THESIS

on

BREAD AND BREAD MAKING.
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BREAD AND BREAD MAKING.

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BREAD AND BREAD MAKING.

DEFINITION OF BREAD:

Bread is a kind of food made of the flour or meal of some species of grain, by kneading it (with the addition of a little salt, and sometimes sugar) into a dough, yeast being commonly added to cause fermentation or "lightness", and then baking it. The yeast causes alcoholic fermentation and the production of carbon dioxide; the latter, an expanding gas, pushes the particles of dough asunder, causing the bread to rise, and, with the alcohol, is soon expelled with the heat of the oven. EARLY HISTORY OF DEVELOPMENT:

The earliest and most primitive way of making bread was to soak the grain in water, subject it to pressure, and then dry it by natural or artificial heat. An improvement upon this was to pound or byay the grain in a mortar, or between two flat stones, before moistening or heating. A rather more elaborate bruising or grinding of the grain leads to such simple forms of bread as the oat cakes of Scotland which are prepared by moistening oatmeal with water containing a little salt, kneading with hands, rolling a thin sheet, and ultimately heating before a good fire, or an iron gridle suspended over the fire. The primitive Johnny Cakes were made of flour and water, and baked in brick owens.

And similar to these mentioned are the barley meal and pease meal bannocks of Scotland, the scones of the East Indies, and the dampers of Australia. The passover cakes of the Israelites were also prepared in this way. The Indian corn meal, kneaded with water and fired, affords the corn bread of America.

The kinds of bread above referred to are designated unleavened, as no leaven has been added to the dough to excite fermentation. No chemical change has therefore been produced except that the starch has been rendered more soluble by the process of baking. Even in the time of Moses however, leaven was employed in making bread. It is held probable that the Egyptians were the first to use leaven; that the secret afterwards became known to the Greeks; and that the Greeks communicated the process to the Romans, who spread the invention far and wide in the northern countries during their campaigns.

Unleavened bread is worked into a stiff dough, rolled thin, and baked, forming crackers and the like, while leavened bread consists in mixing flour and water in proper proportions with salt and yeast added. This is placed in a warm place to rise. The yeast grows and produces alcoholic fermentation. When sufficiently light the dough is baked.

INGREDIENTS USED IN BREAD:

The four ingredients that enter into a loaf of bread are flour, yeast, salt and liquid. A small amount of sugar

is sometimes added. Milk or water, or a part of each may comprise the liquid. Bread made with milk is more nutritious, but it dries out more quickly than the bread in which water is used. The texture of milk bread, even with slight kneading is velvety and pleasing. Half milk and half water give excellent results and are quite generally used. Water bread, without shortening, carefully manipulated, gives a loaf of nutty flavor, but with a trugh crust. In this particular kind the French excel. Water, with two tablespoons of shortening to the pint, is more generally preferred by the American housekeepers. FLOUR:

To prepare the grain for bread making it is usually thoroughly cleaned, crushed, and sifted into a fine soft powder, which we call flour. The modern milling is what is known as a gradual reduction system, whereby the wheat is gradually and carefully reduced. The wheat is run through six systems of rolls, for the purpose of loosening the middlings. These middlings are then purified by means of sieves and air suction machines, which remove all the brown portion of the berry. The middlings are after purification reduced to flour.

The milling systems are known as the high and low systems. In low milling the grain is ground in one process between two crushers placed as near together as possible. Graham flour is commonly produced in this way. This milling product, invented by an American physician

Dr. Sylvester Graham, is really wheat containing all the grain. In high roller milling the grain is washed and tempered. After removal of the bran, the stock is run through five or even six pairs of rollers, each successive pair being a little nearer together than the last pair. After each grinding the fine flour is sifted out, and the leavings of each sifting, called middlings, are themselves ground and sifted several times. In a mill where the grain goes through six straight breaks there are as many as eighty direct milling products, varying in quality from the finest white flour to pure ground bran. The standard set for flour is tested frequently and the milling regulated accordingly.

