

the European product is, in the future as in the past, to be simply "gathered" from waste places where there is no more production expense than there would be in this country in the gathering of rag-weed along the roadside.

Drug houses of the highest class, who aim to use the very best raw materials that the market affords, will doubtless be as anxious to continue the use of the higher grade American products as the American growers are to supply them. Other firms who desire the foreign drugs because they are cheaper, may not be interested in seeing the American industry protected. It is certain that the cultivated drug cannot be raised in this country as cheaply as the foreign wild drug can be gathered.

The Senate Committee is at present holding hearings covering this phase of the question, and it is the writer's opinion that if a moderate duty is placed on the importation of foreign drugs, sufficient to allow the high grade American *cultivated* herb to withstand the competition of the *wild, uncultivated* European herb, then the American drug industry can survive.

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#### AN EXPERIMENT WITH COMPOUND TINCTURE OF BENZOIN.\*

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This paper is entitled "An Experiment on Compound Tincture of Benzoin" because it does not essay to be an exhaustive study. The experiment is limited to a single use of this renowned remedy. Indeed a study of any one of its ingredients must appear to be a life's work to those who read the descriptions of these drugs and the tables of their contents. There is, however, an aspect of similarity between the constituents of two of the ingredients, tolu and storax, which, although not the reason for this paper, did tend to make the subject more worthy of consideration. The report that no true storax was to be had at any price suggested the experiment; and as the pharmaceutical use of storax is chiefly for preparing Compound Tincture of Benzoin, the idea occurred to compare it with tolu under the conditions to be described.

The addition of compound tincture of benzoin to boiling water and the use of the vapor therefrom to treat the throat in certain conditions is the circumstance under which we experiment. This matter perhaps seems too well known to even bear mention. But, strange to say, like so many of the simple things, the exact products of this process do not appear to have been reported in the pharmaceutical lore of this "old-timer." Instead it appears to have been presumed that he who knows what is in the ingredients infers from their nature that certain substances pass off with the steam, and being carried by it to the throat have their effect. The writers have been unable to find any reference to the vapor having been examined, and realizing that it would be of interest to learn more of the matter, especially as regarded the necessity for storax, they sought to examine the vapor, by imitating the conditions under which the treatment is applied, through the use of a retort and condenser.

Accordingly, a half teaspoonful of Compound Tincture of Benzoin was poured into a pint retort half full of boiling water, and as would be expected, an intense

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demonstration of activity, due to the dissipation of the alcohol, immediately took place. The retort was closed without delay and the boiling continued. The distillate was collected in fractions of about one ounce, in order to observe the progress of the process. Seven such fractions were thus taken. The fractions were all colorless, although they displayed a slight turbidity due to an oily scum which floated throughout. The fractions remained turbid upon standing for several days. The distillate in all its parts showed an acid reaction to litmus, but the cause of the turbidity was also an interference with the effect on litmus paper, retarding it very perceptibly. The degree of acidity did not exceed in indications one-sixth grain of benzoic acid per fluidounce of distillate. The proportion of acidity appeared to be uniform throughout the series of fractions. The odor of the fractions varied to some extent but were true to their source. The taste of the fractions was likewise suggestive of the origin.

Although the residue in the retort is not a specific object of the experiments, attention to it at this stage was believed to be warranted. The marked acidity of this fluid established the fact that the total acidity of the ingredients is by no means wholly volatilized by the process, even in the time required to conduct this distillation—a period much longer than the most faithful patient would consent to devote to a single treatment. Thus are the commonly directed proportions of “one teaspoonful to be added to a pint of boiling water” shown to be sufficient and more but a waste of the tincture.

In order now to get a better knowledge of what would be obtained from a considerable volume of the compound tincture of benzoin so distilled with water, the solid ingredients required for 100 mils were placed in a retort with 250 mils of water and a distillation conducted as before. The fractions had odors which varied but always reminding of the ingredients. They all had warm pungent tastes. They were without exception colorless and transparent; acid to litmus, apparently uniformly so as to strength; and in each floated small droplets of a fluid substance, or flattened areas of the same appeared upon the surface. The amount of the total yield of this substance from the quantities representing 100 mils was approximated at less than 0.5 mil (8 minims). The proportion of this substance to the condensed liquid ran the same in all of the fractions.

