Forming and Pressing Cakes in the Oil Mill

Satisfactory Extraction Results in Cottonseed Milling Largely Dependent upon Press Room Procedure*

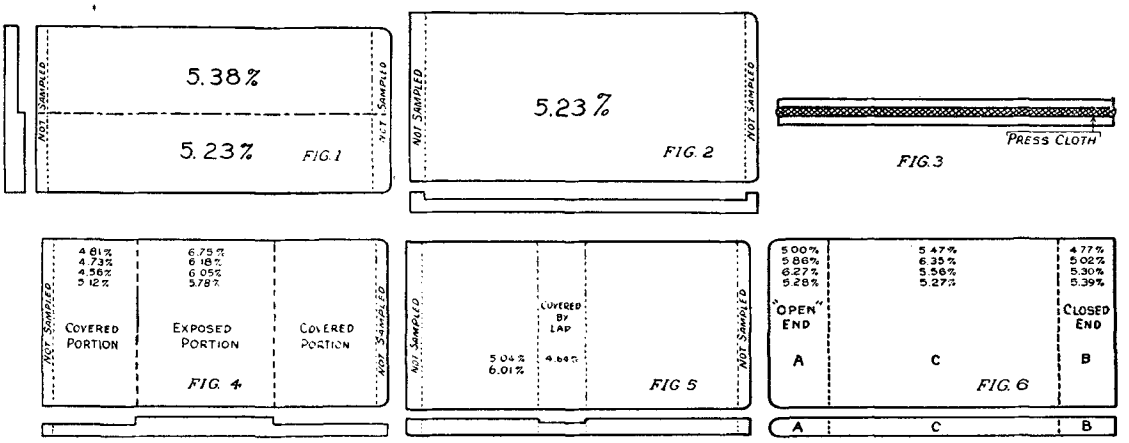
By JAMES G. GIBSON

THE proper forming and pressing of cakes is one of the factors in cottonseed oil milling which heretofore we have been prone to neglect. In reality we find that herein lies the secret of better extraction. Often the cooker is blamed for poor work when the fault really lies in the former or press, or rather in the way they are handled. One usually finds that as long as the meats are cooked reasonably well, good extraction may be obtained, provided the other factors in the press room are under control.

Since you are familiar with cottonseed oil mill machinery it will not be necessary to give any description or explanation of the equipment used. The purpose of the former is to form a cake in such a manner that when placed under pressure in the press the highest possible oil yield can be obtained. The press, with its accompanying change valve, is intended to so apply this pressure as to give the maximum oil yield with the lowest press cloth and power expense.

During the past season while operating our experimental plant we obtained some interesting data which served to impress upon us the importance of proper forming and pressing. At different times we have been shown sketches and charts showing the location of the oil in the cake. I might say, in a cake, since you will probably find that there is a wide variation between cakes even when taken from the same pressing. We usually find, however, that a cake made in a closed-end press box ranges in extraction from low at the closed end through lower under the lap or in the middle of the cake to very high in the three or four inches at the open or "oily" end. With the idea in mind of determining whether or not cakes should have better drainage facilities, the following tests were made:

Figure 1 represents an attempt to show a comparison in the same cake, between one of normal thickness and one made somewhat thinner by an extra thickness of press cloth the length of the cake and one-half as wide, placed on top of the meal in the former tray



*Presented at Annual Meeting, American Oil Chemists' Society, New Orleans, May, 1931.

before folding the cloth. This cake was pressed and stripped and the two halves separated and analyzed. The "oily" portion of each end was discarded. Here we see a difference of only 0.15% in extraction which can be considered as negligible, being within the limit of analytical error.

Figure 2 shows a whole cake made by placing an extra thickness of cloth the size of the cake on top of the meal in the former tray. This cake was made at the same time as that in Fig. 1 and the analysis 5.23% oil agrees with that of the thicker half of the cake in that sample. This would indicate that the thickness of the cake, within certain limits at any rate, has little to do with the extraction.

Figure 3 represents a cake separated into two very thin wafers by the insertion of a strip of press cloth between two layers of meal in the former as the cake was made. After pressing, the two layers were stripped and ground and for comparison the entire cake in the adjacent box was ground and analyzed. The analysis showed that the two wafers contained 4.93% oil while the normal cake analyzed 5.26%.

Going into this further we made a number of light and heavy cakes by varying the depth of meal in the former. In each case a similar result was obtained, there seldom being a difference of more than one-half of one per cent of oil between the samples. However, this difference is sufficient to show that we must expect to sacrifice some oil in order to secure the greater tonnage through the mill.

Figure 4 shows the effect of cutting the press cloth too short. The portion left uncovered due to the short cloth did not receive the same pressure and drainage that the rest of the cake did. Sample cakes were prepared using different lengths of cloth so as to vary the amount of cake left exposed. These analyzed as follows:

Sample	Oil in Cake Under Cloth	Oil in Exposed Portion	Difference
1. 12″ Exposed	4.81%	6.75%	1.94%
2. 5″ Exposed	4.73	6.18	1.45
3. 12″ Exposed	4.56	6.05	1.49
4. ½″ Exposed	5.12	5.78	.66

Which may explain the poor press room work at some mills.