The socalled "straight grade", "patent", "standard" and "household" flours found on the market are made by blending different milling products in such a way as to give the flour the desired characteristics. If, as often happens, it is desirable to blend two kinds of wheat in order to obtain a flour with the average of their characteristics, the grains are mixed before milling. Very complicated chemical tests are necessary to determine the exact quality of a flour, but there are certain general rules by which a good bread flour may be judged off hand. Its color should be white with a faint yellow tinge; after being pressed in the hand it should fall loosely apart; if it stays in lumps it has too much moisture in it; when rubbed between the fingers it should not feel

too smooth and powdery, but its individual particles should be vaguely distinguishable; when put between the teeth it should "crunch" a little; its taste should be sweet and nutty and without a suspicion of actidity.

BREAD FLOUR AND PASTRY FLOUR:

Bread flour is granular to the touch. It passes readily through a sieve. When mixed into a dough it takes up a comparatively large quantity of moisture. On the other hand, pastry flour is soft and oily to the touch. When pressed in the hand it keeps its shape, showing the impress of the lines of the hand. It does not pass so readily through a sieve and absorbs a comparatively small amount of moisture.

STRUCTURE OF WHEAT:

- 1- Wheat grains consists of an outer covering, largely silica, removed before milling.
- 2- Three layers of bran coats, in the form of cells, containing mineral matter, gluten, oil, etc.
- 3- A layer of cells, chiefly gluten and other proteid matter.
- 4- Centre and largest part of the grain made up of cells, of which starch is the chief content.

 COMPOSITION OF WHEAT:

Water	12%
Starch	65%
Protein	12%
Cellulose	5%

(Table continued from page 7	')
Gum and Dextrine	2.5%
Fat	1%
Sugar	2%
Mineral Matter	. 5%

Among flours the preference should of course be given to the one which yields the most nutritious loaf for the least money. The nutritious value of bread depends not only on its chemical composition, but also on its digestibility, and digestibility in turn seems to depend largely on the lightness of the loaf. It is the gluten in a dough which gives it the power of stretching and rising as the gas from the yeast expands within it, and hence of making a light loaf. Rye has less gluten proteids than wheat, while barley, oats, and maize have none, so that they do not make a light, porous loaf like wheat.

As above stated, the gluten in the dough makes the light loaf, so it is essential to always obtain a flour with a high per cent of gluten.

hard spring wheat planted in the spring and harvested in August or early September in Minnesota and South
Dakota is particularly strong in gluten and contains a
minimum quantity of starch. Such a flour is designated as
bread flour. Winter wheat is a softer variety, raised in
the Middle and Southern States. It is planted in the

Fall and harvested in the following June or July. Flour made from this wheat is designated as pastry flour, as it is well adapted to the purpose indicated by the name.

The tenacious, elastic gluten is needed in yeast mixtures, to hold the CO₂, (carbon dioxide gas), that lifts the dough and makes it light. But it is not as desirable in cake and pastry, where tenderness and delicacy are sought for. The relative proportions of starch and gluten in grains depends upon the soil and the climate in which the grain is sown.

YEAST:

Yeasts are minute, microscopic plants, ovallin shape, colorless, and reproduces by budding. Under unfavorable conditions they can reproduce by spores.

In bread, the yeast or leaven is added to give a start to the fermentation process, thereby supplying carbonic acid, which communicates a spongy light texture to the bread.

Flour contains all the food required for the propogation of the yeast plant, which secretes a number of chemical compounds called enzymes, which are active agents in bringing about the chemical changes that take place in bread making.

Pasteur, an excellent authority on all bacteriological and cookery subjects, in his work on fermentation says:- " In introducing a quantity of yeast into a
saccharine wort, it must be borne in mind that we are
sowing a multitude of minute living cells, representing

so many centers of life, capable of vegetating with extraordinary rapidity in a medium adapted to their nutrition. This phenomenon can occur at any temperature between 0° and 55° C, (131°F), although a temperature between 15°C and 30°C, (59°F - 86°F), is the most favorable to its occurrence.

The individuality of the yeast plant, the nature and amount of its food supply, and the conditions under which it develops determine the value of the yeast.

When compelled to work in the presence of or to contend with other ferment bodies, the yeast is contaminated and is of lessened value for bread making purposes. is Yeast used for brewing purposes, developed from healthy, vigorous, well nourished yeast plants and is called high yeast.

There are three purposes for the raising of bread by yeast:

- 1- It makes the material lighter, i.e. more porous, and hence easier of mastication and more palatable.
- 2- It renders it more digestible, because the porous material is more easily acted upon by the digestive juices than the more solid, unleavened bread.
- 3- The yeast imparts a certain flavor to the bread which enhances its value. The importance of the value of this flavor produced by the yeast is well shown by a comparison with that made light by chemical means.

