

feel the astringent effects on the coats of the mouth, can easily conceive the effects of the same treatment of the delicate coats of the stomach day after day, to say nothing of the alum transmitted to the blood. The extent to which this adulterant is used is shown by the fact, that out of a large number of samples of bread analyzed in the city of Boston, more than 700 contained alum. Dr. Henry Mott, in recent investigations, analyzed 24 samples of baking powders and states he found alum in all of them, and that in three of the samples submitted to him for inspection, in one he found 19 per cent., in another 26 per cent., and the third as much as 29 per cent., while others were almost wholly alum powders. This I have only to add my own testimony, having travelled pretty extensively as a journeyman baker, and been witness to its use by commercial bakers both in Scotland and England, and more especially in the great city of London, where I have been employed, where the amount of this adulterant may vary according to the caprice of the boss from 8 to 12 ounces in a batch of 500 to 600 pounds of bread, in lieu of the same weight of salt due to that quantity of bread.

Bread adulterants, however, are not in all cases additions made by the baker. Millers not infrequently employ several substances for the purpose of whitening or otherwise improving the flour or fraudulently increasing its weight. Rice meal, bean meal and corn flour, have been detected in the products of the flour mill; but these are harmless in the face of chalk, sulphate of zinc, bone ashes, dolomitic gypsum, china clay, and even heavy spar have been used for that purpose.

Alum is used by the bakers who make bread for the market, where much competition prevails, in order to cause weak or damaged flour to retain more water and whiten the bread, and in some cases this adulterant is used in bread made from sound flour by individuals who lack knowledge of the science of panary fermentation to improve the color only, and if I am correctly informed, in some of our American bakeries they go a little farther, by the use of sulphate of copper, blue vitrol, in both bread and crackers, for the same purpose, a chemical substance even more dangerous, when added to an article in daily use, like bread. As I have already remarked, the lack of knowledge of the science and chemistry of panary fermentation and its preparation for bread raising purposes, is one of the chief causes that lead men to add these destructive mineral chemicals, to supply the deficiency in regard to the various methods and forms in use among commercial bakers. At the present day, in making yeast, there is a great diversity of opinion as to the merits and system of management in the various kinds of material employed in bread fermentation. These may be classed under three heads, viz. bakers' yeast, brewers' yeast, and bread raised by the chemical process of using a strong acid and a carbonate. This last named process yields unfermented or raised bread, and much of this kind has lately come into use in England, but from the fact that the materials used come properly under the name of salts, but very little common salt can be used in dough making, and hence the bread made is tasteless and insipid. The same may be said of bread made under another process also in use in some parts of England, known as aerated bread. Here the carbonic acid gas is prepared beforehand in a condition of perfect purity, and in a separate vessel. The gas is then forced into water, which becomes highly charged with it, like soda water, the flour is then mixed with this aerated or carbonated water in a strong iron vessel, under pressure. The dough thus formed rises when put in the oven, the gas with which it has been charged, expands and escapes on being withdrawn from the pressure of the mixing vessel, and still more in being heated. The gist of all these different operations in bread making is intended, if possible, to improve on the original of hop yeast fermentation for bread raising purposes; but in all cases the mineral is there and cannot be sold as a wholly vegetable production, no matter how it may be manipulated, besides the expense of the machinery and keeping up repairs. Brewers' yeast, as it is known, is the froth that rises on the surface

of beer and other liquors during its fermentation, consisting principally of a fungoid plant. This plant was said to be first discovered in malt beer in 1680, and its origin, as developed and traced by chemists from that day down to the present, is full of interest. Immense and increasing quantities of German or dried yeast, carefully prepared for bread raising purposes, are now imported into Europe and extensively used in some of the leading cities of America in the manufacture of what is termed Vienna bread; its chemical action on the flour when made into dough is quick and rapid, making it ready for the oven in a few hours, but on the other hand, if not quickly handled after attaining to a certain point, the fermentation dies and the dough rendered useless for any other purpose. All kinds of brewers' yeast made from malt is of the same nature, being the outcome of the destruction and decay of the grain previous to brewing, and the scum or froth that rises to the top composing the yeast plant is decomposed and in the putrefactive stage before it gets into the hands of the baker, hence it is not adapted for large batches of bread, and will not make any kind of bread saleable for the market, unless it is fresh and immediately used; altogether it is a substance quite foreign when mixed with wheat flour, and imparts a musty flavor to the same at best.

