses are of synthetic rubber and are non-interchangeable thus preventing dirt getting into the clean side of the unit. Each hose can be quickly disconnected from the unit for portability, by non-spill couplings which avoid oil wastage in addition to closing the hose ends and attachment connections on the unit. The discharge end of the delivery hose is fitted with a short length of pipe and a control valve which enables it to be used for topping up (in a similar manner to a garage car filling petrol hose) the valve being closed when the desired level of topping is reached. For filtering tanks or sumps it is envisaged that in lieu of the normal sump drain plug, a screwed drain cock could be permanently fitted which would be suitable for connection to the suction hose supplied with the unit. Oil would then be withdrawn from the dirtiest part of the system, passed through the filter unit and returned in a clean condition to the sump via the filling orifice.

During the tests of the unit, silk was used as the filtering material, and was alleged to remove particles down to 0.002 in. in size ; the oils used were OM 65 and 88. There appears to be no reason why a finer filtering material should not be employed with a slight loss in flow rate, and tests on these lines are proceeding.

It is difficult to assess the benefits such a filtration unit as the above would have if put into service. One method is to evaluate its usefulness on the amount of grit and dirt the filter removes over a prescribed period in a ship. If the deposits removed are considerable, there will be no doubt whatever that the filtration unit is performing a valuable function resulting in less wear on working parts, fewer refits, and saving public money.