The Baker's Book

A Practical Hand Book of the Baking Industry in all Countries

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PROFUSELY ILLUSTRATED

Translated, Edited and Published
by
Emil Braun

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Baking in France

Researches and Translation by Emil Braun

The number of bakeries in France is estimated at about 80,000. Outside of the military and other Government bakeries comparatively very little machinery is used and the small baker is still predominant in most of the provinces; in some parts the trade is almost exclusively in his hands yet. But in the northern districts near the Belgian frontier the workmen in the large industrial centres have lately started coöperative societies, which frequently set up their own bakery plants. Outside of these coöperative bakeries very few can be found in France which produce more than 3,000 pounds of bread a day.

The French bakers as a rule use "*sour* dough" in all their batches; the principle of their bread-baking is based on slow fermentation. The Paris bakers attribute the reputation of their Fancy bread, the light, large loaves, crisp and white, to the use of extra care and work in refreshing ferment and sponge. Organization among French bakers is very poor, both masters and journeymen. In some cities Bakers' Syndicates are in existence, about 60 in all, with not more than 1,500-1,800 members. The central Syndicate is in Paris, which is very wealthy. The members own a valuable piece of property at the Quai d'Anjou, where they have a bakery with six ovens, a chemical laboratory, a library and also the headquarters for the distribution of their bread-checks.

The working hours of the French bakers are not controlled by law. The wages paid average 60 francs ($12.00) per month and board. Only in Paris the bakers are paid weekly, where first-class hands earn about 45 francs ($9) per week, with a daily allowance of one kilo bread (about 2¼ pounds) and 20 centimes for wine.

THE Bread of Paris

BY

W. S. HARWOOD.

A BREAD CART.

THEIR DAILY BREAD.

By permission of
The Northwestern Miller.

If it is possible for one to imagine a compound, composite noise composed of one part grunt, one part hiss, and any number of parts of labored breathings, one may gain a pretty fair impression of a man at work on the bread of Paris.

And a wonderful thing is this bread of Paris, wonderful in its extent, its popularity, its powers of sustentation. It is made between the hours of nine in the evening and five in the morning, made for the greater part by the men from whose deep chests and distended nostrils come the savage sounds I heard the other evening as I watched them at work in a typical bakery.

Let us take a look at the workman and his work. He is stripped to the waist; he has nothing on his smooth white skin but a brownish coarse cloth, cinctured at the loins and falling in folds on his bare legs. On his feet are sandals, on his head nothing but a crop of ebony hair, thickly besprinkled with flour dust.

bks

It is a little after nine o'clock in the cool of a late summer evening, and yet it is hotter than you care for in this bakery below the streets of the city, and it will be hotter still before the day dawns; and this stripped kneader knows it, and is garbed for the temperature, not for the boulevard.

By eleven o'clock it will be 120 degrees Fahrenheit in the room. He is a picturesque figure—you need no stretch of imagination to pronounce him one of the most picturesque figures you have seen—Egyptian in type to a marked degree, as he stands at a deep trough or bends down into it with monstrous moans and grunts and hisses, and pulls the vast mass before him with a fury of a man insane.

He has mixed up the flour and water and salt earlier in the evening and there is nothing else in the big deep trough before him, no milk, no yeast, no sweetening of any kind; flour and water make up the bread of Paris.

From to-day's dough of yesterday he has kept out a patty which he has allowed to sour over night, and this he mixes with a mass as the water and flour are merged by his swift hands.

sour dough

Of course, here and there throughout the city there will be found those who mix their bread dough by machinery, but you may rest quite sure that any one of the sixteen different kinds of bread made in Paris, which may come to your table, will in all probability be the product of the brawn of the man at the trough.

Woman Bread Carrier.

Just now, when the rise in the price of wheat on our side of the Atlantic is known, and the general indications of still further stiffening of the flour and grain market are felt, the price of bread here has gone up a bit, and, though it was only a few sous a loaf at the outset, all Paris is stirred, and there are many conferences and discussions over the best way in which to meet the rise.

Our man at the trough has gotten his yesterday's dough well kneaded into the mass now, and, with a swoop of his muscular arms, he dips down into the trough, snatches a great handful of the dough between his wide stretched fingers, grips it mightily, and, with a peculiar savage sound, as though he were some enraged beast tearing its prey limb from limb, he pulls out a section of the mass, turns it at once with a vicious snarl, throws it down, pushes it into the larger mass, covers it over, seizes another great handful and goes through the same program, and so he works, like a demon in distress.

But, when he turns to look at you, there is nothing demoniacal on his handsome French face, and he smiles at you as he answers questions, quite as though he had not just been making certainly the most diabolical noises I ever heard from a sane and sober man. With a short sharp knife, he separates the mass into a section, say, large enough to fill a small barrel.

This he puts in one corner of the great trough—a trough perhaps eight feet long by three wide at the top and two at the bottom, and about two and a half feet deep. This section he puts by itself and covers it with a cloth, leaving it ten minutes to rise. Of course, there are certain fancy kinds of bread, for instance, the "Fantaisie," as they call it, a more fanciful type of bread which is raised in a different way and has some yeast introduced; but the real bread of the city has nothing but a bit of its own kind, slightly soured, to help it up in the world.

All the while our Egyptian mixer has been frantically seizing the contents of the trough, his fellow—as they work in pairs—has been attending to the oven.

The oven isn't quite such an affair as the one in which your cook prepares your daily bread, not like the old-fashioned Dutch oven your grandmother used, not like the strange little electric oven which I have seen at work in one of the offices away up in the top of the Guaranty Loan Building, where a keen-faced man tests, day by day, the flour of one of the great series of mills of Minneapolis.

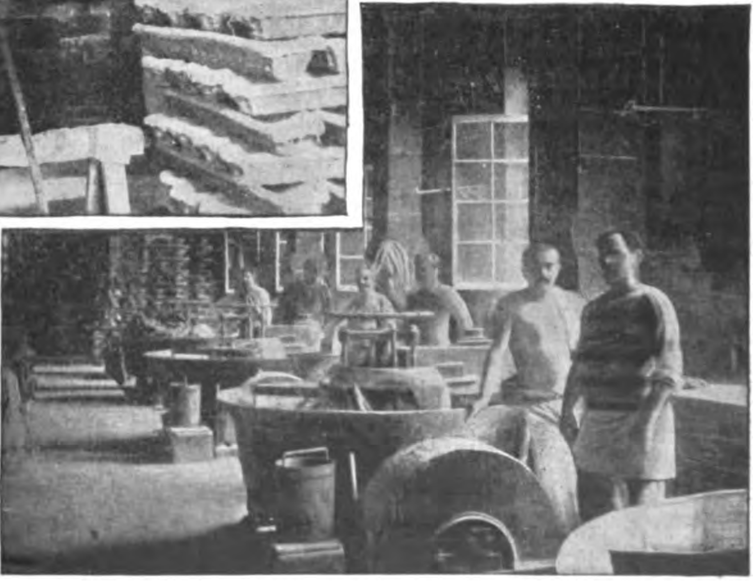
This French oven is an enormous slit in a wall; that's the nearest I can come to an adequate description of it. It is perhaps two feet wide at the opening of the slit, which, immediately at the entrance, broadens out into a wide shallow cavern, where the bread is baked. It is not heated from a fire in a furnace below; it has no gas or electric heat; there is no possible contact with the bread and the blaze; in fact, there isn't any fire. This may seem a singular statement to make, but it is literally true. There has been a fire, and the inside of the shallow, wide, oven is hot to intense heat; but the fire has all been drawn.

Long pine wood, about the size of an ordinary piece of cordwood in America, has been burning in the oven itself for hours; not burning furiously, for the thrifty baker will use the charcoal that is left or sell it to his customers, so that the pine wood just smoulders. But there is enough of it to make an intense heat; and the walls of the oven being of stone and brick, and there being no way for the heat to escape, the oven is kept hot from one day's end to the other.

By a simple draught device the gas from the charcoal is allowed to pass up the chimney, and by an ingenious system of draughts, the heat in the oven may be regulated at will, simply allowing more cold air to come in when the heat is too strong.

But the baker knows just the heat needed to bake the dough to the golden brown of the bread of Paris. If the heat has died down somewhat and there is need of more before the night's baking begins, the furnace-tender puts into the furnace, not fresh fire, but just wood—more of those

Before the Oven.



In the Mixing Room.

long pine pieces, which have been heated to an intense hotness, just to the point of burning, and which have retained their heat in the warm room.


Interior of Bakery

Distributing Room.

They are so hot you cannot bear your hand on them, and, on a long wooden paddle, the workman puts them back in the oven, charged with heat to warm up the interior.

By this time the mixer has his dough ready for the scales. The other workman leaves the furnace, steps up to a broad board now placed over one part of the trough and waits the motion of the mixer.

But he doesn't have to wait long, for the mixer is a man of surprising swiftness, and with a deft cut of his knife he slices out a handful of the dough and flips it on a pair of antique brass scales with their rattling chains. On the other side is an iron weight, just the weight the dough must be before it is ready for the oven.

The other man grabs the quivering mass of dough, manipulates a moment, and, before you have time to see what he is really doing, he has it in whatever form the batch is to be made into—short, roundish rolls, larger ones and slender, or what not. Deftly he flips it into a long wicker basket, lined with coarse cloth, and piles this basket up with others on the floor.

They are about three feet long by three inches deep and perhaps six inches wide at the top. These are the baking tins of Paris. When the pile of the baskets has grown to the height of a man's head, the oven director, so to call him, swings open the door, and with his long wooden spade puts the contents of the baskets into the oven.

There they sit and bake and bake, until the brown loaves come out russet, or golden, or just touched with yellow, or even hardly lighter than milk, as fancy may say, and done to a turn through every fiber, as toothsome a bread as one needs to eat. The crust is quite thick, sweet to the taste after long chewing, and the body of the bread is light and delicate, without being doughy in the least.

