BOOK OF AMERICAN BAKING

A PRACTICAL GUIDE COVERING VARIOUS BRANCHES OF THE BAKING INDUSTRY, INCLUDING CAKES, BUNS, AND PASTRY, BREAD MAKING, PIE BAKING, ETC.

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FOUR PARTS

Part I. Cakes, Buns and Pastry

Part II. Pie Baking

Part III. Bread-Making

Part IV. Miscellaneous

¶ Any recipe or other information regarding the Baking Industry not found in the BOOK OF AMERICAN BAKING will be furnished *free* to all subscribers of BAKERS WEEKLY.

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Part I

Cakes, Buns and Pastry

CAKES, BUNS and PASTRY

Angel Cakes and Food.

2 qts. Whites.	1¾ lbs. Flour.
3½ lbs. Sugar.	1 oz. Cream of Tartar.

If preferred, a little more sugar and a little less flour may be used. Angel Food is practically the same as Angel Cake. Do not grease pans, but dip in water before filling. Turn upside down as soon as taking from the oven. Ice cake as desired.

Alberts.

Four lbs. flour, 2 lbs. sugar, 14 oz. butter and lard, 8 eggs, ½ oz. ammonia and a little lemon oil. Break and rub the butter and lard into the flour so as to incorporate it well. Make a tray, and place sugar in it, the eggs next, and the ammonia and oil of lemon. Beat the eggs a little with the hand so as to mix well the ammonia and oil of lemon. Work all together and shake up until thoroughly mixed; next break into small pieces and roll into balls, and when all are finished place them 1½ inches apart in pans without grease.

Then with a rounded point cone made for the purpose, press in the center of each, so that they will break open in three or four places around the sides, and bake in a tolerably warm oven.

Bolivars.

(See recipe for Molasses Cakes.)

Cup Cakes.

3 lbs. Sugar.
1½ lbs. Butter.
18 Eggs.
1½ oz. Soda.
3 oz. Cream of Tartar.
1½ qts. Milk.
6 lbs. Flour.

Proceed same as ordinary fancy or drop cake. Bake in hot oven.

Cocoanut Cakes.

1½ lbs. Sugar.
3 oz. Butter.
¾ lb. Flour.
¼ oz. Cream of Tartar.
3 lbs. grated Cocoanut.
Egg Yolks.
Flavor (usually Lemon).

Use enough of the egg yolks to make a medium stiff dough and bake in a hot oven.

Currant Cake, No. 1.

Two pounds of sugar, 1 pound of lard, 12 eggs, 2 quarts of milk, 1 ounce of soda, 2 pounds of small currants, 3½ pounds of strong cake flour, 2 ounces cream of tartar, flavor with strawberry.

Take the sugar and lard, rub to a cream, add the eggs, next add the milk. Dissolve soda in the milk, put the currants in, mix all together, take your sieve, put over the bowl. Put the flour and cream of tartar in sieve and sieve through, mix light. Bake in small cup cake pans, grease light. These cakes you do not ice. Sell for one cent each, or six for five cents. Bake in heat of 550 degrees F.

Currant Cake, No. 2.

(Small Mixture.)

Three-quarters pound sugar, ¾ pound lard, 5 eggs, ½ pint milk, ½ pound currants, ½ ounce soda, 2½ pounds flour, 1 ounce cream tartar.

This cake is mixed and baked the same as Currant Cake No. 1.

Cheese Cake.

Two lbs. of cheese passed through a sieve. Put in a bowl and add half a pound of powdered sugar, 4 eggs, 3 oz. of butter and 2 oz. of cornstarch or 4 oz. of flour mixed well together; flavor with cinnamon, lemon, vanilla or mace. Vanilla and lemon may be used together. The mixture should be of a running order, adding sufficient milk to become so. Cheese cake, when baked, should have the appearance of custard, it should be nice and smooth when cut. Cheese cake can be altered or cheapened to suit prices and trade. Less butter and eggs may be used and a proportionately large amount of cornstarch or flour and milk added.

Care should be taken in selecting a good cheese for this cake. Hard, sandy and dry cheese is as good as useless, for you never get the "grit" out of it, and it will absorb the milk or moisture. All cheese cakes when baked are sprinkled over with powdered sugar.

Cup Cake, No. 1.

Two and one-half pounds of sugar, 1½ pounds lard or butter, 15 eggs, 1 quart milk, 1 ounce soda, 4½ pounds flour, 2 ounces cream of tartar, flavor with vanilla.

Take sugar and lard, rub to a cream. Next add the eggs, mix. Take the milk. Dissolve the soda in the milk, mix together. Take your sieve, put over the bowl. Put your flour in and cream of tartar. Sieve through, mix and bake in heat of 500 degrees F. These cakes are baked in large lunch cake pans. When baked and cooled, ice with vanilla and chocolate, and sell at two cents each, or three for five cents.

Cup Cake, No. 2.

(Small Mixture.)

One pound sugar, ½ pound lard or butter, 7 eggs, 1 quart milk, ½ ounce soda, 2 pounds flour, 1 ounce cream of tartar, flavor with vanilla.

This mixture is made and baked in the same way as Cup Cake No. 1, only difference is, no icing. Put, say, about ten or twelve currants in each pan and bake in same heat as Cup Cake No. 1.

Caramel Cake.

1 lb. Butter.
2¼ lbs. Sugar.
3 Lemon Rinds (grated).
1 teaspoonful powdered Mace.
15 Eggs.
1½ pts. Milk.
2 gills Rosewater.
1½ lbs. Flour.
9 oz. Corn Starch.
1¾ lb. Baking Powder.

A small quantity of Powdered Cinnamon.

Cream sugar, butter, lemon and mace together, add eggs gradually, add rosewater and milk, kneading well. Mix baking powder, flour and starch and add to mixture, stirring well. Bake in round pans, moderate oven.

The filler is prepared as follows: 9 oz. Sugar, 3 Eggs, 1 gill Caramel, 5 yolks Eggs, 1½ tablespoonfuls Corn Starch, 1½ pts. Milk. Cream eggs, sugar and caramel, beat yolks and starch together and mix all until smooth. Add milk and cook to a custard. Spread between layers and dust top of cake with powdered sugar.

Drop Cakes.

I.

3 lbs. Sugar.
1½ lbs. Butter and Lard.
20 Eggs.
1 qt. Milk.
2 oz. Ammonia.
2½ lbs. Flour.

Rub sugar and butter thoroughly, adding eggs gradually. Then add milk, flour and ammonia. Bake in hot oven.

II.

3 lbs. Sugar.
1½ lbs. Butter.
15 Eggs.
1 qt. Milk.
1¼ oz. Ammonia.
4½ lbs. Flour.

Cream and proceed as above.

Fancy Cakes.

6 lbs. Sugar.
4 lbs. Butter.
48 Eggs.
2 qts. Milk.
1 1-3 oz. Soda.
1 1-3 oz. Ammonia.
10 lbs. Flour.

Cream well and bake in hot oven.

Fruit Cake.

6 lbs. Sugar.	15 lbs. Raisins.
6 lbs. Butter.	18 lbs. Currants.
48 Eggs.	1½ pts. Molasses.
5¼ lbs. Flour.	¾ pt. Brandy.

Spices, etc.

A smaller and different mixture with citron may be made as follows: 1½ lbs. Sugar, 1½ lbs. Butter, 15 Eggs, 1½ lbs. Flour, 1½ lbs. Citron, 6 lbs. Raisins and Currants, ½ or full pint of Brandy.

Florence Cake.

Sugar, 1¼ lbs.; butter, 12 oz.; whites, 1 pint; milk, 1 pint. soda, 1-3 oz.; cream of tartar, 2-3 oz.; flour, 1¾ lbs. Rub the butter and half the sugar light; beat the whites and the rest of the sugar to them. Then mix in with your rubbed butter and sugar; then milk, flavoring and flour.

Genoa Cake.

2 lbs. Sugar.	15 Eggs.
1½ lbs. Butter.	2¼ lbs. Flour.

3 lbs. Currants and Citron.

The above is a favorite English cake and is usually sold by the pound.

Ginger Nuts.

3 qts. Molasses.	3 lbs. Lard.
1½ pts. Water.	1½ lbs. Sugar.
6 oz. Soda.	8 lbs. Flour.

Less lard may be used if desired. Many add different spices.

Ginger Cakes.

Four lbs. flour, 1 qt. molasses, ½ lb. lard, ½ pint water, 1 oz. soda, 1 oz. ginger, little salt; place the flour on one side of the bowl; put molasses, lard, ginger and salt in the other. Mix one handful of the flour well into these ingredients; then add the soda dissolved in the water, and the remaining flour, and make a smooth dough. Roll out and cut with plain cutter; place on greased pans ½ inch apart, and bake in hot oven.

Honey Cakes.

Put 4 qts. molasses in a kettle and bring to boil. As soon as it starts to boil, add 1 pint water and take from fire. When almost cold mix in about 10 lbs. flour, 1 oz. cinnamon, ginger, and allspice, 2½ ozs. powdered ammonia, 1 oz. soda, and make a baking sample. If there is too much leavening in, work in some more flour; if not enough, work in some more ammonia.

Jelly Roll.

1½ lbs. Sugar.
2¼ lbs. Flour.
7 or 8 Eggs.
¾ pt. Milk.
1½ oz. Baking Powder.

If preferred ½ oz. of Soda and 1 oz. Cream of Tartar may be used instead of Baking Powder. It is important to note that this requires mixing only. Don't beat.

Jelly Roll.

3½ lbs. Sugar.
20 Eggs.
1qt. Warm Water.
5 lbs. Flour.
1 oz. Baking Powder.

Add warm water after eggs and sugar are thoroughly beaten together, then add flour with which the baking powder has been mixed. Bake on wet paper and roll, just covering layer with jelly.

Lady Finger.

2 lbs. Sugar.
24 Eggs.
2¼ lbs. Flour.
Soda and Cream of Tartar.

The eggs should be beaten while slightly warm.

Lady Cake.

2¼ lbs. Sugar.
1½ lbs. Butter.
36 Whites of Eggs.
2¼ lbs. Flour.
Almond or other flavor.

Proceed same as "mixture No. 2" in marble cake recipe elsewhere.

Lemon Cake.

One and three-quarter lbs. flour, ¼ lb. lard, 1 pint molasses, ½ pint water, 1 oz. soda, a few drops of oil of lemon, a pinch of salt; mix one-third of the flour, the molasses, lard, salt and oil of lemon well together, then add the soda dissolved in the water. and the remaining flour, and mix it perfectly smooth. Bake in straight flanged round pans, greased, in a quick oven.

Lunch Cake.

Two pounds of powdered sugar, 1 pound of lard or butter, 10 eggs, 2 quarts of milk, 1 ounce of soda, 4 pounds of cake flour, 2 ounces of cream of tartar, flavor with vanilla.

Take the sugar and lard, put in the bowl, rub to a good cream. Next add the eggs, rub this also to a cream. Take the milk. Dissolve the soda in the milk and mix together. Now take your sieve, put over the bowl, put your flour in the sieve, put the cream of tartar on the flour, sieve through, mix and bake in greased lunch cake pans. Bake in heat of about 550 degrees F. When baked, ice with vanilla icing. When mixing this mixture, be very careful not to mix more than needed, for this will make your cake short and heavy. Sell for one cent each, or six for five cents.

Milan Cake.

Two pounds sugar, a pound of almond paste, a pound and a half of butter, 20 eggs, 4½ lbs. cake flour, vanilla flavor. The almond paste, sugar and butter should be creamed up, the eggs added by turns, and then the flavor and the flour worked in. The mixture should then be medium stiff. Fill into bag with medium sized star tube and dress upon paper into small cakes of different shape, such as crescents, apples, fingers, etc.; then place a small piece of French fruit, a blanched and split almond or pistachio nut on top and bake in a moderate heat.

Marble Cake.

5 2-3 lbs. Sugar.	2¼ qts. Whites of Eggs.
4½ lbs. Butter.	6 lbs. Flour.

Color one-quarter of the mixture with chocolate and another quarter with cochineal keeping one-half natural color. Start with a thin layer of the latter at the bottom, then drop in the other mixtures alternately with spoons, making such effects as the fancy of the operator may dictate.

Mixture No. 2.

Another good recipe for the above is as follows: 4½ lbs. Sugar, 1½ lbs. Butter, 3 oz. Baking Powder, 36 Whites of Eggs, 3 pints Water, 4½ lbs. Flour, Lemon flavor. Proceed same as for pound cake. When cool ice over and cut into squares. This mixture can also be used for a standard white cake.

Molasses Cakes.

3 pts. Molasses.	5¾ lbs. Flour.
3 pts. Water.	3 oz. Soda.
1 lb. Lard.	2 Eggs.

The above can be made with 1 egg. Some use 3 and 4 eggs. Many also use about 3 oz. sugar. For Bolivars add spices. Sugar Bolivars are made as follows: 6 lbs. Sugar, 3 lbs. Lard, 4½ oz. Ammonia, 3 qts, Milk, 12 lbs. Flour and Flavoring.

Metropolitan Cake.

One and one-half pounds sugar, 1 pound lard, 7 eggs, 1 pint milk, ⅓ ounce soda, 2 pounds cake flour, ⅔ ounce cream of tartar, flavor with lemon.

Take sugar and lard, rub to a cream. Add the eggs. Next take the milk. Dissolve the soda in the milk, mix together. Take your sieve, put over bowl, put flour and cream of tartar in it. Sieve through, mix and bake in large lunch cake pans in heat about 575 degrees F. When baked and cooled, jelly the side with fine currant jelly or any other good jelly. Dip them in cocoanut chopped fine. Keep them on a pan. Take a paper cornet, fill with vanilla and chocolate icing, more vanilla than chocolate. Put two round rings on top. These cakes are very good. Sold for two cents apiece, or three for five cents.

New Year's Cake.

1 lb. Butter.	¾ oz. Ammonia.
2 lbs. Sugar.	¾ oz. Carraway Seed.
9 oz. Lard.	6 lbs. Flour.
1½ pts. Water.	

The dough for the above should be worked well. Break the butter up well with the sugar and water.

Orange Cake.

21 Eggs.	¾ lb. Flour.
1½ lbs. powdered Sugar.	¾ lb. Corn Starch.
¾ lb. Butter.	

First beat the yolks and whites separately. Mix together the flour and corn starch. Add to the whites, beaten very stiff, the yolks and sugar, separately, gradually. Next add flour, and while stirring pour in butter **hot**. Make a smooth batter and bake in hot oven.

For the filling use 12 yolks of Eggs, 9 oz. Sugar, 3 oz. Corn Starch, 3 Oranges, 1 Lemon, pint of Water. Use both the juice and rind (grated) of the oranges and the juice only of the lemon. Make a smooth cream of the sugar and starch and then add the orange and lemon mixture. Boil and then spread between each layer, icing on top with soft orange icing.

Plain Apples.

Two lbs. flour, 1½ lbs. sugar, 1 lb. butter or lard, or half of each, pinch of mace. Rub the sugar, eggs and shortening lift, add the mace, ammonia dissolved in the milk, and then the flour. Roll out and cut with a square fluted cutter. Place on lightly greased pans, and bake in a moderate oven.

Raisin Cake.

6 lbs. Sugar.	½ oz. Soda.
3¾ lbs. Butter.	1 oz. Cream of Tartar.
37 Eggs.	9 lbs. Flour.
2½ qts. Milk.	9 lbs. Raisins.

This makes an exceptionally fine cake. If desired citron, currants or peel can be used instead of raisins.

Roosevelts.

In a bowl beat 1 pound 5 ounces of sugar, four whole eggs and 20 yolks light. In the meantime whip 16 whites of egg very stiff, gradually adding 8 ounces of powdered sugar, and carefully mix it in. Add 6 ounces Sultana raisins, 4 ounces of very clean currants, 2 ounces finely minced citron, 1 pound 9 ounces of flour, and finally 6 ounces melted butter. Fill into melon-shaped pans, which have been greased and dusted with flour, and bake in a cool oven. As soon as baked turn cakes out on a sieve and dust while hot liberally with vanilla sugar.

Scotch Short Cake.

3 lbs. Flour.	¼ lb. Lard.
1½ lbs. Butter.	⅛ lb. Butter.
¾ lb. Sugar.	

The above should be worked into a good stiff dough and baked in a cool oven. Too much heat will spoil it.

Sponge Cake.

1½ lbs. Sugar.	2 lbs. Flour.
16 Eggs.	1½ oz. Baking Powder.

Cream well and use a good cream of tartar baking powder.

Soda Cakes.

3¾ lbs. Sugar.	6¾ lbs. Currants.
3¾ lbs. Butter.	1½ lbs. Citron.
13½ lbs, Self-raising Flour.	15 Eggs.
3 qts. Milk.	

The above are usually baked in square molds. Recipe for self-raising flour is published elsewhere.

Sugar Cakes.

6 lbs. Butter (or half Lard).
9 lbs. Sugar.
4½ oz. Ammonia.
2½ qts. Milk.
30 Eggs.
18 lbs. Flour.

Add flour last and do not work dough too much. Use exact proportions given.

Sugar Cakes Without Eggs.

6 lbs. Sugar.
2 lbs. Lard.
2 qts. Water.
2½ oz. Ammonia.
12 lbs. Flour.

Butter is usually used instead of lard. It is frequently used half and half. Milk is generally used also in place of water.

Sugar Cakes.

Four lbs. flour, 2 lbs. sugar, 1 lb. lard or butter, or half of each, 5 eggs, 5 gills of milk or water, ½ oz. ammonia, ¼ oz. soda, few drops of oil of lemon, and if lard is used, a pinch of salt; rub the butter or lard with the sugar until light, then rub in the eggs and soda; next add the ammonia dissolved in the milk or water, and the oil of lemon. When all these are slightly mixed work in the flour smoothly, roll out with rolling pin, and cut with fluted cutter; place on greased pans ¼ inch apart, and bake in hot oven.

Spice Cakes.

2 lbs. Crumbs.
¾ lb. Lard.
¾ lb. Sugar.
10 or 11 Eggs.
1½ pts. Molasses.
½ oz. Soda.
1 oz. Cream of Tartar.
1½ pts. Water.
2¼ lbs. Flour.
Spices.

The pans should be well greased. The tops are usually iced.

Spice Cake.

One-half pound sugar, ½ pound lard, 2 eggs, 1 pound stale cake, ⅓ ounce soda, 1 quart molasses, 1 quart water, a few drops of cochineal, 2½ pounds flour, ⅓ ounce cream of tartar.

Take sugar and lard and mix to a cream, add eggs, next take the crumbs. Mix together and add the molasses and milk. Take the water, add the soda and mix together. Put the flour in the sieve and cream of tartar, sieve through. Mix and bake in lunch cake pans. Grease heavy. Bake in good heat, 600 degrees F. When baked and cool, ice with chocolate icing. Sold for one cent each, or six for five cents.

Tutti Frutti Cake.

Tutti Frutti Cake is made with ordinary cake mixture, any price you may wish, usually baked in pound moulds, covered on top with assorted fruit glace, including Almonds, Figs, Cherries, Apricots, etc., chopped fine and mixed with water icing. Some use whipped cream and as layer cake.

Velvet Cake.

1½ lbs. Sugar.
¾ lb. Butter.
9 Eggs.
1½ gills thick Cream.
1 big spoonful Rosewater.
1½ lbs. Flour.
1 oz. Bitter Almonds (blanched and powdered).
2¼ teaspoonfuls Baking Powder.

Separate yolks and white of eggs. When butter and sugar are thoroughly creamed, add yolks whipped thick. Next pour in the cream, almond paste and flour. Beat until smooth. Then add the flour and whites, which have been previously beaten stiff. Bake in shallow pans lined with buttered paper. Do not have the oven too hot.

Wine Cake Mixture.

2½ lbs. sugar; 1½ lbs. lard; 4½ lbs. flour; 3 oz. baking powder; 2½ pts. milk; 1½ pts. eggs; flavor.

Wine Cake.

3¾ lbs. Sugar.	3 pts. Milk.
2 lbs. Butter.	1 oz. Ammonia.
21 Eggs.	2 oz. Cream of Tartar.

6¾ lbs. flour.

Bake in hot oven. Cream, butter and sugar well and use exact proportions given.

White Mountain Cake.

4½ lbs. Sugar.	1½ oz. Soda.
2¼ lbs. Butter.	3 oz. Cream of Tartar.
18 Eggs (Whites only).	3 1-5 lbs. Flour.
1½ pts. Milk.	Lemon or Orange flavor.

These cakes are made to sell at 25 cents each. By cheapening the ingredients, however, many sell them at 15 cents, which seems to be the popular price.

LARGE CAKES

BY LOUIS STERN

Lo Soni Cake.

Twenty-one pounds of powdered sugar, 13½ pounds of lard or butter; this must be rubbed well for fifteen minutes, and if made with cake machine will take eight or ten minutes; add 6 pints of eggs (rub them a few at a time), 3 quarts water or milk. Dissolve 2 ounces of ammonia in wet part of mixture, 1½ ounces of ground mace, 1 ounce of gelatine. Mix this all together. Next put 1 pound of egg nuterine or 2 teaspoonfuls of egg color; add 24 pounds of strong cake flour, with 1½ ounces cream of tartar. Mix this all together. Mix very light. This is baked in thin pound cake pans; each pan will hold from 7 to 9 pounds; fill three-quarters full, close lid down tight and set in cool oven in heat of about 33 degrees F. Baked, but still hot, take a good egg icing and cool it with some walnuts and sprinkle on top. This cake can be sold for 12 or 14 cents per pound, according to trade.

Genoa Cake.

(Sold by the pound.)

No. 1.

Five pounds of granulated sugar, 3½ pounds of lard or butter, 40 eggs, 1 ounce ammonia, 4 pounds raisins, 2½ pounds citron, 8 pounds of cake flour; rub sugar to a cream; add slowly few eggs at a time; dissolve ammonia in ¼ gill of cold milk; mix raisins and citron together and add to mixture. Now put in your flour; mix light, and bake in one large pan, greased good and thick; put heavy paper around and put in oven in slow heat of about 330 degrees F. When baked and still hot, put over it a good boiled fondant icing and sprinkle a few chopped nuts over the top. This is a very good cake and will lay for months without getting mouldy or hard. Sold for 12 or 14 cents a pound.

Fruit Cake No. 1.

Thirteen pounds of powdered sugar, 12 pounds of lard, 100 eggs, 2 quarts of molasses, 1 pint of good sherry wine, ¼ pound of gelatine, 30 pounds of currants, 25 pounds of raisins, 10 pounds of citron and 10 pounds of strong cake flour. Put sugar and lard in cake machine, let work good. Next add the eggs and dissolve gelatine in ½ gill of water; add gelatine, molasses, currants, citron and raisins; let mix, and last add the flour. This is baked in large pound cake tins without a cover; put in oven in slow heat of about 330 degrees F. Very good cake, sold for 10 cents a pound.

Fruit Cake No. 2.

Bake in small duchess cake pans and sold by the pound at 10 cents per pound. Take 7 pounds of sugar, 5½ pounds of lard of cottonseed oil, 50 eggs, 1 quart of molasses, 1 pint of good sherry wine, 2 ounces gelatine, 15 pounds of currants, 4 pounds of citron, 5 pounds of raisins, and 5 pounds of strong flour, with 4 ounces cream of tartar. This is mixed the same as Fruit Cake No. 1. Baked in a heat of 400 degrees F.

Molasses Fruit Cake.

(Sold by the pound; 12 cents per pound.)

Take 11 pounds of granulated sugar, 6½ pounds of hard lard, 70 eggs, 3 quarts milk, 1½ quarts of water, 1½ ounces soda, 3 ounces cream of tartar, 2 ounces of gelatine, 12 pounds of currants and 21 pounds of strong cake flour. Rub sugar and lard to a cream; next add the eggs, few at a time; dissolve soda and gelatine in the water; add milk and water. Mix together, then add the flour and cream of tartar, and last add the currants. Of course you can use any other fruit instead of currants, such as raisins, citron, lemon peel, and so on. Mix light and make in two large pound cake forms, propped down with large bricks. When this is half baked, take large piece of thick paper, put over the cake so it will not get too black, and put in heat of about 300 degrees F. When baked, turn over so to get to the bottom. Take some soft chocolate icing with some candy fruit, and pour over the cake. This cake must be kept in a showcase or a closed box so as to keep it away from the air. If kept away from air it will keep soft and fresh for weeks.

Raisin Cake No. 1.

Take 3 pounds of sugar, 2 pounds lard, 35 eggs, ½ ounce soda, 1 ounce cream of tartar, 2 pounds raisins, 1½ pounds of currants, flavor, and 4½ pounds strong cake flour. Take sugar and lard, rub to a cream; rub for about 10 minutes; add slowly the eggs, few at a time; take soda and dissolve in ⅛ of a gill of water. Now add your cream of tartar, flour, raisins and currants, and mix light. This cake is baked in diamond-shaped forms, about 20 pounds to the form; lay on flat baking pans, prop down with heavy bricks so it will not run from under. This cake is baked in a heat of 250 degrees F.

Cheap Raisin Cake No. 2.

Fourteen pounds of sugar, 9 pounds of lard, 2½ quarts of eggs, 1 ounce gelatine, ¾ egg nutrine, 2 quarts of water, 1 ounce of mace, 2 ounces cream of tartar, 6 pounds raisins and 15 pounds of strong cake flour. Rub sugar and lard to a cream, add slowly the eggs, few at a time. Dissolve gelatine and add egg nutrine in the water and mix. Now add the mace; mix all together, then take 15 pounds of flour; sift flour and cream of tartar, mix light. This is baked in duchess cake pans lined out with thick paper. Two pounds to the pan. Sprinkle fine raisins on top of cake and bake in heat of 300 degrees F. Takes one-half hour to bake.

Ledner Pound Cake.

Fourteen pounds of sugar, 9 pounds of lard, 5 quarts of eggs, 2½ quarts milk, 2 ounces of gelatine, 1 ounce of mace, a little vanilla, 1 ounce of soda, 2 ounces of cream of tartar, and 14 pounds of flour. Take sugar and lard and rub to a cream. Now add the eggs, 1 quart to every 2 minutes till all gone; take the gelatine, mace and vanilla, soda and mix in the milk. Dissolve, mix good. Next add the flour and cream of tartar. Mix very light. Baked in large pound cake pans with closed tops, say 9 pounds to a pan; close down tight. Put in oven in heat of about 250 degrees F. When baked, take a good fondard icing with some chopped nuts or almonds, and sprinkle on top of cake while still hot.

Pound Cake No. 1.

Ten pounds of sugar, 7 pounds of cotton-seed oil, 90 eggs, 1 quart milk, 1½ ounces gelatine, 1 ounce soda, ½ ounce mace, vanilla, 12 pounds of cake flour. Rub sugar and lard to a cream; next add the eggs (few at a time), and dissolve gelatine and soda in the milk with mace and flavor. Mix light and add flour and cream of tartar. Mix and bake in 10-pound cake pans lined with thick waxed paper. Bake in heat of 300 degrees F. Sold at 18 cents per pound.

POUND CAKE FOR WHOLESALE.

The development of the pound cake business in America during the last five years has been rapid. Especially is this true of the East. New York, Boston, Philadelphia and Baltimore have all consumed large quantities, while the western cities have not been as large consumers. The reason for the latter, I believe, is because in most cases those who have been pushing the business have tried to sell their goods too cheap or have gone to the other extreme and charged prices out of reach of the general purchasing public as an everyday commodity. Those who have charged the higher price have made more of a success than those who tried to sell too cheap. Hence I shall treat this matter from a standpoint of high class goods.

In the first place I will consider the method of manufacture, and the first thing to be considered is the method of creaming.

Method of Creaming.

The creaming of butter is the most essential feature of the cake business. A large number of bakers fail in this important point. Hard, lumpy butter and soft, oily compound, or lard, are thrown together into the machine; then the sugar is thrown in regardless of the lumps it may contain, and then the maker expects a fine smooth eating cake. This is a great mistake, as from such mixing satisfactory results cannot be obtained. Where two or more substances are being mixed together they should be of the same degree of toughness, as near as possible.

Where it is desired to cream up a hard butter and a soft greasy butter or oily compound, the hard one should be worked either by the hand or the machine and made pliable, and the soft one should be put in the ice box to harden. When butter, or butter and lard or compound is being used, they should be of the same consistence as near as possible.

The speed of the machine is also an important factor. About 150 revolutions a minute is a safe speed. Under no circumstance should a hard wiry or brittle butter be used. If used at all, it should be well worked with the machine before adding the sugar. In fact, it is a good plan to let the machine revolve a number of times with the butter alone, then add half of the sugar, which should be previously sifted through a fine sieve. When this has been well worked, add the balance of the sugar, extracts, or spice, and if you are using a coloring, this should now be put in.

Let the machine run from five to ten minutes, according to the weather. In hot weather your materials all being hot the butter would gather heat and possibly cause your mixture to curdle. See that the mixture is scraped down in the machine thoroughly; then start machine again, adding the eggs a few at a time. When the eggs are all added, flour should be lightly mixed in, but never before it has been thoroughly sifted, as this is one of the greatest mistakes possible to make—to use flour that has not been incorporated with the air before mixing. When you are using glycerine, this should have been well worked up and added when a portion of the flour has been worked in, although if your butter is strong enough it is better to work the glycerine in when sugar is being mixed, but if your butter is any way soft this should not be done. In using glycerine too large quantities should not be used. The same is true of glucose, which if used in small quantities is an advantage, but when too large quantities are used most disastrous results are obtained. The judicious use of some of these articles are the roads between success and failure. It must not be supposed that these articles are used in all kinds of cakes, but certain kinds of cakes they are the needed help, and are not used merely for the purpose of cheapening the cost, but to improve the quality.

