of three observers, graded according to their experience with the method at the time.

TABLE VI
Experience Required for Visual Estimation

Observer	Freyer	Thoede	Haddon
Experience with method	Much	Very little	None
No. 771	4.3	4.8	4.0
772	5.9	5.9	5.5
773	5.9	5.7	5.9
780	4.5	4.7	3.9
781	4.2	4.0	3.0
782	4.2	3.9	2.8

To see to what extent the lint on original or whole seed might be estimated by this method ten samples were arranged in the order of their lint percentages as judged by the writer. Then the amounts of lint was determined gravimetrically. These were the samples shown in Table I, each from a different oil mill. The series is given below in the actual order of lint percentages and in the order arranged as in the Table VI.

Actual Order		Adjudged Order
11.2% Lint	Valley Mills	Valley Mills
11.1	Waco	Austin
11.1	Taylor	Waco
10.5	Austin	Taylor
10.4	Hearne	Hearne
10.1	Houston	Houston
9.9	Victoria	Corpus C/O
9.5	Corpus C/O	Corpus Christi
9.3	Corpus Christi	Victoria
8.7	Robstown	Robstown

Only two samples were placed out of their proper order, and the error represented is 0.6 per cent lint. Since the average interval between adjacent samples is 0.3 per cent lint in the above series, it would seem that if a carefully prepared graded series of standard samples were arranged as in the case of mill delinted seed, visual estimates of an accuracy of about 0.6 per cent lint might be made. It should be recalled, however, that this about represents the entire range of variation for a given locality under ordinary conditions.

REPORT OF THE SEED ANALYSIS COMMITTEE

J. L. MAYFIELD, Chairman

IT is with a great deal of regret that the Seed Analysis Committee this season finds itself unable to offer any constructive suggestions for improving the present methods of seed analysis. Primarily, this is due to the fact that present conditions have caused reduction in the personnel of the various committee laboratories, such that they were unable to make the considerable number of tests that would have been necessary to justify any changes. Also, due to the controversial nature of the questions studied, the Chairman felt that no recommendations should be made on any point, through the study of a single laboratory, regardless of its thoroughness. However, three definite subjects were studied by the Committee and in order that the Society may have this information for discussion and thought they will be briefly reported on.

The subject most unanimously agreed upon by the committee was the advisability of attempting to find a mill more suitable for grinding fumed seed than the present Bauer Mill. This phase the chairman undertook. Samples of fumed seed were sent to several manufacturers, together with rough specifications as to what was wanted. One company, Eimer and Amend, undertook to adapt one of their mills to our requirements. The result was highly satisfactory as far as the type of sample was concerned, but after the alterations in the mill had been made its price of one hundred and seventy-five dollars was considered prohibitive. By the time these negotiations were finished it was too late to contact any other manufacturer, though we strongly recommend continuing these efforts.

The question of an adequate mill was but one approach to the main problem of the lack of uniformity of results, especially in oil determinations, and to some extent those of ammonia. Of course, fineness of sample is essential, but evidence indicates that both the time element and the temperature of the preheating and fuming ovens exert a marked influence on the oil determination. Strong differences of opinion were brought out in the study, some workers holding that the seed should be treated in such a way that a yellowish, slightly darkened sample results, and others that such a sample is obviously charred and will give high results. It has been definitely shown that excessive heating, so that the lint appears blackened, will give high results, due probably to the fact that some non-oil materials in the hulls, and lint, and perhaps some of the lipase of the seed are rendered ether soluble. It is probable that the present temperature and time limits are satisfactory where operators use large well ventilated preheating ovens and oil bath fuming ovens. However, where smaller preheating ovens are used, subject to large heat variations and spot heating, it is equally probable that some seed are too excessively heated to give accurate results. It is, at least, incontrovertible that this study should be continued and that the lowest possible efficient temperatures should be stipulated and rigidly followed. It has been shown that the type of pot used for fuming is important since the rapidity with which the acid is released to the seed is governed by the thickness and glaze of the pot. In this regard the relatively thick, heavy, unglazed pots give a noticeably superior sample with far less chance of the lint charring.

The chairman also asked the committee to compare the present method of mixing the ground sample to one in which the material is mixed with an iron mortar and pestle, using the small end of the pestle so as to get a mixing rather than a crushing action. For the past two seasons this method has been followed in the writer's laboratory with, we believe, a 10 to 20 per cent finer sample. Certainly a smoother, less linty material is achieved with no greater expenditure of time or energy. However,

no recommendation can be offered for the reasons previously stated.