Figure 5 is a sketch showing the analysis of a cake covered completely with cloth. Here we find that the analysis of that portion immediately under the lap is considered lower than that in the adjacent parts. In the case of extremely long laps we note quite a difference. This is probably due to the unequal pressure caused by the double thickness of cloth at the lap.

An interesting test to apply to the slab cake from any mill is to separate average samples of cake into strips as shown in Fig. 6 and analyze these for oil. For instance, a number of cakes were selected from different lots of slab as produced, and each group of cakes was broken into three parts as shown in the sketch.

Figure 6 shows the results of analysis of four different lots of cake in this manner:

	1st	2nd	3rd	4th
% Oil in Open End	5.00	5.86	6.27	5.28
% Oil in Closed End	4.77	5.02	5.30	5.39
% Oil in Remainder of Cake	5.47	6.35	5.56	5.27

Tests No. 1 and No. 2 show the result of improper forming, the cake being thick at the ends and thin in the middle. This prevented the middle of the cake from receiving the proper pressure and at the same time put an undue strain on the press cloth at the ends. The third test represents more of an average cake. Naturally we expect the highest oil in cake to be at the open end of the press box. The remainder of the cake is fairly uniform. The fourth test shows a very uniform distribution of oil. This cake was slightly "green" and was fluid enough to permit the equalization of the pressure on the entire surface. Such a test as the one outlined above often aids materially in locating the cause of poor extraction.

While it is true that the cooking of the meats has a direct bearing upon the extraction, the time of cooking, the conditions under which the meats are prepared for cooking, etc., make little difference as long as the meal is cooked to the point where it is not too green to stay in the press yet where the oil is ready to flow. We cannot attempt to discuss here the effect of cooking upon the quality of the oil produced.

We all know that in actual practice it is to our advantage to keep the pressure on the cake for the maximum length of time regardless of the operating cycle. For this reason we try to cut the charging time down to a minimum. Often in doing this the operating parts of the former are speeded up to the point where it no longer turns out uniform cakes. As a result of this we find cakes with high and low spots, thick ends and low centers, wedge shaped cakes and cakes with ragged edges, instead of the level, uniform cake we desired. Such careless forming should be avoided. If speed is necessary keep the former operating at the speeds recommended by the manufacturer and speed up the crew.

In choosing press cloth choose one of the proper width for the press boxes and, if necessary, alter the former tray to fit it. If the cloth is too wide for the former it does not lie flat as the cake is formed and consequently a ragged edged cake results. As for the proper

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length of cloth, the data given above indicates that the cake must always be completely covered. Economy in press cloth would require that the lap be very small though the amount of lap will depend largely upon the kind of stripper used.

Even after the cake is properly formed it may be ruined by improper panning. The pan shover should never permit any meal to fall from the pan while he is working nor should the cake be mashed or broken as it is slid into the press.

No one can attempt to set a rule for pressing. Ram speeds, time under low pressure, maximum pressure, and drainage time are all factors which depend entirely upon the character of the seed and the market for products. We do know, however, that the press boxes should be in good condition, not bent or distorted, and the drainage channels kept open. The chokers furnished by the manufacturers of the usual change valves are ground to give good uniform action to the ram in the press and the operator need concern himself only with their proper operation.

Remember that uniformity in the press room is one of the principal factors in securing good results. Maintain a uniform operating schedule, permitting the presses to be under pressure as long as possible, speed the crew up so that the presses are charged rapidly without letting the forming of the cake suffer, and watch the hydraulic system so that every pressing receives the maximum pressure on schedule; if these things are followed religiously, good press room work will become the rule.

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Micro-Kjeldahl Method

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run using the same reagents and procedure as with the samples, after the apparatus had been thoroughly steamed for at least 15 minutes. Care was taken that the same amount of liquid was contained in each flask to insure the same intensity of color. The contents of the receiving flask *C* from a sample were titrated directly with dilute standard sulfuric acid from a microburet; and the end point was taken when the shade of color of the indicator exactly matched that of the blank. This proved to be a very faint pink at a pH of about 5.7. By matching the blank it was unnecessary to subtract a blank correction from the amount of acid used.

Table I—Comparative Accuracy of Micro-Kjeldahl Method

Samples Analyzed	Nitrogen in Sample	Error with Micro-Kjeldahl	Error with Micro-Kjeldahl
	Mg.	%	%
8	21.114	0.62	0.29
6	1.000		1.20
4	0.583	1.85	0.24
4	0.100		3.00

It can be readily observed that this apparatus and procedure can be used with rapidity and accuracy on samples requiring as much as 10 cc. of cencentrated sulfuric acid in the digestion mixture, as well as samples containing as little as 0.1 mg. of nitrogen. The comparative accuracy of this method with the micro-Kjeldahl method is shown in Table I. By running two sets of apparatus at the same time it was found that 20 samples could easily be analyzed in a half day.

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