TABLE 5

Extraction at Moisture Levels in Meals "as Received"

Moisture in Meal	Skellysolve F			Skellysolve B		
	Oil Extracted at End of		Efficiency (Proportion oil extr'd by initial extr'n)	Oil Extracted at End of		Efficiency (Proportion oil extr'd by initial extr'n)
	Initial Extr'n	Final Extr'n		Initial Extr'n	Final Extr'n	
Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
47.8	8.8	27.1	32.6	9.4	26.8	34.9
47.2	9.8	32.6	30.2	11.3	30.5	37.2
46.6	9.1	29.8	30.4	10.7	29.7	35.9
37.7	11.7	35.0	33.5	14.0	35.6	39.2
33.5	13.7	39.3	34.9	19.3	40.3	47.9
33.1	12.3	35.2	35.0	15.6	35.5	44.0
27.8	27.0	47.5	57.0	.....	.....	.....
24.6	28.3	48.5	58.3	.....	.....	.....
23.0	26.5	48.6	54.5	36.4	49.7	73.4
19.0	30.3	51.2	59.1	39.7	51.6	76.9
17.6	31.5	56.0	56.3	41.1	56.7	72.6
16.4	29.4	49.5	59.5	36.0	50.2	71.7
15.8	36.8	54.7	67.2	41.5	53.0	78.3
14.9	35.5	52.9	67.0	43.8	53.1	82.5
14.0	34.8	59.4	58.6	41.0	59.4	68.9
13.3	39.2	55.2	71.0	46.6	56.4	82.5
12.4	43.6	55.9	78.0	49.2	56.8	86.6
12.2	40.3	61.7	65.3	48.2	61.7	78.2
9.9	43.3	62.0	69.9	50.7	61.0	83.1
9.1	47.1	62.4	75.4	50.2	62.3	80.6
8.7	45.3	63.1	71.9	55.1	62.8	87.8
7.9	47.3	62.2	76.0	56.3	63.3	89.0
7.1	54.1	65.1	83.1	58.9	64.7	91.0
6.7	50.5	59.5	85.0	54.5	59.9	91.1
6.6	51.4	65.2	78.9	58.8	64.6	91.0
5.6	51.2	64.5	79.3	57.2	64.1	89.3
5.5	51.9	63.3	82 1	56.3	63.4	88.8
5.4	50.6	64.4	78.7	58.8	65.1	90.3
5.4	53.5	65.0	82.3	60.6	65.1	93.2
5.2	53.4	65.7	81.2	57.0	65.5	87.0
4.9	52.0	67.6	77.0	55.2	67.6	81.7
4.0	50.4	65.8	76.6	54.6	65.6	83.3
4.0	49.6	66.5	74.6	52 9	66.9	79.0
3.3	51.9	67.1	77.4	.....	.....	.....
3.3	49.9	68.0	73.3	.....	.....	.....

there is an optimum moisture content for grinding kernels most effectively.

To obtain further data on this subject, portions of tung kernels containing 5.0 percent moisture were adjusted to various moisture levels, up to 14.6 percent, by addition of the requisite amount of water to each portion, placing it in an air-tight container and shaking occasionally until the water was absorbed and evenly distributed. One set of these samples was ground and analyzed in the usual manner, using the Russwin food grinder, while the other set of samples was ground in a Raymond attrition pulverizer. The resulting meals were extracted, reground and re-extracted, in the usual manner. The results of the extractions are shown in Table 6. It is interesting to note that with both grinding procedures the highest extraction efficiency was obtained when the moisture content of the unground kernels was in the neighborhood of 7 percent.

TABLE 6

Extraction With Skellysolve F at Moisture Levels Produced by Adding Water to Kernels Before Grinding

A. Using Russwin Grinder *

Moisture in Kernels	Oil Extracted at End of		Efficiency (Proportion oil extracted by initial extraction)
	Initial Extraction	Final Extraction	
Pct.	*Pct.*	*Pct.*	*Pct.*
5.0	49.6	63.9	77.5
6.6	55.4	63.9	86.7
8.0	54.3	63.4	85.7
9.5	52.3	62.1	84.2
11.5	49.4	61.1	80.8
13.3	44.4	59.1	75.2
14.6	42.6	58.3	73.1

B. Using Raymond Pulverizer *

Moisture in		Oil Extracted at End of		Efficiency (Proportion oil extracted by initial extraction)
Kernels	Meal	Initial Extraction	Final Extraction	
Pct.	*Pct.*	*Pct.*		*Pct.*
5.0	4.5	62.8	63.2	99.2
6.6	5.2	64.8	65.3	99.2
8.0	6.6	63.5	64.3	98.9
9.5	7.5	63.0	63.8	98.9
11.5	9.1	61.8	62.7	98.6
13.3	10.7	60.1	61.1	98.4
14.6	12.1	59.1	60.3	98.0

* Identification of the equipment used by giving the name of manufacturer should not be construed as an endorsement of such equipment by the U. S. Department of Agriculture.

