chloroform for this purpose. The method which has given the best results in our hands, however, is that of Bernegau and Heidlberg, published in last year's Proceedings. We have slightly modified the method as follows:

Dissolve sample equivalent to 0.2 gm. or less of morphine in not more than 15 cc. of water (insoluble matter does not cause emulsions) in a separator, add 50 cc. of amyl alcohol, make alkaline with ammonia and heat on steam bath for 10 minutes, shake for 5 minutes and allow to stand until cold. Draw off aqueous layer into a second separator and pour the amyl alcohol into a 300 cc. Erlenmeyer flask containing a few grains of sand. Repeat the extraction with amyl alcohol twice. Distill off the united amyl alcohol solutions in an oil bath just to dryness. (Do not overheat). Blow out the vapors of amyl alcohol and dissolve the residue of morphine alkaloid in 20 cc. of N/20 sulphuric acid with the aid of chloroform and heat. Titrate back with N/50 potassium hydroxide, using methyl red as indicator.

In a series of experiments, while we obtained from 0.5 to 0.76 percent more than the theoretical quantity of morphine sulphate by the amyl alcohol method, we obtained from 5 to 13 percent less than the theoretical by the phenyl ethyl alcohol method, and from 4.7 to 7.5 percent less than the theoretical by the isobutyl alcohol method.

ANALYTICAL LABORATORY OF H. K. MULFORD COMPANY, June 20, 1913.

OREGON AND CANADA BALSAM OF FIR.*

J. G. ROBERTS AND M. M. BECKER.

Considerable difficulty has been experienced in the past year or two in obtaining Canada Balsam of Fir (Terebinthina Canadensis). It is stated that it is practically unobtainable at this time and that there will be none available until the next crop has been gathered. In view of this fact, it has become necessary to find a suitable substitute. Accordingly there is considerable Oregon Balsam Fir now being offered to the trade. This is an allied natural product and bears a close resemblance to the better known Canada Balsam of Fir.

As information regarding Oregon Balsam of Fir is exceedingly meagre it became necessary in order to obtain data that would assist in establishing the identity and purity of given samples to obtain some Oregon Balsam of Fir from a known source. Such a sample was procured through the courtesy of Mr. R. G. Bailey, who guaranteed that it was a genuine sample of Oregon Balsam of Fir. It is very similar in color, odor and taste to the Canada Balsam but it is noticeably thinner.

We have examined several lots of Oregon Balsam of Fir that were purchased on the open market and have noted several points of difference between them and

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the Canada Balsam. At this time we will make comparisons between the results obtained on the authentic sample and the results obtained on previous lots. In this manner sufficient data may be obtained that will aid in distinguishing the Oregon Balsam from the Canada Balsam.

Canada Balsam of Fir is recognized both by the U. S. and the British Pharmacopœias. But with the exception of the customary description, the magnesium oxide test and the various solubilities there are no tests in either of them that would aid in establishing its purity or identity. In view of this fact it has been our custom to compare our results with standards given in the British Pharmaceutical Codex and in Allen's Commercial Organic Analysis, Vol. 4.

The chief differences that we have observed between the Canada and the Oregon Balsams are in the viscosity, the solubility in alcohol and in the character of the magnesium oxide test. The Oregon Balsam is thinner than the Canada Balasm. It is also completely soluble in alcohol, whereas the U. S. P. Balsam yields a turbid solution on the addition of alcohol. Canada Balsam conforms to the U. S. P. magnesium oxide test which requires that the Balsam should solidify when mixed with 20% of its weight of magnesium oxide previously moistened with water. The Oregon Balsam does not solidify even when mixed with 60% of its weight of magnesium oxide. The addition of the excess of Magnesium Oxide causes a separation of the water used for moistening. The resulting mixture is stiff but it does not have the same consistency as the Canada Balsam test.