A cake to sell well must have flavor, texture and grain, and neither of these can be obtained from an imperfect mixture, or one that is imperfectly made. In using eggs, great care should be used in their selection, as when the prices are high and eggs scarce, these are the times when large quantities of cake are usually sold. Therefore, in figuring the cost of your cake, don't do it in June, when everything is naturally cheap. June and December do not work in harmony together, as a rule, and if you are basing your profits on June prices to sell in the spring months, when everything is high, you will have to readjust matters. With proper management, however, and carefully considering these matters, it will be possible to make a good cake at a popular price.

In baking your cakes the pans should be covered similar to a sandwich pan. If you have no pans suitably covered, the pans can be covered with thick brown paper or thin wood—anything to keep the top heat of the oven from browning the cake too much, as the sale of your cake will depend to a great extent upon the delicate appearance of it. When we state that these cakes are better if kept a few weeks before being sold, this possibly would seem strange to many of our readers; nevertheless, it is a fact that if this class of cake is properly made and properly baked, age up to a limited time will be the determining factor in its quality.

But it must be borne in mind that the storage of the cakes after being baked, or as soon as being removed from the oven, will have much to do with the future keeping qualities of the cake. It is a mistake to turn the cake out on the iron pans or on wooden shelves and allow them to remain there with the steam from the baking being kept in them, as you must recollect that the paper around the pans which in the baking has adhered to the cake has become thoroughly saturated with grease and has consequently practically formed an air-proof surface. Therefore the steam has very little chance of escaping readily, and in order to get the best from this class of cakes they should cool off readily, and as soon as they are thoroughly cooled should at once be wrapped in an air-proof paper and stored on shelves, with sufficient space between all sides for a circulation of air between each cake. Your shelves also should be formed from slats, or if made from solid wood should have two such slats running longways, in order that the air can get under as well as all around them. If placed flat on the shelves, the possibilities of moulding in hot weather is greater. I think now, that I have given pretty thorough instructions, on a general principle. Of course, there will have to be instructions given occasionally in the various cakes that I will describe, but if the instructions which I have given here are carried out, the others will be mere matters of small importance.

There is one thing here that I will speak of, and that is in the formula in which I give milk in: I meant you to be careful to see that in hot weather there is no chance of the milk being sour—or in fact at any time, although in hot weather the danger is much greater, both from the milk souring quicker and also from the fact that the cake is more readily to form a bacterial growth of a vicious ferment.

In some of the cakes that I describe I shall mention baking powder. This will always mean cream of tartar, soda, or corn starch mixed in the proportions that I shall give later on. Under no conditions should the common phosphate baking powder be used, although in some cheap small cakes these are to be preferred, but where it is necessary to use the cheap ones I will mention it. I contemplate giving quite a number of cakes of different forms and flavors, and whilst this may seem unnecessary yet it may be helpful to some of our friends in various parts of the world. I will now proceed to give two formulas and will continue next month on same subject.

56 pounds good white soft winter wheat flour,
36 pounds good tough waxy butter,
1½ pounds pure glycerine,

46 pounds standard powdered sugar (46 pound),
14 quarts good fresh eggs,
2 quarts fresh sweet milk (not skim),
1 ounce ground mace,
3 ounces good vanilla extract,
4 ounces baking powder.

Place the sugar and butter into the mixer, letting it revolve slowly. As it gradually creams up, add the glycerine. Add the eggs gradually, about a quart at a time. If the butter shows a tendency to curdle, add a few handfuls of flour. When the eggs are all in, add the milk; sift the baking powder and spices into the flour, and add to the mixture. Then mix lightly but thoroughly.

Here is a cheaper cake, but one which is really a nice cake, and one that will sell well almost anywhere:

15 pounds good butter,
8 pounds cottoline and compound,
33 pounds standard powdered sugar,
54 pounds soft white winter wheat flour,
12 ounces baking powder,
8 quarts eggs,
1½ pounds glycerine,
Extract vanilla or lemon.
2 ounces ground mace,
5½ quarts milk,

A little egg coloring used in your milk to make it the desired color would help the appearance of the cake.

Cream up this, as in the preceding mixture, but as soon as the mixture is thoroughly mixed, place into the pans. The least handling after the cake is mixed the better, as there is quite a little powder used here, and you do not want it to work before going into the oven.

I will now give the baking powder formula. Remember that the baking powder described here should be made at least three or four days before using, keeping it covered in an air-tight can. The reason it should be blended together is to avoid its hasty working when freshly mixed in the cakes:

4 Pounds soda,
7 pounds cream tartar,
3 pounds corn starch.

Mix all together and pass through a sieve several times, and then put into a can for storage. In using it, always sift it through a fine sieve with the flour.

A FEW HINTS ON CAKE MAKING

Flour for Cake Making.

In order to secure the best results in cake baking the subject of Flour must be studied very carefully.

For cake baking Winter Wheat flour, of course, is used. Unfortunately, there is no regular standard for Winter Wheat flour, hence the baker is constantly confronted with the necessity of solving many problems as to how to secure the best results with different brands, some being soft and others strong, tough, etc., all requiring a little different treatment. No "Fancy Straight" or "Patent Winter" flour, according to present standards, are the same, hence it is impossible to give "standard" recipes in cake making. The best recipe ever devised will not be successful in every case. Bakers frequently condemn good recipes because they cannot get good results, not considering that there may be a great difference in the materials that they are using.

The nearest approach to a standard formula are recipes such as sponge cakes, composed of 1 lb. of Sugar, 1 lb. of Eggs, 1 lb. of flour; or pound cake, made of 1 lb. of Sugar, 1 lb. of Butter, a pound of Eggs and a pound of Flour; doughnuts, where 4 lbs. of Flour are used to the quart of Milk, etc.

However, for the reason that every time we get flour the flour is different, the baker must change the recipe to conform with this difference in the flour.

The most benefit, however, would be derived in knowing the necessary amount of milk to use, thereby obtaining that which is most important and necessary in successful cake making.

There would be a help, also, in regard to the proper amount of mixing. For instance, if too strong a flour is used more milk or water must be added. The result is the mix is toughened, not only by the strong flour, but by destroying air cells, which are formed by beating the eggs, creaming the butter and sugar, and by the baking powder used.

Sugar.

Sugar is, next to flour, used most extensively in cake making. Standard powdered sugar is familiar to every baker. For a fine powder order XXXX, and a coarser one, fruit or a coarse powdered—also called non-caking powder. This sugar is the best to use for most purposes, as it will cream up easily with butter or with butter and lard. It is much better than standard powder to use for meringue, as it will mix more readily and therefore avoid a tendency of the meringues to get smeary, as is often the case when fine powder is used, which often contains starch. By the necessary sifting it needs, flour and other injurious matters are often mixed in. Although this is the best sugar for cake bakers to use, it is known to but very few bakers. It will not cake like standard powdered, and therefore does away with the annoyance of sifting lumpy standard powdered and saves time and waste of sugar. Light "C" and "A" sugar is sometimes good and profitable to use in cakes, as it imparts a nice color and bloom to the cakes and has a tendency to keep them moister and fresher.

Butter.

Butter is perhaps the most expensive material used in cake making. Many bakers use cheap butter, it sometimes being even rancid—fishy. It is unwise to use this class of butter, for the cakes will surely tell it in the taste. If the price of butter is high, it is better (in order to reduce the cost of the making of the cake) to use good butter and lard, cottolene, or some other similar compound with it. A very good way is to mix a two weeks' supply of butter and lard together, first leaving the butter in a warm room for a day or so, so that it will have the stiffness of the lard and will then mix easier and evenly with it. This seems to help keep the butter sweet and saves lots of time and weighing of butter and lard separately, and it is just the right firmness for creaming, and avoids the lumps which are often hard to rub smooth with the sugar while creaming in winter. It also helps to keep the butter firm and from getting too soft in summer when a stiff compound is mixed with it. It also saves money, as the proportion of butter and lard can be changed as butter gets cheaper or dearer. Sixty pounds of butter to 100 pounds of lard is frequently used. When butter is cheaper, use 75 to 100 pounds, and this can be changed to meet the class of goods turned out in the different bakeries.

Eggs.

Eggs have tried to be replaced by more substitutes than any other ingredient used in cake making. The first thing to consider in an egg substitute is, does it beat up well, as for sponge cakes? You cannot beat up or use many substitutes for sponge cake; but you can use them for anything else. However, half the quantity of eggs regularly used will often make a better cake than you can buy, using egg substitutes.

Eggs are often wasted, more being used than necessary, and where they are of no benefit. It is poor policy to buy cheap eggs, as they are dear compared to good ones, considering the little difference in price, sometimes being only two or three cents a dozen, which makes them dearer in the end than good eggs.

Eggs known as "Spots" among bakers are not only entirely worthless but often spoil a cake.

ONE DOUGH FOR MANY CAKES

The following relative to making as large a variety of cakes from one dough as is possible, without, however, having the cakes appear too much alike, and also have them taste different, by F. Bauer, of Chicago, should prove of great value to the general cake baker.

A good many bakers make the mistake of flavoring almost every cake alike, using lemon and mace or some other similar favorite spice or extract, giving them that monotonous bakers' taste. When more than one kind of cake is made from one mix, it saves the time for weighing and mixing, eliminates to some extent the chances of making mistakes, as it is hard to weigh small amounts of soda, baking powder and ammonia on the bake shop scale; and a little too much of either in a small mix is apt to spoil it, while it would hardly affect a large one. For this very reason many bakers who are not careful and who do not think it necessary to be accurate find it hard to work in small shops or in a bakery where small mixes are made.

Cakes called Butter Rings and "SS" form a good example of the varieties of cakes that can be made from one mix, although a larger, smaller or better variety can be made from others. The Rings and "SS" can be made plain, some strewn with almonds, some with shredded cocoanut, some left plain and iced after baking, by melting the required amount of chocolate and adding to it a part of the dough, Chocolate Rings and "SS" can be made.

Small cookies like Butter Wafers, Almond Wafers strewn with almonds, can be made, also small fancy shaped cookies like "SS," Hearts, Crescents, Rings and Ovals, decorated with cherries and angelica, can be made at Christmas time, and on other occasions, or regularly in better or fancy bakeries.

One mix or dough from which can be derived a large benefit and satisfaction is the ordinary wine cake or layer cake mix, from which you can make layers for layer cakes, ten and five cent wine cakes, loaf cakes; adding chopped nuts and nut flavor to part of the mix, you can make nut cakes. By adding melted chocolate to a certain part of the mix, you can make devil's food cakes, lemon cakes, Boston squares, chocolate and maple squares, raspberry and chocolate drops, cup and currant cakes, and other cakes like nut and cocoanut slices, penny golden-rod squares, etc., can also be made. All these can be flavored and iced so that hardly any customer would even imagine that they were made from one and the same dough. This way of making cakes enables one to make larger mixes, make smaller amounts of each cake so they can be made fresh oftener, and keep a larger variety of cakes in store. On Mondays or other busy days, or when you want to get off a day or so, or being short of help, one can make a large assortment of cakes in a short time.

GENERAL RULES.

BY J. E. WIHLFAHRT.

In making cakes, after the proper selection of ingredients, the respective quantity to be used is of great importance; and the binding material, or the ingredient which binds the different materials into the solid mass, when they come into contact with the heat during the process of baking cakes, deserves first attention. Flour, of course, ranks as the principal binding material and practically is the cheapest material, used in bulk, with which the cake-baker has to deal, and is the one that, by its judicious use, will cheapen or otherwise increase the cost of manufacture.

This is due to the fact that a cake mixture, generally speaking, should be held as soft as possible, as a stiffer mixture would require additional ingredients in order to make the product of the same standard quality, and as flour usually is the cheaper ingredient, then it follows that a stiffer mixture would either decrease the quality of the product or increase the cost of manufacture. Thus the various ingredients principally used in the manufacture of cakes are proportioned in the following way as to their binding qualities in a cake mixture:

Taking as a basis a "pound cake mixture" consisting of one pound each of sugar, shortening, eggs and flour, and it would be desirable to cheapen this mixture by adding, say, milk and flour, it would be necessary to add the milk and flour in even proportions, and for each two ounces of milk and flour so added one-sixteenth of an ounce of baking powder would be required additionally, or in its place a proportioned amount of soda bicarbonate and cream of tartar, which, in this case, would be one sixty-fourth of an ounce of the former and one thirty-second of an ounce of the latter.

Should we continue to add flour and milk and repeat the aforesaid amount eight times, we arrive at a cake mixture calling for one pound each of sugar, shortening and eggs, but one pint of milk, two pounds flour and one-half ounce of baking powder, or an equivalent amount of soda bicarbonate with cream of tartar.

Should we further desire to reduce the cost of manufacture, in purpose not only to reduce the selling price, but also to increase the volume of expansion to a given weight of such cake, we reduce one egg and, correspondingly, two ounces of shortening, and this necessitates to again increase the amount of baking powder one-sixteenth of an ounce for each egg and two ounces of shortening so reduced from the original recipe, which in this case again would be the pound cake mixture.

If we follow by reducing this amount four times, we have a recipe calling for one pound sugar, one-half pound shortening, four eggs, one pint milk, two pounds flour and one ounce baking powder, or a recipe which is the general basis for loaf cake mixture.

This intimates that one ounce of flour has the binding quality for one ounce of milk, if added to a mixture. Again, one egg will correspond in binding quality to two ounces of shortening; that is, one egg, (figuring the average weight of eggs as two ounces each) would correspond to two ounces of milk in binding power, and flour would find its own weight in shortening, and as one egg has the binding quality of two ounces of flour, we may add one egg, and reduce the corresponding amount of flour, which, by producing a softer mixture, increases the quality of the product at the minimum cost of manufacture.

Shortening, in general, (by which I refer to butter, lard, oils or vegetable fats) and eggs have the tendency, when properly incorporated in a mixture, to lighten the cakes, that is why they are creamed together with the sugar, but the same as sugar itself, they have a shortening effect to enrich the cake.

In yeast-raised cakes the binding quality of the different ingredients vary, and one egg, for instance, only possesses the binding quality for one and one-half ounces of corresponding material; but, on the other side, the flour will absorb and retain a good deal more moisture for the reason that for yeast-raised cakes stronger flour is used than for cakes made by the use of baking powders, and again during the process of fermentation the gluten is developed, whereas in baking powder goods the gluten in flour is of no value.

It is needless to repeat here that baking powder and allied products are of entirely different nature and quality, and the comparison is not made with intention to substitute one leavening agent for the other.

Baking powders, ammonia carbonate, soda bicarbonate, cream of tartar, etc., do not add to the nutritious quality of a cake, but their use is tolerated by reason of their great convenience, and, furthermore, they are an absolute necessity for a certain class of cakes, but in all cases good judgment should be exercised to use the least possible quantities that will produce the necessary lightness or neutralize the presence of acidity.

The amount of soda bicarbonate to be used, especially for molasses goods, often depends upon the water, and while the latter is little used in the manufacture of cakes, it is well to state that soft water requires less soda than if hard water is to be used. Hard water may be softened by the addition of a solution of soda bicarbonate.

Sodium chloride, generally called common salt, is very rarely used in the manufactuer of cakes, unless for molasses goods, etc., where the addition of a minute amount exerts a beneficial influence on the binding material employed; it also acts, in part, to neutralize the acidity of molasses, which usually is contained in the latter in overabundant quantities, and, therefore, does not interfere with the action of the soda bicarbonate. The principal reason for using a small amount of salt is that it will stimulate the capacity of the palate to recognize the flavor of the finished product to better advantage.

Sodium bicarbonate, commonly called baking soda, is used to spread and lighten the cakes, as well as for its neutralizing power, as in contact with acids it develops carbonic acid gas, thus leavening the cakes.

Ammonia carbonate is the strongest of this class of leavenings known in the manufacture of cakes, but leaves a displeasing flavor and coarse grain if used in too large quantities; employed in part with soda bicarbonate it usually gives very satisfactory results.

If by error too much soda bicarbonate is used, the product will have a greenish tint and bitter taste. If such error occurs, it is well to add a proportion of cream of tartar or tartaric acid to neutralize the over-amount of soda and allow the mixture to rest sufficient time so one may neutralize the other.

It is hardly necessary to refer to the flour, as every one connected with the baking business knows that soft flour is used for cakes—one containing the least gluten, and consists usually of the soft white winter wheat class. While winter wheat flour often can be bought at a lower price than spring wheat flour, it is not the reason for its use in cakes, but because it is better adapted.

MISCELLANEOUS.

Cleanliness IS godliness.

Always knead butter and lard before using.

Avoid flash heat in baking unless conditions require it.

Ten whole eggs or 18 whites or 25 yolks equal one pint.

Remember butter and sugar require a great deal of rubbing.

When using some lard in place of butter entirely, use half lard and half butter.

Fresh eggs placed in cold water will immediately sink, while bad ones will float on top.

A few drops of lemon juice is a great help when beating egg whites, making them come up quickly.

Cotton-seed oil may be substituted for lard in all cases. It is richer than lard, hence a less quantity must be used.

In beating mixtures do not start too fast. A slow circular motion at first gradually increasing speed gives the best results.

When heating an oven half an hour or more should be allowed to elapse after proper temperature is reached before baking is started.

No baker can hope to make perfect goods who does not accurately weigh and measure all materials. Guess work keeps many bakers poor.

A simple test for molasses is to mix a small quantity of soda with it. If it foams and has a sweet odor it is good, otherwise it is not fit for baking purposes.

Copper utensils should be used with extreme care. When liquids, etc., are allowed to stand in them after cooking poisonous chemical action takes place that is dangerous.

When beating it should be remembered that it is absolutely necessary to keep your tools free of grease or other substances. It is important to beat steadily, frequently changing hands to vary motion.

To test the heat of an oven throw a little corn meal in the center, and if it begins to smoke in 30 or 40 seconds the oven is ready for baking, the proper heat being about 550 degrees Fahrenheit. The dampers should be closed when it reaches this point.

In creaming always rub steadily, adding the eggs very gradually.

Self-Raising Flour.

45 lbs. Flour. 15 oz. Soda.
10½ oz. Tartaric Acid.

The above must be mixed thoroughly. It should be sifted 3 or 4 times.

PASTRY, JUMBLES, ETC.

Bath Buns.

4½ lbs. Flour.	1½ lbs. Raisins.
1½ lbs. Butter.	9 oz. Citron.
1½ lbs. Sugar.	2¼ lbs. Bread Dough.

This is very popular in certain sections. Bake in steady heat.

Butter Cakes.

6 lbs. Flour.	1½ oz. Soda.
6 oz. Butter.	3 oz. Cream of Tartar.
6 oz. Sugar.	Milk.

The above is for the famous "butter cakes" sold in the dairy restaurants in New York and other large cities. The milk should be added gradually to make a medium stiff dough. Roll out very thin—about ½ inch—and cut tea biscuit size. Dock and then bake on hot plate both sides.

Crullers.

1½ lbs. Sugar.	1½ oz. Cream of Tartar.
⅜ lb. Butter.	6 Eggs.
¾ oz. Soda.	3 pts. Milk.

6 lbs. Flour.

A formula when ammonia is used is as follows: 2¼ lbs. Sugar, ¾ lb. Butter; ½ oz. Ammonia, ¼ oz. Soda, ½ oz. Cream of Tartar, 3 pints Milk, 9 Eggs, 6¾ lbs. Flour. Many omit the soda and cream of tartar entirely, using only ammonia.

Cream Cakes.

(See recipe for Eclairs.)

Cream Rolls.

Use ordinary puff paste a little over 1/8 in. thick, cut into pieces of proper width and wash. Make hollow rolls around stick or conical tin tubes. Coat slightly with granulated sugar and bake before removing sticks or tubes. Fill with creams or meringue from bag.

Cream Puffs.

Seal in 1 qt. water to which 1¼ lbs. lard has been added, 1½ lbs. spring wheat flour. Let it work out well.

Then add about 25 eggs, a few at a time. Judgment must be used to get the right stiffness.

Drop them in a dusted pan with either bag or by hand and bake in a fairly warm oven.

Cocoanut Kisses.

2 lbs. Sugar. 1 qt. Egg Whites.
5 drops Acided Acid.

Add sugar after eggs are beaten up firm. Make kisses in rings through star tube. Bake cool in dusted pans. Cover with dessicated cocoanut.

Currant Diamonds.

Two and a half lbs. flour, 1 lb. sugar, 1 lb. butter or lard, 2 eggs, ½ pint milk, ½ oz. ammonia, 4 oz. currants. Rub butter, sugar and eggs light; then add the currants; then the ammonia dissolved in the milk, and lastly the flour. Roll the dough out and cut with a fluted diamond-shaped cutter. Wash them off with milk, place on greased pans, and bake in a quick oven.

Cinnamon Drops.

2 lbs. Sugar.	6 Eggs.
9 oz. Butter.	¾ oz. Soda.
1½ pts. Molasses.	¾ oz. Cinnamon.
1½ pts. Water.	3¾ lbs. Flour.

Bake in a medium oven. Drop mixture on well greased pans with spoon.

Poor Man's Bread

Whip 1 quart and ½ pint of egg whites fairly stiff, then beat into it 5¼ pounds xxxx powdered sugar; flavor with vanilla and darken with burnt sugar color, and finally add 3½ of flour and mix until the mass is a little sunny. Fill into oval shallow pans that have been greased and dusted with flour. Allow them to dry until a crust has formed on top, then bake in a medium oven. When cold knock out of pans, not before.

Cocoanut Kisses.

In a bright kettle put 1 pound finely grated cocoanut, 1½ pounds powdered sugar and sufficient white of eggs to make a medium soft mass. Place on fire and heat until unable to bear the finger in it any longer, stirring constantly. Take off fire and let cool. Then add 4 ounces of stale pound cake crumbs and 4 ounces of flour and sufficient white of egg until the mass can be handled with bag and tube. Then lay them out on greased and dusted sheet pans like almond macaroons. Care must be taken when heating; use only pound cake crumbs, and do not let them stand and become crusted or they will not crack nicely.

Charlotte Russe.

2 oz. Gelatine.	2 qts. Cream.
1 lb. Sugar.	Vanilla.

First dissolve gelatine, then beat up the cream well. Add the sugar, gelatine and flavor. Mix very lightly and fill in the regular cup made of sponge cake mixture. Less sugar may be used if desired. To the above may also be added 20 Whites of Eggs to make a different mixture. Another recipe using egg yolks which is quite popular is as follows: 2 oz. Gelatine, 8 Egg Yolks, 1 lb. Sugar (powdered), 1 qt. milk, 2 qts. heavy cream. First soften the gelatine in cold water. After the yolks are thoroughly beaten add sugar and milk, stirring in the gelatine. Heat, but don't boil, stirring to keep smooth, then beat in the whipped cream and allow to cool.

Corn Muffins.

One and one-half pounds sugar, ½ pound lard or butter, 9 eggs, 1 quart milk, ⅔ ounce soda, 1 pound corn meal, 2 pounds flour, 1⅓ ounces of cream of tartar, flavor lemon.

Take sugar and lard, rub to a cream, add the eggs, rub good. Now take the milk, dissolve the soda in the milk and mix. Take your sieve, put over the bowl, put the corn meal, cream of tartar and flour together, sieve through. Mix and bake in heat of 550 degrees F. Bake in cup cake pans, greased light. No icing. These cakes sell for one cent each, or six for five cents.

Corn Muffins, No. 2.

(Small Mixture.)

Three-quarters pound sugar, ¼ pound lard or butter, 3 eggs, 1 pint milk, ⅓ ounce soda, ¼ pound corn meal, ¾ pound flour, 1 ounce cream of tartar, flavor with lemon.

This mixture is mixed, greased and baked as Corn Muffin No. 1. Sold for one cent each, six for five cents.

Doughnuts.

6 qts. Water.	12 oz. Cream of Tartar.
6 qts. Milk.	1½ lbs. Lard.
6 oz. Soda.	7½ lbs. Sugar.

Add to the above sufficient flour to make a good stiff dough.

French Crullers.

1 lb. Butter.
4 oz. Sugar.
1 qt. Water.
2 lbs. Flour.
28 Eggs.

A richer cruller can be made as follows: 1 lb. Butter, 4 oz. Sugar, 1¼ pts. Milk, 2½ lbs. Flour, 16 Eggs.

Eclairs.

2 lbs. Lard.
3 pts. Water.
35 Eggs.
2 lbs. Spring Wheat Flour.
⅜ oz. Ammonia.

The above is used both for cream cakes and all kinds of eclairs. It is important to remember, however, that the dough for eclairs must be stiffer than for cream cakes. Before starting the mixture it is absolutely necessary, if you desire good results, to have all material properly prepared and ready for immediate use. Eggs should be broken and ready, likewise ammonia, pans, etc.

The lard and water should be allowed to boil for a minute before adding the flour, which must be done very quickly, stirring thoroughly. In fact everything must be done **quickly** if you want perfect goods. Add eggs, about 2 at a time, and when ready add ammonia. Results depend largely on having the dough just right, not too thick and not too thin. Too much ammonia will ruin the batch. Bake in hot oven.

Ginger Snaps.

3 pts. Molasses.
1½ pts. Water.
3 oz. Soda.
4½ lbs. Sugar.
1½ lbs. Lard.
9¼ lbs. Flour.

These are washed with water before baking. Medium oven. Some use ammonia and about 1½ lbs. of corn meal.

Ginger Bread.

3 pts. Molasses.
3 pts. Water.
1½ oz. Soda.
1½ oz. Cream of Tartar.

2 lbs. Crumbs.
1 lb. Lard.
6 lbs. Flour.
Spices.

Have pan well greased. Ice on top. Usually sold in penny squares. For a better grade use 4 or 5 eggs.

Ice Cream Cones.

Eight oz. flour, 4 oz sugar, 1 pint whipped cream, 8 eggs, 1 gill curacoa, pinch of salt, vanilla. These ice cream cones are made in special irons, which are greased and filled with the above batter from a handbag. They are baked on the gas machine. This recipe is for very fine goods, and can be cheapened considerably.

Icing.

Water Icing is made with ordinary Sugar and Water, colored and flavored as desired.

Ornamental Icing is composed of plain Sugar beat up well with Egg Whites and a few drops of Lemon Juice. The usual proportion is to use ¼ lb. sugar to every white of an egg used.

Icing for cake is usually made thinner than ornamenting icing. For a cheap icing Gelatine is used in place of the eggs. Use 2 oz. Gelatine to every pint of water (warm). Beat up well with the sugar.

Chocolate Icing is made with 1 lb. of Chocolate to every quart of water and the necessary amount of sugar. A cheaper Chicolate Icing is made with Cocoa and Cocoa Butter. Boiled Chocolate Icing is made by boiling the chocolate, sugar and water for about 10 minutes.

Transparent Icing is made by boiling Pulverized Sugar and water together in proportions of about 2 lbs. of Sugar to each pint of water. When it becomes like rich cream it is poured hot on the cake top. Care should be taken to rub the sugar thoroughly against the sides of the vessel while boiling in order to mix thoroughly.

Soft Icing consists of Powdered Sugar sifted very fine and boiling water and Fruit Juice mixed. Use 1 lb of Sugar to 2 tablespoonfuls of boiling water and 2 tablespoonfuls of Fruit Juice. This is colored in any way desired. Spread on while the cake is warm. This icing is especially good for sponge cake, etc.

Jelly Squares.

(See Orange Squares.)

Jumbles.

3 lbs. Sugar.	¼ oz. Ammonia.
1½ lbs. Butter.	3½ lbs. Flour.
9 Eggs.	Flavor.

The above is called either Vanilla, Lemon or Cinnamon Jumbles, according to flavor. Frequently a little milk is used in the mixture and more butter. Wafer jumbles are made in about the same way. The formula can be varied in a dozen ways to suit the ideas of different bakers.

Jumble, No. 2.

One pound sugar, ¼ ounce lard, 5 eggs, ½ pint milk, ⅓ ounce ammonia, 2 pounds flour, flavor with vanilla.

This mixture is made, mixed and baked as Vanilla Jumbles. The only difference is, it is put in jumble bag and laid out with star tube. Sell for one cent each, six for five cents.

Vanilla Jumble, No. 1.

One and one-half pounds sugar, 1½ pounds lard, 6 eggs, 1 pint milk, 1 ounce powdered ammonia, 3 pounds flour, flavor with vanilla.

Take sugar and lard, put in the bowl, mix with a cream. Next add the eggs, mix. Take the milk and ammonia, dissolve the ammonia in the milk and mix together. Take your sieve, put over the bowl, put the flour in and sieve through. Mix light and put in jumble bag with plain tube. Lay out on cleaned pans in jumble form. Bake in heat of 550 degrees F. Flavor with vanilla. Sell these cakes at one cent each, or six for five cents.

SPECIAL JUMBLES

BY LOUIS STERN.

Bula.

One pound of lard, 1 pound sugar, 6 eggs, 1 pint of water, 1 ounce soda, 1 quart molasses, and 4 pounds of flour. Put sugar and lard into the bowl and rub to a cream, then slowly add the eggs. Next put in the molasses and mix together, then dissove the soda in the water and mix all together. Lastly add the flour and mix very light. This is put in a canvas bag with a plain tube laid out on clean pans in form of an S. These cakes can be sold for one cent each, or 6 for five cents. They are baked in a slow heat of 370 degrees F. Leave on the pan till well cooled off. If made right these jumbles will keep for weeks.

Chocolate Jumble.

This is made the same as cream jumble No. 1, with the addition of a half pound of bitter chocolate, which is to be dissolved and added to the mixture. When baked fill with white of egg icing. Sold for two cents each, or 3 for five cents. The jumbles are very delicious, but are made very little in this country.

Chocolate Cream Jumble.

Eight and one-half pounds of good cake flour, 2 pounds of lard or butter, 5 pounds of sugar, (in powdered form), 20 eggs, 1 quart of milk, 1 ounce of soda, 1½ ounces ammonia and 1 pound of dissolved chocolate. Put sugar and lard in bowl and rub to a cream. Slowly add the eggs, two or three at a time, then add the milk. Dissolve soda and ammonia in milk and mix together. Then take the chocolate, dissolve it on the stove and add to the mixture. Finally add the flour and mix lightly. Baked in a heat of 450 degrees F. When baked, dried and cooled, take some marshmallow and put some of it between two jumbles, thus causing them to stick together; then fill the hole in the center on one side of the jumble with chocolate icing, and the other side with cream or white of egg icing. Sold for three cents each, or 2 for five cents.

