

Refining equipment of cherry oil plant. Sturgeon Bay, Wisconsin.

Cherry Kernel Oil— Production and Utilization

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THE cherry canning industry of the United States which has shown a rapid growth during the past few years has recently attracted attention to the possibility of utilizing the by-products resulting from the canning operations. As early as 1916¹ the Bureau of Plant Industry called attention to the possible utilization of the pits and juice of sour cherries which accumulated in large quantities in certain canning sections of the United States, principally in New York, Michigan, Wisconsin and California, where, it was estimated, about 1,400 tons of pits resulted annually. Since then increased acreage in those states and expansion of the crop in other states has resulted in an increased output of cherries with a correspondingly larger output of pits. Based on the production of the past three years it is estimated that a total of 38,000 tons of sour cherries are pitted and canned annually in the states of Wisconsin, Michigan and

New York alone, whereas several other states are canning them also in large quantities. Sweet cherries are grown extensively in certain western states but these are marketed for the most part without removing the pits.

The red, sour cherry is designated botanically as *Prunus cerasus*. Two varieties, the Montmorency and English Morello, form the bulk of the cherries produced for canning purposes. From the quantity produced in the three states mentioned it is calculated that about 5700 tons of pits are available annually from the canning operations. Incidental to the removal of the pits there results also a quantity of juice, estimated at about 70 gallons per ton of pits, or approximately 40,000 gallons in the aggregate, which, it is suggested, might be utilized in making jelly. These by-products have been considered valueless and have been discarded as waste, often at considerable expense for hauling them away, but in 1926 initial steps were taken to-

¹Rabak, Frank. The utilization of cherry by-products. Bureau of Plant Industry Bulletin 350. 1916.



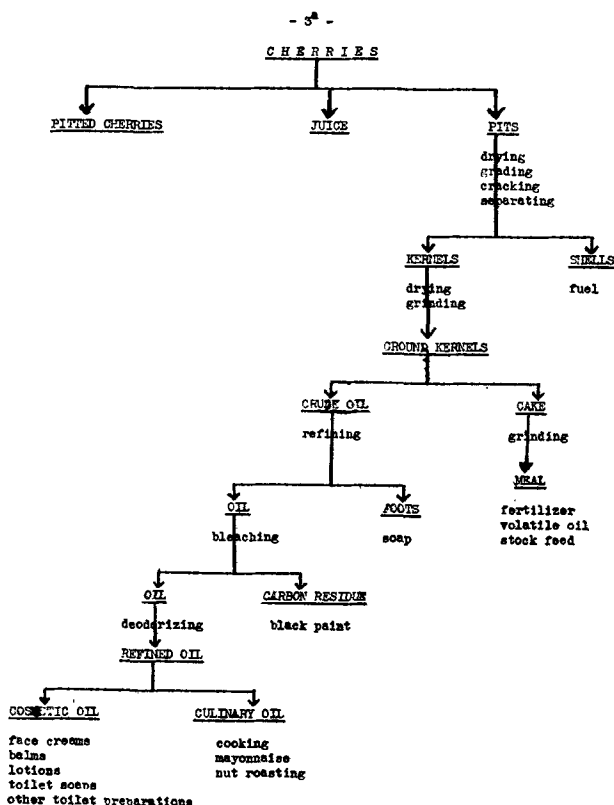
Airplane view of Wisconsin cherry orchard.

ward utilizing the pits for the production of oil, and the Cherry Oil Company of Sturgeon Bay, Wisconsin, was established for that purpose. Sturgeon Bay is located in Door County which occupies the peninsula between Green Bay and Lake Michigan. There the soil and climate appear to combine to produce fruit of the highest quality for canning purposes and 5,000 acres are devoted to cherry orchards. This output of cherries forms the basis for the utilization project now under way at Sturgeon Bay. In addition to this it is estimated that an equal or greater amount is readily available from Michigan by water transportation, but unless large quantities of pits can be easily accumulated at some central point such a project would be neither feasible nor profitable.

Before discussing the products that may be made from cherry pits it is desired to call attention to the relationship that exists between cherries and allied fruits and the sweet and bitter almonds, the latter of which yield commercially valuable oils. They all belong to the same Natural Order, *Amygdalaceae* (or *Drupaceae*), which produces such fruits as peaches, apricots and prunes. All these fruits contain pits with kernels that are practically identical from the standpoint of chemical composition, and all of them contain fatty oils with similar characteristics. With the exception of sweet almond, all of them when specially treated yield also a volatile oil which is designed commercially as bitter almond oil. According to a recent analysis of

cherry kernel oil² it has been shown to be very similar to almond oil and to the oil from apricot and peach kernels. After aging a year the refined oil was found to be in excellent condition and free from all rancidity. The report states also that because of its similarity to almond and related oils cherry kernel oil should be suitable for use in the manufacture of cosmetics and as a salad oil.