And so these Egypto-Gauls keep up their work while Paris sleeps —such part of Paris as indulges in this function—and when the night is old and the sky is gray in the East, tired as only men can be tired after physical labor the most exacting, they go homeward, while the women in their blue dresses are gathering at the bakeries for their stock of the product of the night's hard toil.

These women will carry the bread to your home, if you are so fortunate as to have a home to go to in Paris, and will leave it at six o'clock at your door. You will see them with curious little carts, or bearing the bread in baskets, or, perhaps, oftener, carrying it in loose flowing blue aprons, with the loaves swinging by their side as they walk.

Now and again you will meet some early bread-carrier heavily laden with great poles of bread, long slender loaves taller than the tallest Frenchman in the republic, or, if that is too slight a figure, taller than the chiefest among all the hated Prussians whom you may see sauntering, amidst the suppressed sneers of the populace, along the boulevard. Alsace and Lorraine are not buried; they are above ground and intensely alive. The bread must all be weighed to such as come to buy at the shop overhead, which has opened at, say, half-past five in the morning, to dispose of its share of the product of the night's baking.

The seller of the bread must sell it on the square, so to speak. If he is caught cheating, better were it for him, commercially speaking, that he had never been born. He throws a loaf on the scales; it does not weigh quite enough. He seizes another loaf from the table, guillotines it, in the true French style, under a keen knife below the counter's edge, adds the caput to the loaf, just enough to make the weight precise, and the purchaser drops his sous and carries the bread away in his hands.

Perhaps some special customer, who appears to be more noteworthy in the throng, might be favored with a bit of brown paper about the parcel; but that would be a distinction quite out of the ordinary. The populace takes its bread and carries it away in its bare hands.

Speaking of this reminds one that the woman who brings you your bread in the morning is *sans chapeau*. Possibly some of the readers may be interested in reading something as to the definite formulæ for making some of the various kinds of bread of the city. The main, all-important bread, which makes up such a large amount of the food of the masses of the people, is made, speaking in a general way, like that described above; but here is a more definite recipe, compiled for me by a Paris baker of long experience:

Keep always from the preceding day about two or three kilograms of dough. Six hours before commencing work, replenish the dough, called "chef," with two litres of water, with which you make a dough, working it for twenty minutes.

Let it ferment for two hours, and then add to it five litres of water and work as before. Then again let it ferment one hour and a half and begin working it for the first baking, adding to it twenty litres of water and three hundred grams of salt. This will make from fifty to sixty loaves of two kilograms each.

When the dough has been thoroughly worked with the arms and made very smooth—about fifty minutes' working being necessary—it should remain at rest ten minutes. Then form it into loaves of the required style for the night's baking.

The dough must be weighed, two pounds, two hundred grains for a loaf of two livres (pounds). The dough, after being formed into loaves and placed in the baskets, called "Bannetons," in tiers of six, one above the other, should stand near the oven, where the air may circulate around it for about two hours before placing in the oven. Thirty-five to forty minutes suffices for the baking.

For Vienna bread, take seven to eight hundred grams of raising—which has a basis in hop yeast—to one hundred kilograms of flour.

With this, add water, forming a dough called "Pouliche." The dough should have the consistency of "Crepes," a kind of pancake. Let it rise fifty minutes, then add more water to knead, and salt. The more thoroughly the pouliche is kneaded, the lighter will be the bread. The baking is similar to that of the regular French bread of the former recipe.

For "Pain de luxe," pour into a bagnet three litres of tepid water, add one hundred grams of yeast, and enough flour to form a pouliche of the consistency of the dough of crepes, the pancakes. Let it remain rising for several hours. then place this pouliche in a kneading trough, add two litres of cold water and salt, and proceed with the kneading as with ordinary bread.

Before putting into the oven, cut the top of the dough with a sharp steel knife, to prevent the bread from becoming too much inflated in the oven. Brush the loaves over with cool water on taking them from the oven. From the dough of this "*pain de luxe*" may be made all the ten or twelve kinds of fancy breads—"Tire," "Bouchons," "Empereurs," "Couronnes," "Vock," sandwiches and so on.

The fancy breads sell at various prices, according to the location of the bakeries in the city, the character of the patronage, and the like; but the bread of Paris proper, the mainstay and staff of the people, sells for practically the same price the city over, twenty centimes (four cents) per pound. It is sold by the pound universally. Just at present the price is fluctuating slightly on account of the general rise in breadstuffs. The workman baking in the hot cellar receives. on an average, about eight francs a day, $1.60; not a very high wage for such tremendously hard work. to be sure, but high for Paris, where a good many men are glad to get forty cents a day, and where there are some who are living on less, or, rather, trying to live.

The bread of Paris is not all for the active civilians. There must be bread for the soldiers, and bread for the inmates of insane hospitals, and for those detained for cause in the dim and gloomy prison of de la Saute, and for the unfortunates, or, perhaps, in many cases, the fortunates, who are cared for in the great hospitals.

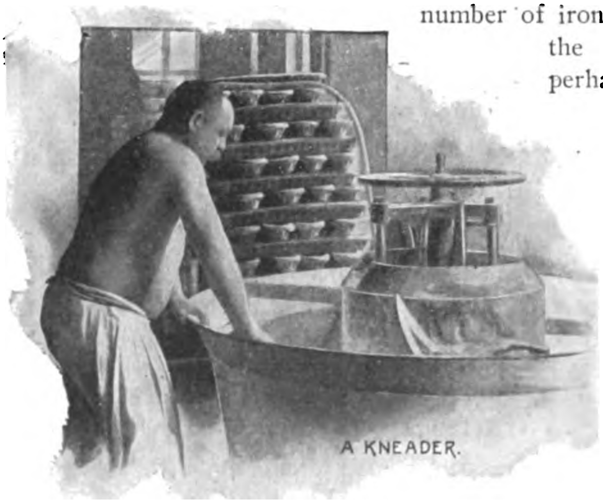
Let us take the bread-making for those who are in the latter institutions, and it is practically the same in all. The building is a large one, covering nearly a square on the rue Scipion; a building of the thirteenth century, once a nobleman's palace, later a convent, now a bread-making establishment. And yet it is more than that, for all the flour is ground on the premises.

A part of the institution has been remodeled to the needs of flour grinding. The process, I suspect, would make a modern Minneapolis miller smile; and yet, primitive as much of it is, I am not so sure but that the results are quite as satisfactory, in some ways, considering the ends aimed at, as though more modern methods were employed.

The finished flour comes out excellent in texture and just tinged with yellow. It is the aim of the milling, so the superintendent says, to get out of the wheat for the hospital patients the very best that is in it; so that the patients may have the most nutritious food possible.

The mill, which grinds out 20,000 kilos of flour a day, say 225 barrels, is kept busy the entire twenty-four hours of every day in the year, to meet the demand. About fifty per cent of the net product of the flour is made into the best bread, and the rest into a second-grade bread.

Each day about 11,000 pounds of bread are made and distributed to the hospitals of the city. The making of the bread is on a large scale; yet the methods of the bakers of the bread on which Paris feeds are precisely the same here as to quality and kind; salt and flour and water is the composition from which the fine, long, rich-brown loaves come. But, to make so much bread in a day, the aid of machinery has been invoked, and, in the long baking room, there are, perhaps, a half dozen great ovens capable of holding hundreds of loaves of bread at a baking. The mixing is done by machinery, a number of iron tubs being set along the rooms, each holding perhaps two or three barrels of dough. There are two fin-like arms which revolve in the dough, keeping it constantly in motion, as the tub also moves in the opposite direction. The baker in the small shop will tell you that good bread cannot be made by machinery, and the baker in the large rooms of the hospital manufactory tells you that he is a fool who says good bread cannot be mixed by machinery. But you can eat of both types of bread and find them excellent; so we may leave the discussion to the experts.


A KNEADER.

Here the men work with nothing on but a strip of linen cloth caught about the loins, and low sandals on their feet. There is a large room adjoining the main bakery where, in a deep stone trough, each baker must stand every morning before he begins his labors, and be washed from head to foot; something which the inmates of the hospitals of Paris may be glad to learn. When the bread has had its finishing touch in the oven, it is carted out to the weighing and cooling room, where it stands in vast crates of shelvings, thousands of loaves ready to be taken out to the hospitals. It is remarkably uniform in color, texture and size. Every morning, as the bread vans begin their journeys to the hospitals, the long room is filled, every inch of shelving space being needed to store the loaves. Toward noon there is a great thinning out, and by night the supply is exhausted.

The workmen in the municipal bakeries receive from six and one-half to seven francs a day, from $1.30 to $1.40. They work eight hours to the day. Fifty-eight per cent. of the wheat in the milling is available for the flour.

Thousands of poor people are fed at the public expense with soup and bread; so that the bread of Paris is philanthropic as well as edible.

And a word as to its edibility. It is a toothsome bread, as it has been said, sweet to the taste, forming no paste in the mouth. There is no suggestion of doughiness in it, nor is there any over production of holes, so to speak. It is light, but not so light that it cheats you or your stomach. All the weight must be there, and with the weight must be the nutriment, for certainly there is a large element of nutriment in it. The inside of the bread is slightly yellowish. There is nothing of the chalky whiteness we see at home in some of our bread-stuffs, either in the flour or the bread.

There is an enormous consumption of bread in Paris. In fact for many people it forms the main staple of diet. An estimate has been made that the consumption of the bread of Paris, the main bread, not the less used fancy breads and the still smaller number of cakes and biscuits and what not, reaches the enormous amount of 3,000,000 pound-loaves daily.