Curna Jumble.

Five pounds granulated sugar, 3 pounds lard or butter, 12 eggs, and 1½ ounces ammonia, 11½ pounds flour, and enough milk to make a stiff dough. Take sugar and lard and break up the same as for pie crust, then slowly add the eggs; do not cream it; put in about 1 quart milk and dissolve the ammonia in it. Lastly add the flour. This mixture is laid out with canvas bag and star tube on dusted pans in the shape of half moons. When baked and cool and dry stick two together by putting jelly between them. These jumbles are baked in a heat of 370 degrees F., and are sold for one cent each or 6 for five cents.

Curba Jumble.

One pound lard, 1½ pounds sugar, 6 whites of eggs, ⅓ ounce soda, ⅔ ounce cream tartar, 1½ pounds flour and a little vanilla. Mix light. Take the sugar and the lard and rub to a cream, then beat up the white of eggs to a stiff snow and add the soda which must be powdered fine to the white of eggs. Next add the flour and cream of tartar, mixing lightly. Put in canvas bag and star tube. Lay out on dusted pans, wash over with milk and drop chopped nuts and almonds on top. Then turn the pan upside down, so the pieces of nuts will fall off, and put in oven to bake in heat of 400 degrees F. When baked, and while still hot, put a little water icing on top. Sold at one cent each, or 6 for five cents.

Cream Jumble.

Seventeen pounds of flour, 4 pounds of lard or butter, 10 pounds of granulated sugar, 3 pints of eggs, 2 quarts of milk, 1½ ounces soda, 2½ ounces of ammonia. Put butter or lard in bowl with the sugar, break up like pie crust, slowly adding the eggs, little at the time, till used up. Dissolve soda and ammonia in the milk and mix together. Finally add the flour, but do not mix heavy, but very light. These cakes must be laid out on dusted pans with the jumble apparatus, because this mixture is too hard to be forced out by the hand and bag system. To be baked in a hot oven in a heat of 490 or 500 degrees F. When baked and cooled off, fill the center with different kinds of jams or jellies. This is one of the best jumbles known, and one of the best sellers in France and other countries. Sold at two cents each, or 3 for five cents.

Cream Jumble No. 2.

Nine pounds of flour, 2½ pounds of lard or butter, 5 pounds granulated sugar, 10 to 15 drops of lemon flavoring, 18 to 20 eggs (according to the size of the eggs); 1 quart of sour milk, 1 ounce soda, 1½ ounces ammonia. This is mixed in the same way and baked in the same heat as the above jumble. When baked fill with jellies or creams and put a little chocolate coating (not too much), on top. Sold for two cents each, or 3 for five cents.

Cocoanut Jumble No. 1.

One and one-half pounds sugar, 1 pound lard or butter, 5 whites of eggs, orange flavoring, 1-3 ounce soda, 2-3 ounce cream of tartar, and 1½ pounds strong spring patent flour. Mix and bake same as above cocoanut jumble, only before putting in oven take a handful of shredded cocoanut and drop on top. One cent each.

Cocoanut Jumble No. 2.

One pound shredded cocoanut, 1½ pounds granulated sugar, 5 whites of eggs, 3 whole eggs, 1 pound lard or butter, 1-6 ounce soda, 1-3 ounce cream of tartar, some lemon flavor, and 1¾ pounds flour. Rub sugar and lard to a cream, then slowly add the eggs. Next add the whites of 5 eggs beaten to a stiff snow. Powder the soda good and fine and add to the mixture with a little lemon flavor, and mix. Now add the cocoanut, but see that it is chopped good and fine or it will not come through the star tube. Lay out on clean pans in regular jumble form. Bake in heat of 420 degrees F. Sold for one cent, or 6 for five cents.

Plain Jumbles.

Make the same as the above cocoanut jumble and mix and bake in like manner, only omit the sprinkling of cocoanut over the jumbles. Sold for one cent or 6 for five cents.

La Cream Jumble.

One and one-half pounds sugar, 1 pound lard, 6 whites of eggs, ⅓ ounce soda, ⅔ ounce cream of tartar, ¼ pound cocoanut, 1½ pounds of flour and a litle flavoring. Rub sugar and lard to a cream, slowly add the eggs and mix together. Next add the flour and cream of tartar. Mix lightly. Put in canvas bag and with star tube lay out on dusted pans in the regular jumble form. Sprinkle some cocoanut on top and then turn pans upside down to allow the cocoanut to drop off. Baked in a heat of 420 degrees F. Sold everywhere for one cent, or 6 for five cents. These cakes will keep from four to five weeks without getting hard.

Sa Voy Jumble.

Two pounds of sugar, 1 pound lard or butter, 6 eggs, 1-6 ounce ammonia, 2¼ pounds flour, and some lemon flavor. Put sugar and lard in the bowl and break up like pie crust. Next add the eggs, a few at a time. Be careful not to cream it. Take the ammonia with a few drops of lemon flavor and make a smooth paste. Mix lightly. Put in canvas bag and with star tube lay out on dusted pans. Put in oven to bake in a heat of 400 degrees F. When baked and while still hot put a little chocolate icing on top. Sold at one cent each, or 6 for five cents. These cakes will keep moist for six or seven weeks, without getting mouldy. The longer they lay the better they taste and the softer they keep.

Sa Voy Jumble No. 2.

One and one-half pounds brown sugar, 7 ounces of lard or butter, 8 eggs, ⅓ ounce soda, ⅔ ounce cream of tartar, 2 pounds of cake flour. Put sugar, lard and eggs into the bowl together and mix very lightly to a smooth paste. Next add the soda with a little mace. Mix together. Finally add the flour and cream of tartar. Lay out with canvas bag and plain tube on clean pan without dusting. Sprinkle some cinnamon or chopped almonds on top, then turn pan upside down, so the unused pieces of almond will drop off again. Bake in same heat as Sa Voy No. 1.

Vanilla Jumble No. 1.

Five pounds of powdered sugar, 4¼ pounds lard or butter, 18 eggs, some vanilla flavoring, 2-3 ounce ammonia, 7½ pounds of flour. Break sugar and lard up, same as for pie crust, slowly adding the eggs, few at a time, till used up. Next add the flavoring, powder the ammonia good and fine and mix together. Lastly add the flour. These jumbles must be pounded out with a jumble apparatus, because the dough is too hard to be forced out with bag and star tube. Baked in heat of 420 degrees F. When baked, and while still hot, wash over with hot water icing. One cent each, or 6 for five cents.

Vanilla Jumble No. 2.

One and one-half pounds of sugar, 1½ pounds butter or lard, 8 eggs, 1 ounce ammonia, 1 pint of milk and 3 pounds of flour. Mix and bake the same as the above, only use plain tube instead of star.

Marshmallow Filling.

(See Icing.)

Mince Meat.

(See Pie Baking.)

Muffins.

(See Sweet Corn Muffins.)

Meringue Pie.

(See Pies.)

Meringue.

2 lbs. Sugar. 1 qt. Egg Whites.
2 drops Acided Acid.

Beat whites steadily, changing hands frequently, until stiff. Then add about 2 tablespoonfuls of Sugar and beat again, adding 2 more spoonfuls of Sugar in a few minutes, after which beat until thoroughly stiff. Now add balance of sugar. A few drops of Lemon Juice will make the egg whites come up quickly. Whites that have been allowed to stand 24 hours come up better than when freshly opened.

Macaroons.

1½ lbs. Almond Paste. 2 lbs. Sugar.
1½ oz. Corn Meal.

To the above should be added enough whites of eggs to get a good smooth mixture. Use only high-grade almond paste.

Marshmallow Icing and Filling.

8 oz. Gelatine. 10 lbs. Powdered Sugar.
2 qts. Water. 1½ lbs. Glucose.
½ oz. Cream of Tartar.

First soak the gelatine in the water, heating slightly to dissolve. Beat thoroughly with sugar in beating machine, and when half ready add cream of tartar and flavor. The glucose may be omitted if desired.

Napoleons.

Use regular puff paste rolled into thin sheets. Cover with vanilla cream and build up with other sheets. Cover top with water icing and cut into oblong squares.

Neapolitan Cake.

Neapolitan cake is made with regular sponge cake mixture, differently colored, pink, yellow, chocolate, etc. Bake in thin sheets and proceed as with layer cake, using jelly and cocoanut between layers. It is usually iced on top with pink and white stripe effect.

Orange Squares.

These are made with ordinary Sponge Cake. Ice, and place slice of Orange on top. More yolks or coloring is put in this cake to give the deep orange color. These goods may be made up in the form of Diamonds, Crescents, etc., jellies or fruits of all kinds may be substituted for the orange. White squares are made with Lady Cake composed of two layers, with Vanilla Cream between and icing on top.

Orange Pastry Tart.

Roll out a round bottom of good puff paste dough, not too thin. Wash the edge with egg and place a strip of the puff paste 1½ inches wide around the edge of the bottom. Decorate this strip with small stars, hearts, crescents, or any small fancy cutter you may have, and from the puff paste wash all with egg and bake well, but take care not to brown the center too much. As soon as baked ice the edge with soft lemon-flavored icing or fondant, and when cold fill the tart with cream filling given below, and decorate the top with fruit jelly, candied orange slices and whipped cream.

Orange Cream for Filling.—½ lb. of sugar, ½ pt. white wine, 6 yolks, the rind and juice of 1½ oranges, ¾ oz. gelatine that has been softened in a little warm water, and if not tart enough add the juice of 1 lemon. Boil this, stirring constantly until slightly thick; remove from fire, and when cooled a little add the snow of 4 whites of egg carefully. In the egg white beat in a handful of sugar to prevent coagulation when mixing it into the warm cream filling. Finish as stated above.

Patty Shells.

Patty Shells are made with ordinary puff paste. Cut out about the size of sugar cakes, cutting small hole in one. Wash over the other with water or eggs. Place the one with hole on top and bake.

Pumpernickel.

4	lbs. Stale Cake (powdered).	6	lbs. Flour.
		24	Eggs.
4	lbs. Sugar.	½	oz. Ammonia.

Spices.

These should be washed over with eggs before baking.

Patties.

Patties or tarts are made with puff paste rolled thin, which forms a lining for pans filled with any kind of fruit. These can be made in endless varieties. A good recipe for the pastry is as follows: 1½ lbs. Flour, 1½ lbs. Butter (hard), 2 Eggs, 1½ oz. Baking Powder, Salt and Ice Water. Medium dough, mixed lightly and rolled four or five times at intervals of about 15 minutes. This can be made very quickly.

Puff Paste for Patty Shells.

Mix 1 lb. spring wheat flour, 2 oz. bread dough, 2 oz. butter, 1 yolk of egg, ½ pint cold water, to a smooth dough. The more it is worked the better. Let lay a little while to recover. In the meantime wash 14 oz. of butter in cold water, press all the water out. Now roll out the dough ¼ inch thick into as perfect square as possible. Place in the 14 oz. of butter formed in a square in the center, turn the dough over the butter from all sides, roll 1 inch thick and turn over again, then roll three times more in the same manner, but give fifteen minutes' time between each roll. When rolling the paste always brush off the flour. Cut proper size and bake in hot oven. If the shells jump too much or topple over, the dough must be rolled some more.

If too close and not enough spring, it has been rolled too much. All depends upon the quality of the butter.

Puff Paste.

1½ lbs. Flour.	¾ pt. Water.
2 Egg Yolks.	1½ lbs. Butter.

This should be rolled at least 4 times, setting aside 15 minutes between each roll.

Puff Paste.

½ pt. Water.	1 lb. Flour.
1 lb. Butter.	

If desired, a richer mixture is made by adding eggs and a little rum.

Pine Apple Tarts.

While apples are at their best, their use in fine cake bakeries can be made manifold and very tasty. A few delicacies in this line are herewith offered:

No. 1.—Half bake a bottom, in a crimped straight flanged pan or in a tin ring, some fine sugar dough. When cool spread this with some apricot marmalade, and upon it slices of apples of as equal size as possible; sprinkle over the slices some finely cut blanched almonds, a few washed currants, sugar and cinnamon, and bake until apples are just soft, but not mushy; then pour over all some very light colored apple jelly.

No. 2.—As above, half bake a bottom of sugar dough. When cool place apple slices in the bottom and bake them until soft. Now beat 6 oz. sugar, 6 egg yolks very light, and add 6 oz. ground stale almond macaroons. Then beat up half pint heavy cream and add it to the beaten eggs. Pour this over the apples and again bake it lightly. When cool dust with sugar or ice with thin vanilla flavored foudant.

No. 3.—Bake in deep straight edge pan a bottom of sugar dough. On a sheet pan bake a net formed by strips of the sugar dough crossing each other diagonally so as to form diamond-shaped openings. The net must be the same size as the bottom, and both should be fairly well baked. Partially fill the bottom with rice which has been boiled soft in milk, adding a little vanilla. Upon this rice place apple slices that have been boiled soft in sugar syrup. Now place the network over the apples, dust with sugar, and fill out the diamonds with pale pink colored foudant that have been flavored with punch extract.

Sugar Dough for Above.—One-half lb. sugar, ½ lb. butter, 10 oz. flour, 3 eggs; some would add ¼ finely chopped almonds to the dough also.

Sponge Biscuit.

6 lbs. Sugar.
66 Eggs.
9 lbs. Flour.
3 oz. Soda.
3 oz. Cream of Tartar.
Flavor.

These goods are usually iced on the bottom and sold at 1 cent each.

Sweet Corn Muffins.

2¼ lbs. Sugar.
15 oz. Butter.
12 Eggs.
1 oz. Soda.
2 oz. Cream of Tartar.
3 pts. Milk.
1½ lbs. Corn Meal.
3 lbs. Flour.

Lard may be substituted for the butter and more corn meal used in place of the flour.

Scones.

6 lbs. Flour.	3 oz. Soda.
1½ lbs. Butter.	6 oz. Cream of Tartar.
1½ lbs. Sugar.	2 pts. Milk.

These are moulded round, ½ inch thick and cut crossways. The dough should be handled quickly though thoroughly worked. Wash with eggs and after half an hour bake in hot oven.

White Squares.

(See Orange Squares.)

Tea Biscuits.

5 lbs. Flour.	2 oz. Cream of Tartar.
¾ lb. Lard.	3 pts. Milk.
⅛ lb. Butter.	⅛ lb. Sugar.
1 oz. Soda.	

Add a little ammonia and salt, let mixture stand for a few minutes and bake in hot oven.

Vienna Biscuits.

— lbs. Flour.	¾ lb. Sugar.
½ lb. Butter.	4 Eggs.
½ oz. Powder.	Milk.

Rub the butter, sugar and powder well into the flour on the board, make a bay, break in the eggs, and wet into a pliable dough with milk. Roll down in a sheet and cut out on slips about 6 inches wide; then spread on the following mixture. Cut up in fingers about 1½ inches wide, and set them on a flat tin about 1 inch apart, lifting them with a palette knife. When you have filled the tin, bake in a moderate oven.

JAMS AND JELLIES

BY LOUIS STERN

Jellies and jams are used in every bakeshop where cakes and tarts are baked, such as jelly roll, diamonds and jelly squares, layer cakes, jelly tarts, etc. No jelly should be put on cakes or tarts to be baked in the oven, for it will cook and run all over the cake. It will make the cake look dirty and will soak into the cake, make it soft and heavy.

Tarts are made by lining small patty pans with puff paste, rolled out thin and filled with different kinds of jams or stewed fruits, such as strawberries, raspberries, cherries or peaches.

Bakers that want a cheap tart usually line small patty pans with puff paste and set away to dry for about one-half hour and bake in medium oven. When baked they are filled with jelly.

Dark Currant Jelly.

For this recipe $200 was paid to Harry DeLuke, the French pastry baker, who brought it to America in the year 1907.

Take 2 pounds of gelatine. Put on stove with 23 quarts of water. When the water begins to boil put in 64 pounds of the best XXXX powdered sugar, ½ ounce of tartaric acid and 1 pint of currant juice. Let it boil on the stove for ten minutes. In the meantime get your pails ready. Rub them on the inside with rum. When the jelly is boiled enough, pour into the pails. Leave them open for one day, then take thick paper soaked in rum, put over the top of jelly and close down tight. You can color this jelly as you like, make it dark currant jelly, red currant jelly or any other color you like by using artificial colors. This jelly is made so good and costs so little that it can be sold at a profit. It will keep for years.

Red Currant Jelly.

Take 2 ounces gelatine. Dissolve in 1 pint cold water, 1 pint rum, 1 quart boiling water, 2 pounds granulated sugar and two teaspoonfuls of currant juice. Put on stove, let boil ten minutes and put in pails for use as needed.

Colebra Cherry Jam.

Weigh 10 pounds of fine ripe cherries, cleaned from stem and pit; put into kettle over the fire with 10 pounds of granulated sugar, 2 ounces corn starch, let boil 20 minutes until jam begins to thicken. When done store away same as other jams.

Peach and Apple Jam.

Take 5 pounds of apples and 5 pounds of peaches. Cut good and fine. Put on stove in kettle, with 11 pounds of granulated sugar. Let boil 10 minutes and add 3 ounces corn starch, 1-6 ounce tartaric acid. Let boil 10 minutes more and it will be ready for use. This jam is very good and is used in all hotels and bakeshops. It is the only genuine apple and peach jam.

Raisin Jam.

Take 8 pounds of raisins, put in kettle on fire, and 7½ pounds granulated sugar. Let boil 20 minutes and add four ounces corn starch and ¼ ounce tartaric acid. This jam is usually stored away in glass jars.

Currant Jam.

Bring 20 pounds of currants to a boil, with 21 pounds of fine powdered sugar and ½ pound of corn starch. Let boil 25 to 30 minutes. Keep stirring till it thickens. When done put in glass jars covered tight. This jam will keep for a year if directions are followed correctly.

Huckleberry Jam.

Bring to a boil 18 pounds of huckleberries, 20 pounds of XXXX powdered sugar, 4 ounces of corn starch. Boil 15 minutes. Keep stirring until thick and when done place in glass jars for future use.

French Orange Jelly.

Take 4 ounces gelatine, soak into 2 quarts of lukewarm water for one and one-half hours, then add 2¾ quarts of boiling water and 3 pounds of granulated sugar, 2 teaspoonfuls of orange extract. Put on stove and let boil five to ten minutes. When done put in wooden pails. Put thick paper soaked in rum over the jelly. Put away for future use.

The Original Peach Jelly.

Take 1½ ounces of gelatine. Dissolve in ¾ pint of cold water, add 1½ pounds of granulated sugar. Next add ¾ pint of boiling water. Put on stove and let come to a boil 10 minutes. Flavor with ½ pint mashed peaches. Put in pail and store away.

Raspberry Jelly.

Take, say, 6 quarts of ripe raspberries. Put in kettle over fire so the juice will flow for 15 minutes. Strain through thin cloth and let stand for five minutes, so it will set. Then measure the juice. To every pint of juice add 1 pound of sugar, and to every pound of sugar add ½ ounce corn starch. Put on stove to boil for 10 minutes.

Strawberry Jelly.

Take 1 ounce of gelatine. Dissolve in ½ pint of lukewarm water. Add ½ pint of cherry wine, ½ quart of boiling water, 1½ pounds of granulated sugar and 2 ounces of strawberry juice. Then put on stove to boil 15 minutes. Pour in pail and put in cool place for future use.

Part II

Bread Making

BREAD-MAKING

THE TECHNOLOGY OF BREAD-MAKING

Trades of every description have during recent years advanced by leaps and bounds toward betterment and improvement.

Inventions and discoveries of most important nature and of stupendous results have from time to time amazed the human mind and thought.

Hand in hand with inventions and mechanical devices used in the trades are step by step reaching greater perfection, simplifying and affording more accurate results of attaining standards of excellence in finished products.

Professor Liebig once said the baking industry is one in which new methods and inventions would be very difficult of introduction, and possibly in his time he may have been right.

The reason therefore may be attributed to the disinclination of the baker of that time to break away from fixed habits, partially, as well as lack of interest manifested by the general public in the production of a commodity so necessary to human sustenance.

But all this has been changed. During the last twenty years the progress made in the baking industry in mechanical contrivances, newer practical method of hydrating doughs, and as well as the great advance made in the study of fermentation, have assumed such vast proportions so as to place this craft on equal footing with any other trade as regards progressiveness.

The watchword for the future then is "more progress," "more convenience," "more perfection."

With this idea in mind, these series of talks have been undertaken, hoping that they may impress the baker as to his responsibilities, and that they might stimulate in him a desire to acquire a greater and more detailed knowledge of the technical points connected with his trade. The bakery of to-day supplies man with that important foodstuff, "Bread," rightfully called "The staff of life."

What other trade is there in existence that can boast of any higher ideal than this?

Pre-eminently, then, the desire should be instilled in every baker to equip himself with the knowledge of how to bring his product to such a state of perfection so that it will absolutely measure up to the standard of its title, *The Staff of Life.*

There are various branches of baking. Bread, cake, pastry and cracker baking. In these talks bread and the materials entering into bread-making only will be discussed.

Raw Materials for the Bread Baker.

In the bread baking the principal materials used are flour, water, yeast, salt, milk, oil, lard, sugar and yeast foods.

1.—Flour and Milling.

A. *The moisture of flour.* Into a glass retort place some flour, taken at random from the stock on hand. Attach to the neck of the retort a glass flask, seeing to it that the connection is airtight (Fig. 1). Heat the flour over a bunson burner gently until brown. Moisture will soon show itself, accumulating at the colder portions of the flask. The neck of the retort should be kept cool with wet cloths. In this manner all the water contained in the flour will be found in the flask.

Ordinary dry flour contains from 8 *to* 18 *per cent of moisture, and averages* 13 *per cent.*

B. *Gluten contents of flour.*—Knead some wheat flour with water into a dough. Lay it aside under cover for fifteen minutes; then place it in a very fine sieve and let a stream of water flow over it, working the dough all the time, until the draining becomes clear, which should be retained for further testing.

There will remain on the sieve a yellowish gray tough mass.

This is the *gluten* which imparts strength to the flour. *Good sound wheat flour contains* 10 *to* 12 *per cent. of gluten.*

The gluten of wheat flour swells considerably in water, but is not soluble .

In the dry state it is horny and brittle.

When moist it soon ferments and quickly putrifies.

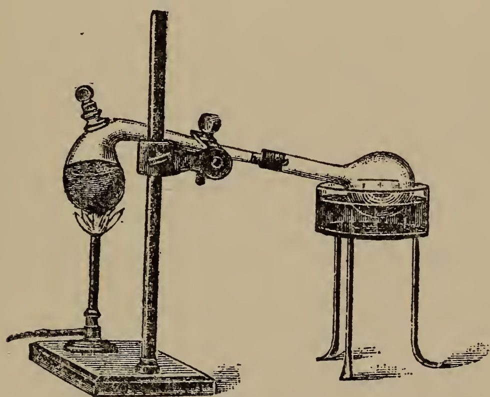

Fig. 1.

Gluten is classified as an albuminoid, but is not soluble in either a weak or concentrated acetic acid solution. When boiled in a soda solution becomes partially soluble.

On account of this characteristic it is closely allied to those albuminoids known as fibrin, which is found in large proportions in animal blood. In contrast to blood-fibrin gluten may be said to be vegetable-fibrin.

The gluten of wheat flour is not a simple body, therefore not an element, but is composed of four varieties of albuminoids: vegetable albumin, vegetable casein, vegetable fibrin and gluten itself.

A marked difference exists in the gluten of rye flour. It is difficult to wash it out. It forms a sticky gray mass and is composed of three varieties of albuminoids—vegetable albumin, vegetable casein and vegetable fibrin. Gluten itself is missing.

These three varieties of albuminoids are contained in much greater proportion than in wheat flour, but the total albuminous matter in both wheat and rye flour are contained in about equal proportions.

C. *The starches of flour.* The wash water which has been preserved from the gluten washing test will at first appear to be milky, but gradually becomes clarified. On the bottom of dish the starch which has come away from the flour with the wash water will be precipitated as a fine white powder.

The proportion of starch in both wheat and rye flour is almost equal. The average is 64 *per cent.* Fine or soft flour contains more starch than hard or coarse flour.

Properties of starch. Take a small quantity of the starch previously obtained from the flour and mix it with water until just milky. Place a drop of the starch water on a clean microscopic slide and put a cover glass over it and gently press it down. In placing the prepared slide under the microscope the starch cells are seen to be fairly round or slightly oval, of various sizes (Fig. 2). A little off the center a bitum is observed.

The "bitum" is a sort of nucleus or spot which is the center around which the concentric rings of starch are arranged.

If by chance some of the starch properties be resting on their narrow surface they will appear elongated. Each starch particle represents a cell. The interior of the cell contains the starch proper, and is surrounded by an external coating of very delicate fibrin or cellulose. Old samples of flour the starch shows cracks and fissures.

The starch of rye flour is but slightly different (Fig. 3), and is difficult to tell it apart from wheat starch. The particles of sound rye starch are a trifle larger.

The starch of potatoes (Fig. 4) has a peculiar pear-shaped formation with very distinct bitum and concentric rings.

The properties of the starches given should enable the baker or student with the aid of the microscope to detect any foreign starch which may have been added to flour as an adulterant.

Mix a little starch with water and divide the mixture equally in two beakers.

Heat one portion to the boiling point; the starch then

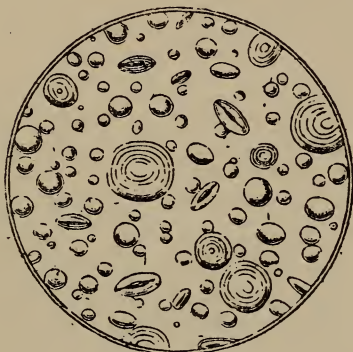

Fig. 2.

Fig. 3.. Fig. 4.

forms with the water, a thick, gelatinous, somewhat semi-clear liquid. The boiling causes the interior of the cell to swell, thereby bursting the cellulose envelopes.

The structure of the starch cell has been completely disrupted. The starch becomes gelatinized.

In the other beaker after a little while the raw starch precipitates. It has completely separated itself in its original form from the water.

Upon stirring the contents of the beaker violently the starch grains do not lose their original character, but simply remain suspended for a time in the water.

When baking bread the gelatinization of the starch does not take place, because the albuminoids of the flour regulated by the heat envelopes the liberated starch after its cellulose cavern has become disrupted, and in consequence prohibits the gelatinization of the starch.

Dilute some of gelatinized starch with water, pour some of it into a test tube and add a drop of tincture of iodine; the cold solution will at once turn a deep blue. Heat the liquid gently to boiling point; the blue coloring will gradually disappear; upon cooling the liquid it again turns blue.

The action of tincture of iodine at low temperature is so intensive that the smallest particles of starch contained in any substance can be detected by its use. By means of tincture of iodine starch adulteration in compressed yeasts may be detected.

Water poured on a lump of starch is rapidly absorbed. Starch is very hydroscopic, that is, absorbs moisture readily, and furthermore, retains the absorbed moisture tenaciously. Hence flour will absorb moisture from the atmosphere. A high percentage of moisture in flour is conducive of putrifying of the gluten and albumin of the flour, rendering the flour unfit for use.

Into a small pan, which has been lightly greased, to prevent sticking, heat while constantly stirring some starch flour. It will turn brown; that is, it has been converted into dextrin. Pure dextrin is soluble in water and is largely used as a substitute for gum arabic. The same conversion occurs in bread, as the starch in the exterior of the loaf is changed into dextrin by the high temperature of the oven and forms the crust of the loaf.

Constituents of starch. Starch is composed of the three elements—Carbon, Hydrogen and Oxygen. The composition of starch is the same as sugar. It contains the same proportions of hydrogen and oxygen as is contained in water, namely, in proportions of 2-1 (H_2O). Therefore starch is a hydrate, and as these water-forming elements are combined with carbon it is called carbohydrate.

To this group of bodies, besides starch, dextrin, all kinds of sugar and cellulose are classified.

D. *Albumen contents of flour.* In a flask place 20 oz. of wheat flour and saturate with 100 oz. of cold water; shake up vigorously several times during one-half hour. Then let the flask stand for some time, after which pour the clear liquid obtained carefully into a filter paper arranged in a funnel.

This clear filtrate is placed in a beaker and heated in a water bath to the boiling point. The clear filtrate will become turbid flocculent. These flakes are caused by a substance which is soluble in cold water and which evaporates upon being heated. This substance is albumin. The albumin of flour is of the same composition as the white of an egg, and is classified under the albuminoids. Wheat flour contains 1.5 per cent. of albumin.

E. *Extractive matter of flour.* After concluding above experiment, filter the coagulated mixture. Place the clear filtrate in an evaporating dish and drive off the moisture by placing the dish in a steam bath. After some time the water will have been driven off, leaving a solid residue in the dish. This residue contains sugar, dextrin, a gum-like substance, and a small quantity of mineral salts, principally potassium phosphate.

Albuminous substances all contain the four elements—carbon, hydrogen, oxygen and nitrogen, a trace of sulphur, and some contain phosphor.

The difference between these substances and the carbohydrates is that they contain nitrogen. They have also received the name proteids, frequently called flesh formers, on account of their nutritive properties.

Sugar, dextrin and gum carbohydrates that can be extracted with water.

F. *Fat contents of flour.* Shake vigorously for some time 10 ounces of rye or wheat flour with 40 ounces of ether, to which has been added 40 ounces of pure alcohol. Heat the mixture gently to 104 degrees F., and fat globules will be seen on the surface of the fluid. This is the fat contained in flour. Rye flour contains 2 per cent., wheat flour 1 per cent. of fat.

