DETERGENT SUB-COMMITTEE REPORTS

L. F. Hoyt, Chairman of the Sub-Committee of the A. O. C. S. on the Determination of Detergency of Soap Products recently summarized the progress of that body in a letter to the Committeemen. In his opinion, the big task from the beginning has been to formulate a workable method. Vital matters of color standards, kind and amount of soil, technique of soiling, etc., have involved much preliminary experimentation, and the interchange of correspondence incident to these matters has made the undertaking slow in gathering headway through its initial stages. It is expected that this year's collaborative work by the members of the Committee will show many ways in which the method can be improved. Although there is only a short period intervening before the spring meeting of the A. O. C. S., Mr. Hoyt is hopeful that most of the committee will be able to complete their program in time to report more definitely at New Orleans.

The Sub-Committee of the A. O. C. S. on Determination of Detergency comprises the following:

Edward Bauer, J. S. Kirk & Co., Chicago; H. C. Bennett, Los Angeles Coap Co.; J. S. Boulden, Wm. Waltke & Co., St. Louis; J. C. Brier, Prof. Chem. Eng., University of Michigan; R. K. Brodie, Procter and Gamble Co.; V. K. Cassady, Palmolive Co.; A. K. Church. Lever Bros., Cambridge, Mass.; R. E. Divine, Armour Co.; Babbitt, N. J.; J. S. Goldbaum, Fels & Co.; Philadelphia; F. H. Guernsey, Cowles Detergent Co.; Lockport, N. Y.; L. F. Hoyt, Larkin Co., Inc.; M. H. Ittner, Colgate & Co., New York City; G. H. Johnson, N. L. O. A. Mellen Institute, Pittsburgh; Fred Kenney, Central Testing Laboratories, New York City; C. P. Long, Globe Soap Co.; E. T. Marceau, Gold Dust Corporation; E. B. Millard, Mass. Institute of Technology; H. S. Mitchell, Swift & Co., Chicago; J. H. Powell, Armour & Company, Chicago; W. S. Rapelje, Kirkman's & Son, Brooklyn; W. T. Peese, Post Brothers, Kansas City; J. G. Vail, Philadelphia Quartz Co., Philadelphia; F. W. Smither, Bureau of Standards, Washington, D. C.; P. H. Walker, Bureau of Standards, Washington, D. C.

Mr. Hoyt reports for his Committee as follows:

The Committee's Report

The material of the collaborative work of the sub-committee for this year is this:

1. *Miniature Washing Test Machine.*

A slightly modified design of the apparatus originated by A. K. Church, Chief Chemist, Lever Bros. Co. Obtainable for members of the committee from the Procter and Gamble Distributing Company of

Cincinnati, Ohio. Price $15.00 net. Size 18″ high and occupying a space of about 10 x 10″. The price does not include a motor, but the machine can be driven by a small laboratory motor.

2. *Secondary Color Standards.*

(a) Color Scale of gray papers, prepared by Munsell Color Co. of Baltimore. The color values of this scale are approximately equal to those of the Standard Gray Pastes prepared with painstaking care by Dr. Walker and Mr. Bruce of the Bureau of Standards from zinc oxide, carbon black, and white mineral oil with such increments of black that the difference in color sensation between the various steps are equal.

(b) Color scale of gray cloths worked out by Dr. P. H. Walker and Mr. Bruce.

The cloths consist of unwashed cotton sheeting soiled with aqueous solutions of suitable concentrations of Higgins India Iink. They range in brightness, compared with a standard white magnesium block from about 23 per cent for No. 12 to about 77 per cent for No. 1.

3. *Detergency Set,* prepared by the chairman of the committee, and consisting of the following items:

1 60 yd. roll of 4-inch wide cotton sheeting, thread count 68 x 58.
1 6 oz. pkg. of lampblack.
½ lb. Edible Tallow (supply obtained from H. S. Mitchell, Swift & Co.).
Free Fatty Acid, as oleic 0.96%
Titer ..... 42.3° C
Color, Lovibond .....30 yellow, 4.8 red
1 lb. Granular Tallow Soap (supply obtained from Archibald Campbell, Globe Soap Co.).
Moisture 3.40%
Titer of Fatty Acids..... 40.2° C
1 lb. Powdered Olive Castile Soap.
Moisture 1.40%
Titer of Fatty Acids..... 19.1° C
1 pt. lubricating oil (100% Pennsylvania base).
Sp. Gr. 60° F..... 30.2° Bé
Viscosity (Saybolt at 100° F)..... 300 seconds

Procedure

(a) *Soiling Cotton Sheeting.*

The cotton sheeting contains considerable starch sizing, which must be removed before uniform soiling can be attained. This can be easily accomplished as follows: cut the sheeting into convenient lengths and boil for about 5 minutes in dilute HCL, (10 cc. 1.20 HCL per liter). Rinse, partially dry and iron out flat.