Summary and Conclusions

DATA are presented to show the effects of moisture on grinding of tung kernels and on solvent extraction of oil from the resulting meal. They indicate that:

(1) The efficiency of oil extraction can be materially increased by vacuum drying ground kernels before extraction.

(2) The state of comminution obtainable on grinding tung kernels is dependent upon moisture content; above 9 percent moisture content the efficiency of grinding, and consequently efficiency of extraction, decreases progressively with increase of moisture content; the most efficient grinding is obtained with material of moisture content in the range of 6 to 9 percent; and, in general, progressively poorer grinding is obtained on tung kernels with moisture contents ranging downward from 6 percent.

LITERATURE CITED

(1) McKinney, R. S., and Freeman, A. F., Oil & Soap *16*, 151-152 (1939).

(2) McKinney, R. S., Rose, W. G., and Kennedy, A. B., Ind. Eng. Chem. *36*, 138-144 (1944).

(3) Freeman, A. F., Pack, F. C., and McKinney, R. S., Ind. Eng. Chem. *35*, 1156-1159 (1943).

Smalley Foundation Report 1943-1944

WE are presenting herewith the 26th report of the Smalley Foundation Committee of the American Oil Chemists' Society. During these past 26 years considerable progress has been made in the accuracy of the determination of oil and nitrogen on cottonseed meal. The results obtained in practically all determinations were slightly lower than last year. It must be understood, in gauging the accuracy of the results, a difference of two points in either direction from the average is permitted without a deduction from the grade. We might add that the results obtained are so nearly perfect that a few hundredths of a per cent higher or lower than on any previous year means very little as far as accuracy is concerned.

During the year one of the collaborators called our attention to the fact that he obtained differences if he made corrections for the blank obtained on the paper and solvent used for extraction. He suggested that we poll the collaborators to find out how many of

TABLE NO. I

Determination of Oil

Analyst No.	Points off	Per Cent Efficiency
29	4	99.980
28	10	99.948
34	16	99.917
57	18	99.906
32	19	99.901
13	20	99.895
36	22	99.885
43, 56	24	99.874
23	26	99.863
47, 55	31	99.838
9	35	99.816
2	36	99.812
72	39	99.796
16	43	99.776
42	44	99.769
7, 33	51	99.733
14	53	99.722
15	56	99.706
37	59	99.691
8	64	99.666
35	70	99.634
11	72	99.623
1	73	99.619
48	76	99.603
77	78	99.592
17, 54	80	99.581
30, 50	81	99.576
71	82	99.571
6	91	99.524
69	100	99.477
12	105	99.451
5	115	99.399
19	124	99.352
49	125	99.345
44	137	99.283
60	168	99.121
31	205	98.928
64	231	98.791

them were actually making corrections and how many were not. The result of this poll was as follows:

Number of collaborators	82
Those deducting a blank	4
Those not deducting a blank	30
Those who do not determine oil	16
Those not heard from	32

On Sample No. 25 we asked the collaborators to report their results both before and after making corrections for the blanks obtained. The averages of the results reported to us were as follows:

When blank was deducted	5.76%
When blank was not deducted	5.80%
Those who reported same result for both	5.79%
Regular average on Sample No. 25	5.77%

From a commercial standpoint and to check laboratory results, which in reality is what the Smalley Foundation is supposed to do, we cannot see that these differences are at all significant.

As usual, 30 samples of cottonseed meal were distributed to the collaborators.

There are attached to this report four tables indicating the standing in percentage of the members taking part. Table No. I gives the standing of 43 collaborators who reported oil determinations on all samples. Table No. II gives the standing of 49 collaborators who reported nitrogen results on all samples. Table No. III gives the standing of 43 collaborators who reported oil and nitrogen on all samples. In these tables we have taken into consideration the results of those reports which were received within the time specified in our original announcement of the Smalley Foundation work. In Table No. IV we have given the standing of those collaborators who reported on all samples, but some of whose reports were received too late to be included under the rules.

The winning collaborators are as follows:

The "American Oil Chemists' Society Cup" for the highest efficiency in the determination of both oil and nitrogen on all samples is awarded to Analyst No. 28, D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C., with an average of 99.953%. The average efficiency is lower than that of last year, which was 99.974%. The certificate for second place goes to Analyst No. 29, Russell Haire, Planters Manufacturing Company, Clarksdale, Miss., who had an efficiency of 99.947%, as compared with 99.969% for last year.

The certificate for the highest efficiency in the determination of oil only is awarded to Analyst No. 29, Russell Haire, Planters Manufacturing Company, Clarksdale, Miss., with an average of 99.980%, as compared with 99.984% for last year. The certificate for second place goes to Analyst No. 28, D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C., with an efficiency of 99.948% as compared with 99.947% for last year.