G. *Cellulose in flour.* Flour contains more or less fibrin. In order to separate it from the flour, the extractive matters of the flour are washed in consecutive order with water, ether and alcohol, the residue is then boiled in dilute sulphuric acid. The fibrin obtained is then washed and dried. In appearance it looks like wood fiber. This substance is contained also in the gluten and in the envelopes of the starch cells. It is insoluble in water, dilute acids or alkaline. It is indigestible and has no value as a food.

H. *Ash of flour.* Take a little flour and spread it on a platinum dish and heat over a bunson burner. Continue the heating until nothing remains but a grayish white powder. This is the ash or mineral part of the flour.

These mineral substances enter into the flour through absorption from the earth by the roots of the wheat grass.

The ash of flour is mostly composed of phosphates, and are of great importance because they are bone-forming and help to build up the framework of the human body.

The Average of Analysis.

Separating the various constituents of flour is called the analyzation of flour. If in a different quantity of flour the amount of each component part is determined it is called quantitative analysis. The total amount of all constituents is always figured at 100, in order to give percentage of each constituent contained. Wheat flour contains 13.37 per cent. of water. It means that 100 oz. of flour contains 13.37 per cent. of water. Therefore 100 lbs. of flour contains 13.37 lbs. of water. The same applies to the starch item, 100 oz. of flour contains 69.30 per cent. of starch.

The total amount of each constituent of several analyses added together, divided by the sum total of the analyses made, will give the average amount of each constituent contained in the flour. These analyses must be made very accurate in order that the results obtained may be reliable.

The following table, according to R. von Wagner, gives averages, subdividing the albuminoids into albumen, gliadin, vegetable casein, cellulose and gluten:

FLOUR.	Water per cent.	Albuminoids per cent.	Fat per cent.	Sugar per cent.	Gum and Dextrin per cent.	Starch per cent.	Fibrin Per cent.	Ash per cent.
Winter wheat	13.37	10.21	0.94	2.35	3.06	69.30	0.29	0.48
Spring wheat	12.81	12.06	1.36	1.86	4.09	65.88	0.89	0.96
Rye	13.71	11.52	2.08	3.89	7.16	58.61	1.59	1.44

FLOUR.	Water per cent.	Albumin per cent.	Gliadin per cent.	Vegetable casein per cent.	Celloluse per cent.	Gluten per cent.	Sugar per cent.	Gum per cent.	Fat per cent.	Starch per cent.
Wheat flour.	15.54	1.34	1.76	0.37	5.19	3.50	2.33	6.25	1.07	63.64
Rye	14.60	1.56	2.92	0.90	7.36	——	3.46	4.10	1.80	64.28

YEAST AND FERMENTS

Mix some flour into a dough and bake it. The result will be a coarse, tough, indigestible cracker.

The flour and water product possesses keeping qualities, but can only be used as a food when soaked in a fluid.

A baked product if used as a nutriment must possess lightness and porosity and be so constituted that it can be easily digested.

For this reason yeast is required in bread making.

Yeast.

A Gas Test.—Dissolve in a flask 2 ounces of syrup or honey in a pint of water at 140 degrees F., and add one-sixth of an ounce of compressed yeast, which has been broken up and dissolved in a part of the saccharine infusion. Seal the flask with a perforated rubber cork, pass a bent glass tube through the perforation and attach a piece of rubber hose to the glass tubing. In fifteen or twenty minutes small bubbles will be seen rising to the surface of the fluid, which will continually increase in number, until the surface is covered with a froth formation, somewhat like the head of a cauliflower.

The fluid is fermenting.—After 1 to 1½ hours the froth forming gradually ceases and finally drops.

During fermentation lead the rubber hose attached to the generating flask into a smaller flask half filled with water. You will notice bubbles oozing from the mouth of the hose through the water. Then at once make a test by holding a lighted match into the small flask. The match will burn readily, just as it would in the air. After ten or fifteen minutes repeat this procedure and the burning match will be extinguished at once, even to the glimmer.

During the first test atmospheric air only was contained in the small flask. It required a little time for the gas of the generating flask to displace the atmospheric air, as a result of which the lighted match went out at the second test.

Another peculiar phenomenon is noticeable in connection with this test. On top of the water in the open flask the developed gas remains stationary, but can be dispersed by an air current, either created by blowing or by waving the hand over the opening of the bottle.

If we then pour some clear lime water into another small bottle and allow some of the gas from the generating flask by means of the rubber tubing to flow into the same, we will find that, after withdrawing the hose, closing the bottle with the thumb and slightly shaking the contents, the lime water turns milky.

This is caused by a combination of the dissolved lime and the gas. The latter, which we have developed, is Carbon Dioxide ($C.O_2$).

By the above tests we find that Carbon Dioxide is heavier than the atmosphere, and thus remains in the bottle undisturbed by atmospheric pressure, for a time, as it combines very slowly with the air. By creating a draught, the combining with the air is facilitated.

Top and Bottom Yeast.

Remove with a glass rod, during active fermentation, a little of the froth from the saccharine infusion and wash it off with a few drops of clean water, and place a small drop of the solution upon the object glass of the microscope. At 300 to 500 magnified strength we notice that the froth consists of small round or oval bubbles, which occasionally, though seldom, are elongated. They appear singly or in groups, and often look like strings of pearls. These bubbles are yeast cells. Figure 5 shows yeast cells after five hours of propagation. Each cell has a thin covering of fibrin or cellulose; while the interior contains a soft granular albuminous substance, called Plasma, or Protoplasma.

During vigorous fermentation at a temperature of 68 to 80 degrees F., the majority of the bubbles are forced to the surface of the fluid by the action of the escaping Carbon Dioxide, and at the final stages of fermentation gradually precipitate. At a temperature of 36 to 45 degrees F. the fermentation is slower, the generating Carbon Dioxide is less active in escaping and without sufficient force to bring the bubbles to the surface. The yeast cells to a great extent grow and settle on the bottom of the generating vessel.

These characteristics designate top and bottom yeast.

Both of these yeasts are of the same species, and either

Fig. 5.

can be converted into the other by the changing of the temperature during propagation. They are recognizable by a slight difference in size. Owing to the more favorable conditions during growth top yeast is somewhat better developed than bottom yeast. Compressed yeast used in bread baking is top yeast.

Distillation Test.—After the fermentation in the generating flask has ceased, and no more bubbles rise to the surface of the fluid, test it by distillation. For this purpose we first filter the saccharine fluid to remove the yeast cells. Place the clear filtrate in a clean flask, stop it with a perforated rubber cork, and connect it by means of a bent glass tube with a cooling apparatus. Figure 6 shows such an apparatus. The vapor generated from the filtrate contained in the flask passes through the coil in the cooler, as shown in the illustration. The cooler is provided with tube connections at the lower and upper ends, which can be fitted with perforated corks, through which glass tubes may be inserted.

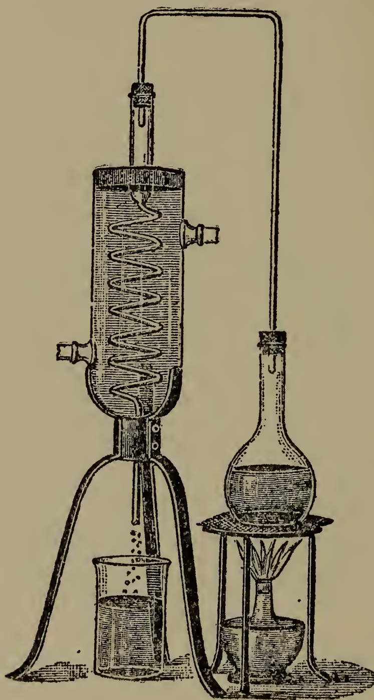

Fig. 6.

The lower tube by means of rubber tubes is connected with the cold water faucet, not shown in the illustration; the flow of cold water around the coil can be regulated at the faucet and drawn off at the upper tube.

In lieu of a cooler as shown, one can be constructed by leading the tube of the filtrate flask into a somewhat wider and longer glass tube, which is connected with a second bottle. The long glass tube, in this case, must be kept cool by constantly pouring cold water over it during distillation.

When all connections have been made tight, heat the filtrate over an alcohol lamp to a boiling point, the flask having been placed on a piece of wire gauze to equalize the heat. The arising vapors passing through the coil are condensed, and drip like tears into a receptacle placed underneath the cooler. This evaporating and condensing of a fluid is called distillation.

The portion of the condensed fluid coming over at the beginning will be found, if tasted, to be very strong spirits of alcohol. Light it with a taper, it will produce a large bluish flame.

As the distillation continues the spirits coming over lose gradually in strength until finally very little else but the vapors of water are condensed. Water boils at 212 degrees F., spirits of alcohol at 172 degrees F. We would therefore infer that at the beginning of distillation it is possible to recover alcohol only if the infusion was heated to 176 degreess F.

This view, however, is erroneous. The boiling point of the mixture is only slightly greater than that of pure alcohol, and the generated vapors are already at the beginning and combination of both fluids, although at first the proportion of alcohol is the greater.

We have now seen that yeast is capable of producing alcohol and carbon dioxide. This is called alcoholic fermentation.

Wine, beer, brandy and other spirituous liquors are produced by alcoholic fermentation, and the same is attributed to the raising of bread doughs.

The yeast cell in its search for nutriment consumes and changes the sugar, to facilitate growth, finally reducing it into simpler bodies of alcohol and carbon dioxide.

The chemical changes of the sugar are due to the ever-changing composition of the albuminous plasma of the yeast cell. When the plasma has lost the power to renew itself, it dies and putrefaction sets in.

Worts of sugar and diffusible albuminous solutions are ideal foods for yeast, as they readily permeate the fine, porous coverings of the yeast cells to nourish the plasma, which at the same time, by its own action, creates the requisite warmth by the dissolution of the sugars with alcohol—carbon dioxide.

The following description will illustrate how this is accomplished:

Make a drumhead, by stretching and fastening a piece of bullock's bladder or either vegetable or animal parchment paper over a cylinder of glass. Place this in a vessel containing pure water, and pour into the cylinder a strong solution of common salt. The salt brine and the pure water are only separated from each other by the thin membrane of the bladder or the parchment. After a little while it will be noticed that the salt solution will have diffused out through the membrane until the liquid, both outside and inside the floating cylinder, has the same strength. This is called osmose, or dialysis.

In choosing its nutriment yeast is very selective. Of the the carbohydrates, glucose, maltose and those of $C_6 H_{12} O_6$ group are capable of direct fermentation, and are quickly and vigorously changed by yeast. In direct opposition, we find that cane sugar, beet sugar, as well as the starch of flour, are not fermentable until chemically changed. This change is brought about by yeast itself.

The plasma of the yeast contains an albuminous substance called Invertin. As explained above, the Invertin, by dialysis, is diffused out through the cell covering and changes cane sugar and sugars of the same class, as well as part of the flour starch, into fermentable sugar, known as invert sugars.

Reproduction of Yeast.—During fermentation yeast nourishes and reproduces itself. The granulations of the living plasma divides itself, and with a portion of the plasma forms a small protuberance at one end of the cell; it then enters the neck, which is gradually developed by the contraction of the cell wall and forms a bud.

The neck finally closes, the budding daughter cell releases itself from the parent cell, and each are then an individual organism.

This operation is known as "budding." Each parent cell is capable of giving off several buds in succession. The daughter cells in their turn reproduce in the same manner, and so with remarkable rapidity yeast cells multiply.

But yeast is also reproduced by spores termed "ascospores."

In this case yeast cells do not throw out a bud, but the plasma divides itself into (usually) four portions called spores, each of which surrounds itself with a thin membrane.

These spores, when set free by the dissolution of the cellulose coverings of the parent cells, on account of their minuteness float away into the atmosphere. If by chance they drop into the proper medium, such as malt wort or flour barms, spontaneous fermentation sets in.

This is recognized by the fact of spontaneous fermentation frequently and easily occurring in the fermenting rooms of yeast factories and breweries, as innumerable quantities of spores are present in the atmosphere at all times.

Pure Yeast Cultures.—By the manner in which yeast nourishes and reproduces itself, we acknowledge it to be a plant of exceedingly elemental structure.

Being devoid of the green coloring matter of the plant

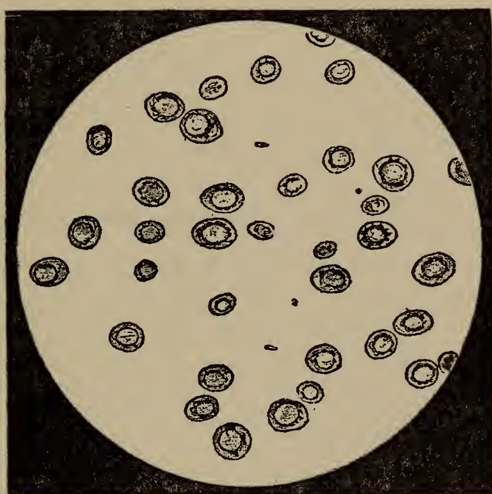

Fig. 7.

Growing Yeast After 8 Hours' Propagation.

(chlorophyll), the yeast cell is incapable of assimilating inorganic matter, such as carbon, nitrogen, ammonia and certain mineral salts, for the purpose of building up their tissues.

Yeast belongs to the family of Fungi, and on account of the peculiar manner of its reproduction is classified as "Sprouting Fungi."

We are obliged to admit that the true nature of the yeast cell has as yet never been entirely satisfactorily explained. Some scientists are of the opinion that yeast cells are but the embryo of higher fungi development; for it is known as a fact that certain species of the sprouting fungi do not possess the faculty to incite alcoholic fermentation, while, on the other hand, some of the higher species of mould fungi possess the qualification not alone to incite alcoholic fermentation, but are also capable of ascospore formation. So much for this explanation.

It has been proven by actual results that different species of yeast produce widely different kinds of fermented liquid. These differences are recognized in the yeast cell of wine, of beer, and of the distillery, the last named being also the yeast of dough fermentation.

If the yeast cell of wine be placed in a beer wort, the fermented wort will assume a vinous flavor, and is known as maltine.

Science has shown that yeast cells are composed of groups of various species. The principal species, among others, as found in brewers' or distillers' yeasts, are known as Sacchoromyces Cerevisial and Sacchoromyces Pastorianus.

Both are very much alike in appearance, both incite alcoholic fermentation, but develop in a similar wort a number of widely different by-products, the analyses of which have thus far baffled the resources of the chemist. The action of these two species is readily recognized by the flavor and taste imparted to the fermented medium.

As the bouquet imparted to wine is attributed to the wine yeast cell (Sacchoromyces Ellipsoideus), characteristic of the grape juice, so the baker recognizes by the flavor of his baked product that the proper species of yeast has been employed, irrespective of the flavor which may have been obtained by other materials used in the baking.

While it is difficult to separate the various species of yeast cells, the phenomena of spore formation has led the way to accomplish it.

At a temperature of 54 degrees F., Sacchoromyces Cerevisial will show ascospore formation in 200 hours, while Sacchoromyces Pastorianus at the same temperature forms spores already in 77 hours. This difference in time of the maturing of the spore formation of the various species of yeast being known, is utilized in transferring the spore of any specific species upon culture plates of nutrient gelatine, upon which the spores develop into little colonies of yeast cells.

The healthiest and strongest appearing cell is then cut out with a sterilized platinum wire and transferred into a flask of sterilized malt wort, and the reproduction from a single cell of any given species is begun. In this manner pure yeast culture is accomplished.

In the fermenting vats growing yeasts are often contaminated by spores of undesirable species from the atmosphere, and result in producing conditions unfavorable for the purposes desired. In such cases we must resort to a pure yeast culture to re-establish the desired fermentation.

Manufacture of Compressed Yeast.—Compressed yeast is the result of alcoholic fermentation of malt and grain worts. As it is of material interest to the baker to acquaint himself with a general knowledge regarding the manufacture of compressed yeast, a short but clear description is given below.

Treating the Grain.—Malt is produced by soaking barley or other grains in water and spreading in thin layers on the floors of the malting rooms. Being moist and in consequence supplied with artificial heat, the grains begin to sprout. As the rootlets grow in size a product is being formed in the germ that has the power to convert starch into sugar. This product is called Diastase. This reaction is still clouded with a good deal of mystery, and it has as yet never been clearly defined.

We know this much, however, that some parts of the nitrogenous matter of grains are chemically changed into Diastase.

Practice teaches the maltster, by the size the rootlets attain, when the maximum diastasic strength of the malt has been reached.

The sprouting of the malt is now arrested by drying the malt in kilns at a temperature of 131 to 176 degrees F., which evaporates the moisture and kills further germination.

For malting purposes barley is mostly used, as its diastasic strength exceeds that of any other grain.

The Yeast Mash.—For preparing the yeast mash crushed malt and rye is employed, although other grains are used to replace part of the rye, such as corn and buckwheat.

Experience teaches, however, that the best results are obtained by the use of barley malt and rye only.

The materials are selected with great care. The water employed is boiled, the rye must be clean and free from dust, and the malt free from mould. The rye is first soaked in water and then crushed.

In 200 liters of water at 125 degrees F., 100 kg. of the grains are mixed and constantly stirred for thirty minutes, until all lumps have disappeared, the temperature in the meantime remaining constant. At this temperature the dissolving of the albuminous matters of the grains is favored, and the changing of the starches into sugar and dextrin is facilitated.

Saccharification of the Mash.—At the expiration of the thirty minutes the temperature of the mash is gradually increased by steam from 122 to 158 degrees F., and constantly stirred.

It has been substantiated that these temperatures are best suited for a perfect gelatinization and saccharification of the starches without injuring the diastasic properties of the malt. At the same time, a temperature of 158 degrees F., which is continued for two hours, is useful to effectually sterilize the mash by destroying the undesirable bacteria. During this time the diastase, which, as we have seen, was produced in the sprouting barley during malting, effects its function in the quickest possible manner. The result is a very sweet, lasting fluid.

In order to ascertain whether the saccharification has been complete, a small portion of the mash is filtered and tested with a drop of tincture of iodine. When the tincture of iodine discontinues to produce a blue coloring in the filtered fluid the saccharification is complete.

Acidulation of the Mash.—This is probably the most momentous stage of compressed yeast manufacturing, and watchfulness must be practiced, if the object be to produce a pure yeast free from all possible contamination.

The means used for this purpose is the introduction of lactic acid fermentation. The mash is covered up, occasionally the mash is stirred, but always from bottom upward, so as to bring as large a surface as possible in contact with the atmosphere (oxygen), while the mash is kept at a temperature favorable to lactic ferment growth.

The reason for this acidulation is twofold. In the first place, the lactic ferments assist in converting the insoluble albuminous matters of the grains into soluble matter. Technically, this is known as changing the albuminoids into peptones.

In the second place, lactic ferment is absolute poison for the undesirable bacteria, which may have developed, without injuring in any way the yeast cells proper, but rather has an influence for good toward them. Sulphuric acid is sometimes added to increase the acidity.

When the acidity reaches 2½ per cent. in the mash it is ready for further manipulation. Apparatuses to indicate the per cent. of acidity developed are used for the purpose of accuracy.

The acidulation of the mash having been satisfactorily completed, further operations are dependent upon the method selected to produce yeast. The older method is known as the "Vienna Process," while the newer method is called "Aeration Process."

The Older or Vienna Process.

Fermentation of the Mash.—At the completion of the acidulation of the mash it is at once cooled to 77 degrees F. This is accomplished by continuously agitating the mash by mechanical means with hollow plungers that are filled with ice or cold water, and which at the same time serves to aerate the mash.

The former method of cooling the mash in shallow vats, on account of infection and introduction by and of undesirable bacteria from the atmosphere into the mash, has been generally discarded.

Fermentation is now introduced by adding a certain quantity of compressed yeast, which must be free from starch adulteration.

In a short time a head begins to develop upon the surface of the mash, which gradually grows and rises to the top of the half-filled vats. The period of fermentation depends upon the temperature of the mash as well as the density of the mash.

The higher the density of the mash, the more vigorous the fermentation.

In general, the time consumed for proper fermentation is twelve to eighteen hours.

As fermentation proceeds, the density of the mash becomes less, while the yeast cells increase, and at the same time the temperature of the mash raises.

The mash in this process contains the whole of the grains, and for this reason the head, which contains the yeast cells, and which is skimmed off as it rises, must be

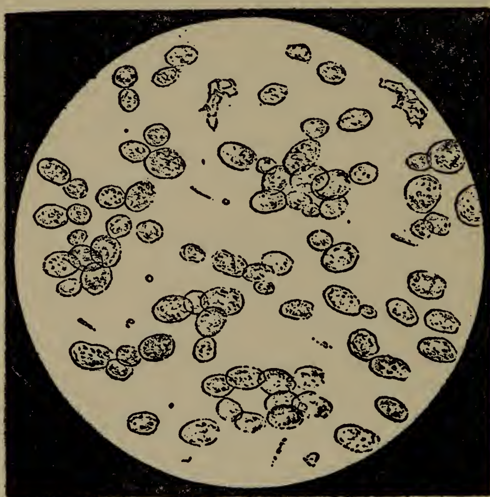

Fig. 8.
Yeast Cells Fully Developed.

strained; it is subsequently washed and then pressed. In contrast to this method the newer or "Aeration Process" for the production of yeast presents entirely different phases.

Production of Yeast by Aeration Process.

This method was invented in Sweden about ten years ago, and is in use in many yeast factories to-day. A decided greater percentage of yeast yield is accomplished by the "Aeration Process."

After the saccharification of the mash is completed, the extract called "wort" is strained to remove the husks and bran of the grains. Large vats containing a double bottom are used for this purpose, the inner or upper bottom being perforated. Spigots are attached to the bottom of the vats to draw off the "wort." At first the extract appears opaque and is again returned to the mash. This pouring-back process is continued until the "wort" finally flows perfectly clear from the spigots. The extractive matter still adhering to the husks and bran of the grains is washed out or "sparged" with hot water.

Another way employed for recovering the clear "wort" is by means of the filter press. The percolation method, however, is preferable, as the extraction of the essential properties is more complete.

Fermentation is produced in the "wort" by adding small quantities of compressed yeast also, or by the use of pitching yeast. During the fermenting period a continuous stream of atmospheric air is forced through the "wort" by the aid of air pumps. In order to eliminate atmospheric dust and bacteria, the air before entering the "wort" filtered through cotton, and sterilized by passing it through a solution of salicylic acid. It is also necessary to distribute the air to all parts of the "wort" equally, by means of perfected tubes, which are attached to the main air pipe, branching out in various directions at the bottom of the fermenting vats, with the perforations facing downward. At the beginning the air current is very moderate, and is increased in accordance and in proportion of the yeast growth. At the final stages of fermentation the air current is again moderated. This forcing in of air, or rather oxygen, in the "wort" stimulates in an exceedingly large measure the propagation of yeast, but care is exercised in this respect, however, for if the air pressure be too strong a large per cent. of alcohol, a very important by-product, will be lost. The characteristic feature of this method, distinguishing it from the Vienna Process, is the continued aeration during fermentation, hence called "Aeration Process."

Obtaining the Yeast.—Fermentation of the "mash" or the "worts" proceeds at a lively rate. In observing the "head" or froth, during the "Vienna Process," which at first is transparent, gradually assumes a milky or of more opaque appearance, caused by enormous increasing growth of yeast cells, filling up the froth bubbles. When the cells are fully developed the fermentation may be considered finished.

Practice assumes, although the assumption is not always reliable, that this stage has been reached when the "head" or froth begins to recede. The only sure method to determine proper maturity of the yeast cell is by microscopic observation.

Placing some of the froth under the object glass of the microscope, the yeast cells most appear well developed and isolated from each other. It should be the exception rather than the rule that budding cells still be visible.

Not until assured that the proper time has been reached should the skimming of the upper portion of the froth be begun. This portion of the "head" contains the so-called "pitching yeast," and is used largely in starting new propagation.

Large galvanized perforated spoons with long handles are used to skim off the froth. Repeated observations of the froth during the skimming are made, to ascertain the condition of the yeast cells.

The yeasty froth is immediately mixed with ice cold water to arrest further fermentation. This also serves to increase the keeping properties of the yeast.

The water containing the skimmed-off matter is now run through strainers of varying sized meshes, the coarser retaining the husks and bran, while the finer meshes prevent the gummy matter adhering to the yeast cells from passing.

The strained yeast cells are caught up in vessels containing water, where they precipitate in a compact layer, and is then ready to be washed.

In order to watch the settling of the yeast, these vessels are constructed with windows so as to give the operator a perfect vision of the settling.

This operation of washing the yeast in new water and allowing it to settle is repeated several times, at which time nearly all of the impurities have been removed and excellent keeping properties have been attained.

A newer method of washing yeast has lately been introduced by the invention of a specially constructed patented centerfuge. If it be intended to mix starch with the yeast, it is usually done just after the washing has been completed.

Potato or rice starch are used. The utmost carefulness must be observed in the examination of the starches, as they frequently are contaminated with bacteria or acids, which tend to injure the keeping qualities of the yeast and very soon become unfit for use.

After the clear water of the last washing has been removed by decantation, the compact settled mass is pressed dry by hydraulic or filter press, and finally formed by specially constructed machines into pound pieces, familiar to all bakers.

The "mash" or the "wort" after the yeast has been removed contain alcohol in paying quantities, and is recovered by distillation.

One hundred kilograms of mash yields an average of 11 per cent. yeast and 28 per cent. of alcohol, if fermented according to the "Vienna Process." The "Aeration Process" yields 25 per cent. of yeast and 18 per cent. of alcohol. The remaining grains in the liquids are much sought after for their value as desirable fodder for cattle.

Yeast Adulteration.—High class compressed yeast should be free from all adulterants. Most manufacturers, on account of the slimy matter of yeast, causing many difficulties in pressing, add from 5 to 10 per cent. of potato starch, claiming that it increases the keeping qualities by absorbing part of the moisture. The writer, however, does not agree with them.

Starch is undoubtedly at times added to yeast in large excess; it then becomes an adulteration; this fraud is, however, readily detected by treating the sample of yeast with iodine. For this purpose break up a little of the yeast in a test tube with some water, shake it up well and add a few drops of tincture of iodine; after standing a little while thte starch will settle at the bottom of the tube in a dark blue layer.

Plaster of paris has also been found in yeast; this, besides being fraudulent, is decidedly criminal, and verily, is giving a "stone for bread."

Nature of and Examination of Compressed Yeast.—A good sample of compressed yeast should have a creamy white color. A brownish discoloration would indicate that fermentation had been too for prolonged before skimming. It should have an odor of apples, not cheesy; neither should it have an acid odor or taste. A piece of blue litmus paper pressed against the cut of the yeast should remain neutral or at the most show but a faint sig nof red; a marked change in the paper from blue to red would indicate acidity.

A microscopic view of good yeast dissolved in water should have the appearance as seen in Fig. 2, shown above. When broken it should show a fine fracture, irregularly rounded. Should it be crumbly, deterioration has set in. In lukewarm water it should melt readily, and not be sloppy to the touch. The dissolved yeast placed in a glass tube should settle slowly and evenly with the water above it perfectly clear. During this test adulteration with plaster of paris is readily detected, as it would be the first to settle out, and by carefully decanting the flpid, examination of the sediment would disclose plaster of paris.

If the solution of yeast and water does not clear itself the yeast is spoiled, and is of no use for the fermenting of doughs. It is contaminated with wild yeast and harmful bacteria, and would be instrumental in starting putrefactive fermentation, ruining the flavor of baked goods. Should we desire to ascertain the amount of starch present in an adulterated yeast, the following method is applicable:

Weigh a small beaker and a small glass rod on a very accurate scale; or, better still, on an analytical balance, and assume the weight to be 17.5 g. In the beaker place 10 g. of the compressed yeast under examination; break it up fine with the glass rod, and place the beaker in a hot water bath for several hours, weighing occasionally until two consecutive weighings are exactly equal; for instance, 21.2 g. We deduct from this the weight of the beaker and glass rod, giving us the following figures: 21.2 g. — 17.5 = 3.7 g.

The quantity of moisture evaporated out of the yeast would therefore be 10 g — 3.7 = 6.3 g. According to the findings of Hayduck, pressed yeast contains originally 73.5 per cent. and dry starch 36 per cent. of moisture.

We now proceed to make deductions to determine the quantity of starch contained as an adulterant in the mixture. We set the example: "What per cent. of starch is contained in a mixture of yeast and starch if 10 g. of the mixture gives off by evaporation 6.3 g. of moisture, yeast containing 75.3 per cent. and starch 36 per cent. of moisture?"

Solution.—One hundred g. of pure press yeast, heated to dryness, gives off 73.5 g.; therefore, 10 g. heated should give off 7.35 per cent. moisture.

In our test the loss is but 6.3 g., consequently a deficiency of 1.04 g. This in itself indicates starch adulteration.

Starch gives off 36 per cent. of moisture; therefore, 1 g. gives off 0.36 g., and 1 g. of yeast 0.735 g. of moisture. With each 1 g. of starch addition the moisture loss is found to be 0.735 — 0.36 = 0.375 g. deficient.

In the 10 g. mixture under examination there is contained as many times 1 g. of starch as 0.375 g. is contained in 1.05 g., which is equal to 2.8 g. In a 100 g. mixture the result would be 28 g., or 28 per cent., which is the per cent. of starch adulteration in our mixture examined.

The Fermenting Strength of Yeast.

The best manner for the baker to test the strength of yeast is to take equal parts of the samples of the various yeasts, about 10 g.; dissolve in 100 g. of water at 85 degrees F., and make a dough with equal amounts of the same bread flour (about 1990 g.).