Attempts at separating it from the aqueous portion by inducing coalescence of the droplets failed, it is believed, only because of the small amount of the substance, so recourse was had to the use of ether with the hope that this substance and any benzoic and cinnamic acids present in the aqueous portions of the distillates might all be removed and made available for further examination. Upon evaporation the ether solution left a residue which was recrystallized from alcohol, in which it was found to be readily soluble. This treatment yielded a mixture composed of the pale amber-colored oily substance and small, white, granular crystals. The odor of the distillates was still recognizable in this residue. The first portion of ether so applied carried the oily liquid into solution to a certain extent, dependent upon a selective solvent effect which it exercised, but not in its entirety, a fact proven by the presence of numerous droplets which remained as the undissolved portion of the original droplets, even after a second treatment with ether, while the residue from the second ether showed white, granular crystals and but little other substance.

Chloroform had the same solvent effect upon this residue of the droplets as did ether. The mixture of the oily and granular substances was treated with very dilute solution of sodium hydroxide to remove any benzoic acid which might be present. The effect of this solvent on the oily portion of the residue was to cause it to assume a buttery consistency. Cold water produced the same effect and warmth restored the oily globules. When this buttery material was heated with a five percent solution of sodium hydroxide it became fluid but did not dissolve.

The granular crystals gave reactions for both benzoic and cinnamic acids; the former seemed to be present in larger quantity.

Attention was now turned to the ingredients as individuals, and each of them was distilled with 250 mls of water, using the quantity of drug which would be needed to make 100 mls of compound tincture of benzoin, this plan serving to compare them not only with the latter but also with each other. Again, to observe any irregularity in the progress of the treatment, the distillates were collected in fractions, and it is noteworthy that the fractions from the same ingredients were invariably uniform throughout the series. Likewise, the distillates were all colorless, while the odors and tastes were characteristic of the sources.

Ten grammes of benzoin, when distilled as described, gave a distillate having a whitish opalescence when first received, but after a few hours showed a slight sediment of white, dust-like powder. The liquid reddened litmus; and after one of the fractions had been neutralized with solution of sodium hydroxide it showed benzoic acid in slight amount compared to reasonable expectation.

Two grammes of aloes treated in the same manner gave a transparent distillate in which floated a trifling amount of scum. The substance of which it was composed seemed to agglutinate upon agitation, but the quantity was too minute for further examination. The distillate remained clear upon standing. Litmus was not affected by it.

When 4 grammes of tolu were subjected to the same process a distillate with a milky opalescence was obtained, the cause of which was the presence of a substance that in the main floated upon the surface of the liquid in distended droplets, although upon standing it became transparent through the coalescence of the minute droplets into globules of sufficient size to admit of this result. These globules were colorless or very pale amber-colored. Warmth and quiet did not promote coalescence, but tended to increase the layer floating upon the surface, while contact with ice clouded the distillate made transparent by standing, presumably through excluding some or all of the substance with which the water was saturated. The reaction of this distillate was acid to litmus. The test for benzoic acid showed but a faint indication of its presence.

Eight grammes of storax were next distilled. The distillate as received from the cool condenser showed a small quantity of a white, tissue-like scum which upon the slightest agitation broke up into feathery forms, and immediately passed into droplets of an oily substance, mainly floating upon the surface. The properties of these droplets were strikingly similar to those from tolu except in odor. The quantity of them in this experiment was approximately the same as that from the tolu, although in percentage quantity it was but half what tolu yielded. The effect of heat and cold on this distillate resembled in all respects the behavior shown by the distillate from tolu. Except for the scum this distillate was trans-

parent when obtained, and it remained so upon standing, as did the distillate from tolu. It was neutral to litmus, and tests showed no benzoic acid.

These experiments demonstrate in a practical manner, for the valuation of the idea being considered, that there is a remarkable similarity (identity is not asserted) in the products of a steam vapor from tolu and storax; also that tolu yields twice as much of these products as does storax. Again, steam volatilizes a certain proportion of the constituents of both substances, as well as of benzoin, but does not nearly exhaust any of them in the time that would be devoted to the treatment. The final result must be essentially the same whether the tincture is added to boiling water or to cold water, and this brought to boiling.

And let us add just a few words here as to actual requirements of temperature for the mixture of tincture and water, regardless of utensils, of which there are many kinds. It is necessary to have at least a slight ebullition observable in the mixture to insure sufficient velocity in the ascending vapor to properly carry it back into the throat. Less than that affords but warmth, and not the reassuring impact of vapor which is had from a boiling liquid. Nor is there any position quite so favorable as that of bending over a column of vapor, rising vertically, so as to bring it into right angled contact with the back wall of the throat.

