3. Hiscox, Dorothy J., Anal. Chem., *20*, 679-80 (1948).
4. Mehlenbacher, V. C., Off. and Tent. Methods, Am. Oil Chem. Soc., 2nd Ed. (1946).
5. Mitchell, J. H. Jr., Kraybill, H. R., Zscheile, F. P., Ind. Eng. Chem. Anal. Ed., *15*, 1-3 (1943).
6. Shorland, F. B., Nature, *165*, 766-67 (1950).
7. Swern, Daniel, Knight, H. B., and Eddy, C. Roland, presented at 25th Fall Meeting, Am. Oil Chem. Soc., Chicago, Ill., Oct. 8-11, 1951.

[Received November 20, 1951]

A Dual Purpose Extractor[1]

H. J. LIPS, Division of Applied Biology, National Research Laboratories, Ottawa, Canada

THE apparatus shown in Figure 1 has proved useful for exhaustive extraction of comminuted solids with liquids, and of liquids with other non-miscible liquids.

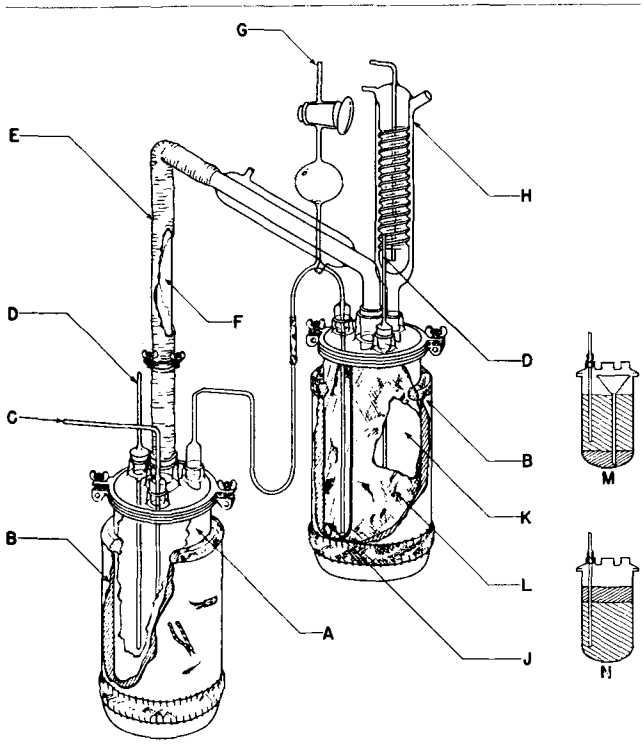
The boiling and extraction chambers (A and L) are 6-liter Pyrex resin reaction kettles equipped with ground glass covers each bearing four standard taper joints. These covers are secured to the flasks with rings and clamps. The temperature of both chambers is regulated by electric heating mantles (B) and may be read on standard taper thermometers (D). For more exact temperature control, the thermometers are replaced by special mercury thermoregulators described in an earlier report (1). Bumping and frothing in the boiling chamber are minimized by introducing inert gas at C.

The vertical portion of the vapor return system (F) is insulated with asbestos cord (E) to reduce reflux. An auxiliary condenser (H) decreases vapor loss to a minimum. Solvent is returned fractionally from the extraction chamber to the boiling chamber by an intermittent siphon (G), which carries a bubble trap, and a stopcock for filling by aspiration. The height of the discharging end of the siphon determines the volume of liquid removed from the extraction chamber each time the siphon operates. The U portion of this siphon keeps the column of liquid unbroken between operations. Flexibility in assembly of the apparatus is obtained by insertion of a spherical joint in the vapor return, and a length of Tygon or Teflon tubing in the siphon.

The main drawing shows the extraction chamber (L) equipped for eluting ground solids in a canvas bag (K). A glass separator plate (J) permits the siphon tube to extend to the bottom of the extraction chamber. For extraction of a heavier liquid with a lighter one, as shown at M, a funnel conducts the condensed lighter liquid beneath the surface of the heavier one. When a lighter liquid is extracted with a heavier one, as shown at N, the condensed heavier liquid falls through the lighter liquid. The length of the siphon tube within the extraction chamber is adjusted according to the volume of the liquid which is being extracted. The intermittent, fractional removal of solvent from the extraction chamber and the relatively long path to the top of the siphon minimize mechanical carryover of droplets of the liquid undergoing extraction.

The amount of material handled can be varied by providing chambers of different sizes. Liquids may be withdrawn or distilled from either chamber without completely dismantling the apparatus. Various refinements such as use of a sintered glass dispersion disc for extraction (as in M) may be made as required. Optimum conditions for exhaustive extraction might vary considerably for different materials.

Petroleum ether extraction of oil from kilogram quantities of ground weed seed screenings (29% oil) was complete in 16 hr. or less, as checked by extraction of 50-g. lots of the same material in a small Soxhlet apparatus. Removal of 20 to 25% of acetic or propionic acids added to kilogram lots of weed seed oil required 16 to 24 hr. extraction with water or 90 to 95% ethanol. These liquid-liquid extractions could be speeded up by alternating refluxing (with the siphon clamped off) and extraction in the extraction chamber.



DUAL PURPOSE EXTRACTOR

A	BOILING CHAMBER	J	SEPARATOR PLATE
B	HEATING MANTLE	K	BAG
C	GAS INLET	L	EXTRACTION CHAMBER
D	THERMOMETER	M	EXTRACTION OF HEAVIER LIQUID WITH LIGHTER LIQUID
E	ASBESTOS CORD		
F	VAPOR RETURN	N	EXTRACTION OF LIGHTER LIQUID WITH HEAVIER LIQUID
G	SIPHON		
H	AUXILIARY CONDENSER		

FIG. 1.

Acknowledgment

The author wishes to acknowledge the interest and helpful suggestions of I. E. Puddington.

[1] N.R.C. No. 2693.

REFERENCES

1. Lips, H. J., J. Am. Oil Chem. Soc., 27, 422-423 (1950).

[Received December 3, 1951]