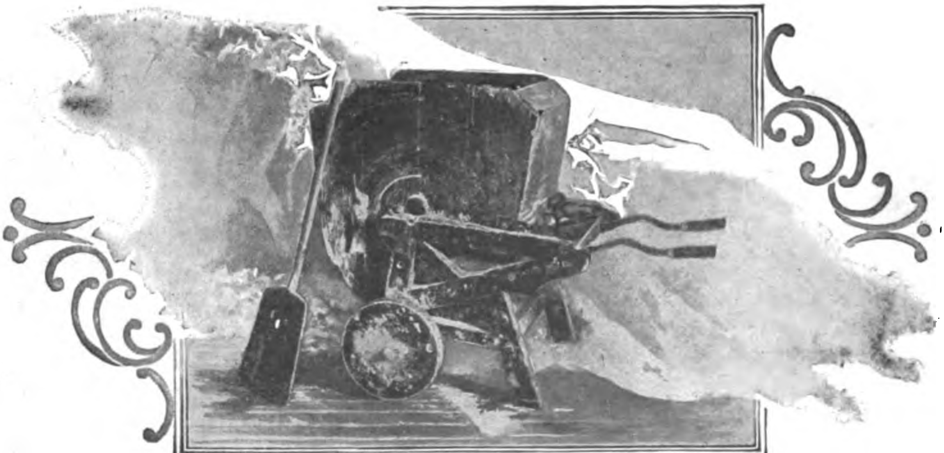
It should be noted, too, that there is a large consumption of rye bread; and the ginger bread of the city, made with a sweetening of honey, is one of its important institutions.

There is no more picturesque character in Paris than the flour carrier. His distinctive characteristic is the great wide brimmed hat which he wears. It is from two to two and a half feet in width, made of the heaviest felt, so heavy, indeed, that it would take a tremendous blow to dent it. The crown is round and very thick, so thick that a heavy weight may be placed upon it without in the least crushing it upon the scalp. The hats are a marked protection against bruises or injuries from the great loads which these men carry. These flour carriers have organized themselves into an order, more honorary, I think, than secret, but an order into which it is quite difficult to get without due and ample credentials of standing and efficiency.

The flour, which comes down into the trough of the mixer in the bake-shop by way of a tube and a long cloth pocket, may have been ground from continental wheat, or, it may have been ground from wheat some of which was raised on one side, some on the other side, of the Atlantic. Frequently the American and French wheat, or wheat from other continental points, is mixed half and half. Deputy Consul-General Bowen finished some statistics as to the amount of cereals imported into France from the United States.

For the year 1896, there was imported into France from the United States 1,680,039 metric quintals of grain and flour, to the value of 20,815,870 francs ($4,163,175.) On this was paid a duty of 4,652,175 francs, or $930,435. Of this amount the far greater portion stayed in France, only a very small portion—166,810 metric quintals, of a value of 2,182,042 francs ($436,400)—going to other continental points. The indications are that the importations of American wheat into France will keep on increasing.

A quintal is equal to 220.46 pounds.



FLOUR BARROW.

FLOUR USED IN FRANCE.

As a rule the French bakers use domestic milled flour, made from grain grown in their own country. France grows 70 per cent. of its own grain on an average; the other 30 per cent. is imported, principally from Russia and America. The Parisian bakers prefer the Hungarian flour for their "Fancy" bread and rolls. That means very dry flour, rich in gluten. If they find one brand that suits, a contract is frequently made for the whole year's supply. The French bakers in New York are doing the same thing. The bread specialties illustrated on colored plates III. and IV. are: No. 1, split, long loaf, called *"marchands de vin feudu,"* weight 2 kilo, length about 1 metre, 160-180 mm. broad and 60 mm. thick. It is pressed down through centre before set to proof. No. 2, rolled long stick, often measuring 1.4 metre (over a yard long), called "mardand de vin roulé." No 3, round, common loaf, weighing about 2 kilo. This is the original loaf of French bread, but is now principally found in country towns only. Similar to this is the "boulot," almost as round as a ball and slashed crosswise. Very strong flour is used for this bread. It takes a good steam in the oven.

No. 4, *Ripped Ringbread* is a specialty of the Champagne province.

No. 5, *Cut Ringbread,* popular in the Normandy and in Burgundy.

No. 6, *German or English Bread,* not made so much in late years. About 10 per cent. potatoes are used in the dough; is made in different shapes.

No. 7 represents the Kaisersemmel, called "Empereur's" or "National." (For formula, see Vienna bakery.)

No. 8 (colored plate IV.), *"Polkabread,"* weight 2 kilo, about a half yard long and 1-5 metre wide. It was originated from the "boulot" loaf; the proper setting of this loaf is the main point. It used to be only a luxury bread, but since sold by weight its demand has increased about five times over.

No. 9, split loaf, weight 2 kilo; about ½ metre long; it is pressed down through centre with the arm and laid upside down between cloth to prove. Softer flour is used for this bread and it is baked after 2 or 3 batches have taken off the first heat. Not so much steam is required.

No. 10-11, the genuine Parisian dinner sticks or Luxury Bread, made in loaves of 1 and 2 pounds, of 4-5 respectively, ½ metre long.

No. 12-13, *"Flutes."* Very thin, long sticks; used extensively to serve with soup.

No. 14 is a small fancy roll called *"Imperatrice"* (Empress-semmel), same dough as Kaisersemmel.

No. 15, *"Tirebouchaus"* (corkscrew), the most popular French roll. Made up after the style of our Coney Island rolls, long, pointy; but when they are peeled to go into the oven they are cut across two or three times. The oven wants a good Schwaden (steam). The same dough as all the above rolls.

No. 16, *"Flute crèvées"* (Borsted flute). The same as the above, only cut once lengthwise on one side.

No. 17, *"Croissants"* (Crescents). Made the same as the Vienna Crescents or Kipfel (see Vienna Baking).

REGULATION OF BREAD PRICES IN FRANCE.

Bakers in France are subject to restrictions and regulations undreamed of in this country. In the fortified towns along the frontier they are bound by law to have a certain stock of flour always on hand in case of emergencies. The bakery not only has to be kept clean, but the baker has to deposit with the local authorities a certain sum of money as a surety for the proper conduct of his business. The law also looks after his weights and measures, which circumstance places him in the same position as the British baker; but, in addition, the law regulates the price at which bread can be sold. Napoleon III. ordered on one occasion that a loaf about equal to our quartern should be sold for not more than sixpence, and this at a time when we were paying eightpence and ninepence.—*Pearson's Weekly.*

For many years the bakers in France have been laboring to secure the repeal of a law which was passed as a temporary measure in 1791. The trade has demanded from the public and from the government that liberty should be given to the baking trade to fix the retail price of bread in accordance with the price of flour and local necessities. As it is at present, the municipal councils have the prerogative of intimating to the bakers the price at which they consider the bread ought to be sold, and, necessarily, this gives rise to much discontent on the part of the bakers. Doubtless, a number of indignant householders, who periodically write bitter complaints to the British newspapers, would like to see a similar institution in their country. There is, of course, a natural feeling of repugnance on the part of tradesmen to the idea of either state or municipal interference in the regulation of the profits which they are to derive from their labors. It is argued that whilst legislators should not interfere with the ordinary courses of business, it is quite within their province for them to do so when the articles supplied are absolute necessities of life. Were there a monopoly in the supply of bread, there might be some reason for the state to step in and declare that it should not be sold above a certain figure. Although there is no doubt that the supply of bread is necessary, and a very important matter for the wage-earning portions of the community, it is safeguarded from any attempted abuse by the free competition which enters into the business. There is no doubt as to the freedom of it, and many of our bakers will be of the opinion that a little less freedom in this direction would be beneficial, and it would prevent the matter degenerating into a license. The great price question is one which seriously affects all bakers, and, however much they may desire that a fair and reasonable profit should be permitted to each worker, there are local conditions which disturb this, and which render it often impossible to secure an adequate remuneration on the capital invested, the labor involved, and the risk incurred. It is in the moments when the yield is incommensurate with the expenditure that the idea of a paternal control by a wise outside power commends itself to the mind which is strained and worried with the unscrupulous and irresponsible competition which exists both without and inside the trade. These feelings are only temporary, and all bakers will realize that in having the liberty of fixing the price at which the manufactured article can be sold, they possess a privilege which they would not wantonly resign. It is for this privilege that the French bakers are contending, and for which they have been working in the legislature for several years. It may be interesting to learn that a few weeks ago the official price in Paris was based upon the yield of 100 kilos of flour selling at 29.31 francs. The expenses of baking are calculated at 12.22 francs, total expenditure, 41.53 francs. On the assumption that 100 kilos of flour yield 130 kilos of bread, the price per kilo is arrived at, viz., .32 franc, or about 3 pence for the two pounds of bread. A kilo weighs about two pounds.—*The British Baker.*

THE NEW BREAD AT PARIS.

(The Schweitzer System.)

Among all the exhibits of bread and bread making at the Paris Exposition, the one which interested me most was a system of milling and baking combined. This system has a double purpose: (1) To make the flour more palatable and more nutritious than that made by the ordinary roller mill; and (2) to make it immediately before baking, so as to secure for the loaf a flour which is absolutely fresh. It is well known that all food substances when ground to a fine powder have a tendency to become oxidized. As is the case with coffee, which is best when freshly roasted and freshly ground, so it is with cereal flour, which is never so aromatic, so palatable or so nutritious as at the moment when it is first made.

The Schweitzer system, in regard to the milling operations, is a return to the old system of millstones, with the exception that corrugated steel grinders take the place of the millstones of the olden days. These grinders are so accurately adjusted as to admit of the making of the finest flour, while avoiding actual contact of the two grinding surfaces. The simplicity of the apparatus, its cheapness and the ease with which it can be installed, commend this system particularly for domestic use and for the supply of villages and small communities. Nevertheless, it is capable of being operated on an extensive scale, as is demonstrated by the large establishment at La Villette, Paris, where more than 100,000 pounds of bread are made per day from flour not more than twenty-four hours old.

This system of milling also retains in the flour many of the nutritive elements which the roller system eliminates. The germ and many of the gluten cells, especially those situated near the outside of the grain, in the aleurone layer, become flattened on passing between the rollers, and their particles are not able to pass through the bolting cloths; hence they do not appear in the flour. For this reason the flour made by the roller process is extremely white and very smooth to the touch; its whiteness being due to the preponderance of starch, and its smoothness to the crushing of the starchy particles by the mill rollers. On the other hand, the flour produced by the Schweitzer system has a marked yellow tint and is granular, because the particles composing it have never been crushed, but have been simply separated and torn by the grinding surfaces.