The Oregon Balsam does not dry as readily as the Canada Balsam. A drop spread on a glass plate was still sticky at the end of three weeks, while some of the Canada Balsam under the same conditions was noticeably drier and did not adhere to the finger when touched. This fact leads us to the conclusion that the Oregon Balsam is not as suitable as the Canada Balsam for microscopical work.

As previously stated, neither the U. S. P. or the B. P. give chemical constants for Canada Turpentine. The British Pharmaceutical Codex states that it should have a specific gravity of about 0.987 to 0.994 at 15.5° C., an optical rotation of +10° to +4° and an acid number of 80 to 87. Allen quotes an acid number of 80 to 87, an ester number of 4 to 10, and states that it contains a resin which is difficultly soluble in alcohol. In Squire's Companion to the British Pharmacopœia we find that the optical rotation of the distillate should be from —26° to —29°. All of the samples of Canada Balsam that we have examined compared favorably with the above standards.

The specific gravity of the Bailey sample is within the limits quoted for Canada Balsam. As a matter of fact, these limits seem to apply to Oregon Balsam generally as the specific gravity of all our samples have been well within these limits.

The optical rotation of the Bailey sample is +8° 36′. This is higher than what was obtained on other samples as they have ranged from —2° 52′ to +0° 42′.

As a rule, the optical rotation of the distillate is a better method of determining the difference between the Canada and the Oregon Balsams. But the optical rotation of the distillate obtained from the Bailey sample is—26° 39′, which is well within the limits given for the distillate of the Canada Balsam. Previous

samples had optical rotations, ranging from —34° 43′ to —41° 3′. These are all higher than the standard of—26° to —29°, given by Squire.

Generally the acid number is a satisfactory means for establishing the difference between the Canada and the Oregon Balsams. With one exception all of the samples of Oregon Balsam examined have had an acid number above 87. The following are the acid numbers obtained on the various samples: 100.5, 100.8, 105.82, 106.75 and 111.

The ester number is valueless as a means of identity. With the exception of one sample of Oregon Balsam which had an ester number of 13.9, all of the samples had ester numbers within the limits of 4 to 10, given by Allen for Canada Balsam.

The following is the analytical data obtained on the Bailey sample of Oregon Balsam of Fir:

Specific gravity at 25° C.	0.9865
Specific gravity at 15° C.	0.9930
Solubility in 95% alcohol	Completely
Solubility in 90% alcohol	Completely
Solubility in ether	Completely
Solubility in chloroform	Completely
Solubility in benzene	Complete
Optical rotation direct when taken at 25° C.	+8° 36′
Optical rotation of distillate when taken at 25° C.	—26° 39
Boiling point	157° C. to 230° C.
Acid number	111
Ester number	5.25
Saponification number	116.25

Conclusion.—It is rather difficult to establish data for determining the points of difference between substances of similar origin such as Canada Balsam of Fir and Oregon Balsam of Fir. In this investigation we have found that the most reliance can be placed on the viscosity, the magnesium oxide test and the solubility in alcohol. None of the samples of Oregon Balsam have answered the U. S. P. magnesium oxide test; they are all thinner and completely dissolve in 95% alcohol. All of the samples of Canada Balsam of Fir have given satisfactory results with the U. S. P. magnesium oxide test and are not completely soluble in alcohol. They have also compared favorably to the standards given by the British Pharmaceutical Codex, Allen's Organic Analysis and in Squire's Companion to the British Pharmacopœia. As previously stated, the acid number is a good indication, as the acid number of Oregon Balsam is usually higher than the acid number of the Canada Balsam.

On account of our limited experience with Oregon Balsam of Fir and also because the sample under discussion is the only one that we have obtained from a guaranteed source, we are unable to suggest standards that would differentiate between a natural and an artificial Oregon Balsam of Fir. But we feel confident that the data given above will be useful in determining that point.

ANALYTICAL DEPARTMENT, SMITH, KLINE AND FRENCH COMPANY.