In drawing conclusions it will be well to review the findings. As will be recalled, the ingredients of 100 mils of compound tincture of benzoin (twenty times the quantity usually prescribed for the purpose) gave but minute amounts of any or all of these volatile substances. The aloes, having supplied but its odor, and nothing of worth, may surely be omitted without loss of activity. Benzoin, under the conditions, furnishes little, if anything, besides a very small amount of benzoic acid; storax yields no benzoic acid but does supply the oily substance hereinbefore described; tolu gives but a trace of benzoic acid, but twice as much of a similar oily substance as does storax. Except for the fact that benzoin furnishes a larger proportion of benzoic acid than does tolu it might also be omitted. Consequently, though this treatment be used for the medication contained in the vapor, as well as for the avowed effect of the steam, it would now seem unnecessary to include the storax; and even if there is the necessity for conserving it, which arises because of its scarcity in the market, such does not appear to be the only reason it may be permanently left out of this treatment, and compound tincture of benzoin reserved for other uses.

The following formulas are capable of furnishing products similar to those obtained from compound tincture of benzoin:

Tincture of benzoin.....	2.5 mils
Tincture tolu.....	2.0 mils
Alcohol.....	0.5 mils

Mix them to make.....5.0 mils

to be used in place of the same volume of Compound Tincture of Benzoin. This formula, in the accustomed quantity, seems worthy of trial.

Another formula that will suggest itself, because it is the same as the foregoing, but minus the alcohol, is:

Benzoin, in coarse powder.....	0.5 gramme
Tolu, in small fragments.....	0.4 gramme

Mix. Use as the equivalent of 5 mils of the tincture of benzoin and tolu just described.

At first sight it might seem wasteful to use the alcohol which, from observation, is volatilized the instant it touches the boiling water. But the alcohol serves a purpose in distributing the materials upon the water that must not be overlooked; for when the solids are used without previous solution the benzoïn and tolu soon become adherent to the sides of the vessel, and, to appearances at least, are protected to a large extent from the action of the boiling water.

Following thought through the channels which lead to the use of active principles in place of simples, we find ourselves confronted by the possibilities in the combination of:

Benzoïc acid.....	0.63 gramme
Tolu.....	4.00 grammes

Mix and use as equivalent of either formula.

The amount of benzoïc acid is based on the official requirements of 12.5 percent in benzoïn from any source.

And as a final alternative, tincture of tolu in quantity equal to the commonly used compound tincture of benzoïn is believed by the writers to be quite as suitable for the purpose, for it supplies a sufficiency of the oily substance, and being a 20 percent tincture, in this proportion very likely furnishes as much benzoïc acid as would the 10 percent of benzoïn in an equal volume of the compound tincture.

#### THE STATUS OF ALCOHOL LEGISLATION.

The exemptions named under the Volstead (Internal Revenue) bill relate to:

Denatured alcohol or denatured rum produced and used as provided by existing laws and regulations.

Medicinal preparations manufactured in accordance with formulas prescribed by the United States Pharmacopœia or National Formulary or the American Institute of Homeopathy that are non-potable and incapable of being used for beverage purposes.

Patented and proprietary medicines that are non-potable and incapable of being used for beverage purposes.

Toilet, medicinal and antiseptic preparations and solutions that are non-potable and incapable of being used for beverage purposes, contained in bottles or packages, upon which are printed conspicuously and legibly in English the quantity by volume of alcohol in such preparation.

Flavoring extracts for use only in cooking and for culinary purposes that are non-potable and incapable of being used for beverage purposes.

*The Oil, Paint and Drug Reporter* draws these deductions from the hearings and expressions:

That despite the surety that insofar as it relates to the manufacture and use of intoxicating liquors the prohibition law will be enforced, every provision will be made for the protection of the legitimate user of industrial alcohol, and for the punishment of the illicit user and nostrum faker.

That the enforcing officers, the Internal Revenue Bureau, not only stands ready to assist the industries of the country in securing supplies of industrial alcohol, but in enlarging the scope of its present uses.

Deputy Commissioner Gaylord voiced the attitude of his associates when, in closing the hearing, he said:

"I do not think anybody can foresee how great is the importance of providing an unlimited supply of cheap alcohol for the industries of the United States. There has already been made an alcohol fuel which, if it can be made sufficiently cheap, will provide an adequate substitute for gasoline, for coal, and for any other fuel. The problem is, 'What can American chemists do with alcohol?' They have already done much, and either have developed or are developing such new things in connection with alcohol that I do not think it is overoptimistic to expect that almost anything may be developed either in the line of fuel or as a material for an almost unlimited variety of industries."

Mr. Crounse epitomized the importance of alcohol when he said: "Alcohol occupies a tremendously important position in the industries of the country. If I were to say that it is as important industrially as pig iron I do not think the statement would be extravagant."