the steam rises with the pressure, and it is possible to raise the temperature within the still to 220° C. This is a novel and clever application of thermo-dynamics to the problem of securing high temperatures.

Several of the research laboratories visited were splendidly equipped, not only for carrying out chemical research, but also semi-commercial investigations. Every possible type of plant equipment built on a small scale had been provided.

It would not be possible in an article of this length to present a comprehensive description of European refining practice so I have attempted to point out some of the more interesting points of difference between their practice and our own and also to present a few of the more promising ideas which have been advanced for improving methods of refining. I came away from Europe with a high respect for the ability of their oil chemists and a keen appreciation of their liberality in affording opportunities for observation.

Pine Nut Oil*

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PINE nut oil from *Pinus monophylla* is described by *Blasdale*[1] as "a brown drying oil with an unpleasant odor and taste." It is classed by *Lewkowitsch*[2] as a drying oil, although the iodine number is but 101.3. This figure has been confirmed by *Adams and Holmes*[3] and by the writer. On the other hand, quince seed oil (from *Cydonia Vulgaris*) with an iodine number of 113-120 is classed as a non-drying oil. Here was an opportunity to investigate an anomalous situation.

A quantity of the nuts or seeds was obtained through the courtesy of the Forest Service in Nevada. These were ground, extracted in *Drechsel* extractors with ether, and about 21 per cent of a light yellow oil of a balsamic taste and odor was obtained. This oil showed the following characteristics:

Drying quality: Submitted to the usual Archbutt test—(drying on a glass plate at 50°) it was not dry after 30 days' exposure. The oil about the stopper of the container did not dry after months of exposure as much as cottonseed; it resembled olive more closely in this regard. This test would alone decide the question.

Table I. Chemical & Physical Characteristics

Specific gravity 20° C	0.911
Acid value Mg KOH per gram oil	5.4
Reichert-Meissl value	0.89
Saponification value	183.9
Unsaponifiable matter, per cent	1.95
Iodine number Hanus	102.1
Thiocyanogen-iodine number	78.8
Saturated acids corrected per cent	8.1
Unsaturated acids corrected per cent	84.5
Iodine number of unsaturated acids	122.6
Clycerine per cent	8.9

The fatty acids were determined by saponification of the oil with an excess of a known quantity of N/2 alcoholic potassium hydroxide: the excess of hydroxide was neutralized with a known quantity of N/2 hydrochloric acid. The solution was evaporated to dryness and the residue weighed. This contained the potassium soaps, a known quantity of potassium chloride, glycerine and unsaponifiable matter. The latter was extracted with ether, which, on being evaporated, left a heavy terpene- or sesquiterpene-like oil. The glycerine was determined by the acetin method on a fresh sample. Knowing the amount of potassium in the soap, the fatty acids combined with it could be determined: thus the fatty acids, glycerine and unsaponifiable matter were determined.

The saturated fatty acids were determined by the well-known lead-salt-ether method. Their methyl esters were prepared and fractionated, using 37.5 grams. From these three fractions the following percentages were obtained:

Saturated Acids:	myristic C_{14}	5.0 per cent
	palmitic C_{16}	2.7 per cent
	stearic C_{18}	0.4 per cent

No evidence of a low boiling methyl ester was found, hence lauric and lower acids are absent.

[1]J. Am. Chem. Soc., *17*, 935 (1895). [2]"Analysis of Oils, Fats and Waxes," [3]Ind. & Eng. Chem., *5*, 285 (1913).

*Original Contribution, received July 27, 1932.

The percentages of oleic and linoleic acids were calculated according to the suggestion in *Lewkowitsch I*, 574, 6th Ed.

$$x + y = 100 \text{ and } \frac{90.x^*}{100} + \frac{181.y}{100} = \text{iodine number fatty acid.}$$

We obtain 35.8 per cent of linoleic and 64.2 per cent oleic acid with 84.5 per cent of unsaturated acids. This means of course in the oil there are 30.2 per cent linoleic and 54.3 per cent oleic acid.

Unsaturated Acids in Original Oil:

	Acids	Glycerides
Linoleic	30.2	31.6
Oleic	54.3	56.7

Summary

THE oil would seem to be made up about as follows:

(Linoleic Acid	31.6 per cent
(Oleic Acid	56.7 per cent
Glycerides of (Myristic Acid	5.3 per cent
(Palmitic Acid	2.8 per cent
(Stearic Acid	0.4 per cent
Unsaponifiable matter	1.95 per cent

As a check upon the foregoing, the iodine number of the oil may be calculated therefrom. Figured from 31.6 per cent glyceryl linoleate and 56.7 per cent glyceryl oleate, the iodine number is 103.8. This checks well with that found, 102.1.

It is possible to calculate the percentage of linolenic acid as well as those of linoleic and oleic from the iodine and thiocyanogen-iodine numbers: this calculation indicated 10.1 per cent glyceryl linolinate, 44.4 per cent linoleate, 33.7 per cent oleate. Figured from these the iodine value would be 132.4. This shows that linolenic acid cannot be present in any considerable quantity. Pine Seed Oil from *Pinus monophylla* must therefore be classed as a semi-drying oil.

The author here wishes to acknowledge the assistance of Messrs. H. J. Svien, H. D. Addison and G. T. Vaala by whom the experimental work was carefully performed.

*Decimals omitted as within errors of determination.

United States Absorbs Most of Philippine Exports

The position of the United States in Philippine export trade has developed to an even greater extent than its place in the islands' import trade. By 1923 the United States was taking annually about 70 per cent of the total exports, compared with approximately 20 per cent in the early years of American occupation. Since 1923 Philippine export trade with the United States has grown steadily until in 1930 the American market absorbed 80 per cent of the total.

In the following table leading exports to the United States are shown for 1929 and 1930:

With the industrial expansion which accompanied the World War period, Philippine sugar and coconut products attained leading places both in total export trade and in trade with the United States. Since 1924 more than 90 per cent of Philippine sugar has been consumed in the American market, which now absorbs practically all—about 99 per cent—of the amount exported. In 1930 sugar accounted for slightly less than 50 per cent of Philippine exports to the United States compared with 40 per cent for the previous three years. The islands now supply 40 to 45 per cent of the demand for sugar in the United States.

Coconut products, including oil, copra, desiccated coconut, and copra meal, in the order named, rank second in exports to the United States, accounting for 30 to 35 per cent of the total trade. Production of coconut oil on a commercial basis in the Philippines was a wartime development, and although the industry now is reduced to a much smaller scale, oil is still the principal coconut product exported, from both a volume and value standpoint. In the last five years 98 per cent has gone to the United States. The oil is an edible fat, but it is used mainly in the manufacture of soap.