Soiling Mixture:

5 grams Lubricating Oil
3 grams Edible Tallow
x grams Lampblack (x = 2 to 3)
2,000 cc. Carbon Tetrachloride

Note: Experiments have indicated that it is not feasible to rigidly fix the amount of lampblack to be used in the soiling mixture, since

variation in technique of soiling will give different results with the same solution.

Dissolve the oil, tallow, and lampblack in 1 liter of CCl 4 in a 2½ liter glass-stoppered bottle (or a 2 quart fruit jar provided with rubber ring and cover, if more convenient), shaking thoroughly for 5 minutes. To the mixture add 1 liter more of CCl 4 and filter rapidly through several thicknesses of washed sheeting. Preserve the soiling solution in a closed container.

The sheeting is to be soiled as follows:

Pass a continuous strip of sheeting of any convenient length, from which sizing has been removed as above described, through the soiling solution on a tray or dish and then through a wringer. Dry the cloth rapidly with the aid of an electric fan or suspend for a few minutes in a drying chamber, and when dry press out flat with a warm iron.

This process should result in securing an even soil on the cloth and sufficient lampblack should be used (the amount can be determined only by trial) to produce a shade which will match the S 52 of the Munsell gray scale.

Caution: Even with the standard soiling mixture, containing no readily oxidizable constituents, there is evidence that soiled cloths several days old do not wash out as white as freshly soiled cloths. Therefore in this year's progress, to avoid possible differences which might be caused by using soiled cloths of indefinite age, it has been considered advisable to specify that all washing tests should be run on soiled cloths which are not over one day old.

Program of Washing Tests

This year's program is to be limited to the attempted determination of the comparative detergent value of the two soaps (of widely different titer), in distilled water only, at (a) 100°F; and (b) 160°F; and (c) 160°F, after one, three and five washings respectively of the same cloth.

Connect up the washing machine to any convenient power so that the wash wheel will have a speed of 250 r.p.m. with load. Provide a gas burner to maintain the desired degree of heat in the washing machine during the test. Drill a small hole in the cover of the machine close to one of the longer edges so that a thermometer can be inserted in the space between the side of the machine and the wash wheel itself.

All soap solutions are to be made up in distilled water, and to avoid deposition of lime and magnesium soaps in the machine with the possibility of introducing an undesirable and uncertain factor into the washing process, all rinse water should be either distilled water, or very soft water; i.e., thoroughly softened by some process such as the Per-

mutit process. In rare cases where the tap water supply is very soft (as for instance in Boston whose water supply has a hardness of only 12 to 14 parts per million as $CaCO_3$, such tap water should be used for rinsing.

Dissolve 5.00 grams of a standard soap sample, as received, in 500 cc. of distilled water, using heat, if necessary. Dilute to 1 liter with distilled water and adjust to the desired temperature. Fasten a strip of soiled cloth, shade S 52, on the wash wheel; pour the soap solution rapidly into the machine; run for 5 minutes at 250 r.p.m. maintaining the temperature of the solution at one of the definite, prescribed temperatures. Stop the machine and drain off the soap solution. Add 1 liter of rinse water, run the wash wheel for 1 minute and drain. Repeat the rinsing twice more. Remove cloth and when nearly dry press with a warm iron, fold to four thicknesses and record its color value on the Munsell gray paper scale. Repeat the entire washing and rinsing process as above *on the same cloth* and record the color value after third and fifth washing. (Note: The experience of those who have worked with this or similar washing processes has been that several washings—sometimes as many as 10 on the same cloth—may be required to bring out differences in the detergent value of soaps which may not be apparent after only one washing). Also, if possible, record the color of the washed cloth on the scale of the "India Ink" gray cloths.

The following table is suggested as a form in which results should be reported for convenience in comparison and tabulations:

Color of Cloths	Tallow Soap		Olive Castile Soap	
	Munsell Gray Paper No.	India Ink Cloth Scale	Munsell Gray Paper Scale	India Ink Cloth Scale
	Washing Test at 100° F			
(a) Original				
(b) After 1st Washing				
(c) After 3rd Washing				
(d) After 5th Washing				
	Washing Test at 122° F			
(a) Original				
(b) After 1st Washing				
(c) After 3rd Washing				
(d) After 5th Washing				
	Washing Test at 160° F			
(a) Original				
(b) After 1st Washing				
(c) After 3rd Washing				
(d) After 5th Washing				

I wish to express my gratitude, and to call the attention of other members of the committee to the extent to which we are all indebted for invaluable assistance rendered by Dr. Walker and his associate Mr. Bruce, to Mr. Brodie, and to Mr. Church.

L. F. Hoyt, Buffalo, N. Y.