On several occasions complaints have been heard that our present hull analysis is inaccurate and presents a false picture. With this in mind, the committee compared the present official method with one in which the hulls were treated in an identical manner as the seed; that is, dried, fumed, ground, and both oil and ammonia determined. The results proved conclusively the weakness of the present method. Oil and ammonia results were consistently from two to three times as great as under the present method. Moreover, these losses check very closely mill operations and the method has the added advantage that the value of both the cake and oil lost in the hulls above the theoretical, can be easily shown. The expense of the test is obviously about that of a seed analysis and while agreeing to its superiority, the committee did not wish to recommend it without further study. It is our intention to present this problem to the Crude Mills Operations committee for further study in order to determine if, in the opinion of the mills themselves, the added advantages are worth the additional cost of the test.

The other test studied this season was that of the lint determination of seed. This is easily the most inaccurate test now described in our methods. While we can not hope for too great accuracy in this test, due to the difficulty in getting representative samples, nevertheless preliminary work has shown that a great improvement may be made. Our study included both the method used by Dr. Freyer, which is an adoption of the present test, and one in which a five gram sample is fumed, the lint removed by rubbing, and dried. The lint is found by subtracting the moisture loss from the total loss in weight. This method has the disadvantage of using a small sample and the advantage of no loss of hull. Additional comparative tests are necessary before either can be recommended.

The committee feels that while we can make no definite recommendations, we have at least raised several pertinent questions for the consideration of the Society, and which we hope will assist the committee following us to make some material improvements in our methods of analysis.

WAXES IN THE CANDLE INDUSTRY

By L. W. GELLER*

DURING recent years much work has been done to find a synthetic wax or resin capable of hardening and improving the various grades of paraffin for the production of a better and less expensive candle wax.

For a better understanding of the problem, commercial candles can be divided into five principal groups:

1. The first group contains all the candles which are consumed in glasses or in jars made from any kind of fireproof plastics.
2. The second group consists of the colored and decorative candles.
3. The third group contains the beeswax or religious candles.
4. The fourth contains all the white household molded candles.
5. In this group are the small birthday and taper candles.

For the production of candles there are two waxes in common use —paraffin and beeswax. Stearic acid, the commercial form of which is a mixture of palmitic and stearic acids, is an important substance for the candle manufacturing. This fatty acid, while not a wax, behaves like a candle wax as far as the burning property is concerned, being consumed like paraffin or beeswax.

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By mixing the waxes with other materials, attempts have been made to improve the quality of the candle waxes. These added materials include:

1. Natural hard waxes, such as carnauba and montan wax.
2. Synthetic waxes, such as the IG-waxes, or waxes made from palmityl (cetyl), stearyl, oleyl alcohols, or their homologues and derivatives.
3. Substances related to fatty acids, especially palmitic, stearic and oleic acids, as follows:

a. Amido fatty acids and alkyl or aryl amido fatty acids, such as Stearic amid ($C_{17}H_{35}$-CO.NH_2), stearic and palmitic anilid ($C_{17}H_{25}$ CO-NH.C_6H_5) ($C_{15}H_{31}$CO-NH.C_6H_5), oleic benzidid ($C_{17}H_{33}$CO-NH.C_6H_4-C_6H_4.NH-CO $C_{17}H_{33}$), etc.

b. High molecular ketones, obtained from stearic, palmitic, oleic and other fatty acids. Such are stearone ($[C_{17}H_{35}]_2CO$), palmitone, oleone ($[C_{17}H_{33}]_2CO$), etc.

4. Hydrogenated oils and fats.
5. Substances foreign to the properties of candle wax or stearic acid, such as benzo-naphthol.[1]
6. Coating substances, consisting of synthetic and natural resin.[2]

All these materials have been used with the purpose of hardening and improving the dripping property of the candles.

Before going into further details we must consider what the hardening of a candle wax means. Generally, it is believed that the hardening of a candle wax is achieved by raising its melting point. In fact, that is not the case, especially with the candle waxes. To the waxes belongs the property of softening before they reach their melting point; and often the difference between the softening and melting point is equal to 10-20° C.

It is clear that for a candle the softening point, and not the melting point, is the property which determines the degree of hardness. Accordingly, a hardening agent for a candle wax will be an addition agent which raises the softening point of the original wax and, correspondingly, the bending point of a candle made from it.

The melting point may be determined by bringing a sample of about 30 grams of melted wax in a test tube of 4 inches in length and 1 inch of diameter. The tube is then closed by a cork in which is inserted a thermometer subdivided into fifths of a degree C. The tube is brought into an empty bottle of about 5 inches in height and 3 inches in diameter, closed by a cork provided