Baker's yeast proper is composed of flour scalded with boiling hop water, or hops and malt, or both combined, according to taste or habit of the operator, which forms what is termed stock yeast, which in most large establishments in Scotland and England, undergoes a second process of fermentation, with an addition of potatoes and flour previous to dough making, while a few others in the south west of Scotland use the malt stock as a base, without potatoes, in the form of quarter sponges made from the raw flour.

Without attempting to discuss on the various methods in the preparation of the yeast plant, which would occupy too much space on this subject, I will merely remark, notwithstanding the thousand and one methods in vogue, to be found in cookery books and periodicals of the day, the yeast maker may repeat the process for a lifetime, but without a thorough knowledge of the nature of the material used, and its chemical action on the flour in the process of fermentation, he operates or cannot control it at will. The amount of good flour destroyed annually through failure of the yeast plant in the hands of the baker, commercial and domestic, in all parts of the old world and the new, is witness of this fact. Even such men as M. Pasteur and other chemical celebrities, who have made the various phases of yeast fermentation their close study for years, could not define the chemical action of the yeast plant in bread fermentation, so as to come within the scope of comprehension of the ordinary commercial baker. It is well known to the trade that their stock yeast will degenerate in proportion to the frequency of storing or starting it with seed of its own kind. For years back and up to the present day it is customary for the baker to apply to his neighbor craftsman for fresh stock to renew his own, sometimes as often as every second or third brewing, if not well versed in the art of preserving it. One of the principal causes of the deterioration of stock yeast, if not scientifically prepared, will generate a certain amount of acid, this acid is the active destructive principle in all vinous fermentation, its tendency is to decompose the starch and gluten of the flour, and it generated in the stock, will increase in strength at every stage in its progress, and the result is, if the bread is not actually sour, it will leave traces of acid which can be detected by consumers of keen taste after the bread is cold, more especially in starchy, weak flour that has been robbed of its gluten, for the reason that the starch of the grain being of a softer substance than the gluten it yields first to the action of the acid. There are two kinds of acid—that of mineral and vegetable—the former may be made strong enough to dissolve and decompose rocks, bones and various kinds of metals, and the latter made to decompose and destroy any kind of vegetable substance. Its power of decomposition may be learned by leaving a steel knife blade in vinegar, and in a short time

it will corrode and eat the metal completely through. Sometimes the miller, having but one run of stone, if overpressed with business, to supply his customers may allow it to run beyond its proper grinding capacity on one dressing till it becomes perfectly glazed, and in this condition, if overfed, will destroy the gluten of the grain in overheating by excessive friction. A good deal of bad flour is made in this way, and when it gets into the hands of the baker, he is puzzled to know whether the flour or his yeast is at fault. Where this happens in milling it will darken the natural color of the bread, and however sound the yeast may be, it will not rise to the same height in the process of baking, besides being wet and soggy, making it difficult to bake except in a well tempered oven, to which the generality of our American stove ovens are not adapted, where digestible bread is the object sought.

A good deal more might be said on the art of cooking wheaten bread, if space would permit, but may be made the subject of a future article. I would like, however, before closing, to note a few items in regard to the preparation of Graham flour or meal. Medical men tell us, what we all believe to be true, that wheat meal is the most healthy to use; but they do not instruct us in the art of how to cook it in the way of extracting the nutritive properties of the whole grain. As the quack doctor facetiously remarked, you may eat bran till you become all bone. In our American household economy, where the whole meal is used, whether made into bread by the use of yeast powder or yeast fermentation, as a general thing, the meal is prepared whole as it comes from the mill; the bread made from it is digestible enough, on the same principle that whole wheat will pass through a horse without excretion in any of the nutritive qualities of the grain in the process of assimilation and digestion. The outer coating or bran of the wheat composed in part of woody fibre, and to extract any nutriment that remains, it must either be kiln-dried and reduced to powder, or reduced to a pulp by boiling or steaming. Previous to its admixture with the dough made from fine flour, that is, instead of working the yeast with the whole meal, the fermentation should be set in fine flour in the usual way until it has risen, and the proportion of bran due to the wheat previously scalded with boiling water, into which put a pinch of sal soda, mix altogether, bringing up the dough to the required stiffness by adding the shorts or fine middlings, and when light enough, bake. If the yeast be fresh and free of acid, you can produce a loaf of Graham bread fit for the table of the gods. The sal or washing soda is very powerful in softening hard water, and a small pinch of it won't hurt if put into the tea kettle by lovers of a strong cup, besides a saving in the quantity used. This I learned from an old maid more than 40 years ago.

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