In 1929 the Cherry Oil Company installed a new plant fully equipped with the most modern machinery for the purpose of converting waste pits resulting from the Door County canning operations into cherry kernel oil, with press cake and shells resulting as secondary products. In order to produce a high grade oil suitable for cosmetics and edible purposes the crude oil must be refined, and for this purpose a complete unit for refining, bleaching, and deodorizing was also installed. During 1929 and 1930 approximately one million pounds of pits were converted each year into these commercially valuable products, resulting in a yearly output of about 63,000 pounds of oil, 147,000 pounds of press cake, and 540,000 pounds of shells. The general procedure of converting the pits into



Flow chart, showing uses of cherry products.

²Jamieson, G. S. and Gerter, S. I. American cherry kernel oil. Oil and Fats Industries, vol. 7, p. 371-372. 1930.



Oil refinery plant.

these several products, and the uses of the products, is shown in the accompanying flow chart.

The wet pits, which constitute about 15 per cent of the cherries, contain approximately 25 per cent of adhering moisture as they come from the pitting machine which must be removed in order to facilitate cracking. This is done by means of a tray drier. The pits are graded according to size and then cracked by passing them between steel rolls adjusted for each size so as to prevent as much as possible the breaking of the kernels. The kernels are then separated from the shells by means of shaker sieves combined with an aspirator system which withdraws the shells. By this process about 28 per cents of the kernels and 72 per cent of the shells are obtained. Most of the natural moisture contained in the kernels still remains and this must be reduced to not more than 10 per cent before they can be crushed for the extraction of the oil. This is accomplished by means of a steam rotary drier. The dried kernels are ground by means of an attrition mill and thence conveyed to the oil expeller. About 30 per cent of crude oil is thus obtained and the resulting press cake contains from 6 to 7 per cent. The crude oil is pumped into the refining tank where it is treated with caustic soda and the foots allowed to separate. The foots represent a refining loss of about 6 per cent. The neutral, supernatant oil in the refining tank is then transferred to the

bleaching tank where it is treated with 6 per cent of a special carbon bleaching agent. The bleached oil is passed through a filter and then subjected to the action of superheated steam in the deodorizer after which it is ready for the market. The refined oil is straw colored and possesses a pleasant bland taste.

Because of its neutral, non-rancid character cherry kernel oil has two distinct uses in commerce. As a cosmetic oil it is recommended for face creams, balms, lotions, toilet soaps, and other toilet preparations where a natural, stable oil similar in chemical composition to almond oil is required. It is reported that cosmetic preparations of high quality prepared with it have shown it to be especially adapted to such purposes because of its stability and neutral character. As a culinary oil it possesses valuable properties for use in mayonnaise, the roasting of nut meats, and for cooking purposes. In the roasting of nut meats it has been found to be of exceptional value because of its very bland taste and non-rancidity as compared with other oils used for this purpose and the flavor of the nut meats is materially improved because of these properties.



Cherry pickers at Sturgeon Bay.

The shells which result in large quantities from the cracking of the pits are valuable as a fuel. Their usefulness of a raw material for the production of charcoal is also indicated.

The press cake, or meal, resulting from the crushing of the kernels has been found to be a very efficient fertilizer. The meal contains the cyanogenetic glucoside, amygdalin, which when hydrolyzed produces a volatile oil containing hydrocyanic acid (prussic acid) and benzaldehyde. In the early experiments conducted with cherry kernels it was found that the meal contains nearly 1 per cent of this oil, which is practically the same as bitter almond oil and suitable for the same flavoring purposes. Because of the formation of this oil when the meal is moistened the latter can not be used for stock feed but if the oil is extracted the meal becomes val-

uable for this purpose on account of its high protein content (30.8%) and compares favorably with linseed and other meals used for stock feed.

The carbon residue resulting from the bleaching of the oil has been successfully utilized in the preparation of a black paint by mixing it with linseed oil and is used for painting the cut ends of branches of the trees during the pruning of the orchards.

The complete utilization of cherry pits at an important cherry-producing center for the production of cherry kernel oil and other products has been described. As a new domestic oil of high quality, perhaps equally as useful as oils now imported for the purposes mentioned, cherry kernel oil should receive the consideration of the consuming industries.



Hotel Congress, Chicago.

THE Fall Meeting of the American Oil Chemists' Society which is to be held at the Congress Hotel, Chicago, Thursday and Friday, October 20 and 21, bids fair to outdo the two previous record breaking meetings of the Society in the North. Arrangements have been made with the Congress Hotel for the use of the beautiful Florentine Room for our meeting.

Mr. Campbell, Chairman of the Soap Section, and the local committee are working hard to arrange an interesting program and entertainment.

The first day of the meeting will be devoted

Autumn Meeting Plans Well Advanced

to the Soap Section, and the following preliminary program has been prepared:

Committee Reports:

Soap Analysis Committee—M. L. Sheely
Glycerin Committee—J. T. R. Andrews
Detergents Committee—J. G. Vail

Papers:

“Determination of Refractive Index of Glycerols by the Immersion Refractometer”—L. F. Hoyt.
“Color Standards for Commercial Facts”—J. E. Doherty.
“Simplified Color Readings”—A. S. Richardson.