The growth of yeast and hence the raising of bread is very closely dependent upon temperature. Yeasts grow readily in moderately high temperatures, less readily in low temperatures, and not at all if the temperature is in the vicinity of freezing. Common yeast grows best if kept between 75° F and 90° F. If the dough is kept at temperatures above 90° F there is almost sure to be trouble from the growth of undesired organisms which give rise to unpleasant flavors. Bread made from such dough is very apt to be sour. The temperature should be higher in winter than in summer, owing partly to the fact that flour in winter is quite sure to be cold and to require some time to become warm. In winter a temperature of 95° F is not too great for the proper raising of the dough, while in summer a temperature of 70° F is more satisfactory. It is more satisfactory to use a thermometer, so that the best results may be obtained. This is rarely done in an ordinary kitchen and as a result the best results are not always produced.

The length of time for the yeast to grow in the dough before baking is dependent upon the temperature of the fermentation; but it is important that it is not too long. If the temperature is low (below 70° F), so that it requires a longer time than usual for to rise sufficiently, the texture of the bread is apt to be crumbly and brittle, and a sour taste is very likely to develop, due to the growth of other micro-organisms,

besides the yeast. If, on the other hand, the bread rises too quickly, owing to too high a temperature, an abundance of gas is produced which makes the dough rise rapidly; but the bread will be inferior in flavor, texture, and color. The best results are obtained by a moderately active growth of the yeast, which will produce a sufficient amount of lightness in the dough in the course of eight or ten hours.

The various forms in which we obtain yeast from the market are simply ways of preserving and introducing the yeast into the dough so as to leaven the entire mass.

These various ways are dry cakes, compressed yeast, and sometimes yeast foam and yeast powder. The Magic yeast cakes are a form of the dry yeast. They are a mixture of corn meal and live yeast to a stiff dough. A little flour is used to hold the meal together, then it is rolled out, out, and dried. Compressed yeast is a recent invention and is now an immense industry. It is made by growing yeast plants in some sweet liquid, then drying the material to check the growth and pressing it. A little starch is often added to give body to the cakes. If carefully made they are uniform in strength and composition, but will not keep more than two or three days. "Farm" used in Scotland is fermented hops and water used before it stands long enough to turn to beer.

nops are often added to liquid yeasts for two purposes: (1) They give a slight nutty flavor which is subse-

quently imparted to the bread, somewhat improving its taste; (2) The extract of hops is a partial antiseptic, in a measure preventing the growth of bacteria, though not injuriously affecting yeast.

Sugar added to yeast sweetens the bread and may serve as food for the yeast plants. Salt retards the growth of the plants.

A good yeast cake is of a light even color. There is an absence of dark streaks in it. In making bread we soften the cake in liquid to separate the plants, and then stir them into the flour, where they find a complex food which they enjoy, begin to grow, and chemical changes take place. Starch is changed to sugar and sugar to alcohol and carbon dioxide. The CO2, (carbon dioxide), makes the bread rise and is driven off with the alcohol in baking.

PROPORTIONS OF INGREDIENTS:

The quantity of the liquid rather than the quantity of flour determines the size of the loaf. Two cups of liquid will make two loaves of bread of average size; but whether two, two and one-half, or three portions of flour be used to one of liquid, the difference will be one of texture rather than one of size. Two cups of liquid will be found a most convenient unit of measurement. With this use one-third a cake of compressed yeast to one whole cake or even two or three cakes, according

to the length of time to be spent in the operation, softened in half a cup of luke warm liquid. If liquid yeast be used take a half cup to two cups liquid, in case the dough is to stand over night. A level teaspoon of salt, two teaspoons of sugar if desired, and from two to three pints to complete the necessary ingredients.

GENERAL DIRECTIONS:

TIME NECESSARY FOR BREAD MAKING:

The greater the number of yeast plants, the more quickly, other conditions being favorable, will the bread be lifted up; and in making bread, we take this into consideration.