Chemical analyses show that the flour made according to the Schweitzer system has more than twice as much phosphatic material as that made by the ordinary roller process. The importance of this fact in respect of nutrition should not be lost sight of, and we must admit that nutrition, not whiteness of color, is the principal object of bread-making.—H. W. Wiley, in the *Forum.*

MEDICATED BREAD IN PARIS.

In Paris a baker has been advertising "medico-hygienic-peptonized" bread, pastry, buns, and muffins for some time as a specialty. This concern, in addition to its regular customers, is catering to persons who sometimes have not appetite enough to relish their food in its ordinary state. The medicated bread contains phosphate of lime, iodide of calcium, Rola cocoa and guaiana. From seven to ten ounces per day is the amount recommended. This action on the part of some of the bakers, brings them into direct competition with the druggists and chemists, who have been making vigorous objections. The Chamber of Parisian Pharmacists have called attention of the police authorities to the matter, in the hope that they will cause the practise to be discontinued. The medicated bread, it is said, has a large distribution among consumptives in Paris, and that the profits derived from its sale are devoted to charitable institutions.

BREAD MADE OF TORREFIED POTATOES IN FRANCE.

Mr. L. Eugene Mouline, of Vais-les-Bains, in the Department of Ardèche, has invented a plan for drying potatoes by heat. The object of the inventor was to diminish the expense of transporting a product which, like the potato, contains 75 per cent. of water. The process of Mr. Mouline is thus described in *La Nature:*—The potatoes are carefully washed, and then grated or crushed by means of the apparatus employed in making cider. The paste thus produced is afterwards squeezed in a press. All the water which it is possible to extract from the paste passes into a receiver, in order that from it may be collected, after the water is poured off, all the dregs which have been carried into the receiver. Finally, the compressed pulp is separated into its component parts or divided by a root-cutter, and put in an oven moderately warmed; there it is turned over at short intervals until it is thoroughly dry, when it takes on a light yellow tint. The matter must be treated by a temperature sufficiently high to impart an agreeable flavor, without a complete transformation of the starch into dextrin. It is the product of this process, very convenient to transport, that can be kept an indefinite length of time without spoiling, and is as yet unknown as an article of commerce, to which the inventor has given the name of torrefied pulp. If this torrefied pulp, in a raw state, is useful for fattening domestic animals only, it can be used for human food by converting it, by boiling water, into a *puree*, from which the bits of skin can be eliminated by passing it through a cullender. You can also grind the pulp, and make of it a light yellow flour, which can be bolted like any other flour. Mingled with wheat or rye flour, in proportions which may go as high as one-half, out of this pulp-flour can be made a bread mixed with potatoes, analogous to ordinary domestic bread, and very digestible by reason of the partial conversion of the starch into dextrine. Parmentier, as well as the Chevalier Mustel, described a century ago a means of using potatoes in the preparation of bread, but their process was everywhere abandoned because it produced a sort of lump in the bread. In what respect was this process defective? Because the starch of potatoes can be used in the paste of bread in a very small proportion only; otherwise it makes the bread heavy, without contributing to it nitrogenous elements in sufficient quantity. Moreover, it takes too much time to pick out the little lumps which are found in the dough. Still further, the starch contained in the soft part of bread, not having been converted into dextrine, as in the crust, is not completely assimilated, because it is changed into glucose by the action of the saliva only, and for that purpose mastication is always insufficient. For a long time past attempts have been made to extract flour from potatoes by drying them, cut into slices, in an oven a little cooled, after baking bread. They omitted, however, to brown the potatoes, and there has always been too much water to be evaporated. The flour of torrefied pulp is naturally less pure than the starch of commerce, since it contains a little parnechyma, but this matter, although inert, is considered favorable to digestion on account of its mechanical action on the intestines, for the same reason which gives bread its refreshing quality. From the explanations which have been made it will be seen that what distinguishes the flour of torrefied pulp from roasted starch or the dextrine of commerce is, first, the mode of fabrication; and, second, the different degree of heat by which the torrefaction is produced. Not being intended to replace gum in industrial use, the flour of torrefied pulp is less soluble than dextrine, but it is more solub'e than the ordinary starches made from potatoes, and this it iswhich constitutes its value by giving it a more appetizing flavor. Consequently, the inventor hopes that the use of his torrefied pulp and the yellowish flour it produces will be found very advantageous from an economic point of view; and that there will result therefrom an increase in the cultivation of potatoes sufficiently great, during years of dearth, to make up for a deficiency in the crops of cereals. The results obtained by Mr. Mouline appear the more important, because by the new progress made in agriculture, Mr. Amie Girard, the celebrated Professor of Chemistry, has grown from 600 to 800 quintals of potatoes on a hectare of land, and the proprietors do not know what to do with this mass of roots, since there is in their neighborhood neither starch factory nor distillery.—*Mark Lane Express.*

BREAD IN THE FRENCH PROVINCES.

The bakers in the French Provinces, and notably in the country districts, complain that the majority of the peasants still continue baking at home, and that it is, consequently, very hard indeed for a baker in such a district to get a decent living. It is a fact that, whenever it is practicable, the French farmer infinitely prefers baking at home, not only because he considers that it is much cheaper, but because he has very shrewd suspicion that the baker's bread is often adulterated.

FINE FRENCH BISCUITS.

The so-called "*Japanese Biscuits*" of Paris are very popular. The following ingredients are used: ½ lb. unblanched sweet almonds; ½ lb. powdered sugar; ½ lb. butter; 6 ounces chocolate (grated); 1 lb. cake flour; ½ ounce vanilla sugar; 4 eggs.

First crush the almonds fine; sift the flour into a bowl, make a bay in the centre and put all the other ingredients into it. Last, add the eggs, beaten a little, draw in the flour and mix into medium stiff dough. If too stiff, a little sweet cream is added. Roll it out, thickness of sugar-cookies, go over the tops crosswise with a ripped rolling pin and cut out with medium-sized oval scalloped cutter, wash with yolk of egg (with a pinch of salt) and bake in hot oven.

FRENCH GINGER NUTS.

1½ lbs. flour, 1½ lbs. sifted stale cake, 1 oz. soda, ½ lb. lard, ½ lb. granulated sugar, 1 pt. molasses, ¾ pt. water, ½ oz. cream tartar, and spices. Rub lard into flour and jumble all together into a smooth dough. Cut out about 1-3 of an inch thick. Spread them on granulated sugar, after which place 30 on each ordinary sheet pan and bake with door closed. While hot, jab a hole in the centre of each and drop varied color icings on top in center.

FRENCH MUFFINS.

4 lbs. roll dough; ¾ lbs. butter; ¾ lbs. sugar; ¾ pint eggs or yolks; ¾ pint milk, salt, vanilla sugar. Warm the milk with the butter and bake up with the roll dough, and set away for a while to proof. Then

add the sugar, eggs and salt, and beat up well until it blisters. Fill into greased muffin rings (half full) and set in proving closet until they have some proof, but not to the top of rings. Bake a nice brown top in a sharp oven.

CROUSTADES—(Patty Cases.)

Into a small bowl put four ounces of pastry flour (sifted), three egg yolks, a pinch of salt and three tablespoonfuls olive oil, mix all together with a gill and a half of tepid water, add a little beer or a half compressed yeast cake dissolved in a little warm water. Mix all well and cover with a cloth. Set away in temperature of about eighty degrees Fahrenheit for about two hours. Then stir up again. Heat some good, pure lard same as for doughnuts; dip the iron mould into it until hot. Then dip the mould into the batter not quite to the top; take it out again at once and plunge it into the hot frying lard and keep it there until fried a golden brown. When done remove the shells from the mold and set them upside down on a drainer. Continue in the same way until all are fried.

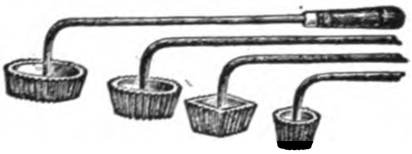


Fig. 101 Case Fryers

The mould is generally made of cast brass, two inches high and one and a half inches wide, of oval shape and scalloped; and screwed onto an iron rod with wooden handle at the end. You might add a pinch of nutmeg to the batter.

PARISIENNES.

One lb. sugar, 1 lb. butter, 12 eggs, ½ pint milk, 1 oz. soda, 2 ozs. cream of tartar, little egg color, vanilla sugar, 4½ lbs. flour. Break off in 2-oz. pieces, roll round, flatten a little, wash with egg, dip in coarse sugar, lay on slightly greased tins, let stand about a half hour and bake in quick oven.

BRIOCHES—(French Coffee Cake.)

The finest French coffeecake is the Brioche. Very rich and very tender. The method of preparing them is as follows: 2¼ lbs. flour, 1¼ lb. butter, 1½ pint eggs, 3 ounces sugar, ½ ounce salt, 2½ ounces compressed yeast.

Take one-quarter of the flour and set stiff, sponge with the yeast and sufficient lukewarm milk; roll it up into a ball and cut in four pieces, which place into a basin and cover with warm water. Set it aside to proof. In the meantime rub the butter to a cream, adding gradually the eggs, flour, sugar and salt, and beat until very smooth. Then add the sponge and after it has been set aside for several hours beat again and set in cool place over night. In the morning fill in scalloped moulds (buttered), roll a small piece into the shape of a turnip for each cake and stick the pointy end into the centre of the large cake, so it will form a head on top. After giving the cakes a light proof, bake in good heat.

Fig. 102. French Coffee Cake.

GENUINE BABAS.

(Another Delicious French Coffeebread.)

