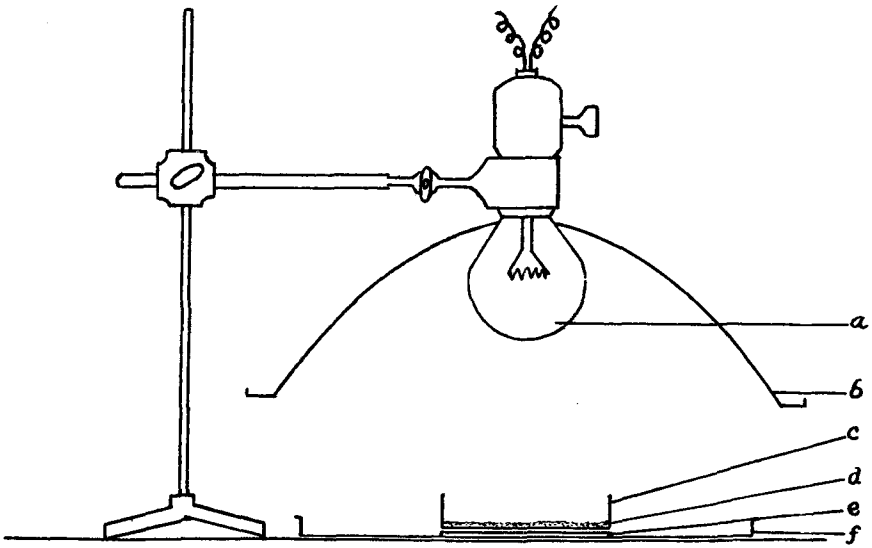
A New Method for the Rapid Determination of Moisture

By T. L. RETTGER
The Buckeye Cotton Oil Co.

THE accurate determination of moisture in cottonseed meal and related products, while apparently simple, has offered great difficulty to the chemists of the industry. Through the thorough study and subsequent standardization of other analytical methods there has been achieved a degree of accuracy which is truly remarkable. But the determination of moisture has stubbornly withstood all similar efforts to arrive at a procedure of analysis which would give comparably accurate results. The analysis for moisture is accepted as an approximation only.

The two methods for moisture determination in use are (1) oven drying to constant weight and (2) distillation and condensation of the moisture. The first method is simple and the most dependable, although quite frequently there are changes in the weight of the sample in addition to moisture loss. A minimum of two hours is required. The second method is quicker but is less reliable and usu-



A. 50 W. Clear Lamp
B. Auto Reflector
C. Moisture Dish
D. Layer of Sample
E. Asbestos Mat
F. Tin Plate

ally requires fragile apparatus and considerable manipulation.

In the method given below a thin layer of the sample is exposed to light and heat. The absorption of light energy produces heat effect and the rapid liberation of the moisture present. The advantages are simplicity of apparatus and procedure, and particularly the much shorter time required. The short time of heating, about fifteen minutes, minimizes the change in weight due to chemical change in the sample. Results agree with those obtained by other methods on cottonseed meal, hull bran, and corn meal. While experiments with the method have been confined to these substances, it is probable that accurate results may be obtained on other materials that may be finely ground. The principle involved may be applied in designing apparatus which will make a number of determinations simultaneously.

Material Required: One support, clamp holder, and clamp.

One extension cord and lamp socket.

One 50W clear Mill Type lamp.

One automobile headlight reflector.

One 9 inch tin pie plate.

One 3 inch circle asbestos.

One thermometer.

Aluminum moisture dishes, di. 90mm., ht. 15 mm.

Analytical Balance.

Assembly: Enlarge the hole in the center of the reflector so that the lamp can be screwed into the socket through the hole. Drill four ¼ inch holes on a three inch circle around this hole for ventilation. Place the tin plate on a table with the asbestos mat in the center. Support the lamp and reflector directly over it, with the rim of the reflector about two inches from the level of the table. See the illustration.

Adjustment: Spread several grams of the material to be analysed in the lid of a moisture dish and place on the asbestos below the lamp. Rest the bulb of the thermometer in the sample and after ten minutes adjust the height of the reflector so that the temperature will be constant at 115°C. ± 5°. The apparatus is now ready for use.

Analytical Procedure. Weigh 5 grams of the ground sample into a tared moisture dish. Spread the sample over the bottom of the dish in a thin even layer and place on the asbestos mat below the lamp. Expose for fifteen minutes. Replace the lid, cool and weigh. The time given is the maximum, and may be reduced on some materials.

COMPARATIVE RESULTS—MOISTURE

Cottonseed Meal

Brown-Duvel	Electric Oven	Lamp Method
6.2	6.3	6.4
5.8	6.3	6.4
		6.4

Cottonseed Hull Bran

Brown-Duvel	Electric Oven	Lamp Method
10.9	11.2	10.8
11.1	11.2	11.0
		11.0

Corn Meal

Brown-Duvel	Electric Oven	Lamp Method
12.0	12.5	12.4
12.0	12.7	12.5
		12.5