In order to prevent transferring of any one yeast sample

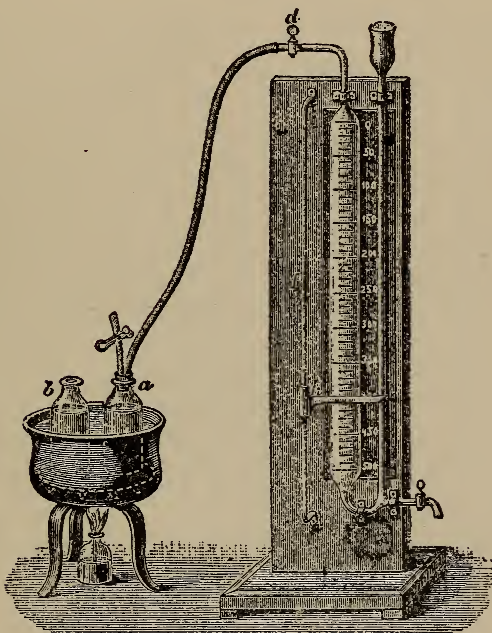

Fig. 9.

to either of the other doughs, it is advisable to thoroughly wash the hands between each mixing. Place the doughs in glass jars of equal dimensions, and allow them to raise at an even temperature. It goes without saying that all ingredients must be weighed exactly alike, and the temperatures in all cases be the same. The yeast whichc gives the greatest expansion of the dough has the preference.

Another simple manner to test the strength of yeast is to drop a piece of the dough into tepid water (85 degrees F.), and observe the time consumed between immersion and when the piece of dough rises to the surface of the water. The dough which rises in the 2shortest time lontains the strongest yeast.

Of course, in technical schools yeast strength is determined along different lines. A Hayduck carbonic acid measuring apparatus is used for this purpose, and is shown in cut (Fig. 9). It consists of two connecting glass tubes fastened against a board. The wider of the tubes has a capacity of 500 cc., and ends at the top in a narrow glass tube, to which rubber tubing may be attached, and is graduated in cubic centimetres. The other narrow tube ends at top funnel-shaped.

Through the funnel the apparatus is filled with water, colored blue to make observations easily. In order that the water may not absorb any of the carbonic acid gas, which would tend to make the test inaccurate, on top of the water in the wider tube a thin layer of petroleum is poured.

In gas generating flasks (a) a suitable "wort" and a definite amount of yeast, to be tested, is dissolved and placed in a water bath. (B) is a second flask for the next following test. (C) is a pinch-cock, which is left open so long as (D) is kept closed. The generated carbonic acid gas forces the water out of the wide tube and is caught up at (G). The yeast which has the ability to displace the largest amount of water at stated periods is considered the best fermentation inciter. Before any readings are taken the water in both tubes is brought to the same level by means of cock (E).

If care be taken to use the exact proportions of materials in each test at even temperature, reliable conclusions are obtained from each individual yeast sample.

Water.—Next to flour, water is the most abundant compound used by the baker. It is the great solvent of Nature. Pure water is composed of the two gases, hydrogen and oyxgen, in proportions of 1 to 8. It is colorless and tasteless.

Water as found in nature is never pure. Owing to its action as a solvent, it contains bodies like lime, magnesia and potash in solution, besides air, carbon dioxide and other mineral matters. Hard water is such as contains more than seven grains of mineral salts per gallon.

The hardness due to bicarbonate of lime may be neutralized by boiling. Other mineral salts are penniment.

In general, soft water is more adaptable for bakers' use, as hard water retards fermentation and somewhat checks the softening changes going on in the dough during fermentation.

Doughs made with hard water require to lay longer to properly mature.

It is for this reason that the baker will find it necessary at equal dough temperatures to modify his methods when using hard or soft waters to get uniform results.

It is of the utmost importance that water used in the bakery be free from organic matter that is detrimental to health, as many such organisms have a tendency to set up putrefactive fermentation in doughs.

In a broad sense, however, water that is declared fit for drinking purposes can be safely employed in bread work.

Salt.—Chemically known as chloride of sodium. It is produced from three different sources: Bay or sea salt, rock or mine salt, and natural brine or pit salt. Of these the refined product of natural brine or pit salt is to be preferred by bakers.

It should be dry, to insure uniform results, as wet salt contains a large percentage of water, which interferes with obtaining accurate and uniform quantities needed in the doughs.

It is added to doughs in varying amounts, from 1½ to 4 pounds per barrel of flour, and gives bread flavor and taste. When working with soft water more salt is required than in hard water. While salt gives the bread flavor, it also retards fermentation. It is especially of import by keeping in check lactic and butyric fermentation, causing sour bread. Authorities claim that salt in all proportions from 1.4 per cent. upwards retards fermentation and diminishes the speed of gas evolution, the raising of the dough.

Milk.—Is largely used in bread making. Dry milk on account of its convenience, has supplanted fluid milk in a large measure in the bakery.

Although not universally accepted, the writer is of the opinion that dry milk containing pure butter fat will add equal flavor to bread in which fluid milk is used.

Besides giving flavor and nourishing properties to bread, on account of its dryness it has water absorptive qualities that are of economic value to the baker.

Dry milk also contains soluble extracts that have an invigorating influence on yeast growth, i. e., fermentation, and improves and gives a better bloom in the crust of the bread.

In point of economic value, the baker should determine, by making small trial doughs, the increased volume obtained by reason of the extra moisture absorbing properties of dry milk when used in doughs.

Fat.—Lard, compound lard and cotton-seed oil are the fats generally employed in bread making. The use of fats effects a finer texture in the bread.

A colorless shortening assists in producing a whiter crumb, and also by coating the cells of the loaf retains the moisture of the baked bread. Doughs containing large amounts of shortening, under best and equal conditions, will stand a larger amount of proof, as part of the shortening in a well mixed dough has combined with the gluten of the flour used, allowing it to stretch further and become more elastic and still hold the increased amount of gas generated by the heat of the oven, and produces a loaf of greater volume.

Not all shortenings will produce the same effect, and the baker should experiment with small batches. The points to be determined are the effect the shortening has on the crust, volume of the loaf, as well as the color.

Sugar.—Among the sugar groups used in the bakery we find cane sugar, malt extracts, glucose and yeast foods.

Each of these products have characteristic effects on fermentation and doughs, and will be treated in a later paper.

DOUGHS LEAVENED BY YEAST

BY PROF E. W. HABERMAAS

There are two distinct ways of making doughs. One way is to set a sponge first, then make the dough, and the other way is to make the dough at once. The first is called a "Sponge Dough" and the second is called a "Straight Dough." Straight dough is so called, because all ingredients such as yeast, salt, sugar, lard, water and flour are all mixed and formed into a dough. There are various reasons for making straight doughs, a few of which we will proceed to give. In the first place, it is more convenient to make a straight dough, because it does not require as much time to make as does mixing the sponge dough, because the mixing is all done at one time. Then, again, a straight dough can be taken in a shorter time than a sponge dough. By this I mean that in case of necessity the dough can be taken, in from 1½ to 2 hours after it has been made. I do not advocate taking the dough in such a short time, but it can be done, because I have done it with good results.

Straight dough requires more yeast than doughs made from a sponge, because the yeast has not as favorable a medium in which to grow, in the straight dough as it has in the sponge dough. It is conceded by some that straight dough requires a stronger flavor than a dough made from a sponge; by others that a stiffer dough is required; by others, that the finished product has a coarse texture, and that an "yeasty" taste predominates. The author made straight doughs daily for eleven years successfully. He neither made a specially stiff dough nor did his finished product have a coarse texture nor an "yeasty" taste. Sometimes when the temperature of the shop was very high or an exceptionally weak flour was sent us, then would our product have a somewhat coarse texture, but this would soon be remedied by using less yeast and reducing the temperature of the liquid used. There are advantages in using strong flour, but they are alike in the straight and the sponge dough, and they are larger yields and larger goods, but these are not the only points to be considered.

Some bakers are partial to spring wheat flour, because the yield in bread is greater than when a blend is used.

Too often is quantity preferred to quality. It seems that most bakers are working to the one end, namely, to get the flour which yields most bread. In this endeavor they are sacrificing quality for quantity.

Spring flour containing a larger per cent. of gluten than winter wheat flour naturally takes up more moisture, producing in turn more bulk, therefore more bread.

Then again the gluten in the spring wheat flour is of a tenacious character, producing a tough elastic dough. Such a dough can resist a greater gas pressure than can one made of weaker flour, and can therefore stand more proof, thus producing a larger and better appearing loaf than one made of a winter wheat flour or a blend.

If a blend is used, we will say two parts of a high grade winter wheat, and one part of spring wheat flour, and the dough is properly worked, the bread will have a fine, smooth, soft, velvety texture, and a mild, sweet taste. The loaf will not be as large a loaf as the one made of spring wheat flour. but will remain soft and moist longer than the loaf made of spring wheat flour. The reason for this is, that winter wheat flour contains a larger per cent. of natural moisture and a smaller per cent. of gluten than the spring flour, therefore it takes up less moisture, and consequently does not lose as much by evaporation in baking; thus leaving a larger per cent. of moisture in the bread.

The chemist's test cannot decide the true baking value of a flour. A bakeshop test, made by a practical baker, is absolutely necessary to decide this matter.

The principal points to be considered when making straight dough are these: the temperature of the ingredients, the temperature of the shop, the quantity of yeast, and the quality of the flour used. If the temperature of the shop is very high, the liquid used should be cool, and the quantity of yeast should be reduced.

The most favorable temperature for fermentation is from 80 to 90 degrees Fahr., though I prefer to have the dough 85 degrees Fahr.

Before proceeding to make the dough, take the temperature of the flour and the shop, then heat the water to a temperature which will give your dough a temperature of 80 degrees Fahr. when ready. For example, if the temperature of your flour were 5 degrees Fahr., the temperature of the water would have to be 10 degrees Fahr. Now if the temperature of the shop were 70 degrees Fahr., the temperature of the water could be raised to 110 degrees Fahr. I would advise you not to get the temperature of the dough too high, but would rather that you raise the temperature of your shop. Dough chills very quickly when it is on the bench, and after a dough is chilled it will come up very slowly. When making dough in a dough-mixer, the temperature of the water should be at least 5 degrees higher than when making it by hand, because the mixers are more or less cold, while, when dough is made by hand you have the animal heat of the hands to keep up the temperature of the dough. When the weather is very warm, the temperature of the water must be changed to suit. For example, if the temperature of your shop is 90 degrees Fahr., your flour would naturally be very near the same temperature (providing it were kept in the shop), then the temperature of the water would have to be at the utmost 75 degrees Fahr., because the temperature of the dough would continue to rise while it was in the trough or mixer.

Process for Making Straight Dough.

Heat the liquid to the required temperature, then dissolve the yeast in a portion of the liquid, then, when the yeast is dissolved, add it to the rest of the liquid; then add the salt and dissolve it; then add the fats and sugar; then add the flour. (As above mentioned for uniform results it is best to weigh the flour, sugar, salt and fats.) After the flour has been added, work it into a smooth dough.

Weighing and Measuring Ingredients Used in Baking.

By Professor E. W. Habermaas.

All solids used in baking should be weighed, and all liquids should be measured accurately. Varied results and failures in baking are very often due to inaccurate weighing and measuring of ingredients. If your recipe calls for a pound of sugar, don't use 1¼ pounds instead. Or if a recipe calls for 1 gallon of milk, don't use ⅞ gallon instead. The author has often seen bakers use 1¼ pounds of some ingredient when 1 pound was what should have been used. Many bakers are exceptionally careless about measuring the liquids, such as milk and water. They will dip a quart or pint measure into a can of milk or into a bucket of water and draw it out on a slant, thus causing a portion of the liquid to run out. Often as much as one-fourth of a pint of milk will run out of the measure, still they will count that a full measure. This may seem a trifle, but when measuring a number of quarts or pints, it ceases to be a trifling matter but becomes a matter of vital importance. For example, you are about to make a dough of four quarts of milk or water, and you measure the milk or water as above shown. After having added the flour and you are making the dough, you will find that the dough is too stiff. This is based on the fact that you use a given quantity of flour to every quart of milk or water used, as should be the case, if you expect uniform results. You have the correct amount of flour, but not enough milk or water. Then again, the yield of such a dough would be less than it should be. Most bakers do not weigh the flour for their dough. Where this is the case, flour is usually added until the dough is of the proper consistency. So in that case the fact that the baker had not measured the liquid accurately would not necessitate getting too stiff a dough, because he has not a given quantity of flour to work in but adds it until the dough is of the proper consistency, but the yield will be less because there is less dough.

I do not approve of this method of making doughs, because the results are not uniform, and it requires more time to make the dough, because you are compelled to add more flour occasionally to get the proper consistency. Whereas, when you have the exact amount of flour and add it at once, you can proceed with dough without interruption. Then again, when you weigh the flour for your dough, you always have uniform results.

The flour, sugar, malt extract, salt and fats (if any) should be weighed, and the milk or water measured or weighed for every batch of dough, no matter how large or how small, if you would have uniform results.

One of the "hit or miss" methods prevalent in most shops is that bakers measure the water and weigh the salt, and guess at the rest. Fats, sugar and flour are seldom weighed. What are the consequences? Sometimes they have a stiff dough, sometimes a soft dough, and sometimes a medium dough. Sometimes the dough comes up too fast and sometimes too slow, owing to the consistency of the dough. Then, again, they never get the same number of loaves out of the same size batch. If the dough is too stiff, they get more than the required number, and if the dough is too soft they get less than the required number out of the batch.

In large shops such methods would not be tolerated, then why should they be tolerated in small shops? Thousands of dollars could be saved monthly in bakeshops if more accurate methods were adopted.

When using avery strong flour you can use a little more yeast than ordinarily without fear of mincing the dough, because strong flour can stand more proof; but unless absolutely necessary, don't use any more yeast than is required under ordinary conditions. During the summer months it is well to use more salt than during cold weather, because salt acts as a governor—it holds the dough in check and keeps it sweet.

Too much yeast creates an over-abundance of gas, and if the dough is not tough enough to withstand the pressure of the gas, it tears and allows the gas to escape; the dough then falls and loses its vitality. If this dough were "made up" into loaves, and when baked were cut in two, it would be seen that the texture would be very coarse; it would be a mass of holes, and the taste would betray a trace of lactic fermentation. This bread would not be fit to eat. Don't allow your doughs to get too old. If a dough gets too old it loses its vitality, and when baked it will have a coarse texture and will have a sour taste. Test your doughs as follows: When the dough has set about one hour, jam your hand into it; if it begins to fall it is ready to take; if it does not fall, allow it to set about one-half hour, then try it again. A dough may be taken before it falls, but I would not advise you to make a practice of doing that. I have made a batch of bread and had it baked and out of the oven in three hours. I set the sponge at 9.30 a. m., made the dough at 10.30 a. m., and had the bread baked at 1 p. m. This bread had a very fine, smooth texture, and had a very sweet taste. I advocate taking doughs as soon as they are ready, if you want a nice, smooth texture and a sweet taste to your bread; and trust that it is your aim to produce such a loaf.

The third process in the art of bread making is pushing or "punching" the dough down.

Pushing or "Punching" the Dough Down.

When the dough is well "up," or raised, push or "punch" it down (using both hands), to force out the gas, then raise up one end of the dough and lap it over the other, then push it down again. Continue this process until the dough is firm and compact, then cover it, and when it is up again take it. This is done to prevent the dough from getting too old, or from losing its vitality. When a dough is required at a certain time and there is no time to push or punch the dough down, this process may be omitted.

The fourth process in bread making is breaking the dough.

Breaking the Dough.

When the dough is ready remove it from the trough or bowl and put it on the bench or table; then cut it into pieces weighing about 10 pounds; then pat it down with both hands, then take up one end of the dough and lap it over the other, then pat it down again until you have the piece of dough very flat; then fold it over and over. Continue to pat down and fold over the dough until it is very compact, then take up the next piece, and so on, until you have the entire batch of dough firm and compact. In some large shops this work is done by machines called "dough breaks."

"Breaking" is done to free the dough from excessive gas and to keep the dough young and also to produce a firm loaf of bread. If the dough is "made up" before it has been freed from excessive gas, it will produce a spongy loaf of bread, with large, irregular holes in it. Such a loaf of bread will dry out very quickly. After the dough has been freed from excessive gas it becomes firm and compact, and the loaves of bread made from this dough will likewise be firm and compact. (At this period of the dough all gas contained in the dough can be classed as "excessive," because it is of no real value, but rather a hindrance, because it makes additional work to get the dough into proper shape for making it up into loaves.) Now, when the yeast again becomes active and gas begins to form, the loaf will raise evenly, because what gas remains in the loaf is evenly distributed throughout the loaf, thus producing a nicely shaped loaf.

The fourth process in the art of bread making is weighing.

Weighing the Loaves.

Cut the dough into pieces of as near a uniform size as possible, then weigh them as required. The exact weight I cannot fix; that must be determined by the price of material used, the locality in which you are located, the cost of labor, etc.

In making up a selling price, every detail, such as cost of material, labor, rent, light, fuel, heat, wrapping paper, twine, advertising display, wear and tear on horse and wagon (if you have any), feed, etc., salary for yourself, interest on money invested, etc., must be figured in, or "you will come out of the small end of the horn," as they say.

After the dough is made, proceed as follows to work it smooth: Cut off (with a scraper) a portion of the dough and place it on the bench, then spread it out (using both hands) as wide and long as possible, then fold it double, then spread it out again, as before directed, then fold it over. Continue this process until you have a nice, smooth, dry dough, then take up another piece of dough and proceed as directed. Continue taking up pieces of dough and working them as directed until you have worked the entire batch of dough, then put it in the trough and allow it to "raise." When making straight dough with a dough mixer, proceed as follows: Put the water into the mixer (but keep back a small portion in which to dissolve the yeast), then dissolve the yeast, then put it into the mixer, then add the sugar, fats, salt, etc., then start the mixer, then add the flour and allow the machine to run until you have a smooth, dry dough. Some bakers allow their mixers to run ten minutes and others allow them to run twenty minutes. This is simply a matter of opinion. My advice is to run the mixer until you have a smooth, dry dough.

Processes in Bread Making.

Before we have the product called bread, it has passed through fourteen processes, which I will name and describe in rotation. The first of these processes is called setting sponge.

Setting Sponge.

Setting sponge is the first process in the art of bread making. Proceed to set sponge as follows: Measure the quantity of liquid desired and put it into a mixing bowl or trough, then take out a portion of the liquid and dissolve the yeast in it (about ½ gallon for each pound of yeast used). The yeast must be thoroughly dissolved; then add it to the rest of the liquid, then add flour to give it the consistency of medium dough (2¼ pounds of flour, one-half spring wheat and one-half winter wheat will give you a fine sponge), then work it well to prevent crust from forming on it, then allow it to raise. The length of time required to raise the sponge depends upon conditions, namely, the quantity of yeast used, the temperature of the shop, the temperature of the liquid and flour, the consistency of the sponge, and the size of the sponge. Large sponges require less yeast (in proportion), and raise quicker than small sponges, because they are not as easily chilled as small sponges are. Some bakers prefer an old sponge and a young dough, while others prefer the opposite—a young sponge and an old dough. I prefer to take the sponge as soon as it is ready, and the dough likewise. By so doing we always get an article that is not overproved, and without a trace of lactic fermentation. Goods made from an old overproved dough are not fit to eat. If you make a nice, sweet product you will have no difficulty in establishing a good trade. Watch the sponge and take it just as soon as it begins to fall. If you want to test a sponge shake the vessel, and if the sponge falls it is ready to take. If the sponge is not ready, the shaking up which you gave the sponge will not check the growth of it. I have taken sponge one hour old and produced excellent results.

The second process in the art of bread making is making dough.

Making Dough.

Melt the fat (if lard or compounds are used), dissolve the sugar and salt in the water, then add them to the sponge and work them thoroughly, tearing the sponge to pieces and working it until you have the whole a smooth mass, then add the flour (in portions), enough to make a fairly stiff dough, and work it thoroughly until you have a smooth, dry dough. Work the dough same as when making a straight dough. Keep the dough covered and at a temperature of not less than 80 deg. F. When the temperature of the shop is below that, and the dough is to be taken in two or three hours, both the sponge and the dough must be kept above 85 deg. F. While a little chill would not affect a dough, still it would delay it considerably. Chilling retards the growth of the yeast, and after the dough has been chilled it will take some time to raise its temperature to continue the growth of the yeast cells.

There are various ways of hurrying doughs, a few of which are as follows: By using a little more yeast than ordinarily, and by making a soft dough, and by reducing the quantity of salt, and by keeping both the sponge and the dough at a high temperature. When using a larger per cent. of yeast than ordinarily, watch both the sponge and the dough, and take them young (just as soon as they are ready), or lactic (souring) fermentation will take place. Don't use too much yeast. Too much yeast will give the baked product a peculiar taste, and will compel you to be very careful in the handling of the dough, especially so in warm weather.

VARIATIONS IN BREAD TEXTURE

BY C. MILLER

That there is a wide variance in texture or grain in bread from day to day, or from batch to batch, produced under seemingly same conditions, is not to be denied. There are several causes, any one of which may produce the difference between good and poor texture:

(1) Improper fermentation, the most fruitful source.
(2) Improper handling or preparation of the dough previous to panning.
(3) Over-proofing before baking.
(4) Ovens too hot or too cold.

By taking up these causes in the order named I hope to point out to those who are not practical some of the difficulties which confront the operative baker, and which make the production of uniform texture in bread almost as difficult as it would be to bail the water out of Lake Michigan with a bucket.

My observation, covering a period of more than thirty years, leads me to believe that absolutely uniform texture or grain in bread will never be produced so long as we make bread with yeast. This brings me to the first cause named, that of fermentation.

As there are no known mechanical means of determining the amount or degree of fermentation in dough, this must be left to the judgment of the baker, and his judgment is prone to err. If the dough is under-fermented the resultant texture of the bread will most likely be rough, waxy and heavy to the eye and touch. If the dough be over-fermented, the texture takes on a grayish look and feels coarse and dry and inclines to crumble. The difference in time between under and over-fermentation is not long, and, as previously stated, depends entirely upon the judgment of the operative baker, and were his judgment infallible, which it is not, other conditions in the bakery many times make it impossible for him to take the dough at the proper period of fermentation, due to the erratic and eccentric nature of fermentation of the various batches under course of manufacture. Although made apparently identical, in which every ingredient, including the water, has been carefully weighed, the revolutions of the mixing machine counted, to produce as near as possible one dough like the other, these doughs, all of a temperature not to vary more than half of a degree, and this temperature controlled in a room specially constructed for this purpose—with all of this care and fidelity to detail, it is seldom that any two doughs will ferment exactly alike. That being so, what may be expected where such facilities are lacking, and where such close attention to detail is not practiced? The subject of fermentation is a long one, and I only touch upon it as it relates to the texture or grain of baked bread, pointing out the difficulty of its control outside of the laboratory.

Taking up the second cause of poor texture (in the order named), that of improper handling of the dough before panning, I may say it is impossible to make bread of a fine texture or grain without a certain amount of manipulation of the dough during the process of fermentation. This has been termed by the baker "cutting over" or "turning back." If this part of the work is not properly done there will be a consequent sacrifice of texture or grain. This cutting over, when properly done, consists of cutting the dough in pieces as large as can be conveniently handled, and stretching these pieces as long as possible and placing the same again in the trough, one piece on top of the other, until the entire batch has been so treated. This serves two purposes: (1) That of again bringing the dough, which had become warmer in the center of the batch, to a uniform temperature throughout; (2) it makes a more thorough distribution of the air cells which were produced by the gases in their attempt to escape by rising upward through the mass of dough. It is this repeated redistribution of the air cells to finer size and greater number which aids materially in the production of a bread of fine texture. This can best be illustrated by calling your attention to the "snow-flake" bread, or brake dough, which was once quite popular in many sections of this country. The process of manufacture, in which the dough was run through iron rollers from twenty to thirty times, always folding and running through the rollers again and again, is an intensified redistribution of the air cells, and this process produces a texture or grain very fine and pleasing to the eye and touch.

The over-proofing of the dough before baking is a weakness inherited by environment by about 99 per cent. of the operative bakers. This desire to see a large loaf at the expense of flavor and texture is caused largely by the criticism of the smaller loaf by the general public. It is an inevitable law of nature that you cannot get something for nothing. You cannot have quality, with fine texture or grain, and at the same time have a large loaf which only pleases the eye on its exterior. Either quality or quantity must be sacrificed. It is for the individual baker to say which it shall be.

And last, but not least, the cause of poor texture or grain is due to improper heat of the ovens, as without a perfect baking heat it is quite possible to spoil the most perfect dough. If the oven be too hot, causing the bread to crust before the loaf has had time to become heated through, the result will be poor grain or texture, as the gases within the loaf would be imprisoned by the crust already formed, and as these gases become more heated and light as the loaf grows hotter, they eventually follow along the lines of least resistance and break through the loaf at its weakest point of crust already formed, causing the loaf to be ill-shaped and drawn, and the grain to be uneven and furrowed. Again, if the oven be too cold, the loaf is too slowly heated to stop in time the action of fermentation, and the result would be much the same as over-proofing—open texture with inclination to be dry and crumbling.

Greek Bread.

One-half pint milk (bare measure), 1 ounce yeast, pinch of flour, 2 eggs, ½ ounce sugar. Ferment 90 degrees F.

Dough.

One pound flour, ¼ pound butter, 3½ ounces sugar, ½ ounce ground cinnamon.

Make the above quantities into a very light dough, and allow to lie covered in warm place for 45 minutes. When ready to turn out on to the board, hand up, and pin out to little more than ¼ inch thick. At this stage sprinkle some granulated sugar over the dough, splash with little water, and bring two sides over to meet in the center, so as to entirely enclose the sugar. Pin out again and repeat same operation of adding sugar and folding over. The dough will now require to be pinned out to ¼ inch thick, when it should be cut into strips 2½ inches wide and placed on warmed greased baking sheets. Wash with milk, sprinkle over a good layer of granulated sugar, and place into the prover containing little steam. When ready bake in hot oven, allow to cool, then cut into small square pieces, according to size required.

AMERICAN RYE BREAD METHODS

In Europe most all of the rye breads are raised with sour dough, but American bakers employ a variety of methods; some bakers are using the sour dough process, others are taking a part sour dough and use compressed yeast with it, others use a potato ferment, or compressed yeast without sour dough. The sour dough process recommends itself because it is cheap; all that is required is a small piece of rye bread dough left over from the previous day's batch for a start; there is no yeast to pay for. It is a process which requires experience and close attention to make a nice and palatable bread. The difficulty lies in the treatment of the sour dough. This dough should not be sour, as the name would make one believe; it should be kept up to a certain degree of sweetness by refreshing or renewing it regularly. Rye breads made with sour dough have a peculiar characteristic flavor; this flavor is lacking in rye breads which are raised only with yeast.

A combination process, in which yeast and sour dough are used together, either with a sponge, or also in a straight dough, produces a sweeter loaf, and there is not as much danger of getting the bread too sour (which may happen in the straight sour dough process), if not closely watched. Yeast added to the sour dough secures a stronger and shorter fermentation, and only one sponge is used in the process, while, with sour dough only, two successive sponges are employed. The short yeast and sour dough process gives just enough acidity to the dough to give a good taste.

Rye bread is also made with ferment. One Detroit bakery makes from 400 to 600 loaves per day by this process. The potato ferment is made in the afternoon (they use potato flour), stocked away with dry yeast, and in the morning a straight dough is made with ferment and more water. This process makes a nice, moist and sweet loaf and sells well.

In other bakeries, the left-over pieces of rye and wheat dough which accumulate during the day from the dough-mixer and the dough, are used for a sort of sour dough, for a start, or in place of the regular solr dough. The scraps are thinned down with water, and in the evening some yeast is added and a sponge is set with more rye flour; the rye dough is made from this sponge afterwards. This method works all right, but care must be taken not to add too much old dough, and also to take the dough young, otherwise it is apt to make a dry, flat loaf and the bread cracks easily in baking.

Some bakers set a sponge with compressed yeast and rye flour and let the sponge drop twice. The sponge is made very slack, and contains two-thirds of the water, and the other third part of the water is put on for the dough. Letting the sponge drop twice gives it a little more acidity to the dough. This process would make a much better flavored bread if the sponge was taken on the first drop, and for doughing three or more pounds of old rye dough added, according to the amount of bread to be made; it would give better flavor and make a moister loaf.

In other bakeries where only a small quantity of rye bread is required, bakers do not set a separate sponge for rye; they dip out of a broken-up wheat sponge and make the dough with rye flour; a piece of sour dough is added by some piece of sour dough is added by some bakers, which gives better flavor to bread made by this method. The sour dough process consists of a succession of sponges; every day a small piece of sour rye dough is left over for this purpose to begin with. It is important in this process to keep the sour dough from getting too old, because when too old it becomes putrid and loses strength. Where rye bread is not made every day, or where sour dough is kept over from Saturday to Monday, we used to work plenty of rye flour with some salt in the piece of dough kept over, and make a very stiff dough, and rolled this in a well-dusted flour bag and kept in a cold place till required. (In southern Germany the sour dough is kept in a liquid state, it is thinned with cold water and kept in a cold place.) Only a small quantity is required for a start; this is freshened up once or twice before it is made into the first and second sponge, after which the final dough is made. For instance, to make a batch of 100 pounds of rye flour into bread the procedure is as follows: Two pounds of sour dough are freshened up with one quart of water and one pound of rye flour into a soft sponge at about 75 to 80 degrees Fahr. After three hours add two more quarts of water and about six pounds of flour and make this into a medium firm sponge, this is called "grund sour." In from five to six hours this will be ready for the second sponge or "voll sour." For this second sponge add fifteen quarts of water and with about forty pounds of flour make a soft sponge. This sponge will be ready in from three to three and one-half hours and drop. For the dough add fifteen quarts of water, about one and one-half pounds of salt and about fifty-two pounds of rye flour and make a smooth stiff dough. After the dough is made it should not be given much time to come on before scaling and moulding, because the large second sponge will cause the dough to ripen quickly during the time it is scaled and moulded. This should be done in as short a time as possible so the first loaves do not get too much proof before the rest is moulded. For a smaller batch more time can be given. This process of getting the sponges ready for the final dough may seem tedious to some readers, but the rye bread is baked generally during the daytime, while breads and rolls are baked at night, the freshening-up and setting first and second sponge is done during the night, this is particularly so where there is only one oven.