"Babas" are made from 7 lbs. flour (blended: 1-3 cake flour, 2-3 bread flour); 3 ounces compressed yeast, 2 lbs. butter, 1¼ lbs. sugar, 25 eggs, milk, 1 lb. currants, ½ lb. Sultana, ½ lb. stoned large raisins, ¼ lb. citron, chopped very fine, ½ ounce salt, 3 lemon rinds grated. Set soft sponge with one-third of the flour, the yeast and sufficient lukewarm milk. When it breaks the first time it is ready. Cream together in the meantime the butter and sugar, add the eggs, two at a time, then the salt, lemon and the rest of the flour, and gradually the sponge. Perhaps a little more milk. Beat all well together and add the fruit. Fill in fancy form-cake moulds, well buttered, and set to raise in warm place. Bake in moderate heat. Don't let raise to top of mould. When baked have a syrup ready of ½ pint water, 1 gill best Jamaica rum, 2 lemon juice, lemon rind and stick cinnamon, ½ lb. sugar. Just before serving time, dip the whole cake into this syrup for a second, and pour the rest of it onto the plate on which the cake is served.

SAVARIN CAKE.

The formula for this fine French lunch cake is about the same as for "*Babas.*" The forms for all these kind of coffee-cakes have a cone in the centre so the cake has a cavity. In *Savarin* this cavity is filled with whipped cream before serving.

The Baking Industry in Austria.

BAKER ORGANIZATIONS IN AUSTRIA.

The ordinances that regulate the bakers' trade in Austria are issued by a trade corporation which exists by order and under supervision of the government, and all bakers are subject to its laws.

Besides this semi-official board there is an independent organization, the "Austria," membership of which is not compulsory. These organizations in their entirety are generally acknowledged as good and efficient.

Under their supervision of trade interests in general they also provide for emergencies of a humanitarian nature, as sick and death benefits as well as mutual assistance in the form of loan banks, coöperative warehouses for flour and other supplies and the acquisition of machinery through mutual guarantee.

Another branch of their activity provides for the regulation of disputes arising between employer and employe, and pronounces on the vexed questions of apprenticeship. The administration of trade schools is also part of their duty.

The support of this administration is derived from a variety of fees. The initiation fee for masters is twenty dollars (forty kronen). An annual contribution is levied upon masters, journeymen and apprentices, varying in amount from one to eight dollars. These contributions and also fines that may be imposed are subject to collection by law, if necessary.

The appointment of officers is effected by election and the person so appointed is obliged to accept the office, and is bound by oath to the faithful performance of his duties.

In case of disputes the parties thereto have to submit their grievances or justification to the committee in writing, who will then give their decision from which the parties may appeal to the public courts within eight days, except in cases of sick and death benefits, which are according to statute beyond appeal.

The regulations governing the sick benefit administration are very complete and explicit. Besides the details found in all similar institutions they stipulate a contribution from the masters to not exceed half of that of each employe. A journeyman's contribution must not exceed three per cent. of the guilder earned. Apprentices do not contribute. The sick benefit for men must be not less than one half of their wages; that for women not less than one third.

If employes fail to contribute their rates, the amount is deducted from their wages and handed over by the masters.

The sick benefit averages about ninety cents per week, which is granted for twenty-six weeks, and half that amount for the following half year, with medical aid and medicine free of charge. The death benefit is forty dollars.

For the benefit of convalescents a home has been erected in Königstetten, a forest locality near Vienna, and further relief is granted in the form of medicinal baths, as saline, sulphur and mud baths.

In 1898 there were 6,913 men and 499 women contributing a total of over $80,000, and the treasurer's report shows a very satisfactory condition of their financial standing.

The committee is composed of twelve members, two-thirds of whom are journeymen and one-third masters.

These details indicate a highly laudable condition of things that is worthy of emulation on this side of the water.


Johann Müller, Vienna, President Bakers' Organizations, Austria.

JOHANN MÜLLER, OF VIENNA.

In connection with the above article we are glad to be able to give the portrait of the popular president of the bakers' organization, "Austria," whose president he has been for many years.

Born in Coburg on the Rhine, he went to Vienna early in his youth. Since entering his uncle's bakery, he zealously labored for the benefits of his trade as well as for the municipal welfare of his adopted city. In recognition of his many services he was decorated with several orders, and what is more indicative of his sterling worth is the fact that he fully enjoys the respect and love of his fellow tradesmen as well as that of his fellow townsmen.

WHAT MADE THE VIENNA BAKERS FAMOUS THE WORLD OVER.

This question can be easily answered with a few words—*"The Hungarian Flour."* The fact is not disputed that there is hardly a spot on earth, where wheat is grown, which excels the Hungarian in color and gluten. In all parts of the world we find progressive bakers adopting the name *"Vienna Bakery."* In Europe the bakers have always been anxious to get Hungarian flour, at least for their Vienna Loaves and small coffee bread, *"Wecken und Kipfel."* Every progressive German journeyman's ambition was and is to this day to travel to *"Vienna"* to seek work in one of its leading bakeries. *"Vienna"* is really the *Mecca* of the baking fraternity of Europe, as much so as Paris is the Mecca of the "Chef de Cuisine."

The question comes natural—*"What gives the Vienna bakery products their reputation?"*

First, it is the fine flavor; second, the lightness and sponginess; third, the rich color, and fourth, the freshness, small batches being baked every few hours.

A great share of the credit for these points can be traced to the famous Hungarian flour. However, it requires a special skill and more care on part of the baker to bake with the hard, rich Hungarian flour than if the common German flour is used. The fermentation must be studied before an otherwise proficient, experienced German baker can bake a good *"Vienna Loaf"* or *"Kipfel"* and *"Kaisersemmel."* The original Vienna process is about like this:

With one quart lukewarm milk and five to six ounces compressed yeast and sufficient Hungarian patent flour set soft sponge. When ripe add five pints more of cold milk, the necessary salt (according to the weather), and work with sufficient flour into a soft dough; work the dough well, cut into small pieces, throw them on top one another and repeat this several times to get as much air in your dough as you possibly can. The Hungarian flour, rich in gluten, has the tendency of stiffening the dough more, after it is mixed, therefore it must be mixed slacker than ordinary dough. Lard or butter may be added, if desired to make the bakestuff richer. One of the characteristics of the Vienna baker is small doughs, worked up quick, and frequent small batches. In many leading Vienna bakeries and cafés as often as eight times a day trays of fresh, crisp and delicious small coffee bread in different shapes (see Colored Plate 10, Vol. I.) are brought from the bakeshops. This requires considerable extra work, but prices are charged accordingly and good wages are paid the bakers in these establishments. Like the special work required for preparing the *"Vienna Coffee Bread,"* particular care is required in baking the same. The old Vienna ovens have a solid clay hearth and are slanting. The ovens are filled with wood (the front part), which is fired and after the ashes are drawn out it is swapped three or four times. First one batch of *"Kipfel"* or some other *"Smalls,"* set on pans, are baked off, then follows the *"Semmel,"* water rolls, etc.

Not more than three or four bakings are baked in one heat, the oven being *refired* frequently. From this description it can easily be seen to what trouble and care the original *"Vienna"* baker goes to sustain the world-wide reputation of his splendid Hungarian patent flour. The flour alone could not produce the fame for the "Vienna Bakery" without the efforts and skill of the baker himself. The successful method of the Vienna baker may be summarized as follows:

Well seasoned flour (at least three months' old), plenty yeast, but water or milk always added cool, soft doughs, lively fermentation, quick making up, a flashy oven, with plenty steam in it.

With the improved continuous steam patent bake ovens of the present time and the perfect transportation facilities to secure the Hungarian patent flour at a nominal cost, we find Vienna bakeries and Vienna bread of all varieties in any city throughout Europe, and many bakers would not hesitate to challenge the original Vienna bakers for a baking contest.

One successful German baker says: "I have worked in Vienna during the eighties and have baked after the Vienna method ever since. The only exception is that I make straight dough, use the very strongest yeast and bake in continuous baking patent ovens. For the dough I use fifty parts *Budapest Louisen flour* (Hungarian Patent) and fifty parts German wheat flour. I figure that every *liter* milk makes 5 pounds of dough, or about 300 grams more than if I use only German flour. This repays for the higher price of the Hungarian flour."

The percentage of small rolls or semmels produced by the bakers of Vienna compared with the large loaves (Laiberl) is very characteristic

Viennese. Mr. M. Hackl, Bakerie Superintendent in Vienna, prepared the following interesting statistics:

Laiberl (large bread loaves)	17 per cent.
Salgstangen (salt sticks, small)	½ per cent.
Mohnstrizerl (poppyseed sticks, small)	5 per cent.
Wecken (butter rolls)	3 per cent.
Kaisersemmel (Emperor rolls)	70 per cent.
Muerbes Gebaeck (butter rolls, fancy shapes)	4 per cent.

This shows the usual large percentage of the famous *Kaisersemmel.* The daily bread consumed in Vienna is estimated at $200,000 kronen. Ninety per cent. of the total output is made of wheat flour and only ten per cent. of rye flour.

A few of the methods or formulas may be of interest here. The orders are generally given to the mischer (mixer or assistant) by stating the quantity of liquid to be used in the batches; for instance, 10 Liter rolls, 50 Liter Kaisersemmel, etc. Flour is not weighed. One liter is estimated to produce 2½ kilo doughs on an average.

THE CRESCENT OR VIENNA KIPFEL

originated with baker Peter Windler and his wife, who had a bakery at number 841 Gruenangergasse, Vienna, at the time the Turks beleaguered the city. This baker had that patriotic, humorous idea to give his rolls the shape of the half moon or crescent, the emblem of the Mohammedans. His crescents at once found a ready sale. Everybody wanted to devour the crescents from patriotic impulse. In the house above mentioned a bakery has been operated since 1585 up to the present day.

Fig. 103. Kipfel

A good formula for "*Muerbe Kipfl*" which is used by some of our best bakers in America is the following: Take 20 pounds of the plain roll dough, add 2 pounds butter, 1 pound lard, 10 eggs, ¾ pound sugar. Work up again and let rest a short time before moulding up.