If bread is to be made quickly, two or even two and one-half compressed yeast cakes may be used to a pint of liquid. Thus made, the whole process need not take over three hours. If dough is to be mixed at night and baked with the first fire in the morning, the quantity of yeast may be reduced to one-third a cake to one pint of liquid. The longer time of fermentation as a rule, gives the best flavored bread; for by the products of fermentation, which give a peculiar and characteristic sweetness to the loaf, are generated during the longer process. In using a large quantity of yeast, we may improve the flavor at the expense of time, by cutting down" the dough once or twice after it has risen to double its bulk. As the dough quickly rises again, after a part of the gas has been let out, this does not lengthen the process to any considerable extent. Still, except during extreme heat, when souring may be anticipated, the method fulfills the requirents of occasional rather than general practice.

overy detail. If in the beginning of the process the yeast is overheated, or father on the kneading has not been sufficient or the dough is allowed to become too light, good bread cannot be expected. Each step must be given nost careful attention.

THE SPONGE:

A sponge, in bread making, is a mixture of flour with liquid and yeast. It is usually made thin, and in consequence the ferment acts very quickly. A sponge is advisable for biscuits and all yeast preparations where much shortening is to be used, as it retards the rising. After fermentation has been established in the sponge, the shortening may be added with the rest of the flour; and the whole will quickly become light.

KNEADING - OBJECT OF:

Dough is sufficiently kneaded when it has a firm, elastic texture, rebounds when prodded with a finger, feels smooth and satiny, and does not stick to hands or board.

The object of kneading is to develop the gluten in the dough, and to distribute the yeast evenly so that

a fine, even texture is secured.

Dough is kneaded the first time to distribute evenly the little yeast plants and other ingredients, to give body to the dough, and bring out the elasticity of the gluten, and to make the mixture smooth. The second kneading is to break up the large cavities caused by gas bubbles, and to make the texture uniform and fine. Length of time for

the first kneading depends upon the quantity of flour and shortening that is to be incorporated into the dough.

The second kneading should be only of such length as is needed to put the dough into proper shape for baking.

TIME AND TEMPERATURE FOR RAISING BREAD:

The taste and texture of bread are largely dependent upon the time given for rising. If the flavor and other characteristics associated with home made bread be desired they can best be secured by long slow rising at a temperature a little below that of the living room or between 55° F and 60° F. But all things considered, a temperature of 68° F is probably the most favorable for bread making, but the operation may be hastened by setting the bowl of dough in a pan of water that is kept just below 90° F. A fair test of this may be made without a thermometer by placing the back of the hand in the water and counting twenty-five. When the dough has risen to double its original size, it should be worked down and put in pans to rise. When double in size it is ready to bake. As a gener-

al rule, dough made with one cake of compressed yeast to one pint of liquid will double in bulk in three hours.

About one hour is required for the second rising, after the dough is in the pans, and a fifth hour for baking.

BAKING-OVEN TEMPERATURE:

Yeast bread is baked to kill the ferment- lest fermentation go on in the stomach, - to drive off the alcohol, to stiffen the glutenous walls, cook the starch, and form a pleasant tasting crust. The yeast plant is killed at a temperature of 212° F. To raise the temperature at the center of an ordinary loaf to this point requires nearly an hour's cooking in an owen heated, when the bread is put in, to about 400° F, that is, in a fast oven. The loaves in such an oven will rise a little, crust over, and brown slightly, in spots, during the first fifteen minutes. Biscuits and rolls require a hot oven and will bake in from twenty minutes to half an hour. A thick loaf of bread baked in the early morning is considered in good condition for eating by night, but it will be in better condition the next morning. Thin rolls well baked are not as objectable eaten warm. Slack baked bread is abominable and indigestible. It may contain uncooked starck, bacteria, and moulds; and will sometimes sour in theoven. To insure thorough cooking, the loaves should not be too large. A good bread baking oven has a temperature of 400° F to 450° F.

CARE AFTER BAKING:

Remove the bread at once from the tins, and let cool in the fresh air, uncovered. Never rap a cloth around the bread. If a soft is liked, brush over with butter. A crisp crust is more wholesome. When fully cold, store in a tightly covered stone jar. This should be washed, scalded, dried, and aired at least once a week. Never put cut slices into this receptacle, but keep the jar free from crumbs. Never put a cloth into the jar with the bread.

KINDS OF BREAD:

Rye Bread is very extensively used in northern European countries. A sandy soil is well adapted for the growth
of the grain. It yields a flour darker than wheat flour,
and is almost equal in nutritive value to wheaten bread.