In the large rye bread bakeries, where they bake many batches per day, a batch is baked every two and a half to three hours. A larger "frund sour" and less water on the "voll sour" with a moderately warm temperature ripens sponge and doughs more rapidly and gets the bread ready for the oven in a short time.

How to make Genuine Rye Bread.

In a recent paper upon this same subject, Geo. Freeman, of Kalamazoo, an expert baker, had the following to say upon how to make genuine rye bread.

During my career as journeyman baker, working in different shops, I have found there were hardly two who made rye bread precisely the same. But although they work different ways the result aimed at was the same.

Some got it pretty regularly and others did not. But since giving the subject a little extra thought I see where I and others have worked very much in the dark, and during the course of my remarks I shall endeavor to throw as much light on the subject as I possibly can, from the viewpoint of a baker, to bakers, and so enable you (who do not already) to see it as clearly as I do myself. I have here, gentlemen, two loaves of what I consider genuine rye bread, the formula for which has never given me any trouble since I adopted it. I will tell you first how I made them and the why and wherefore afterwards.

We will take for example a six gallon dough for a 125 pound batch. From the previous day's rye sponge, I have saved one pound of sponge in the crock and kept it in the ice box, so the first thing I do is to take half a pint of water and skim milk and bring it up to required temperature; and add to the one one pound of sponge in the crock and stir in sufficient rye flour to make a little stiff dough, the temperature of which must be from 92 to 95 degrees, and let stand until the sponge is ready.

Next take half an ounce of hops and boil about 20 minutes in two quarts of water; strain off the hops, saving the liquor for the sponge.

Next I prepared the blend of flour taking 40 per cent. blended Wisconsin rye; 20 per cent. pure black Wisconsin rye; 40 per cent. low grade spring.

We now come to the sponge, making a six gallon dough. I take four gallons for the sponge, being two-thirds of total liquor in the sponge and one-third or two gallons at doughing stage.

I take three and one-half gallons of water (at required temperature); seven ounces of yeast, two quarts of hop liquor, twenty-eight pounds of prepared blend of flour, about one-third of total required.

Mix thoroughly. Temperature when mixed 80 degrees in summer; 84 degrees in winter.

You will notice I allow seven pounds of flour to the gallon of water in the sponge, which makes it medium soft, causing it to show the drop good. A stiff rye sponge will sometimes hold up on top until it is completely rotten. On this account I have water and flour weighed accurate for rye sponge.

The sponge is usually ready in three and a half to four hours. I give it a full drop and regulate how far it comes up the second time by the strength of the flour. In this instance the sponge took one full drop and had risen half way up the second time when I took it. I have already had to give the sponge the second full drop when using very strong flour.

Now we come to the doughing stage: Two gallons water (about 10 degrees lower temperature than required for sponge; two pounds of sour from crock; one pound eleven ounces of salt; 50 pounds of the same blend of flour as used in the sponge. Mix good and thorough. The temperature should be about 80 degrees in summer when finished, and 84 in winter.

I cover it up and allow to stand until when I push my fist well into it and withdraw quickly, it recedes slightly instead of resisting. It is generally one and a half to two hours in getting ready. I then throw it out on the table and have it scaled, rounded up, made into loaves, set in boxes, dusted with corn meal, with the crease down and set away to prove. When the loaves had risen or increased in bulk about 50 per cent. we washed them over with boiled corn starch and water, and set them in the oven to bake; the oven being as near 400 degrees as we can get it, with steam running in. The steam is left running in until the loaf is done rising, then we shut it off and open the steam damper a few minutes. A few minutes before we commence to draw we turn the steam on again to glaze the crust, which does away with washing after it comes out of the oven. We let it bake until it a good rich brown and gives a firm sound when rapped with the knuckles. The result of this description vou see in these two loaves.

Now, gentlemen, I will endeavor to tell you in as short and plain a way as I know how why I did or did not do certain things.

I will take the sour first: That is the cause of endless trouble to most bakers, and many have stopped using it altogether. The idea is to produce just a little acid taste to the bread and still retain the full, sweet rye flavor, a kind of "bitter sweet" as one may say. People who like a little of it in their rye bread would be the first ones to distain sour and flavorless rye bread from over-fermentation. And I would not blame them either. So the old fashioned idea of adding sour is an excellent one, if conducted rightly. And I find when it is done right it contains a high per cent. of lactic acid—the same bacillus the farmers and dairymen develop by letting their milk sour before churning to give a flavor to their butter and cheese. The same bacillus gives the acid taste to buttermilk and cottage cheese, and what German does not like them? Now milk may be said to be the home of lactic bacillus; that is why you heard me say add water and skim milk. The ideal temperature for its development is 95 degrees. You notice milk turns sour very quickly during hot weather; that is the reason.

Do not make the sour over night, as at the conclusion of the lactic ferment others, undesirable, may commence and cause you endless trouble.

Do not put the sour in the sponge and think to save a little yeast that way. It may turn your whole sponge sour, and spoil your bread. If you want a little more acid taste to the bread, use a little more sour, and vice versa.

You will notice I use a little hops (or rather hop liquor) in the sponge. The reason is to keep the sponge as pure and sweet as possible. Rye flour differs from wheat flour in that there is in rye flour scarcely any of what we call gluten. It analyzes a higher content of albumenoids than the average wheat flour, but they are nearly all soluble in water, and therefore, ready for easy assimilation by bacteria, and as it is this the proteids bacteria thrive on they have an easy chance to start a very undesirable fermentation, unless something is used to hold them in check. Therefore, I advise using a little hops which will do it effectually.

Now we come to the doughing stage again: We have kept our sponge in good condition and it is ready. We must still keep the dough cool and maintain the alcoholic fermentation throughout, but here we do not need to use any hops, even though we have the sour, as here we have the best retarder of all, plenty of salt, which not only brings out the flavor, but holds in check all foreign ferments, as long as there is any food left for the yeast to thrive and work on. So be sure to take your dough as soon as you know it is ready.

Regarding the blending of flour, gentlemen, everybody knows the blend of flour to make the loaf that his trade demands. Some places they demand a big loaf and the baker uses more spring; some places they do not trouble about size, and the baker used less spring and more rye.

I think I have said sufficient, so in conclusion let me remind you: Keep your sponge cool, use plenty of good yeast, do not let your sour get too old, keep your dough cool, use plenty of salt, and do not have it wait when you know it is ready and you will have no trouble in making Genuine Rye Bread.

MALT EXTRACT IN BREAD-MAKING

What is known in the bakers' trade as malt extract is a natural cereal sugar syrup made by dissolving wholly or partially malted cereals in warm water, and evaporating the extract thus formed to a thick syrup.

Used in connection with bread-making it is a positive benefit in many ways.

One of the most vital points in good bread-making is to permit fermentation to proceed just far enough to ripen the dough without injuring the delicate flavor of the gluten in the flour. Sugar to some extent injures this delicate flavor, giving the bread a slight acidy smell which is avoided when malt extract is used. With sugar you also get a dead brown color and a crust that will soften, whereas malt extract gives a lively, snappy brown that will retain its crispness, usually lacking when sugar is used.

Malt extract will shorten up tne time of the doughs in hastening fermentation and giving more life with less yeast, and if handled properly will produce a loaf superior in every respect.

The writer has watched carefully the growth of a great many doughs during the course of fermentation, both with sugar and malt, and while the malt process is shorter it is much more gentle than the sugar and gives a more compact dough from start to finish. It will also save the baker considerable money in the course of a year, as it saves sugar and cuts down yeast and you can almost if not entirely cut out shortening.

Too much malt should not be used, as it is a powerful factor in a dough and might defeat the purpose for which it is used. From one pint to one quart of 120 deg. malt to the barrel is a good proportion. Good results are obtained with one pint malt, one pound yeast, eight quarts milk to the barrel of flour. No sugar and no shortening. By a different process with the use of malt, one and a half barrels of flour can be worked with one pound of yeast, obtaining the best of results. Of course, some flours require more than the pint of malt to the barrel, but those flours would also require more sugar. A quart, however, may with safety be used to the barrel of flour.

A vast amount has been written on the subject of malt extract, many writers disagreeing as to its value. The following article by Henry A. Kohman, of the Fellowship in Baking Technology in the University of Kansas, covers the subject pretty thoroughly, pro and con:

It will be remembered by members of the National Association that last year the Executive Committee established a Fellowship in Baking Technology in the University of Kansas, and that Henry A. Kohman, of Lawrence, Kansas, was appointed to this position for a term of two years. The agreement between the association, on one hand, and the University of Kansas and Mr. Kohman, on the other, was that Mr. Kohman should devote his time and best attention in an endeavor to solve some of the chemical problems which so often perplex the baker, the result of his researches to be the property of the association, on terms to be mutually agreed upon.

At the February meeting of the Executive Committee, in Kansas City, Mr. Kohman was present and made a verbal report on the work so far accomplished by him, and was instructed to prepare a paper on the subject for publication in the trade press, which paper is given herewith. In transmitting his paper Mr. Kohman says that he has spent much time in collecting publications relating to the science of bread-making, in order to get a thorough understanding of the whole subject, and that in order to be practical as well as theoretical he has spent part of his time in the bakeshop.

The paper is as follows:

The Use of Malt Extract in Bread-Making.

When the National Association of Master Bakers made it possible for me to visit a number of the best bakeries in this country and Canada, I met with frequent inquiries in regard to the malt extract question. Some bakers used it to good advantage, but the majority used little or none. Looking over the formulas which I obtained through the kindness of the bakers in these different baking establishments, I find that only about five or six per cent. of the bread contains malt extract.

Practical Experiments.

In order to throw some light upon this question I undertook a series of experiments, the result of which I give below.

Preliminary experiments were made with five different commercial brands of malt extract. Their reducing-sugar content and diastatic activity were determined. The percentage of reducing sugar showed no great variation and needs no further comment. The diastatic activity, however, varied considerably. By the diastatic activity is meant the number of times its (own) weight of maltose a given quantity of extract will produce when allowed to act upon acid-free soluble starch for one hour at a temperature of 40 degrees C. (104 degrees F.).

The activities of the five extracts mentioned above are as follows: No. 1—8.56, No. 2—15.71, No. 3—8.60, No. 4—9.69, No. 5—20.13 These results were obtained under similar conditions, and are, therefore, strictly comparable. It is quite evident that these extracts have different sugar-producing values. No. 5, for example, will produce 2.35 times as much sugar as No. 1.

Malt Extract vs. Sugar.

Having determined the relative diastatic values of the malt extracts, it was desirable to determine their values as sugar producers in bread-making; and to see if the saccharine material in bread could not be supplied cheaper by means of malt extract than by the use of granulated sugar, as is commonly done. Five different breads were made, all conditions and ingredients being kept as nearly similar as possible, except the kind and quantity of saccharine material used. After the breads were made and dried the percentages of reducing sugars were determined. The tabulated results follow:

	Grams Flour.	Saccharine Material	P'c't'ge Sugar Pound.
No. 1......	800	20 gms. cane sugar................	5.37
No. 2......	800	None	3.64
No. 3......	800	8 gms. malt extract No. 5.............	6.00
No. 4......	800	8 gms. malt extract No. 1.........	5.68
No. 5......	800	1 gm. malt extract No. 5 and 30 gms. cooked flour..............	5.27

The percentages found are calculated on the dry bread. The results reveal several interesting ang significant facts. The eight grams of the lowest diastatic extract (activity 8.56) produced more sugar in the bread than the twenty grams of cane sugar. It is also evident that the lowest diastatic extract produced nearly as much sugar as the highest. The ratio of their activities is 8.56 to 20.13, while the ratio of the percentages of sugar produced is only 5.68 to 6.00. We might expect that the extract with an activity of 20.13 would produce more sugar than the one having an activity of only 8.56, but the resuts show that it did not. The explanation seems to be that both have an activity sufficiently high to convert into sugar and dextrin all the starch that is freed from the cellulose by having the cell walls broken, and neither attacks the starch granules that are still enclosed by celluose.

It is a quite significant fact, too, that the one gram of malt extract No. 5, together with thirty grams cooked flour, produced nearly as much sugar in the bread as the twenty grams of granulated sugar. This bread, No. 5, in addition to having the sugar supplied in the cheapest way, had its moisture and freshness retained longer than the other breads.

The bread having no saccharine material added showed on analysis to have 3.64 per cent. of reducing sugar. Some of this sugar was in the flour, but the larger part of it was formed by the enzymes in the flour during the fermentation period and the baking of the bread.

Knowing the percentage of sugar and the weight of dry bread produced from the 800 grams of flour, I calculated the amount of sugar in the total quantity of bread produced in each baking. Then by deducting the amount of sugar in bread No. 2, which had no sugar adde, from the amount in the other breads, the total amount of sugar produced by the malt extract was obtained. In this way it was found that the malt extract No. 5 produced 2.65 times its weight of sugar when added directly to the dough as is commonly done, and that it yielded 14.67 times its own weight of sugar when a portion of the flour was cooked, as in experiment 5; or it produced 5.5 times as much sugar when added to flour, the starch of which had been gelatinized by cooking, as it did when added to the raw flour. The cooked flour was cooled to 120 degrees F. and then the malt extract added. The results show that while malt extract produces considerable sugar when added directly to the raw flour, it produces much more sugar when a portion of the flour is cooked.

Now, one might suppose that the heat of the oven would certainly gelatinize a portion of the starch, and thus aid the diastase in the conversion of the starch into sugar, and avoid the necessity of cooking a portion of the flour. But when we consider the fact that the starch does not begin to gelatinize until the temperature is raised to 152 degrees, which is already about 30 degrees above the most favorable temperature for the activity of the diastase, and the fact that the diastase is killed at a temperature of about 175 degrees F., we can readily see why the gelatinization of starch in the oven is of little assistance to the diastase in the conversion of starch into sugar.

This also throws some light upon the fact that the low diastatic extract produced approximately as much sugar as the one having the high activity. As stated above, both of the extracts, when used to the extent of one per cent., figured on the flour, have sufficient diastase to convert the broken starch granules into sugar, and the higher activity then can be of value only in the conversion of starch into sugar after gelatinization of a portion of the starch by the heat of the oven, and then only while the temperature rises from 152 degrees F., at which temperature the starch is gelatinized, until it reaches about 175 degrees, when the diastase is killed, and under very unfavorable conditions, for the temperature is far above the most favorable activity of the diastase.

While the high diastatic extract seems to yield but little more sugar than the one of low activity when added directly to the raw flour, it has a decided advantage when a portion of the flour is cooked, for then the amounts of sugar produced by different extracts will bear much more nearly the same ratios to each other as the activities of the extracts.

Besides supplying saccharine material in the bread, malt extract has other advantages. In addition to the sugar it contains mineral salts, peptones, and other protein materials which stimulate fermentation. These proteins, besides being a source of nitrogenous food for the yeast, act upon the proteins of the flour, making them assimilable by the yeast.

In addition to the amylolytic ferment, the diastase, which converts starch into sugar, malt extract contains proteolytic ferments which act upon the gluten much as the ferments of the yeast. These ferments aid the yeast in preparing the gluten, and hence a smaller quantity of yeast can be used when malt extract takes the place of granulated sugar. In other words, the dough matures quicker, owing to the presence of these ferments in the malt extract. While the extracts with the higher diastatic activity produce only a little more sugar than the lower diastatic extracts, they act upon the gluten much more vigorously, and consequently the dough matures much sooner when a high diastatic malt is used. This latter, then, is better suited to hard flours, while the former can be used to good advantage with weak flours.

The dextrin formed by the diastase gives a very desirable color to the crust of the bread, which is often lacking when no malt extract is used. In addition to these advantages, malt extract produces an agreeable flavor, and this is, perhaps, one of the best arguments for its use.

From the table above it is evident that a given weight of malt extract goes much farther toward producing sugar in bread than does the same weight of cane sugar, but there has been nothing said of prices. By a few calculations I think we can show, approximately, how much the baker can save in dollars and cents by using malt extract in place of cane sugar. We will assume the flour to be worth $4.50 per barrel or 2.29 cents per pound, cane sugar 5 cents per pound and malt extract 7 cents per pound. As a basis of comparison we will take 100 pounds of cane sugar, which at 5 cents per pound will be worth $5.00. As stated above, one part of malt extract will produce 2.65 times its weight of sugar when added to the dough directly and 14.67 times its weight of sugar when a portion of the flour is cooked. Then it will take 100 divided by 2.65 equals 37.7 pounds of malt extract to produce 100 pounds of sugar by the first method. Since malt extract contains sixty per cent. or more of sugar, the 37.7 pounds would supply 22.6 pounds of sugar and there would be used up 77.4 pounds of starch from the flour to make up the 100 pounds of flour. The 77.4 pounds of flour at 2.29 cents per pound would cost $1.77 and the 37.7 pounds malt extract at 7 cents per pound would cost $2.64, making a total of $4.41 for the 100 pounds of sugar, against $5.00, the cost of the cane sugar.

By the second method, in which a portion of the flour was cooked, it would take 100 divided by 14.67 equals 6.81 pounds of malt extract to produce 100 pounds of sugar. This would contain 4.1 pounds of sugar and there would be used up 95.9 pounds of starch from the flour to make up the 100 pounds of sugar. The cost of the 6.81 pounds malt extract would be $0.50 and the cost of the flour $2.20, a total of $2.70. Then there would be a saving of $5.00 minus 4.41 equals $0.59 by the first method and $5.00 minus $2.70 equals $2.30 by the second method on every hundred pounds of cane sugar used. So far we have considered only the saccharine material. The cane sugar, of course, contains nothing but saccharine material. The malt extract, however, in addition to the sugar, contains about seven per cent. of protein material, which has not been mentioned, and which is an item of considerable importance, and also mineral salts which stimulate yeast fermentation. Besides, the malt extract gives a color to the crust of the bread and a flavor which is quite desirable. When the starch of the flour is converted into sugar, the gluten remains and makes the bread that much richer in protein, which is one of the essential constituents of white bread; also it absorbs several times its weight of water and thus increases the yield of the bread.

It is quite evident that there are many points to be considered in connection with the use of malt extract in bread baking. Most of the evidences, however, seem to indicate that it can be used to good advantage. The principle that "If a little is good, more is better," will not apply, however.

Two pounds to the barrel may give splendid results, while four pounds to the barrel may cause a miserable, soggy loaf of bread. The amounts that can be successfully used depend upon the strength of the flour and the diastatic activity of the extract. With a weak flour one must use low diastatic extracts, while with strong flours one may use larger quanties of extracts with a greater diastatic power.

COTTON SEED OIL IN BREAD-MAKING

BY DAVID CHIDLOW

Cotton seed oil has received so much attention from bread makers in the past few years that it would seem there was nothing left unsaid regarding its advantages in bread-making; but thoughtful bakers will be alert to learn anything new regarding the properties of oil for shortening, which will make them better bakers by using shortenings with an understanding of their properties in bread-making.

Why Are Shortenings Used?

Shortenings are used in bread-making to accomplish certain definite results, the most common being: first, the coating of each little cell in the loaf whereby the moisture is retained in the loaf, preventing its escape exactly in the manner that waxed or oiled paper would prevent the escape of moisture from a loaf around which it was wrapped. Cut a good loaf after it has been baked about twelve hours, examine it in full daylight, and notice the sheen reflected from each rounded cell. This sheen is greater in loaves which have been properly fermented, using the right proportion of shortening, than in the loaves where the shortening was either deficient in amount or of improper character. Of this matter we will say more further on. Secondly, the use of shortening whitens the bread. Thirdly, a part of the shortening combines with the gluten to make it elastic, and thereby expands more readily and makes a reasonably large loaf. All of these points you can test very readily by making up small batches, using 100 ounces of flour. Take a reasonably good spring wheat patent flour and use 6 pounds 4 ounces of flour, 1½ ounces of yeast, 1½ ounces of salt, 2 ounces of sugar and 3 pounds 12 ounces of water, taking the water at such a temperature so that you will have the dough at 84. Make up the dough and place it in a wooden pail, previously oiled, then cover the dough. At the end of two hours take the dough out and fold it over two or three times. At the end of three hours do the same thing again; again at three and one-half hours. See that dough temperature is maintained as near 84 as possible. At four hours scale it off into sizes for your pan, and prove about sixty minutes in a proving chamber having a temperature of 90.

So far I have said nothing about the quantity of oil to be used. This is because I want you to realize what an influence the amount of shortening has on dough and its expansion. In one dough of the size given above use 1 ounce of oil; in another use 2 ounces; in the third use 3 ounces. Add the oil to the sugar and salt, rub down smoothly until it is a creamy mass; then add a little of the water and a little of the flour and rub down again. Do this with each of the doughs so that the oil will be uniformly mixed in the dough. You will note that the texture of the loaf containing the least amount of shortening is broken. The loaf will not really stand the amount of proof that is given to it, because the gluten will not stretch sufficiently to hold in the gas. The loaf containing the 2 ounces of shortening will be improved very much, and the one containing the 3 ounces will not only be improved in texture and appearance, but will retain the moisture very much longer, as you will find, if you will put a loaf from each of the doughs aside for two days, weighing before and after standing.

Each Shortening in Its Proper Place.

In a number of experiments at Chidlow Institute, Chicago, seven years ago, it was found that every kind of fat that could be used in bread-making had a character of its own which it exhibited in various ways. In fact, they varied so widely as to suggest much deeper research than was at first contemplated at that time. In making up a number of doughs, small amounts of each shortening was added to the loaves, increasing the amount until a proportion of 40 pounds per barrel of flour was used, the lowest amount of shortening used being 2 pounds per barrel of flour. The loaves from each of these batches were placed aside with a view of finding out how much of the shortening was brought to the outside of the loaf by escape of the moisture, and it was found that nearly all shortenings came to the surface or crust of the loaf in different proportions. These tests were made many times over, and always with the same results. With some shortenings the amount of fat brought out was nearly one-half of what was added; in others it would be less than one-fourth, and in some it was as high as three-fourths. Evidently the shortening that would carry three-fourths of the quantity to the crust was unfitted for bread-making by that particular method and with that particular flour.

The details of these experiments are of no service here. Thev are only referred to as indicating a difference of result obtained by the use of different shortenings. The same thing was noted in making experimental doughs. These were made of the same weight of flour, yeast, sugar, shortening, and water. They were then placed in a glass jar which was marked off so as to give clear readings of the expansion of each dough. The jars were then placed in a water bath maintained at a uniform temperature, and covered with glass to keep the surface of the dough moist. Some of the shortenings used permitted the doughs to rise very much higher than where other shortenings were used, and it made no difference how often these doughs were made and the tests repeated. The shortenings that permitted a very high expansion of the dough on one test always gave a high expansion in another test, so that the results were uniform. This gave us the very information we were in search of, showing us that we must find the best method for each kind of shortening, and for each kind of flour.

Best Method of Using Cotton Seed Oil.

The following instructions are based upon a part of these experiments under the following specific conditions: In the first place it must be understood that a method of making bread is best suited for a particular flour, and that alteration of flour usually requires an alteration in the method, or at least a modification of the method. Many of the spring wheat patent flours being sold are second patents, and as such they are best made into doughs by use of sponges. Take, then, spring wheat second patent flour and a four to six hour sponge. One-half of the total oil should be used in the sponge and the other half in the dough. This brings shortening in accomplishing the expansion of the loaf, in giving a clear whiteness to the loaf, and a bright sheeny coating of the cells making up the structure of the loaf. The average amount of shortening used for pan bread in the United States is five pounds per barrel of flour. Assuming this proportion, then, at least one-half pound of shortening can be discarded without any loss of the shortening power.

The foregoing instructions are not applicable to other flours than of the type given, nor can they be used properly with straight doughs.—*Cotton Seed.*

CORN FLAKES USED IN BREAD

Corn flakes are made from the starchy part of the maize kernel. The starch of corn itself has little value for the bread baker in its crude form. It is insoluble in cold water, and can only be dissolved by the disintegration of the organized structures of the granules.

On being boiled with water it forms a gelatinous looking mass, and dissolves.

When examined after boiling the starch granules are seen to have broken up, a small part remaining in the liquid as minute insoluble particles.

In this condition starch is very susceptible to the action of the bodies known as ferments.

Bearing this in mind, this same change takes place in the process employed in the manufacture of corn flakes, that is, the crude starch granules have become completely gelatinized.

The value of gelatinized starch as formed in corn flakes, especially when used in connection with a small quantity of malt extract or malt flour, is not sufficiently understood by many bakers, and it is hoped that these few remarks will make the matter clearer and be of interest to all bakers who are desirous to increase their knowledge in the works of their chosen vocation.

It has conclusively been shown in text-books, that cooked starch, i. e., corn flakes, are more susceptible to "saccharification," that is, sugar is sometimes called saccharum or saccharine matter, hence the term which is applied to this change that the starch thus undergoes. This conversion is due to the ferment known as diastase found in malt and has the power to convert the gelatinized starches of the corn flakes into maltose. Maltose, on the other hand, is changed by the ferment zymose, contained in yeast, into glucose.

This body is of interest to the baker as being the ultimate form to which all sugars are changed, and in this state is readily broken down into carbonic acid gas and alcohol, which causes doughs to rise. It follows then that corn flakes are a very valuable article to the baker on account of its gelatinized starch, its low cost, absolute sterility, its purity, and, above all, its great moisture-absorbing qualities.

Its use in connection with malt may eliminate the use of cane sugar entirely, and still furnish all the saccharine necessary to give bread the desired sweet flavor and taste. In order to make this clear, the result of the following experiments will corroborate the above statement. After the bread was baked and dried and ground the quantities of reducing sugar were determined by chemical test:

No. 1—100 gm. flour, 58 c. c. water, 2.5 gm. cane sugar gave 5.5 gm. saccharine.

No. 2—100 gm. flour, 56 c. c. water, no cane sugar, gave 3.9 gm. saccharine.

No. 3—100 gm. flour, 62 c. c. water, .125 gm. malt, 3 gm. corn flakes, gave 5.4 gm. saccharine.

The different quantities of water were increased to give dough equal viscosity.

It must be remembered, in making comparisons from this table, that the saccharine matter in the bread is produced in one instance, by the action of the diastase contained in the malt extract, in the other by the action of the enzymes in the flour upon the partial disrupted starch granules of the flour itself, and in the third instance by the cane sugar used.

The results obtained from these experiments are interesting and worthy of careful consideration, inasmuch as ⅛ gm. of malt with 3 gm. of corn flakes (perfectly gelatinized starch) produced practically as much saccharine matter as when 2½ gm. of cane sugar was used. In other words furnishes the bread sufficient saccharine matter at the least possible cost. In addition to this the corn flakes absorbed twice its weight of moisture in the dough, thereby increasing bulk, a decided gain to the baker.

For the sake of argument, it is admitted that the same chemical action takes place when using any other highly starchy product which has been cooked. Corn flakes, however, eliminates any necessity for previous boiling, since it is already prepared in its manufacture and is very sensitive to the attack of diastasic action.

It is also a fact that some of the starch in the flour, which has become disrupted during the milling, is gelatinized by the heat of the oven during baking, giving diastase opportunity to convert some of the starch into sugar. But since raw starch does not gelatinize until the temperature has reached 150 degrees F., which temperature is already higher than the most favorable one for diastasic action, and the intervening time during which the temperature of the baking is increased to 175 degrees F. (a killing temperature for diastase), is very short, a relatively small amount of the gelatinized starch is converted and the baker therefore is compelled to add the more costly article, cane sugar, in order to produce the desired amount of saccharine matter in his bread. This fully explains the difference of saccharine matter found in experiments No. 2 and No. 3.

It further shows that bread containing gelatinized starch as found in corn flakes is fully as good a sugar producer as when using cane sugar, and, as before said, at the smallest possible cost.

To produce the maximum amount of sugar from corn flakes the proportions of malt extract and corn flakes as given, should be mixed in about two gallons of tepid water for each barrel of flour to be made into dough. at a temperature of about 140 degrees F. Allow it to remain at this constant temperature for 1½ hours. In this time nearly all of the gelatinized starch of the corn flakes has become converted into maltose. In practice this would show that if 100 lbs. of cane sugar at a cost of $5 be used in bread work the same saccharine matter could be supplanted by using 116 lbs. of corn flake, a price of about $3.50 plus 18c worth of malt, making a total cost of $3.68, and shows a saving of $1.32 where 100 lbs. of sugar is employed.

Corn flakes, besides furnishing saccharine matter, has other advantages. It contains some mineral salts and proteids which are very acceptable nitrogenous foods and readily assimilated by the yeast, causing a rapid and vigorous fermentation.

They also prepare and soften the gluten, giving to the doughs that much desired velvety feeling, and the maximum expansion in the oven. Corn flakes and malt extract may also be used as a short ferment and makes it possible to decrease the amount of yeast usually used without affecting the quality of the bread.

A formula for pan bread which has been used for years and is giving good results is as follows:

Water, 1 qt.; malt extract, .40 oz.; salt, 1 oz.; corn flakes. 1 oz.; lard, 1.75 oz.; yeast, .33 oz.; dry milk, .75 oz.; flour, 3 lbs. 7 oz.

Of course, this can be increased to any amount.

The directions are: Take ⅛ part of the water to be used at temperature of 82 degrees F. and in it dissolve the corn flakes, malt extract and yeast. Let this stand 20 minutes to ferment. It will have risen considerably in this time and fallen; then add it to the balance of the ingredients and make dough.

Corn flakes give color to the crust, is an absorber of moisture, retains it and keeps bread fresh, and inasmuch as it has no pronounced flavor of its own will not predominate or cover up the flavor obtained from good wheat flour and correct fermentation.

This would indicate a third good quality of corn flakes, that is, used simply as a filler for its value as a water absorber only.

While the above tables indicate the use of 6 lbs. of corn flakes to a barrel of flour, satisfactory results have been achieved when 10 lbs. have been added per barrel of flour.