KAISER SEMMEL (EMPEROR ROLL).

This is one of the characteristic and best selling Vienna varieties of breadstuff. A perfect, fine Kaiser Semmel is really the pride of the Vienna baker. The moulding of these rolls is quite a knack, and out of a hundred bakers you may find ten who can mould a Kaiser Semmel properly. Of course in Vienna every baker must be proficient in making this particular roll. Before he can do this, he is not considered a good baker. In many bakeries, especially in this country, a cutter is now used which cuts the roll into the five parts, otherwise done by hand. (See figure 104.)


Fig. 104.—Roll Cutter

Most doughs for small goods of the Vienna bakery, such as semmel, rolls, kipfels, etc., are subject to the following rules: The dough is not allowed to rest undisturbed until ready; on the contrary, the dough is always kept young, and worked over two or three times. It is cut up into pieces, which are kneaded thoroughly by hand, to press all the air out of the dough. By this method a close, fine grained roll is obtained. More or less milk is used.

a. Formula (50 *quarts.*)—A soft sponge is set of 25 quarts liquid with 2¾ pounds compressed yeast; let this stand until it settles in the centre, when the other 25 quarts are added (lukewarm) and sufficient strong Hungarian flour to make a medium stiff dough. Salt, about ¾ ounce for every quart liquid.

b. Formula (*richer*) *from another Vienna bakery.*—Best No. 0 Hungarian wheat flour; temperature of flour, 60 degrees Fahrenheit; temperature of bake shop, 80 degrees Fahrenheit; temperature of liquid, 74 degrees Fahrenheit. Set sponge of 5 quarts water, 5 quarts milk, 1 pound yeast and about 14 pounds flour. When it falls in centre add 10 quarts milk, 1 pound salt, ½ pound sugar, a piece of lard or butter and sufficient flour to make a medium stiff dough. Let dough rest about one hour, push it down and let rest for ½ hour longer, push down again and after another rest of twenty minutes the dough is ready to be made up into rolls. After the dough is cut into pieces with the dough divider and moulded into round biscuits let them prove for about 15 minutes, when they are ready to be made up into the proper shape. Being set away on boards covered with cloth, well dusted, for 15 to 20 minutes longer, they are ready for the oven. Kaiser semmels are always baked direct on the hearth of the oven, which must also have a good *"Schwaden"* (steam).

VIENNA RYE BREAD.

A sponge is set of 10 quarts water (82 degrees Fahrenheit), 4 ounces yeast and 55 pounds rye flour No. 1. Let this stand until it drops in centre, which should take about 5 hours. Then add to this sponge 7 gallons water and about 16 pounds more rye flour, mix well and set away to ferment for 3 hours, after the expiration of that time 55 quarts more water are added with about 100 pounds rye flour, to make a dough somewhat stiffer than at the previous stages. This dough is allowed to stand until thoroughly fermented, *i. e.*, until it breaks on top and is ready to drop. Take 2-3 of this dough and place it in another trough or in the dough-kneading machine with 7 gallons water and the necessary quantum rye flour, salt and caraway (¾ to 1 ounce salt for each quart water). Mix all well together into a stiff dough which is now ready.

The remaining 1-3 of the first dough is also mixed with 65 quarts water and 160 pounds rye flour, salt and seed. This batch is set away to prove, so it will be ready for moulding after the first dough mentioned above is worked up. But you retain part of this dough again, 1-3, and retain for "*Sauer*" or leaven for the next dough. (Same as described above.) For the first few days, after starting a new fermentation or "*Sauer*," the bread will taste almost too sweet, it will not have quite the proper flavor of a genuine rye bread. Therefore, it may be recommended to make smaller doughs from the above mentioned quantity of "*Sauer doughs*," for instance, in place of pouring 70 quarts water to the sponge or *Sauer*, pour only 50 quarts.

FEINES KARTOFFEL BROT (Fine Potato Bread).

Boil 1½ pounds potatoes and mash them. Mix with 1 quart milk and 1½ ounces yeast and flour to a medium soft sponge. When done add 1 quart milk, 1 pound lard or part butter, 5 ounces sugar, 2 ounces salt, 4 egg yolks, ½ pound raisins and after having mixed all these ingredients with the sponge make a medium stiff dough with sufficient wheat flour; a blended flour is best.

The dough must be given time to ferment again, after it has been pushed down the first time, but the loaves should not be given as much proof as usual for other bread.

VIENNA KUGELHUPFS (Form Kuchen).

1 quart milk.
2¼ ounces yeast.
5 egg yolks.

½ pound sugar.
¾ ounce salt.
11 to 12 ounces butter.
6 ounces raisins, lemon flavor.
2½ to 3 pounds No. 0 flour (Kaisermehl, which is about equal to our best Minnesota spring patent.)

Prepare same as "*Bündkuchen,*" page 299, Vol. I.

MOLKEN BROT (Milk Rye).

This is another specialty of Vienna bread. Mixture of 80 per cent. clear rye flour and 20 per cent. straight spring wheat (common). In place of water use all molken (Buttermilk).

For a dough of 60 quarts take 40 quarts buttermilk to set stiff sponge with 1½ pounds compressed yeast and necessary flour, let it rest until it settles in the centre. Pour the remaining 20 quarts lukewarm buttermilk with 3 pounds salt and mix with flour to make a stiff dough. This dough must get a good proof, and after being cut down given another rest for about one hour before it is moulded.

MUERBE WECK (Butter Rolls).

Sponge and dough prepared like Kaisersemmel. The quantities of materials figured for each gallon milk are:

4 ounces yeast.
3½ ounces salt.
1½ ounces sugar.
1 pound lard.
¼ pound butter.

Lard and butter is not to be added until the dough is nearly thoroughly mixed.

GERSTEL (Sauerdough Pastilles).

If there is no baking to be done for a few days, and therefore no fresh Sauerdough to be had, the Vienna bakers prepare what they call a "*Gerstel.*" They take a quantity of the regular "*Sauer*" and mix it with flour and corn flour or fine corn meal into stiff paste, and form it in small balls, like small marbles. These are dried in the air (but avoid exposure to sun). When dry, these ferment balls can be kept for some time in a cool place. Whenever wanted for starting a sponge soak a few of them in lukewarm water for a few hours, and then proceed as described in previous formulas, adding flour and freshening up the Sauer from time to time. If the bread cracks during baking, it contains too much leavening power, or fermentation was carried on too warm. In the former case the quantity of *"Sauerdough"* has to be reduced or more water poured for the dough; in the latter case, the water for *"Sauerdough"* and dough must be kept a few degrees cooler. If the loaves blister and show holes inside, the dough was evidently too young or the "Sauer" too fresh.

The Vienna bread specialties, as illustrated on colored plate 10, Vol. I, are:

1. Kugelhupf (Turkhead).
2. Mahustrizl (Poppyseed twist).
3. Salzstangl (Salt sticks).
4. Muerbes Strizl (Butter twist).
5. Laiberl (Split Roll).
6. Heiligen Laiberl (Saints twist).
7. Schwarzes Hausbrot (Black Family loaf).
8. Feines Kartoffelbrot (Fine Potato bread).
9. Milchbrot (Milk bread).
10. Kaiserweckerl (Emperor bun).
11. Kaisersemmel (Emperor roll).
12. Gemischtes Brot (Mixed bread).
13. Kipfel (Crescent roll).
14. Brotwecken (Bread roll).
15. Muerbes Weckerl (Butter roll).
16. Patent Wecken (Patent roll).
17. Kaffeehaus Wecken (Coffeehouse roll).

Bohemian Bakeries.

Bohemia has about 3,000 bakeries. The city of Prague leads with 295. Outside of this city are very few large or steam bakeries, and these are, with few exceptions, controlled and owned by Millers. The Master Bakers have an organization among themselves, but keen competition and jealousy hamper the progress of the organization considerably. They also stand under the control of the city authorities. During the last ten or fifteen years many bakeries have been started in the suburbs of cities (about 100 in the vicinity of Prague alone) where rents and labor are cheaper. These bakeries bring their bread to the city and sell it cheaper than the city bakers. The average wages paid to young bakers and benchhands is 8 florins, for ovenmen and mixers 17 to 18 florins without board. The custom of boarding the men has been abolished in nearly all the bakeries. A central organization was started about 6 years ago. Vigorous protestations have been instituted by this body against the Muehlen-Baeckereien (Bakeries run by flour mills). The members of the Association in the city of Prague also established a co-operative buying centre which has proved very successful. The first year 60 per cent. dividends have been paid to the members, but since that 20 per cent. of the surplus are added to the reserve fund.

The bakers in Bohemia, as a rule, bake a very good bread and use a mixture of Bohemian and Hungarian flour. The Hungarian flour is stronger and makes a larger looking loaf, while the Bohemian flour is considered as giving bread a finer flavor. The different brands of flour are distinguished by numbers instead of names. They are 0, 1, 2, 3. One special Bohemian fancy bread is called Karasek. It is a salted Semmel and is very popular with all classes. The principal point for making these delicious Semmels is a good pure compressed yeast and plenty of it. To set a sponge of 40 kilograms (about 94 lbs. flour) use about 1½ lbs. yeast, 4 ounces salt and 3 quarts of milk, the rest water. The sponge should stand only about an hour. Then twice the above quantity of flour is added and with sufficient water and more salt worked into a medium stiff dough. The dough is worked over three times before it is ready to mold up into Semmels.

Before they go into the oven they are washed and well sprinkled with salt. Some are also sprinkled with caraway seed. Semmels are baked on the stone hearth direct, not on tins. Other similar Bohemian specialties are: Vánócky (stritzeln) Loupácek (butter rolls) and Kavarenské rolliky (coffee house rolls).

Very popular are the *Kalacs* (Kalatsches). See Fig. 12, Plate 11. This is a rich, round or square coffee kûchen with a filling of either stewed poppyseed, apples, prunes, etc., sweetened.