The certificate for the highest efficiency in the determination of nitrogen is awarded to Analyst No. 28, D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C., with an average of 99.957% as compared with 100% for last year. The certificate for second place goes to Analyst No. 16, W. W. Wynn, Jr., Barrow-Agee Laboratories, Cairo, Illinois, with an average of 99.953%, as compared with 99.996% for last year.

TABLE NO. II

Determination of Nitrogen

Analyst No.	Points off	Per Cent Efficiency
28	9	99.957
16	10	99.953
8, 13	11	99.947
2	13	99.938
10	15	99.928
23, 25, 34	17	99.918
29, 36, 56	18	99.914
9	22	99.896
32	23	99.890
69	24	99.886
33	25	99.881
35, 43	26	99.876
21	27	99.871
30, 37	30	99.857
1	32	99.847
22	33	99.843
11, 55	37	99.824
6, 71	38	99.818
12	39	99.814
17, 49	40	99.810
15, 42	43	99.795
14, 47, 57, 77	45	99.785
44	46	99.781
19, 64	47	99.775
54	52	99.753
72	70	99.667
50	72	99.657
26	74	99.647
48	84	99.599
31	107	99.487
7	120	99.428
39	150	99.285
5	229	98.909
60	238	98.866

TABLE NO. III

Determination of Oil and Nitrogen

Analyst No.	Per Cent Efficiency
28	99.953
29	99.947
13	99.921
34	99.918
36	99.900
32	99.896
56	99.894
23	99.891
2, 43	99.875
16	99.865
9	99.856
57	99.846
55	99.831
47	99.812
8, 33	99.807
42	99.782
37	99.774
35	99.755
14	99.754
15	99.751
1	99.733
72	99.732
11	99.724
30	99.717
17	99.696
71	99.692
77	99.689
69	99.682
6	99.671
54	99.667
12	99.633
50	99.617
48	99.601
7	99.581
49	99.578
19	99.564
44	99.532
64	99.283
31	99.209
5	99.154
60	98.994

We would again commend the painstaking and careful work of T. C. Law in the preparation and distribution of samples. This year has been particularly difficult due to lack of help and difficulties with the mail service.

We are again including in this report a list of the previous winners of the highest award for both Oil and Nitrogen. They are as follows:

1918-1919—G. C. Hulbert, Southern C. O. Co., Augusta, Ga.
1919-1920—G. C. Hulbert, Southern C. O. Co., Augusta, Ga.
1920-1921—C. H. Cox, Barrow-Agee Labs., Memphis, Tenn.
1921-1922—Battle Labs., Montgomery, Ala.
1922-1923—Battle Labs., Montgomery, Ala.
1923-1924—L. B. Forbes, Memphis, Tenn.
1924-1925—E. H. Tenent, International Sugar Feed Co. No. 2, Memphis, Tenn.
1925-1926—Battle Labs., Montgomery, Ala.
1926-1927—W. F. Hand, Miss. State College, State College, Miss.
1927-1928—E. H. Tenent, International Sugar Feed Co., Memphis, Tenn.
1928-1929—Geo. W. Gooch Labs., Los Angeles, Calif.
1929-1930—Southwestern Labs., Dallas, Texas.
1930-1931—W. F. Hand, Miss. State College, State College, Miss.
1931-1932—J. N. Pless, Royal Stafolife Mills, Memphis, Tenn.
1932-1933—D. B. McIsaac, International Veg. Oil Co., Savannah, Ga.
1933-1934—W. F. Hand, Miss. State College, State College, Miss.
1934-1935—W. F. Hand, Miss. State College, State College, Miss.
1935-1936—N. C. Hamner, Southwestern Labs., Dallas, Texas.
1936-1937—N. C. Hamner, Southwestern Labs., Dallas, Texas.
1937-1938—W. F. Hand, Miss. State College, State College, Miss.
1938-1939—W. F. Hand, Miss. State College, State College, Miss.
1939-1940—A. G. Thompson, Jr., Southern C. O. Co., Columbia, S. C.
1940-1941—Russell Haire, Planters Mfg. Co., Clarksdale, Miss.
1941-1942—T. L. Rettger, Buckeye Cotton Oil Co., Memphis, Tenn.
1942-1943—Barrow-Agee Labs., Memphis, Tenn.
1943-1944—D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C.

TABLE NO. IV

Special Table

Analyst No.	Points off	Per Cent Efficiency
Determination of Oil		
80	52	99.719
65	200	98.953
41	221	98.843
62	493	97.421
Determination of Nitrogen		
80	42	99.793
41	44	99.790
75	49	99.767
65	61	99.710
38	85	99.595
62	150	99.285
Determination of Oil and Nitrogen		
80		99.756
65		99.322
41		99.317
62		98.353

Personnel of Committee:

M. G. BOULWARE
P. D. CRETIEN
E. D. GARNER
F. F. HASBROUCK
T. C. LAW
F. R. ROBERTSON
J. J. VOLLERTSEN, *Chairman*