Much depends, however, where corn flakes are used simply as a filler, upon the strength of the flour.

To conclude, I have tried to show that corn flakes can be used in three different ways.

First as a sugar producer, secondly as a yeast saver, and thirdly as a means to increase bulk and leave it to each individual baker to adopt either method, and trust to have been instrumental in telling something that may be of value, if not to every baker, at least to some.

POTATO FLOUR AND BREAD

Potato flour is a yeast food. It contains gelatinized starch, sugar, dextim amides and mineral matter, all of the bodies are yeast nutrients, the first-named being converted into sugar by a ferment in the yeast. The analysis of pure imported potato flour should approximately show as follows: Water, 10.69 per cent; protein, 6.59 per cent; fat, 0.23 per cent; nutrious extractive matter, 78.73 per cent; fibre, 1.18 per cent; ash, 2.58 per cent, making in all a total of 100 per cent.

The extractive matter is mostly carbo-hydrates (sugar). The ash, the mineral matter, mostly phosphates.

We have here three important bodies for yeast production—carbo-hydrates, protein and phosphates, and the last two, moreover, act as powerful stimulants. Owing to these facts, the writer thinks a closer acquaintance about the use of potato flour will be of some interest to the progressive bread baker.

It is often said that formerly, before the introduction of compressed yeast, when potato ferments were mostly used, that bread was superior in flavor and keeping qualities than most of the bread baked at present.

Furthermore, bakers of to-day find it absolutely necessary to add large quantities of sugar, lard and often milk to their dough to overcome the effect that compressed yeast has brought about. It is not the writer's intention to belittle the value of compressed yeast, as this product is now an inseparable commodity in the bakeshop.

It is, however, possible to get back the advantages obtained from the old potato ferment process by the judicious use of pure potato flour.

It eliminates entirely the old cumbersome method of boiling and mashing potatoes, scalding flour and setting away the ferment until ready for use, for five or six hours. Pure potato flour used in connection with a small quantity of diastasic malt extract will accomplish results gratifying to the baker and assist in cutting down cost of production.

In the first place, the diastasic power of the malt extracts converts the carbo-hydrates of the potato flour into maltose, and if this is carried in far enough produces more than enough saccharine matter for any dough. Secondly, the extractive and mineral matter of potato flour gives great assistance to the raising properties of yeast by stimulating and increasing yeast cells in a medium befitting their propagandation according to the laws of nature. While this may seem clear in theory, any baker can easily ascertain the above bespoken values of potato flour by practical tests. The following formula will be sufficient to guide the baker to make any size test he contemplates to make for a straight dough: 1 qt. water, .08 oz. malt extract, 1 oz. potato flour, .75 oz. lard, 1 oz. salt, .33 oz. yeast, 3 lb. 5 oz. spring patent flour. For a barrel of flour this would equal 15 gals. water, 7 oz. malt extract, 3¾ lbs. potato flour, 3 lbs. lard, 3½ lbs. salt, 1¼ lbs. yeast, 196 lbs. flour.

Weigh the potato flour into a clean tub, pour 4 gals. of water, at 90 degrees F., in, also the 7 oz. of malt extract, and mix up; then break into it the yeast and see to it that it is all dissolved. Cover up with a clean bag. Now get all your other ingredients into the mixer or trough, the balance of the water, your salt and lard scaled off, and your barrel of flour ready. By this time your ferment in the tub will have risen, and be on the point of falling. It is then ready to mix all together and dough. The water should be tempered so as to bring the dough out between 82 and 85 degrees F.

Mix the dough well until clear. Allow it to stand and give it full proof before knocking down first time, which will take about 3½ hours. When it has come up again about three-quarters proof knock down again. Give it another one-half proof in the trough and your dough should be ready to take; in all, 5½ to 6 hours. You will find that potato flour makes your bread keep moist. It will give a rich nutty flavor and will give a much larger yield on account of its moisture, absorbing qualities, and on the whole make a very satisfactory loaf. This, in the writer's estimation, is the best way to use potato flour in order to get best results at lowest cost of production.

Potato flour may be used dry. When making straight dough this way the potato flour must always be sifted into the flour dry. The quantity to use varies according to strength of the flour and the baker's own ideas, say 4 to 6 pounds for each barrel of flour. Without changing your usual formula, except cutting some of sugar and increasing water, it will produce good bread.

If the potato flour is scalded and then cooled before using it will assist such as went to get a solid home-made loaf.

No other ingredient, to the writer's knowledge, will produce bread that will compare in flavor and texture with the old style potato ferment bread than when employing pure imported potato flour judiciously, according to any of the above methods described, nor can any bread be made, considering quality, cheaper or as cheap.

FERMENTATION

A Few Remarks by E. Wilfahrt, an Authority Upon the Subject

The term fermentation, as applied to baking, we find first described as a form of spontaneous decay, changing the carbohydrates contained in the dough into alcohol and dioxide gas. Such fermentation is termed alcoholic. Other varieties of fermentation also exist during the process of doughing, and are termed lactic, acetous, viscous and putrefactive.

The process of fermentation which has for its object the manufacture of bread must be of alcoholic nature, containing ½ of 1 per cent. acidity in proportions of 95 per cent. lactic and 5 per cent. acetic. The presence of lactic fermentation softens the gluten, while the presence of acetic fermentation causes a larger expansion of the loaf.

Of course, the larger the percentage of the acetic acid in proportion to the lactic acid, the larger would be the ultimate expansion of the finished loaf; that is, if no excessive percentage of acidity is produced. While the presence of acetic acid in minute proportions acts favorably on the expansion of the loaf, an excess of it must result in sour bread. Consequently, the acids contained in their proper proportions in the fermented dough exert a beneficial influence, both as to the flavor of the bread and assistance in fermentation.

Viscuous fermentation produces the much dreaded disease "rope in bread," and is really the beginning of putrefaction of the raw material employed. This trouble is caused by over-acidity in the dough and heat, or by uncleanliness, which generates over-acidity, or excess growth of microbes, and this causes rope in bread.

Putrefaction means decomposition of materials employed. It is a non-alcoholic ferment, and the material undergoing putrefaction always gives out a decidedly bad odor.

In making a dough the first point to consider, after proper ingredients have been selected, is the temperature of the dough and of the proving room. The utmost care should be exercised to keep the dough room at a uniform temperature. The best temperature for dough is 78 degrees F., after mixing, and the temperature of the shop should be about 82 degrees F.

To keep a dough thus made at the proper temperature during the period of fermentation it is necessary to use salt in the proper proportions to the amount of sugar and shortening added in the mixing of the dough. So that the rising acidity during the process of fermentation may be properly neutralized salt is used, first to govern the fermentation, and secondly, to give the bread the necessary flavor. Although it is generally conceded that salt retards fermentation, nevertheless this action is most powerful on non-alcoholic ferments. Consequently, salt, if used in the proper proportion, really acts as a stimulant to produce a healthy dough, or perfect loaf of bread.

My experience has taught me that for plain white bread three ounces of salt to a gallon of water is the proper amount. For each two ounces of sugar and shortening added to a gallon of water, one-quarter ounce of salt should be correspondingly added, until four ounces of salt are used to the gallon.

Such a dough, therefore, will call for one-half pound each of sugar and shortening and four ounces of salt to each gallon of water. This would make a very rich home-made dough with a large yield, on account of its moisture retaining power.

In adding more than one-half pound each of sugar and shortening to the gallon, as in making rolls and sweet doughs, the amount of salt must be reduced one-quarter of an ounce for each additional two ounces of sugar, and shortening added to the gallon, until two ounces of salt is all that remains to be used to the gallon of water. From this limit only one-eighth of an ounce is deducted for each additional two ounces of sugar and shortening added.

The amount of flour added to the gallon of liquid depends upon the class of bread to be made. It averages 12½ to 15 pounds to the gallon.

Malt extract is one of the best acquisitions in the manufacture of bread, as it is very useful in increasing the keeping qualities of the product, and gives a better flavor to the loaf, such as is produced by the use of milk.

The shortening should be added after the dough is thoroughly incorporated with the balance of ingredients, as if added first, it will not give the desired results and the flour will not absorb the same quantity of water, as if the shortening were added last.

The temperature of the bakeshop during the operation of molding is another important feature. The dough room should be kept at as uniform a temperature as possible, as the dough is very susceptible to changes of temperature.

In some bakeries the water used is hard, while in other shops soft water is used. The character of the water used has as much to do with the fermentation as the temperature of the water. The softer the water the quicker the fermentation. Generally speaking, dough should never be made without the use of a thermometer to insure uniformity day after day. All ingredients used should be carefully weighed, then the so-called ill-luck in the shop will be a thing of rare occurrence.

Part III

Pie Baking

PIE BAKING

STANDARD RECIPES

2	qts. Fresh Fruit.	1½	lb. Sugar.
1	qt. Water.	2	oz. Corn Starch.

½ oz. Salt.

The above formula is adapted to the following pies: Apple, peach, cherry, raspberry, strawberry, gooseberry, huckleberry, currant and rhubarb. For the apple, peach and currant pies use 1 oz. of corn starch instead of 2 oz. For the rhubarb pie use only 1 pt. of water and about a half pound less sugar. From 1 to ½ oz. of spice is added to the apple and peach mixture.

When green fruit is used it should be boiled about 2 minutes. Rhubarb requires more time. Dried and evaporated fruit should also be boiled for a few minutes. If the fruit is not boiled it will run and stick to the plate.

After boiling, add the sugar and flavor and mix thoroughly. The corn starch may be omitted if desired. Before placing pies in oven wash lightly with milk or egg wash.

Pie Crust.

Use 2 lbs. lard and 4 lbs. of flour. Rub together lightly but thoroughly. The whole secret of a good crust is just the proper mixing. If worked too hard the result is poor.

Furthermore. great care should be taken not to put in too much water. This is very important. Cotton oil, butter or other shortening may be used instead of the lard. Pies are better if the filling is put in cold. Always keep the shortening in the ice box before using.

Custard Pie.

1½ lb. Sugar. ½ lb. Flour.
25 Eggs. 6 qts. Milk.

Add a little salt. If desired corn starch may be used instead of flour. This pie is filled in the oven.

Lemon Pie.

5 qts. Water. 10 Eggs.
4 lbs. Sugar. 1 doz. Lemons.
¾ lb. Corn Starch.

The corn starch may be omitted if desired. Some use about ½ a pound of lard and butter.

Rhubarb Pie.

3 lbs. Rhubarb. 1½ lbs. Sugar.
Corn Starch as desired.

The rhubarb should be cut in small pieces after it is peeled and allowed to stand over night with the sugar. Strain off juice and boil for a minute, then add the rhubarb and let boil for 2 or 3 minutes. The corn starch is frequently omitted.

Pumpkin Pie.

4 lbs. Mashed Pumpkin. 4 oz. Flour.
1 lb. Sugar. 2 qts. Milk.
8 Eggs.

Salt, ginger and cinnamon.

When cooked, drain pumpkins dry and mash thoroughly. Add sugar, ginger, etc. Mix flour and milk and add this to the pumpkin. See that the mixture is smooth and without lumps. This pie is filled in the oven.

Mince Meat.

6 lbs. Currants.
1 lb. Suet.
8 lbs. Apples.
12 lbs. Beef.
3 lbs. Sugar.
4 lbs. Raisins.
1 pt. Brandy.
2 pts. Cider.
4 oz. Allspice.
4 oz. Cloves.

Variations of the above are made in many ways. Some add citron and 1 or 2 qts. of molasses. About 1 oz. of pepper may also be used. Lemon and orange peel is frequently used. Tripe is sometimes substituted for beef. If desired a little cinnamon or nutmeg may be added.

GOOD PIE AND PIE FILLING

By Richard Voigt, Terre Haute, Ind.

The first profit in pie lays in the filler, or thickness for the fruit. The public prefers a full pie, and without the so-called filler; you cannot make a full pie and sell it at a profit. So many use corn starch to thicken; this has a corn taste and makes the filling of a tough nature, and the second day the pie looks flat and unsalable. Others use cake crumbs; this is really the worst, as old laid-over cakes are more or less rancid, the many materials the cake was formerly compounded from does not flavor the good taste of a pie. My way of making filler is as follows: I take Pearl tapioca, have same ground to fine meal like corn meal. The cost of this is 4½ cents per pound, and ¾ of a cent per pound to grind it—for general use I take 12 qts. of water, 2 lbs. of tapioca, 6 lbs. of sugar, put all in a kettle on the fire, and stir until the milky appearance disappears, when the mixture is done; this should never boil, only become of glassy appearance; this is absolutely tasteless, and really conducts the most delicate flavor of any fruit. This mixture costs a little more than 1 cent per pound.

Next take a reasonable amount of this so-called filler and mix it with any canned fruit, thereby holding the filler together, and cheaper at the same time. I use 8 lbs. of large seeded raisins, 6 qts. water, 10 oz. tapioca and 4 lbs. sugar. Put the water, tapioca and sugar on the fire and treat as before said, until it becomes clear. Next add your raisins, and if you want to make it real good, squeeze to it a couple of lemons, let all of it cool and you will have a filling at the cost of 3 cents per pound.

Raspberries make the best berry pies, made of dry berries, and is made such: Take 14 qts. water, 5 lbs. evaporated raspberries, boil them a few minutes, then add 6 lbs. sugar and 2 lbs. tapioca and finish on the fire; this filling costs 4 cents per pound.

So many others can easily be made by applying my method. There is only one thing to be observed; this is a little accurate labor. Weigh everything and have your kettles clean; copper kettles are best.

Further, you must try out such suggestions to find out whether or not they are what you want.

Pie Crust and Paste.

I will say a few words about making pie crust or pie paste. To make an ordinary cheap, good crust, you must weigh your flour and lard, and dissolve the salt in the water, and be sure to know how much water it takes to mix the dough so you may pour in the full amount at once, thereby saving the over-working of the dough. Ordinary winter flour takes 1 qt. water, 4 lbs. flour, 2 lbs. lard, 1 oz. salt. Many bakers have trouble with watery custard pie. This is caused from baking too long. A custard pie is baked as soon as it is firm, no matter what color it may be, and must be taken from the oven. Often times it is the fault of the milk (fresh cow milk, I mean); therefore, I made good use of the dry milk. This dry milk helps to thicken the custard, makes the pie sweeter and firmer. If you mix 4 lbs. sugar, 1 lb. lard, or butter, in a bowl, add 2 qts. of egg yolks, then 2 lbs. spring flour, 1 lb. dry milk, you will have a regular dough. Now, gradually add 10 qts. of water, and next fill your pie bottom in the oven with a dipper; this will make a firm and sweet custard and bakes much faster than the corn starch custard. I don't like corn-starch for pie work. My experience is that starch settles oftentimes and is too heavy. Flour dissolves in the liquid moisture. This, however, is a fancy or experiment and not a real fact in every case.

Part IV

Miscellaneous

MISCELLANEOUS

HEATING OVENS

BY PROF. E. W. HABERMAAS

Proceed to heat the oven as follows: Free the grate of ashes and clinkers, then put the wood (which should be thoroughly dry) in the furnace; then put some paper in the furnace and light it; then open the damper and the draft door. When using coal for fuel, put some dry wood in the furnace, then put coal on it and light it, then draw the damper and open the bottom draft door. Now watch your fire, adding fresh fuel. When about one-third of the fuel is burned, fill the furnace with as much fuel as it will hold, then close the door; continue this process about three times. When the last furnace of fuel has burned down about one-half, close the damper partly (to prevent the heat from escaping through the open flue) and as the fire continues to burn down, continue closing the damper, and when the fire has burned down completely, close the damper entirely and shut the bottom draft door. The oven should be fired at least one hour before you begin baking in it, to allow the heat to moderate and to become evenly distributed throughout the oven, producing what is known to the trade as a ground heat. If you bake in a freshly heated oven your goods will scorch on the outside and remain doughy inside. Some goods require a very quick oven, but the first heat in a fresh oven (providing the oven has been properly heated) is almost too hot for any class of goods. If you are compelled to bake in a freshly heated oven, open the damper and allow the oven door to remain open while baking, thus allowing a portion of the excessive heat to pass into the flue. This first heat is called flash heat, because it is not a lasting heat. An oven may be overheated or underheated to a degree as to render it unfit for service. Bakers should be very careful about heating their ovens. Little fuel can be used and excellent results obtained, providing the one who does the firing knows how to fire an oven. Follow our directions very carefully when firing ovens. If you have too much heat in your oven you can remedy that by drawing the dampers and leaving the oven door open. But if you have an underheated oven you will find that the only remedy is to build more fire. This is wasteful extravagance, though sometimes it is difficult to avoid, especially when you have damp or green wood. There is also a flash heat in an underheated oven, but it is not intense, nor does it last very long.

On the other hand, if the bottom draft and furnace doors are not air tight, though you have them closed and have the dampers open, and only a moderate breeze is blowing, the fire will burn briskly. If you want the fire to die, close the damper and the bottom draft door. When you close the damper and the bottom draft door you shut off the supply completely, or the life of fire, then it dies. Chimneys should be built to tower above the roofs of adjoining buildings, so that the air currents can pass over them unobstructed.

We have shown above that it is necessary to supply fire with air to create combustion, so we will now show what is understood by combustion.

Combustion is defined: "To burn, or burning. The process by which bodies combine with oxygen and are thus seemingly destroyed. Oxygen exists uncombined in the atmosphere to the extent of 22 per cent. by volume and more than 23 per cent. by weight." The fact that air (and plenty of it) is absolutely necessary to produce combustion, seems foreign to most people who fire ovens, etc. These people poke a fire and give it draft as a matter of fact, but do not know why. All highly flammable material, such as pitch tar, resin, pine wood, paper, coal oil, gasolene, etc., and even gas will not burn unless mixed with a certain per cent. of air or oxygen, and all so-called inflammable (fire proof) material, such as mineral wood, prepared felt, asbestos, iron, steel, etc., can be entirely consumed by fire if subject to sufficient blast. Under ordinary conditions, so-called fire-proof material will not burn, but throw them into a blast furnace—one equipped with a powerful blower—and watch the results. In a short space of time you will find nothing left to indicate that such material had been thrown into the furnace.

The above illustration is given simply to show what a necessary factor air is to produce combustion even in a limited degree. Not only is air necessary to produce combustion, but the more air or draft you give a fire the more perfect the combustion, and the more perfect the combustion, the greater the heat it produces, and the greater the heat produced, the less fuel is required. Air is less expensive than either wood or coal; bear this in mind and profit by it. You have learned the necessity of using the poker frequently, and you have learned what is meant by draft and combustion. Now be guided by what you have learned.

It is not necessary to go into detail about the construction of continuous baking ovens, nor of the firing of these ovens. The builders of such ovens will furnish you the necessary information when you get ready to purchase such an oven. Enough is said when we say that more fuel is required to heat a continuous baking oven than furnace ovens, because the fire does not get inside of the oven proper (the baking chamber), but encircles it. The heat must pass through the brick before it enters the baking chamber. For this reason more fuel is required to heat the oven. But after you have the required temperature in your oven, and begin to bake in it, but little fuel is required to keep it at the regular temperature during the baking period.

Proceed to fire continuous baking ovens same as you would furnace ovens, and when you have the temperature in the oven as required, close the damper partly and the bottom draft entirely, and put on fuel only when necessary, that is when the temperature begins to fall during the baking period. When the temperature begins to fall, open the bottom draft and also the damper and poke the fire frequently. It is not absolutely necessary to keep up the fire after your oven has the required temperature, unless your work requires it. In large bake shops where large batches of bread are baked continuously, it is absolutely necessary to keep up the fire, but in small shops this is not necessary unless a larger variety of goods are made; in that case it would be best to keep up a low fire.

Preparing Ovens for the Baking Process.

This applies to furnace ovens only, because the fire enters the baking chamber. The flames as they circulate around the oven carry with them more or less ashes, and scatter them over the hearth. This necessitates cleaning the oven before it can be used, especially when baking bread on the hearth. A mop or "swab" is used for this purpose. This mop or "swab" consists of a long pole, on the end of which a cloth or gunny sack is fastened. An old peel handle may be used for this purpose or you can purchase a swab pole from any supply house. Proceed to swab the oven as follows: Dip the cloth into a vessel of clean water and get it thoroughly wet, then put it into the oven and push it back as far as possible and let the pole rest on the hearth, then take hold of the pole with both hands and bear down on it so as to raise the cloth slightly to allow it to whirl around freely, then draw it out about 1½ feet with a rotary motion; then push it back again; do this quickly. By pushing the pole forward and drawing it back with the rotary motion, you cause the cloth to whirl around and throw the ashes or dust forward towards the oven door. Continue this process, beginning at the back of the oven and working forward to the oven door, then take out the swab and put it on the rack; then take a broom and sweep out the dust or ashes.

While swabbing the oven you raise considerable dust, therefore it is necessary that the damper should be open to allow the dust to pass into the flue. Usually while swabbing the oven the atmosphere in the oven is thick with dust and if the damper were closed this dust would settle on the hearth; but by keeping the damper open during this period most of the dust is drawn into the flue. When the atmosphere in the oven is clear (free from dust), close the damper and the oven door. Your oven is now ready for the baking process, but I would advise you not to bake in the oven immediately after it has been heated, unless it is absolutely necessary, because the first heat in an oven is usually intense.

FLOUR AND WHAT FLOUR WILL PRODUCE

BY F. D. EMMONS, MINNEAPOLIS

Bread-baking is becoming more and more each year a manufacturing process. Gradually the baker is introducing improved machines and improving his process of making bread by the introduction of new methods. Bread-baking has reached the stage where the process can be operated throughout practically by machinery.

The bakers operating the smaller bakeries usually have a mixer and molding machine. A few years ago even bakeries of large capacity did not have even these machines. The baker has come to see that a larger knowledge of the proper conditions of baking and what takes place during the process of bread-baking gives him better bread.

In going through the bakeries of the United States, we find the uppermost question in mind of the master baker is "QUALITY." His constant endeavor is to make a better lot of bread. The people of the United States are receiving a better loaf of bread each year, as the increase in the sale of baker's bread testifies.

There is still room for improvement, however. The baker's difficulties are not only encountered through the ingredients used in bread-making. In fact, these cause only a small part of his troubles. The baker not only has to be a baker and understand baking thoroughly, but he must also be a weather prophet. Weather conditions affect bread-making more than any other conditions which arise. There are very few bakeries having absolute control of their dough room. To have uniform bread each day it is necessary to have control of the dough room. There are very few who realize the importance of controlling these factors. I would like to leave this one message—"Watch Your Dough Room."

Flour Storage.

To have flour in the best condition for the baker's use is a problem which most of us do not give enough attention. Flour should be kept in a dry, light and well ventilated room. The temperature should be from 70 to 75 degrees F. and the flour should be so piled as to allow a free circulation of pure air to every sack.

Light is a strong factor on the proper aging of flour for baking purposes. Give the flour all the light you can. There are a great many bakers who store their flour in a dark basement. Some of these may be fairly well ventilated and dry, but the flour receives no light. Darkness and dampness go hand in hand. Flour requires light to give it the best conditions for it to age.

Putting flour in a cold, damp cellar is like putting meat in cold storage. The aging process is checked by the cold and the flour remains as it was when first put in storage. No aging process takes place. The flour has simply been preserved in the same state as when placed in the cellar.

Possibly you have placed a handful of flour in a thin layer in the bright sunlight for two or three hours, and then compared it with the original flour. It has been bleached by the sunlight, and if it were baked beside the same flour which was not placed in the sunlight, you could hardly believe they were the same flour.

Occasionally moving flour helps to age it; if it is turned over once a week, or preferably more often, the aging process is hastened.

Flour should always be sifted before using. In packing in packages, flour is compressed and sifting loosens the small particles and mixes air in the flour. There are machines on the market specially adapted for this work. Besides being sifters these machines have beaters, which throw the flour and drive air into it. This aerating not only assists in aging but has added value of giving it greater water absorbing power, thus having the flour in much better condition for bread-making process.

Under conditions of a well ventilated room, pure, dry air, well lighted, and at temperature of 70-75 degrees F., flour will probably be in the best condition to use in about ninety days.

Many bakers do not have storage facilities for carrying their flour ninety days. With this in mind, we stored flour at a temperature of 84-86 degrees F. for thirty days. The results received were very satisfactory. This manner of storing for thirty days could be readily carried out by many bakers who have not facilities for storing their flour for a longer time. This would give much better results than the general storage conditions which many bakers have now.

Where the flour storage is limited and no heated warehouse, the space on the floor above the ovens can be used for flour storage. The heat from the ovens keeps the flour warm and insures a warm place to store flour. It is also warmed quickly if it is necessary to use the flour immediately. If the flour can be held for some time stored in such a manner it ages quickly. It is necessary, however, to be sure no flue gases come in contact with the flour, as these gases quickly destroy the gluten. The above method has been very successfully used in places where flour storage was limited and no means of heating the flour was available.

During the aging of flour there is a slight loss of moisture, which is utilized in two ways:

1. Part is absorbed by the air.
2. Part is used by the gluten in the aging process.

When water is added to aged flour in mixing dough, the loss in moisture is more than made up by the larger percentage of water it will absorb. Flour which is aged will on the average absorb 5 per cent. more water than flour which is freshly milled. The baking value of the flour is greatly increased by proper aging. The gluten is much more elastic and tough and makes a much better handling dough. The flour is whiter in color, the fermentation period is more easily handled, and it makes a much better loaf of bread in general.

Flour Mixing.

Many bakers mix flour from different mills, thinking they receive a more uniform and better blend of flour, that when one flour is poor the other usually is good and helps it along. In reality the opposite is the case.

Every mill has its own separate system of bolting flour, so that they have the small particles of flour of the same uniform size. The sizes of flour particles from different mills will differ, consequently if these flours are blended, there will be flour particles of varying sizes. When mixed into dough, the smaller particles take up the water first and much faster than the larger particles, and fermentation begins immediately on the smaller particles. The larger particles require a longer time to take up the water, therefore the fermenting dough is not uniform—the dough from the larger particles being slower than that from the smaller particles. Thus, part of the dough will be "too old" and the remainder "too young."

Some mills select their wheat and mill the flour by systematic chemical and baking analyses, so that the gluten is of uniform quality and gives the best results when it is handled alone. If another flour is mixed with it, the gluten being of a different character will make an inferior gluten of the first flour and it will not give as good results as when handled alone.

Color of Flour.

The progressive miller is a close student of the wheat berry. It is necessary that he understand thoroughly the constitution of wheat to obtain the best results in the flour he grinds.

Milling in its simple form is merely the separation of the bran coats and germ from the floury part of the kernel. To make these separations as thorough as possible requires a vast amount of machinery and a large number of operations.

The gluten of the wheat is not evenly distributed throughout the berry. The central portion contains the least, and it increases toward the outside. Starch, on the other hand, is found to be just the reverse—the largest percentage being found in the center and the percentage decreases toward the outside. Some flours are made from the very central portions. This gives a flour deficient in gluten and excessive in starch, and will not stand the treatment given it by the baker. It is starchy in color on account of the excessive amount of starch and the small quantity of gluten.

An excessively white color and strong gluten are never found together in the same flour. In studying the needs of the baker in flour, we find he does not want an intensely starchy, white color, as this flour will not give a corresponding white color in the bread.

What the baker does want is a flour containing the greatest strength and best color combined. It will be slightly creamy in color, but when baked will make as white a loaf as intensely white flour, and has the added advantage of having larger water absorbing powers, and the power to withstand the harsh treatment given it by the baker. The baker in his mixing and fermentation develops the color in a loaf of bread. An intensely white flour will give a very dark loaf of bread if not fermented properly. On the other hand, a flour with good strength and creamy in color will, when handled under proper conditions of fermentation, give as white, if not whiter bread than the whiter flour. It also has the added advantage of withstanding the vigorous treatment of the machines. It gives a better volume, texture and pile in the loaf, and if through accident there is any delay in taking the dough when it is ready, the strong flour will stand it, while the white flour will have to be taken at just the right time to give good bread.

Color in bread is not necessarily obtained by using a white flour. A better color can be obtained by using a strong and slightly creamy flour handled properly in the fermentation. The mixing of the dough at a high speed, and proper fermentation at the correct temperature, are the factors which make white bread.

Mixing the Dough.

To start a dough right is to mix it right. A properly mixed dough should be mixed twenty minutes, in a single arm machine, mixed with a speed of at least 36 revolutions per minute. Some mix their doughs the same length of time in mixers at a speed of 60 revolutions per minute. This gives toughness to the dough and makes it take up more water. There is one danger, and this is allowing the dough to warm up too much. The mixed dough should be 80 degrees Fahr. It is necessary to find the amount the mixer warms up the dough in twenty minues' mixing, and allow for this in the temperature of the water added. A dough properly mixed should be tough enough to be pulled out like a rope without breaking.

Too many bakers are running their doughs too hot. We have had an exceptionally early spring—the change from cold to warm weather was very sudden. The bakers have not considered this and made the necessary changes, and consequently the dough is mixed too warm.

Humidity plays a very strong part in the fermentation. With a high humidity the dough works much faster than with a low humidity. It is necessary to take this into consideration in preparing the dough.

Fermentation.

Probably the most important step in bread-making is the fermentation period. To start the fermentation correctly means to have the dough mixed correctly as to temperature and ingredients added, to obtain the best results in fermentation.

Yeast ferments best at a temperature of 86 degrees. But, if a dough is set at this temperature, and has a tendency to warm up during fermentation, it gives even a higher temperature when the dough is ready for the pans. Other ferments also start to develop at this temperature which cause the dough to become sour, to a more or less degree, and in this way either cause sour bread or at least a loss of the rich wheat flavor.