The Bohemian bread specialties, illustrated on *Colored Plate* 11, are.

1. Krudonky (Hospital Buns).
2. Modré housky (Blue Buns).
3. Duse Seelen (For All Soul's Day).
4. Kosti ((All Saints' Day).
5. Mazanecky (Easterbread).
6. Dalamánky (Dalalam Rolls).
7. Strajzle (Streusel Kuchen).

8, 10. Stané rohliky (Salt Sticks).

9. Precliky (Pretzels).
11. Kràjene housky hóstinské (Sliced Hotel-rolls).
12. Némecky Kolác (German Kollatsche).
13. Schwarzes Hausbrot (Black Bread).
14. Bandury (Militia Rolls).
15. Vorsusáky (Kipfel).
16. Vanilkovy suchar (Vanilla Zwieback).
17. Venecky (Wreaths).
18. Obycejny Kolácek (Common Kuchen).
19. Vánocky (Twist).
20. Karlovarské suchary (Carlsbad Zwieback).
21. Barchesy (Jewish Bread).
22. Karásky (Salted buns).

23, 24, 25. Kavarenské rohliky (Coffeehouse rolls).

26, 30. Loupácek (Butter Rolls).

27. Paganák (Paganini Rolls).

28, 29, 31. Same as 23. 24. 25.

ANISE PRETZELS.

Into one pound fine dry pastry flour, rub 6 ounces butter, 2 ounces sugar, one lemonrind and some aniseseed. Mix all well. Make a bay in centre into which break 4 eggs and mix all to a stiff dough. Make up into small pretzels and wreaths, wash with egg, dip in coarse sugar and bake on buttered cookie pans.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¼ nat. Size

BOHEMIAN CHRISTMAS STRITZEL. (Twist or Wreath.)

To each two pounds flour take 7 ounces sugar, 6 ounces butter, 4½ ounces almonds, 1-3 ounce salt, 1½ ounces yeast, a pinch of vanilla powder or cinnamon. Mix like other coffee cake dough, with milk.

FASCHING KRAPFEN. (Buttercakes.)

Two pounds warm flour, 10 egg yolks, 1 egg, 6 ounces melted butter, 1½ ounces yeast, 3 ounces sugar, lemon and salt to taste. Mix all into smooth dough, adding sufficient warm, sweet cream or milk. Place the dough on the table, dusted with flour and roll out. Cut out with round sugar-cake cutter, not very thick, spread in centre with jam and place another piece of dough same size on top, after rim has been washed. Press together around the rim and set away to prove on boards, covered with cloth and dusted with flour. When raised bake in hot lard. When baked on bottom, turn over.

BOHEMIAN KOLLATSCHEN (very fine).

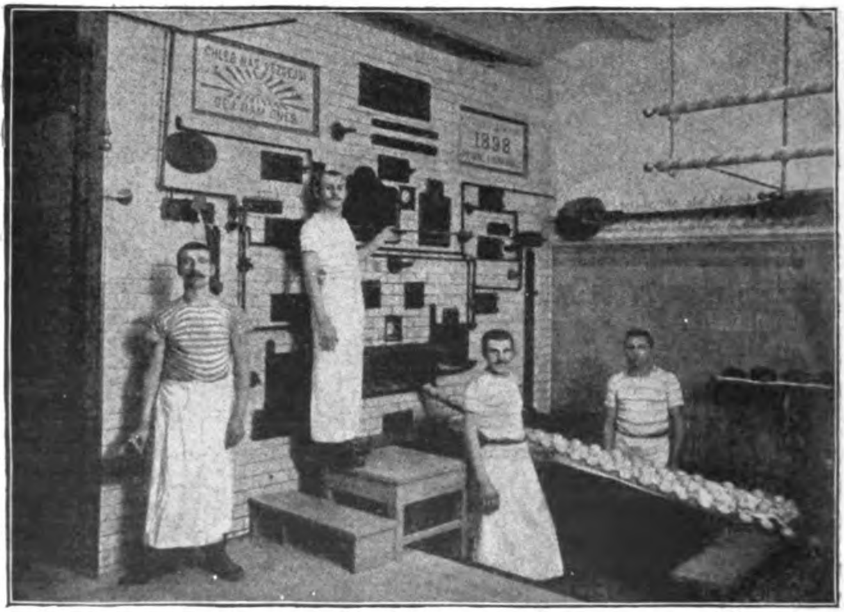
Cream 4 ounces lard and 5 ounces butter, add 6 yolks, 1½ ounces dissolved yeast, 4 eggwhites beaten stiff, 2½ ounces sugar, lemonrind, 2 pounds flour and a little warm milk, salt. Beat the dough well and set away to raise. Roll out ½ inch thick, cut in square pieces (perhaps 4 by 4 inches), place a spoonful of jam or poppyseed-cream in centre, pull the four corners to the centre and place them on greased pans. Wash with eggwash and dust with chopped almonds, and when raised a little bake in a quick heat.

These cakes can also be filled with cheesefilling.

A MODERN BOHEMIAN BAKERY.

In the city of Budweis, in Bohemian-Austria, the oldest bakery is that of Jan M. Kadlec. It was established in 1850, over half a century ago, by the father of the present owner, who succeeded to it in 1882. Ambitious and enterprising, and determined to have an up-to-date bakery in every particular and detail, Mr. Kadlec traveled Europe from end to end, visiting all the Expositions and large bakeries with the purpose in view of adopting the best features in his own establishment. Five years ago he began to remodel and rebuild and the results attained are now most gratifying.

Attention was first paid by Mr. Kadlec to the latest hygienic improvements, and the comfort of his men was especially considered. We reproduce here one view showing part of the bakeshop proper and one of the ovens. The ovens are built after the system of Frank & Laube, of Berlin, but with some changes introduced according to Mr. Kadlec's own ideas.



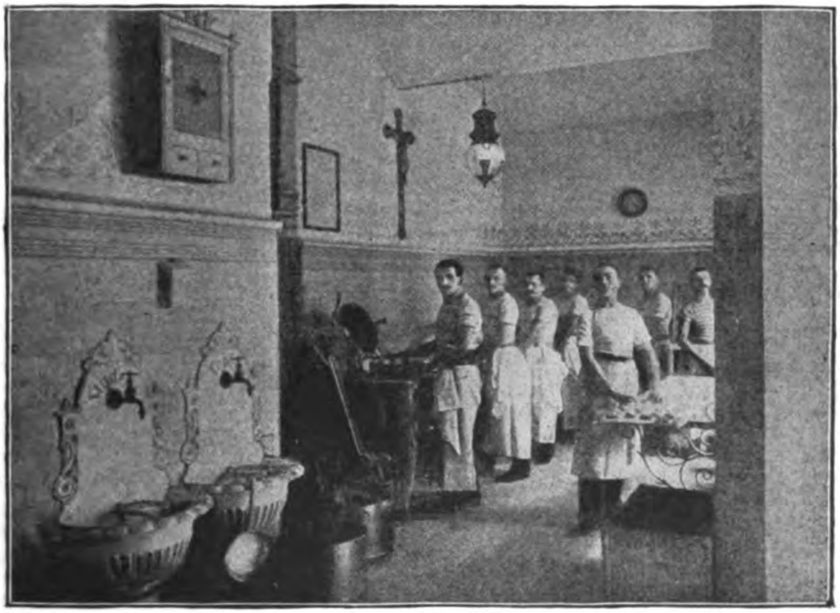
Oven Room in Kadlec Bakery.

The ovens are fired from the rear. There are three fires, one on each side to give top heat and one in the centre to give bottom heat. They are what are known as double-deckers—one on top of the other. One fire is below ground in the foundation and is reached by a spiral stairway.

In the middle of the left side wall of the oven structure is an iron proving closet which is very convenient for warming milk or butter, or drying zwieback, etc. In the rear wall a large copper boiler of about sixty gallons capacity is built, which furnishes hot water for the shop. There is ample provision for ventilation and flues are provided to carry off steam and gas. The oven front and sides are finished in white and blue glazed brick, which looks neat and attractive.

Everything is kept scrupulously clean, the walls are painted and decorated and from the floor up, for four and one-half feet the walls are finished in porcelain tile, which is easily kept tidy. The moulding tables are supported by ornamental iron brackets, which gives no hiding place to roaches or other vermin, and the bake troughs are of iron and on rollers.

The floors are all inclined and have drainage connections so the water will run off quickly when the floors are washed. All the work about the shop is systematized. Every man knows his place and no time is wasted. Large electric lights brilliantly illuminate the shop at night. The sinks are furnished with hot and cold water faucets of modern type and, as a whole, the bakeshop makes a good impression upon a casual visitor.

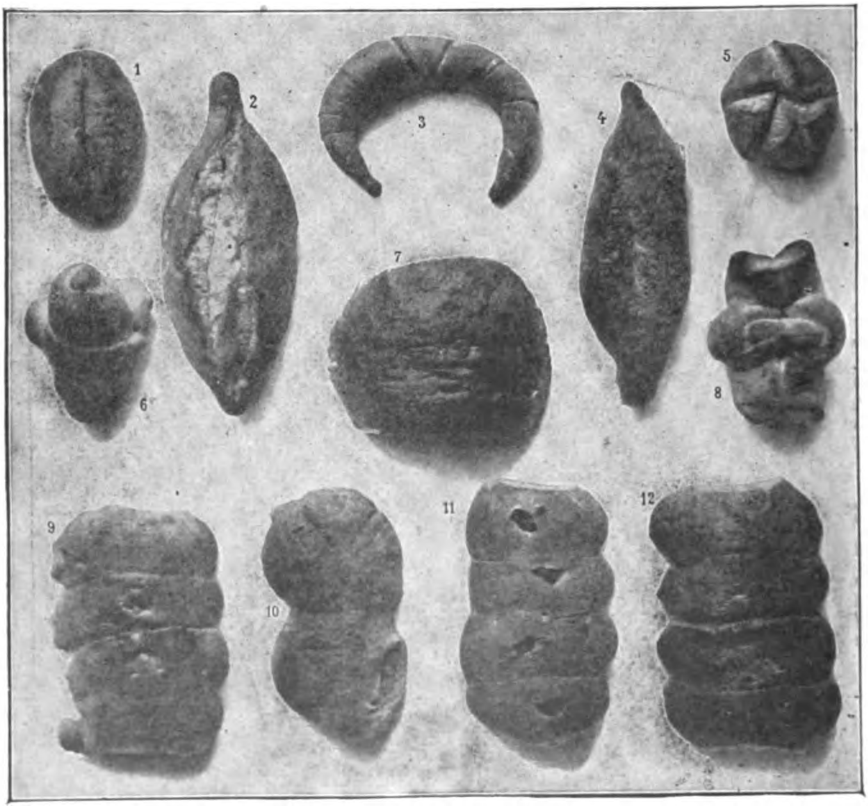


Bakeshop of Kadlec Bakery.