Barley and oats, which when used as bread, are generally made into cakes or bannocks, possess a composition not unlike wheat.

Indian corn which thrives luxuriantly on the American soil, and is largely used there for bread, as also to a considerable extent in the Old World, is little different from wheat in the proportion of its ingredients.

Rice is occasionally employed in making bread, but it is not nearly so nutritious as wheat. With the exception of rice, the various kinds of grain do not sensibly differ in the amount of nutritious matter, yet their difference lies in their gluten content, wheat being rich in gluten, and therefore yields the best bread.

Brown, Composition, or Whole Flour Bread is made from ground bran as well as the flour. The great argument in favor of the use of whole wheat bread is that it contains more nitrogen than white bread, which is true. A straing argument against the use of whole meal bread is that gritty particles present in bran cause an unnatural irritation in the alimentary canal, which explains why brown bread possesses laxative properties.

Gluten Bread is a bread prepared in such a way that it contains no starch or sugar, so as to be suitable as a food for diabetic patients. The flour is made into a stiff dough with water, and allowed to stand for a short time, usually one hour. It is then kneaded under running water so as to separate and wash away the starch. When the water ceases to be milky, the remaining gluten is rolled up into small rolls and baked.

Aerated Bread consists in placing the flour in a strong box and moistening it with carbonic acid water. The dough is then worked up by machinery for ten minutes or so inside the wox, from which it is dropped into moulds which form into loaves. It is then placed in the oven, when the carbonic acid, previously introduced with the water within the dough, expands, and forms a light and palatable bread. Not having undergone the process of fermentation it lacks the peculiar sweet flavor we are accustomed to, and the palate soon tires of the somewhat vapid taste.

STANDARD OF GOOD BREAD:

Bread, if good, is light, uniform in grain and color, not necessarily white, same even pores, thin crisp crust, taste and smell sweet, and crumbs in little pieces when rubbed with the fingers,

Opinions differ as to just what properties good bread should possess. Some wish a moist crumb and a tender crust, others a dry crumb and a flinty crust. But there are certain points upon which all agree: namely, bread should be agreeable in smell and taste, while it should be light and porous, to be easily penetrated by the digestive juices. The bubbles of the crumb should be uniform in size and small. The surface should rebound when compressed and the loaf should keep in good condition several days.

CAUSES OF BAD BREAD:

Sour bread often results if the dough is allowed to rise too long. It is due to the development, during the fermentation, of certain acids in the dough, which come, not from the action of the yeasts, but from the growth of bacteria that are present either in the yeast or flour. The acid produced is either lactic, acetic, or butyric. Frequently it is a mixture of all three, but ordinarily it is lactic acid, that found in sour milk. The bacteria which produce sour bread do not come wholly from impure yeasts, but from the flour as well, especially the low grades of flour.

The same trouble may be due to unclean utensils, which are sure to have anumber of bacteria attached to them.

Recognizing then that bacteria cause sour bread, it is not difficult to suggest proper means to avoid it.

Fresh yeast only should be used. A good quality of flour should be used, and the dough mixed in clean utensils. After mixing he dough should be placed in a clean dish at a proper temperature (75° F in summer and 90° F in winter), so that the bread will rise in about eight hours. Strict attention to these details will commonly remove trouble.

Heaviness in bread is usually due to lack of thorough kneading, to chill, or to insufficient raising.

Heavy streaks often come from allowing a hard crust to form on the rising dough, or from the habit some women have of rubbing off little wads of dough from the fingers in mixing.

Large holes in the loaf come from wheven or insufficient kneading, from over raising, from careless shaping, or from too high temperature in raising and too low temperature in baking. Over raising also gives a flat, insipid taste.

If your loaf, when you come to bake it, looks over puffy or tumbled in, take it from the pan, knead a little, and let ride again.

Cracks are caused by the use of too much flour in

shaping or by placing in too hot an oven at first.

Rolls require a hotter oven than loaves, and should be allowed to rise more, since, being so small, the heat penetrates and rising is checked quicker than in loaves.

Flatness is often due to too large a pan- the dough spreads outward rather than upwards.

Uneven shape comes from careless moulding and from allowing one side to get hotter than the others.

Dryness results both from over and under kneading, from unsuitable flour, and from too much yeast. Milk bread is more inclined to dryness than water bread.

