systems. Heating the oil by means of a condensible vapor is most satisfactory, as close temperature regulation and good efficiency can most easily be obtained.

If steam were used as the heating medium, pressures on the order of 400 lbs. to 500 lbs. G. would be necessary to produce the desired oil temperatures, with reasonable temperature differences. These pressures have been found to give some operating difficulties.

Dowtherm has proved to be a very satisfactory heating medium. This is an eutectic mixture of Diphenyl and Diphenyl Oxide. It solidifies at a temperature of 54° F., only 22° higher than water. Its vaporizing temperature at atmospheric pressure is 500° F. Other properties are shown in Figure 7.

Dowtherm vapor, therefore, at pressures only slightly greater than atmospheric, will serve as a very satisfactory heating medium.

The final oil heater and the steam superheater are located at elevations above the top of the boiler. Dowtherm vapor is supplied to these units, and Dowtherm condensate returns to the boiler in a closed system. Dowtherm boilers are operated in the same manner as steam

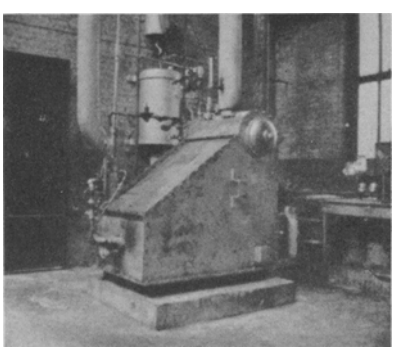

FIGURE 8

boilers, with semi-automatic control of gas or oil burners.

Figure 8 shows a unit having capacity of 100,000 B.t.u. per hour, and Figure 9 shows a boiler having a capacity of 2,200,000 B.t.u. per hour. Both of these boilers are operating in connection with vegetable oil deodorization systems, the former with a continuous system, and the latter with a batch system.

Two Continuous Deodorizer Units have been in operation for over one year. Operating results, flexibility of control, and excellence of the product have been proven.

A study of the results indicates that the free fatty acid content of the incoming oil has a bearing on the reduction in color of the finished deodorized oil. If the incoming oil has a low free fatty acid content, the color is somewhat reduced.

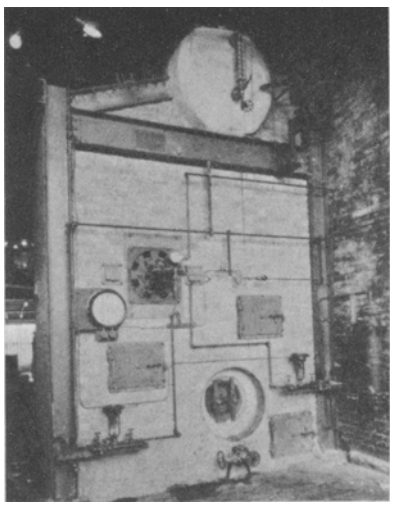

FIGURE 9

As the initial free fatty acid content increases, the reduction in color of the final product becomes less.

The removal of the free fatty acids, for a given capacity rate, steam flow, and vacua, is affected by the percentage contained in the incoming oil. A high fatty acid oil can be reduced to a minimum fatty acid content by lowering the through-put rate of oil.

Losses

Batch deodorization seems to involve some losses of oil due to hydroloysis of the glycerides, and subsequent distilling off of the fatty acids and glycerin, as well as any entrainment loss—judging from a study of numerous batch operating data, and specific tests made.

Continuous deodorization results in minimizing or completely eliminating such losses.

A test run on a 5,000-lb. per hour capacity Continuous Deodorizer Unit, checked by analyzing the condensing water discharged by the Vacuum Condenser, showed that the total carryover loss was 0.11%. This loss was that corresponding to the loss of free fatty acids in the incoming oil:

	Pct.
Free Fatty Acids in Incoming Oil	0.15
Free Fatty Acids in Finished Oil	0.04
Total loss by analysis	0.11

Thus no loss of original glycerides was found.

The entrainment of oil from the Deodorizer to the Vacuum Equipment is prevented by a special type of entrainment eliminator, having very low pressure drop built into the top of the Deodorizer Tower.

Three commercial deodorizer units are now being constructed, having designs essentially similar to the two units on which a year's record of operation has been obtained.

The following conclusions may be reached with respect to the operating characteristics and product of the Continuous Deodorizer:

1. The Continuous Deodorizer is satisfactory for the deodorization of salad oils, as well as the standard shortenings, of both the pure vegetable oil, and animal-vegetable oil type.
2. The flavor, color, and general quality of the finished product is in every way satisfactory.
3. The consumption of injection steam, and correspondingly, steam used for vacuum booster, is greatly decreased, as compared with batch operation.
4. The water required for the vacuum condensing equipment is decreased, in proportion to the decrease in steam.
5. The recovery of from 60 per cent and more, by heat exchange, considerably decreases the cost of heating the oil.
6. The continuous process allows of great flexibility as to capacity, operating efficiently at low rating, yet is instantly available for peak requirements.
7. Operation is less subject to variation than with batch operation, resulting in the finished product being more uniform.
8. Automatic control is easily adapted to the Continuous Deodorizer.

Erratum

OIL AND SOAP, Vol. 15, page 129, middle of 3rd column.

For the sentence on composition of Antarctic whale and cod liver oils substitute:

Approximate molar percentage composition of Antarctic whale and cod liver oils, respectively, were myristic 9, 2; myristoleic 4, 2; palmitic 17, 14; palmitoleic 17, 10; stearic 2, 1; C_{18} unsaturated 35 (mean unsaturation —2.6H), 26 (—3.3H); C_{20} unsaturated 12 (—5.6H), 25 (—5.5H); C_{22} unsaturated 4 (—9H), 20 (—7.4H); and C_{24} unsaturated ——, less than 1 per cent.