A dough works best at a temperature of 80 degrees Fahr., having the room at 76 degrees Fahr. The danger points in the temperature of a dough under these conditions are 76 degrees and 86 degrees Fahr. If a dough is mixed at 80 degrees Fahr. and put into a dough room having a temperature of 76 degrees Fahr., it will probably go onto the bench at 82 degrees Fahr., which gives the best results in the bread. If a dough is mixed warmer than 80 degrees Fahr. it is necessary to watch it much closer and take it at exactly the right time. Even with the most careful observation of a dough at a warm temperature, a loss of flavor or a tinge of sourness develops. Our advice is to be wary of a warm dough.

The age of dough is the critical point in bread-making. How to tell the age of a dough is a question we have never seen satisfactorily answered. Most bakers tell intuitively, and this has required long experience. The color, texture, volume and flavor of the resulting bread are dependent almost entirely on the age of the dough.

The length of time of the first rising in a straight dough is a point many bakers do not consider. If the dough is too young, give more time on the first rising; if too old, shorten the time of the first rising. The age of a dough is governed to a considerable degree by the first rising.

A strong flour requires three risings by the ordinary methods of bread-making. There are processes used where the dough is punched at stated intervals. This, however, is used more successfully where very good control is had over the temperature and humidity.

Technically, a dough is ready when the yeast has reached the maximum of its energy. If the proper development of gluten and the maximum of energy of the yeast is not reached, a young dough is the result. A young dough will not spring in the oven, the texture will be coarse, the color will be yellow in varying degrees, and a generally poor loaf is received.

If the fermentation is carried too far, the yeast will have lost its vitality, other ferments will have started to develop. The loaf will have a tendency to fall in the oven. It will not spring in the oven, the texture will be coarse, the color dark and the wheat flavor lost, a sour odor will also be noticeable.

If the dough is fermented at too high a temperature, both young and old characteristics will be noticeable in the loaf.

Any improper handling of a dough, either by ingredients added, length of the period of fermentation, or wrong temperature, will give a dark, coarse and small loaf. The miller is usually blamed for these results, which in reality are not caused by the flour, but by the improper use of the ingredients and methods of handling.

Ingredients.

The ingredients in bread-making that have a vital influence upon the finished bread, are: Flour, water, yeast, salt. It is always necessary to have these. Other ingredients act in the capacity of hastening fermentation, yeast foods, flavor, etc., to give a character or special flavor to bread.

We contend there is no bread recipe. What we call a bread recipe is merely a combination of ingredients in proportions to suit the conditions under which the baker is working. We all havve books full of bread recipes, each a little different from the other, and all striving to obtain the same bread, or give their bread a slightly different character.

One baker finds his conditions are suitable for one combination of ingredients; another finds he cannot use this recipe at all. He finds another combination which suits his conditions. All are working under different conditions of climate, temperature and manner of handling. Consequently, it is necessary to find the proportion of ingredients which best adapt themselves to the present conditions. The character of bread desired naturally influences the ingredients used, and as conditions change the ingredients must change to meet these conditions, if a special character and individuality in bread is desired.

Water.

Most bakers do not use as much water as is possible in bread-making. A hard, northwestern flour requires a slack dough if the flour has been made from wheats having the right characters and properly milled. The best results are obtained by setting the dough as soft as can be handled. When mixing the dough the water at first is not thoroughly absorbed by the flour particles, as the gluten is so hard it takes some time for these particles to thoroughly absorb all the water they will hold. This continuing to absorb is known to the baker as "tightening up." This featuɪe is characteristic of Northwestern flours, and is lacking in other flours. When mixing a dough from Northwestern flours always allow for "tightening up," and mix the dough softer than it is intended to be when you "take the dough." The opposite is the case in softer flours as they "slack off."

Any flour will lose this characteristic of "tightening up" if a dough when mixed is too hot. Gluten is in reality a vegetable glue and softens when the dough is mixed warm, and consequently will not absorb the amount of water it should, and it will have a tendency to "slack off" instead of "tightening up."

MILK VALUE IN BREAD

BY W. E. BREEZE, OF LONDON

Of course, we all know that wheat grown under certain conditions varies, and, as the climate and soil differ, so does the gluten, as is exampled between comparison with a soft and a strong flour. In the same way it applies to milk. The composition of fat in new milk is determined by the breed, climate, food and health of the cow. A really rich milk would produce as much as ¾ oounce to 1 ounce of fat to the pint, especially just now, when the animals are kept up and fed pretty well. They give less milk, but it is much higher in quality. In summer, when there is plenty of grass, the cows give more milk, and, on the whole, more fat, but the percentage is not so high as it is just now. In Holland, for instance, milk is poor, and more deficient in fat, because the pastures are more moist and watery. Whether the various fancy brown breads do or do not carry out, as they are reputed to do, all the properties accorded to them I am not prepared to say. Time must be given for a suitable trial, and if they are are not found suitable we must turn our attention to something else. A milk loaf of a favorable quality is generally being inquired for, but I am sorry to have to record that the majority of bakers do not treat it with the same respect that they accord to its rivals. Its rivals are sold under certain conditions. You must not adulterate it in any sense, for if you do you are liable to prosecution. But the old milk bread is not standardized as to its composition, and there is hardly a bread-maker who does not sell "milk bread." I may also safely venture to say that the milk added to the bread is as varied in quantity as there are purveyors of the commodity. There is no stipulated or understood quantity, and in consequence the quality of the loaf suffers.

During my experience I have known and seen bread sold as "milk bread" which had never seen the sight of milk, but, on the other hand, there are other bakers who are most particular and have the most liberal quantity of milk, the result being they produce a beautiful and most honest loaf. I have seen other bakers who put in about six quarts of milk, and the bread is made up in fancy shapes and weights, and styled fancy bread. There is no recognized standard for the quantity of milk used per sack. Whether it is of sufficient importance to the trade that such a loaf should be made and sold is another matter. But I wish to put before you the value of milk in bread-making, and also to emphasize the benefits which, in my opinion, are derived from bread made with the addition of milk. I have eaten brown bread which has set up irritation in the stomach, but this has never happened to my knowledge when the bread has been made with good sweet full cream milk. I am convinced if this milk bread were kept before the public, made, of course, from the proper ingredients and in proper proportion, there would be no doubt as to the best loaf to be obtained at fancy prices, a loaf which would leave the baker an equal, if not better, profit than we obtain to-day for our fancy browns. In 1908, at the London Exhibition, for the first time, a milk powdered loaf won the first prize in the milk bread competition, and thus beat the new milk itself. That bread looked very nice, and its color was excellent, the weight sent in being about 2 pounds. It is true there is no recognized standard shape for milk bread, so several shapes were sent in, the competitors seeming to satisfy themselves to produce an ordinary loaf with milk in it. I do not know whether it would be possible for the manufacturers to suggest lines upon which shape and quality could be combined to produce a standard milk loaf. I do not know whether I am asking too much, but in time it would not amount to anything more than asking for a cottage loaf, a crumby or tin loaf. If manipulated and produced properly, it would increase it dietetic value, and be a different commodity, with changed properties, and yielding nourishment in a new and concentrated form.

Dry Milk.

I do not say that the combination I have spoken of is a correct one or not, but I do not think it should beat the use of full cream milk, for I have always noticed a distinctive delicate flavor with the new milk in comparison with the dried article, and I did not intend to treat of dried or condensed milk, but only of new milk, skimmed milk and separated milk. To make my subject more complete, I will, after all, first touch upon dried milk. This is a very useful and unvarying commodity. It is fairly quick in solution in warm water, and is convenient, especially in cases where really good dairy milk is scarce or unobtainable. Its fat and sugar are more or less varied, or practically nil, and as dried milk is minus lactic acid, the flavor being sometimes interfered with by evaporation, I cannot recommend it in preference to good new milk. Of course, with a little doctoring, you may improve some faults, but the delicate flavor of new milk is not so pronounced.

Condensed Milk.

I will now pass on to condensed milk. Sweetened condensed milk is a most desirable substance from an economic and handy point of view. It may be used in water alone or in conjunction with separated milk. Of course, you use it for what it is worth. If used separately, milk fat, or some other fat, such as good sweet lard or neutral fat, will have to be used to make up the deficiency, the usual quantity being about one small tin and 3 ounces of fat per gallon of water.

Buttermilk

We will now pass on to buttermilk, which you all know is very useful in the manufacture of soda and powdered goods, as the lactic acid already formed has the property of softening the gluten in the flour, thereby rendering the goods soft and mellow. As, however, I am concerned with breadmaking, we will leave the powdered goods alone. I have had some very good results from condensed milk by keeping it active, and not allowing it to lag. It seems to have a bleaching effect, and from a nutritive point of view comes very near to new milk. Again, the proteids of the milk and mineral matter are practically digested by the action of the lactic organisms, and new milk undergoes no change during fermentation in the dough. The changed condition in the buttermilk is of great advantage, and lactic acid adds flavor to bread made with compressed yeast. There is no reason to suppose that bread made with buttermilk will go sour sooner than that made with fresh milk if the fermentation is managed properly. To use buttermilk in bread-making the milk must be fresh—not more than twenty-four hours old. Old milk will not do, and when fermentation is started the dough must be attended to and baked in a good oven. Of course, I am not going to advise a novice to use buttermilk, or he would most probably be doomed to failure, but I have indicated the possibilities of the use of buttermilk. I will give you an analysis of buttermilk and also of new milk. New milk contains 4.0 per cent of fat, 3.6 of proteids, 4.5 milk sugar, 9.7 of ash or mineral matter, 87.2 per cent. of lactic acid. Buttermilk has the following proportions: Fat 0.8 proteids 3.7, milk sugar, 3.8, ash or mineral matter 0.7, H^2O 90.85, lactic acid 0.85. The production of lactic acid is limited to the proportion of milk sugar present. I have not made large quantities of bread with buttermilk, but have treated certain quantities as a hobby to try what I could really do with it, and the results were quite satisfactory.

Skimmed Milk.

Now we will consider skimmed milk, or separated milk. We must bear in mind they have very little fat, though the milk sugar is retained; it is simply fresh milk minus the cream. As butter-fat is about 4 per cent. of the total milk, often less, the fat can be replaced by lard or any neutral fat. They are really as good, and the public in any case will hardly give you credit for having used butter. A quart of separated milk, containing 2 ounces of sweet lard or neutral fat, will make nearly as good bread as fresh milk. Do not get the idea that it will be thinner, and therefore use more fat than is necessary. One gallon of separated milk and 7 ounces of fat equals one gallon of fresh milk. Lard and neutral fats only affect the texture and shortness, and even butter added as a fat does not give that mild flavor imparted when the full cream is used.

New Milk.

I will deal lastly with new milk, and its advantages in comparison with the last named. The composition of new milk consists of 87 per cent. of water, 5 of milk sugar, 4 of fat, and about 3½ of albuminoids, the rest being mineral matter. The effect of added milk to bread in place of water is, other things being equal, to increase its nutriment. Providing the bread is worked on a short and quick system, as it should be, it will get a bloom, with a rich crumb, color and even texture. The crust will be thin and fine, and the flavor will be most appetizing. Although the table just given is the average composition of milk, there are variations. The casein and albumin are the nitrogenous constituents of the milk, and may be regarded as flesh-formers. The fat consists of stearine, and other constituents which give to butter its characteristic flavor. Milk sugar or lactrose is the only carbohydrate present in starch. The ash consists chiefly of phosphates of lime and potash. Taking the figures given, it can be said that new milk has from three to four times the value of separated milk, and, taking a careful valuation, we get, say, 1s. per gallon of new milk and 3d. for separated. Of course, where large quantities of new milk are bought there would be a corresponding reduction in the price. I get it by the ten gallons; there is no transit to pay, and no second handling is required, the milk coming direct from the farm to the bake-house. The excessive fat per gallon in new milk is worth 9d. per gallon above separated milk, which would cost 3d. The value of a standard sample would be as follows: New milk—Fat 3.5, non-fat 9.0, total solids 2.5. Separated milk—Fat 0.3, non-fats 9.0, total 9.3, value 3d. Taking as a maximum quantity eight gallons of new milk per sack, and as a minimum quantity six gallons, the price of the loaf would be higher. To assist in cases where a large quantity of milk is used the dough must be softer because of the binding effect of the milk. Taking into account the added solids, we should have a larger output per sack, together with a better loaf, one of high dietetic value, while the milk and butter contained in it would improve the flavor, texture, color and physical properties of the crumb. Evenness of texture and cleverness of loaf make a better crumb color, the effect most noticeable with added milk, being due to the percentage of fat present. As a comparison, take 1 ounce of butter with 10 pounds of flour, as against 1 quart of milk. The butter or fat gives a very fine texture and thin crust, whilst the milk results in a better bloom, owing to the unfermentable sugar of milk. Of all milks, fresh full cream is best, and ought to be used with water in equal proportions, as half milk and half water give excellent results.

Miscellaneous.

A good idea followed by many is weighing the ingredients required for as many custard pies used in a week or two. For instance, if you make 4 pies a day, or 24 a week, weigh the required amount of sugar, starch, salt and mace, mix and sift together and put away in a can or box, and every time you make 4 pies weigh off one pound, or four ounces to each pie. This saves time in weighing, and does away with the guessing of the salt and flavor, which is hard in small mixes. The same is done with pumpkin pies, adding to the whole amount the required spices. This enables you to make a uniformly spiced and tasting pumpkin pie, which is the most important feature of it.

Recipe for Preserving Rhubarb for Pie.

The following is a recipe for preserving rhubarb for pie purposes, and it is simple and cheap. Take the rhubarb and cut it in pieces, and put it in fruit jars, filling them with water, and thereby keeping it all winter, or as long as you want it, and when you get ready to use it, it is all ready for use, after sugar, etc., is added.

Bacterial Contamination in Bread

James Grant, an English chemist and teacher of the bakery classes in the Manchester Bakery School, in England, gave the following illustrated lecture before the Bakery Students' Society, on the Baterial Contamination of Bread, which is of considerable interest to American bakers:

It is well known that wheats and other cereals, owing to the deep crease or furrow down the center of the ventral side, and to the hairs (especially in the case of wheat), known as the beard, at the top of the berry, are liable to cause bacterial diseases in our food supplies. It may be objected that washing during the preparation for milling will get rid of dust and its accompanying bacteria. Unfortunately, this is not the case, as may readily be shown by washing wheats that are ready for milling and incubating the washing water. Fruits, equally with cereals, are liable to this contamination. Wines, for example, for hundreds of years have been fermented by the yeasts which adhere to the grape in the "bloom" on the outside of the fruit. Hansen, the great expert on yeasts, has proved that during the period of the year when there are no grapes, the yeasts and other micro-organisms that exist in the soil in the form of spores, which are able to endure periods of stress that kill the adult micro-organisms. Similarly in the case of barley. We have found in our work, time after time, that germs of all kinds exist on the wrinkled surface of the grain. Not many years ago we were able to isolate pure cultures of the bacillus which induces tetanus or lockjaw. During the milling process it can be seen that germs left on the surface of the berry must necessarily pass into the finished flour. Flour, then, is not germ free.

It is claimed by certain millers, who bleach their flours, that one of the chief objects is to render it sterile or nearly so. Research has shown that this claim is justified only to a very limited extent. In the year 1904, Dr. F. M. Blumenthal studied the subject very thoroughly. Two of his results, as examples, will be quoted. In an unbleached rye meal there existed no less than 2,400 micro-organisms per gramme of the meal. After bleaching there still remained 1,600 micro-organisms per gramme. With flour unbleached he found 540 organisms per grain, and with bleached flour 170. In both cases the best figures are only given. It is pretty evident, then, that milled products are not germ free; and further, those spoken of as meals, or in other words, those that contain the husk, are much more contaminated than those from which the husk has been separated, e. g., the ordinary flour.

The chief object of this paper is to give students an idea as to the best methods of undertaking a research or investigation into the cause of contamination. Since taking up the study of bread-making, between five and six years ago, a number of very interesting cases of bacterial diseases of bread have come under my observation, but the one that impressed me more deeply than others was that of a case of bread baked in special tins at a very low temperature, and known in the trade as sandwich bread. For this purpose the bread must be cooked at the lowest possible temperature, so as to form little or no crust. In this particular case of sandwich bread, after a few days keeping, a peculiar formation, resulting in a hole, was developed in the center of the loaf and running in the direction of the length. Accompanying this development was a very unpleasant odor. All around the low flat hole the crumb had a dull, sodden appearance. The question to be settled was: What was the cause of this unpleasant formation? To one acquainted with the life history of very many of the lower forms of life, especially of vegetable life, there was little difficulty in ascribing it to filth bacteria. From the general appearance of a section of a loaf the only conclusion that could be arrived at was that the trouble was due to bacterial action, together with the products formed. Starting from these premises it became necessary to inquire into the sources of such contamination. These might be due to either (1) Dirty and unclean premises and plant, or (2) to the water used, or (3) to the yeast, or (4) to the flours, or (5) to bread improvers used (if any). It could not possibly be the salt, because salt is so strong an antiseptic that there could be no risk from this source. Numbers (1), (2) and (5) were easily eliminated. This narrowed down the work to a study of the flours and yeast. The details of the research will show the means taken to determine, if possible, the actual causes of the trouble. The work was still further narrowed down by the fact that if bacteria were at work it could only be a group capable of withstanding comparatively high temperatures. Again, a large number of expensive media were unnecessary, as bread was a suitable food for our purpose. The requisite appliances were those of an ordinary well-filled bacteriological laboratory.

Ordinary microscopic slides of the diseased bread were made with sterile water, and these examined by microscope. This revealed the presence of moulds and mucor spores, yeasts—both the ordinary cultivated and wild—and numerous bacteria. On further examination after incubation at suitable temperatures, most of the above-mentioned proved to be just the common micro-organisms existing in flours and bread. Some of the bread was then incubated at 80 degrees Fahrenheit for four days. The piece of bread was then found to be covered with a whitish-colored growth, which later developed into a dark yeasty color nad possessed a very peculiar and strong odor. Samples of the flour and yeast used in the manufacture of the bread were treated in a similar manner. In four days the flour specimens showed the same peculiar growth which, in two days, changed to the dark fawn color possessing the same characteristic odor. The yeast, on the other hand, behaved quite normally and developed none of the strange symptoms.

The next step was to try to infect some sterile bread with this peculiar disease, if possible. To this end sterile bread was introduced into Petri dishes, moistened with sterile water, and some of the dish contents sprinkled with flour, and others with crumbs of the diseased bread. The incubation temperatures were 68 and 80 degrees Fahr., respectively. At the lower temperature, as well as at the higher, the cultures were all successful, but it took several days longer in the specimens—at the lower temperature. Various other cultures were now put on, with other media and different apparatus, with a view to isolating the special cause of the disease. All specimens, and also micro-slides from these, had to be examined regularly at fixed periods, entailing, of course, an enormous amount of detail work which cannot here be set forth. Suffice it to say that ultimately by varying the media and mode of cultivation swarms of very minute oval-shaped non-mobile bacteria, and also many rod-shaped mobile organisms, were isolated. By this time all yeasts, moulds, mucors, and other complex growing organisms had been eliminated. To ensure that all the apparatus and media were sterile, blank specimens were put on so as to be parallel with the special culture in each case.

By means of the plate (Petri dish) cultures and Bottcher moist cells, a group of minute bacteria belonging to the Thermo or film species was obtained by which this particular disease could be produced at will. Moreover, prepared in this way, the bacteria which cause the disease were, and still are, very virulent. It only remained now to identify the particular species of the Thermo-group, but this was not an easy matter, as the members of the Thermo group are exceedingly minute. The plate cultures yielded colonies which rapidly increased in size, the disease spreading over the media in all directions. It was finally identified as belonging to the Proteus division of the Thermo or septic bacteria. These exist in most fertile soils, hence the research showed that the flour was produced from near the outer skin of the wheat berry, or, in other words, a low grade of flour. Further, it proves that the miller, with all his modern machinery, has not yet perfected that portion which does the cleansing or washing of the wheat. It should be remembered that the complete washing of the wheat, so as to free it from dust and micro-organisms, especially in the deep crease, and the fine hairs or beard at the top of the berry, is not at all a simple matter; but much more could be done, even if only a very dilute antiseptic was used in the final or next to the last washing water, instead of finishing with the muddy fluid as at present.

BAKERY ACCOUNTING

BY WM. W. ALLAN

Next to the baking business itself, the most important item is that of an accounting system.

Checking Drivers

The first step in this direction is the making up of a list of the various kinds of bread wanted by each driver, showing in total the number of loaves of each brand ordered in the total column. In another column under heading "Total Made" have the foreman enter the number of loaves of each kind made. If a shipping business is conducted the amount of bread needed can also be shown on this sheet under heading "Shipping." If a retail store is conducted in connection with the bakery the amount needed for store may also be shown on this sheet under heading "Store." This completes the Bread Order. (See Fig. "A.")

FIGURE "A."

DAILY ORDER SHEET.

Date......................191..

Driver No. 1	Driver No. 2	Store	Shipping	Total Order	Articles	Total Made
......	......	......	......	......	Buster Brown	....
......	......	......	......	......	Home Made	....
......	......	......	......	......	Large Vienna	....
......	......	......	......	......	Small Vienna	....
......	......	......	......	......	Large Cream	....
......	......	......	......	......	Small Cream	....
......	......	......	......	......	Large Rye	....
......	......	......	......	......	Small Rye	....
......	......	......	......	......	Graham	....

Now prepare a loading sheet for each of the drivers which will show at the end of the day's business the total amount of each kind of bread taken out and charged to each driver. (See Fig. "B.") These sheets can be extended and used for checking in the drivers, as shown.

FIGURE "B."

DRIVER'S LOADING SHEET.

Driver....................No. 1 Date............191..

1st Trip	2nd Trip	3rd Trip	Total Out	Articles	Dr. Amount	Cr. Amount
......	......	......	......	Buster Brown	$........	$........
......	......	......	......	Home Made	$........	$........
......	......	......	......	Large Vienna	$........	$........
......	......	......	......	Small Vienna	$........	$........
......	......	......	......	Large Cream	$........	$........
......	......	......	......	Small Cream	$........	$........
......	......	......	......	Large Rye	$........	$........
......	......	......	......	Small Rye	$........	$........
......	......	......	......	Graham	$........	$........
......	......	......	......	......	......	......
......	......	......	......	......	......	......
				Total Charges	$........	
				Cr. Expense		$........
				Cr. Cash		$........

A form called "Driver's Returns" (See Fig. "C") should also be used, showing the number of loaves of each kind of bread returned by the drivers, and which should be kept, and all entries made thereon, by the bread counter. It is very essential to have some one person, other than the drivers themselves, to check out the drivers and keep the drivers' loading sheets.

FIGURE "C."

DRIVER'S RETURNS.

Driver....................No. 1 Date............191..

Total Returns	Articles	Amount
......	Buster Brown	$........
......	Home Made	$........
......	Large Vienna	$........

....	Small Vienna	$........
....	Large Cream	$........
....	Small Cream	$........
....	Large Rye	$........
....	Small Rye	$........
....	Graham	$
....		
....		
	Total..........	$........

Signed..............................
Counter.

Another form called "Proving Sheet" (See Fig. "D") should be kept in connection with the above forms, and upon which the daily driver's, store, and shipping sales may be entered and compared with the daily output or total made.

FIGURE "D"

PROVING SHEET.

Date......................191..

Charged To	Bu. Br.	Hm. Md.	Lg. Va.	Sm. Va.	Lg. Cr.	Sm. Cr.	Lg. Ry.	Sm. Ry.	Gra. Gra.
Driver No. 1.									
Driver No 2.									
Store Account.									
Shipping Account.									
Total Charged									
Total Made									

Bread Department.

A Bread Department account should be kept in the ledger, and credit to this account should be made for drivers, shipping and store sales, and if bread is sold on the basis of four cents per loaf the total credit to this account divided by four will give the total number of loaves approximately sold for a month or any given period, which figures may be used in arriving at the cost of production per 1,000 loaves for any item of expense, such as bakers' salaries, fuel, merchandise, etc., etc.

At the end of the month charge to the bread department all items of expense for that month, such as advertising, salaries, sundry expenses, light and fuel, merchandise, stable expense, and the monthly proportion of insurance and taxes —the balance will show the profit or loss in this department for such period.

Shipping Department.

If a shipping business is conducted, a shipping department account should also be kept, and to this account can be charged all bread shipped at the rate of, say three cents per loaf—crediting same to bread department. Charge should be made to this account for all express charges and for its proportion of salaries. The credit to this account will be the gross charges to the parties to whom bread is shipped. The difference will show the profit or loss.

My experience has been that if the proper charges are made for all expenses in connection with shipping, including losses owing to bad account, the wear and tear and loss of baskets—the shipping department will invariably show an actual loss, even on the basis of charging only three cents per loaf for all bread used in shipping, unless bread returned by the drivers is used in shipping, and which is used for this purpose by some bakers, and which otherwise would have to be disposed of for considerably less.

Cake Department.

Where cakes, pies, cookies, etc., are made in connection with bread they should be separated from the bread department and all could be included in one department called Cake Department, or any other name suitable. The materials used for the making of these goods should be charged direct to this account when purchased, and all materials used from the bread department merchandise should be charged to Cake Department merchandise and credited to Bread Department merchandise. Also charge to Cake Department its proportion of bakers' salaries, light and fuel, and other expenses belonging to this account. The credit to this account will be the drivers' returns from the sale of pies, cakes, etc., and for those sold to the store or shipping customers.

Store Department.

If a retail store in conducted in connection with a bakery, all goods taken from the shop should be charged to Store Account at the regular wholesale prices, and credited to the bread or cake department. Charge should also be made to Store Account for clerk salary attending store, and should also be charged for its proportion of light and fuel, office salary, and other expenses, and also for all merchandise purchased from the outside to be sold in the store. The credit to this account will be the daily sales as shown by the cash register.

Stable Feed.

A stable feed account should be kept to which is charged all items of hay, grain, etc., used for horse feed. At the end of the month the balance of this account can be charged into Stable Expense Account. The object in keeping this account separate is for the purpose of arriving at the cost for feeding a horse for a given period, which can be done by dividing the number of horses into the total charges to this account.

Stable Expense.

Charge to this account items of medicines, veterinary bills, shoeing bills and stable man's wages, and all other items of expense belonging to this account. At the end of the month charge the balance in Stable Feed Account to this account, which will then show the entire cost of operating the stable.

General Accounts

Ledger accounts should also be kept of Buildings, Harness, Horses, Machinery, Fixtures, Ovens and Wagons, and a certain amount should be credited at the end of each month to each of these accounts to cover shrinkage, the total amount of these shrinkages being charged to Expense Account. Ledger accounts should also be kept of Insurance and Taxes, charging all bills for these items to these accounts, and crediting these accounts at the end of each month with their monthly pro ratio for these items, charging at the same time this pro ratio to Expense.

Inventory.

To install an accounting system as described above, which is on a monthly basis, it will, of course, be necessary to take monthly inventories of Fuel and Merchandise for each department, Stable Feed and Store Stock.

A system such as I have outlined is adequate for handling the accounting end of a baking business having an output up to eight or ten thousand loaves daily, but for a larger baking business a more intricate system would of necessity have to be installed and which would carry with it a great many more accounts than I have named.

A great many minor record accounts could be kept in connection with the above system, but it would be quite difficult to explain all these.

Breaking an Egg with One Hand.

The trick of breaking an egg with one hand is something that you should learn how to do. It not only gives you speed, but shows that you are a workman thoroughly familiar with your business. The trick can be acquired with a little practice. To do it nicely the hand should be a little moist. Hold the egg in the right hand between the forefinger and the second finger with the thumb on top. Strike the egg once sharply on the rim of the glass to crack the shell, then holding it over the glass press down slightly with the thumb and the egg drops out, leaving the shell in the hand. While learning to do this the glass should be allowed to stand on the counter, so that if you fail, the left hand can come to the assistance of the right; but just as soon as you know that you can break the egg with one hand, then you can hold the glass in the other. This saves time, especially when you have two or three to prepare at once. When you have become proficient with the right hand try the left until you can use either or both.

PRACTICAL FLOUR TESTS

Color and Texture.

The color of bread made from wheat flour varies with the kind of wheat used in making the flour and also with the grade of flour used in making the bread. All wheats contain minute quantities of a yellow coloring matter, consequently a fresh, well-milled unbleached patent flour has a live, bright, yellow tint. This yellow tint disappears when a flour is aged or artificially bleached and the flour becomes almost snow white. The lower grades of flour have, in addition to the yellow color, a dark color, due to foreign matter and bran particles. This color does not improve much with age, nor is it possible to improve it by bleaching.

Bread usually appears whiter than the flour from which it is made. This is due to aeration, i. e., mixing air and gases thoroughly through the dough in kneading and fermentation. Very little bleaching really occurs during fermentation, in fact fermentation changes some of the starch which is snow white into dextrin, which is a yellow substance. The whitening effect of aeration, however, overcomes the yellow color due to chemical change and causes the bread to appear whiter than the flour.

In comparing colors of bread in comparative baking tests, there is no better method than allowing the loaves to cool, cutting a slice from each, placing side by side, and using your judgment as to the value of each color in comparison to standard loaf. In comparing a number of loaves by this method the colors will range through tints of white, yellow, gray and blue. Taking pure white as 100 per cent. the other tints in order of their value, are yellow, blue and gray, but it sometimes becomes a question of judgment of the observer which of the colors is the brightest and most clean and of most value.

The texture of bread is caused by the expansion of the dough by the carbon dioxide which tends to escape but is held in and gathers in small quantities through the dough. When bread is baked the dough retains a permanent shape and the cavities in which the gas gathered give the bread a porous appearance. These holes vary in size and shape. A flour with a good quality of gluten holds the gas in small globules and therefore the holes are small and usually elongated from bottom to top of the loaf. This is good texture and when touched gives a sensation of touching velvet. A poor gluten allows the gas to gather into large, round globules and produces a coarser texture and one which is harsh to the touch. Too long a period of fermentation or too much water in the dough will also produce poor texture. As in color, value of texture depends on the judgment of the observer.

MEMORANDUM.

For Notes and Recipes.

MEMORANDUM.

MEMORANDUM.

MEMORANDUM.