Mouldy bread is due to slack baking or to infected crocks, tins, or bread cloths. These should be regularly scalded and aired.

Bread will bulge over the pan when allowed to stand too long before baking or if put in too slow an oven.

EXPERIMENTS:

BREAD SPONCE

For bread sticks at banquet

12 c flour

8 c water

4 yeast cakes

8 t salt

8 t sugar

8 t butter

Heat water to boiling, add salt, sugar, and butter. Let cool and add yeast cakes. Beat in flour.

When dough is light form and roll into long, thin sticks. Put in buttered pans and bake in hot oven when light.

BOSTON BROWN BREAD

l c ry e meal

2 c sour milk

1 c corn meal

1 t soda

1 c Graham flour

1 t salt

3 c molasses.

Place in buttered steaming cups, cover with buttered or oiled paper and steam $3^{1/2}$ hours.

NUT BROWN BREAD

1/2 T lard

1/2 T butter

2 T molasses

1/2 t salt

1/2 c water

1/2 e milk

1 yeast cake

1/2 c white flour

2 1/2 c whole wheat flour

1 c chopped nuts

Follow out the same method used in making white flour bread, adding the nuts with the last addition of flour.

STARCH AND GLUTEN

Mix flour and water to form a dough. Let stand a short time, then wash it on a sieve over a pan of water. Let the water settle; and when poured off, a white mass, which, when dried, is found in the pan, as dry as dust. This is starch. And the doughy, gray, elastic mass left on the sieve, which may be taken up and pulled like candy, is gluten. These are the chief constituents of flour, and their relative proportion determines the character of the flour. Gluten gives a strong gray flour of slightly bitter taste. When baked, gluten bread is very porous. Lacks the familiar taste of whole wheat bread. Is used for diabetic patients.

PARKER HOUSE ROLLS

3 o flour

1 c milk or water

1/4 yeast cake

1 T sugar

I T butter

1 1/2 t salt

Roll 1/3 inch thick. Shape with biscuit cutter, brush 1/2 with melted butter, fold. Piace close in pan to rise.
When light bake in a hot oven.

BREAD

(Slow process)

3 cups flour

1 teaspoon salt

1 teaspoon sugar

1 teaspoon butter

1 cup milk or boiling water, or

1/2 cup each

Scald milk or boil water before using. Discolve sugar, salt, and butter in the liquid. Cool until luke warm. Add yteast cake broken in small pieces, and stirred smooth in a little of the liquid. Beat in half the flour, using a wire beater. Set to rise in a warm room 4 - 5 hours.

When doubled in bulk, add enough more flour to make the bread stiff enough to mold. Pour on floured board and knead

ten minutes. Form into a loaf. Put in a buttered pan and set to rise again 1 - 2 hours. When very light bake in a moderatley hot oven 45 - 60 minutes.

QUICK PROCESS

Double the quantity of yeast for quick process.

GRAHAM BREAD OR RYE BREAD

Use 1/2 Graham or Rye flour and 1/2 white. Make sponge of white. Then add Graham or Rye in mixing.

BREAD WITH YEAST FOAM

Use yeast foam- about 1/3 cup. Enough other liquid to make 1 cup. Proceed as in other bread.

Many good recipes are given for making good bread,
but the one that I find that proves most successful is known
as "Pailroad Pread". It is a "Tried and true", and very easily followed out.

YEAST FOR RAILROAD BREAD

Take 12 large, mealy potatoes, put on and cook until done. In the meantime put together one half pint of sugar, one half pint of flour and scald with hot water; soak one yeast cake in one half pint <u>luke warm water</u> until thoroughly dissolved, then add to the other ingredients. Mash the potatoes through a colander, with all the water they were cooked in, and add enough cold water to make the whole amount two quarts. Add to this one-fourth pint of salt. When this is cool, add the rest, and put aside to rise.

Bread made by the above recipe must rise but once.

As soon as sufficient flour is added to mix out well, the bread is at once placed into greased pans and set to rise.

When quite light place in the oven and bake. Bread made in this way may be baked and ready to use in less than 3 1/2 hours.

In closing let us not forget to mention the bread mixer. Too much praise cannot be given it. It is a blessing to every woman who owns one. It saves time and labor and mixes the dough more easily and thoroughly than can be done with the hands. Twenty minutes or more may be required if the hands are used; five minutes with the mixer.

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