Drugs for simple ailments, bandages and the like are always at hand in a medicine chest, and the rooms of the journeymen are arranged with an eye to proper sanitation. Shower baths are provided, and in a large garden adorned with flower beds and supplied with benches, opportunity is given for rest and recreation after work is done.

Baking In Hungary.

Hungary has only about 2,500 regular bakeries, but a great number of farmers conduct Homebakeries, principally in the vicinity of Budapest and other larger towns. They bake large round loaves, and their bread, being of good flavor and very nourishing, finds a good sale. These farmer bakers come to town once or twice a week on market days to dispose of their bread. They also supply a number of taverns. The bake ovens are the old-fashioned style with clay hearth, and are fired with wood. Wheatflour is used more than rye, and the addition of potatoes to the dough is very popular. Some of these farm-bakers add as much as 30 to 40 per cent. potatoes to each batch. They are



Bread from Trient.

boiled, peeled and pressed through a fine collander or grated and then mixed with the dough. Yeast is used more commonly than sourdough. The loaves weigh from 1 to 6 kilogrammes.

Trentino (Welshtyrol) has only about one hundred regular bakeries.

In Trient and Rovereto are several bread factories with modern plants, run on the coöperative system. In these two cities a number of the bakers are united and do their baking together. Hungarian wheat flour is used more extensively than rye. The use of Ferment and Sourdough is more popular than fermentation with yeast.

The bread specialties of Trient, illustrated above, are:

1. Spaccato (Fine Wheat Semmel).
2. Weggen (Common Wheatflour).
3. Gipfel (Buttercrescent).
4. Weggen (Splitloaf).
5. Semmel (Kaiser Semmel).
6. Cornetta (Wheatroll).
7. Gramolone (Common Wheatloaf):
8. Gramolato (Common Water-roll).
9. Fiocco (Fine Wheatbun).
10. Segala (Ryeloaf).
11. Maisbrot ((Cornloaf).
12. Buffeto (Common Restaurant-loaf).

Pretzel Baking.

1. FLOUR AND YEAST.

To make a good Salt or Lye Pretzel you want dry, old healthy wheat flour and fresh, strong compressed yeast.

2. SPONGE.

For sponge take one-third of the quantity of flour you want to use for a batch and mix it with milk and yeast, same stiffness as for setting sponge for coffeecake or milkrolls. Skimmed milk may be used.

3. DOUGH.

When the sponge is ready, you add more milk or water, also lard or a piece of butter. Break this all up well with the sponge before you add the flour for the dough. Dough must be mixed very stiff and worked well.

PRETZEL DOUGH.

Set sponge of 1 ounce yeast and 1 gallon warm water or part milk with sufficient springwheat-flour. Let sponge get very old, until it is nearly sauer, it can stand 10 to 12 hours. Then add 2 gallons more water, 4 to 5 pounds lard, 8 to 9 ounces salt and the necessary flour (use blended flour for the dough, half winterwheat and half springwheat mixed.) Dough must be mixed very stiff.

Some bakers take a piece of their regular bread dough, for Pretzels; in this case at least ¾ pound lard must be added to every 10 pounds of bread-dough. Other bakers take regular bread sponge and set it aside until it is nearly rotten, and then mix it with the rest of ingredients for Pretzeldough.

4. BREAKING THE DOUGH.

The dough is then placed onto the hand break, see figure:

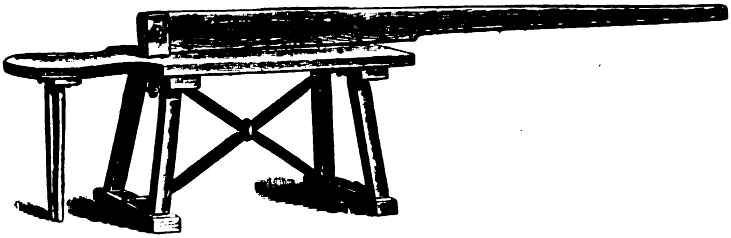


Fig. 105—Old FashionedDough Break.

A piece of dough is placed under the heavy wooden knife, the board being dusted occasionally. On one end sits a man, who keeps on turning the dough and folding it over toward the middle, until it is all smooth. Another man at the handle of the wooden knife keeps on raising and pressing down the knife thereby kneading and cutting the dough. Of course in modern bakeries where machinery is employed, the pretzel-dough is run through the modern dough-break (see machinery) in the same manner as Snowflake Bread.

5. MOULDING OF PRETZELS.

The dough is then weighed off into pieces or cut with the Roll-dividing machine (see machinery). The pieces are moulded up round first, then into cones and after they have given a fiw minutes rest to start proving, they are twisted into proper pretzel form (see figure 72, No. 2, page 277, Volume *One*). Lay them on boards to prove.

6. COOKING.

When the pretzels are sufficiently raised and the oven is ready, they are first cooked in lyewater. In a pretzel bakery you find a large iron kettle set into a brick frame with a furnace underneath, right close to the oven door. The pretzels are dropped into the lyewater, kept at boiling point. At first, they will sink, but come to the surface after a few seconds when they are done and must be removed at once with a strainer. They are immediately placed on the peel, sprinkled with salt, and placed in the oven. The peel, however, must first be rubbed with some of the lye, to prevent the pretzels from sticking to it. In a few minutes they will get a nice golden color.

7. BAKING.

The oven must have a smooth, soft hearth and a brisk flashheat is necessary. The lye soon cools the oven and not much time is to be lost, unless you have a continuous baking patent oven. If the pretzels are baked on tins or grates, they will have a tendency to be tough and doughy. The color of the pretzels is a matter of taste and differs in different localities. In Wurttemberg and other provinces of Southern Germany, the prevailing color of pretzels is a gold or straw yellow. In Switzerland and Austria they are baked much darker. In Elsass-Lorraine and in the Rhinelands they are fancied still darker, even a maroon color. To regulate the shade of color in baking the lye solution must be kept weaker or stronger so they will not color too quick in the oven.

8. MAKING THE LYE.

The old style of making lye: Take a clean, wooden tub and place a linen cloth over the top, press it down in the centre and then nail it fast to the top, so it will not slip into the tub. Lay two sticks across the top, on top of which set a basket. Line the basket with a nest of straw, and then fill it with wood ashes (pine or beech wood is preferable). Then boil the necessary water to which you can add some Fernambuk wood (redwood), also some onionskins and eggshells. Some bakers add spices as well. Pour the boiling water over the ashes and let it filter into the tub.

The very finest lye which gives the pretzels an excellent flavor is made from grapevine wood ashes. Care must always be taken that no coal ashes get mixed in, as they would render the lye useless. Since the introduction of the Laugenstein (lyestone) especially prepared for pretzel bakers, the home-made lye is almost a thing of the past. There are some firms in Germany, for instance, Christian Brommer in Freudenstadt, who have gained a world-wide reputation, and ship their Laugenstein to all countries. Some bakers in this country use the commercial lye sold in cans. The method of using Laugenstein or lye is to pour upon the lye a certain quantity of warm water and add for every 12 quarts of water a handful of salt, which helps to clarify the solution. Skim off the scum carefully, while the solution is boiling.

Why Does Rye Bread Crack During Baking?

The above question was asked by a subscriber of the Berliner *Bäckerzeitung*, to which a number of experienced bakers responded through the columns of the same journal. As this makes very interesting reading to any baker, the opinions of these men are herewith given:

Mr. Habicht: This question is not so easy to answer, there being so many reasons for it and so many different conditions to be considered. The first rule is to set "*Grundsauer*" and "*Vollsauer*" (see page 273 Vol. I.) cold, not over 60 degrees Fahrenheit, the temperature of the air and the season of the year must be taken in consideration. Next, the piece of Grunsauer, which is used as the leaven, should be at least two and a half pounds to every batch of 70 to 80 two-pound loaves. Rye flour must always be fresh from the mill and kept in a cool place. The *Sauer* must be kept young in all stages, and the loaves not peeled too close together in the oven.

2. Mr. Kirstein: To prevent the cracking of the loaves the "*Sauer*" must be freshened up three times in the morning, at noon and about six P. M., the dough must not be too stiff and the loaves not be peeled too close together.

3. Mr. Thum: My opinion is the men are not careful enough with the *Vollsauer*. They set it too cold or too warm, another time too stiff. For instance, when I need 3 pails (18 measures) bread, my man should

freshen up a quarter measure only, warm and soft in the morning. About two hours later he adds one measure cold water to make a stiff *Grundsauer* with sufficient flour, of course. Have all the flour banked up against this in the trough; it should then spread and blossom up like a flower. In the evening add ten or twelve more measures of cool water for *Vollsauer,* but brake up the *Grundsauer* well, before mixing in the flour. After another short rest the final dough is made by pouring five more measures of warm water, one and a half pounds salt and draw in your flour to make a smooth stiff dough. This will make a fine loaf, and will not crack. "I have given this formula to every baker who has worked for me," Mr. Thum says, "and they had never any trouble in getting good positions and hold them."

4. MR. O. S.: The most frequent cause of cracked ryebread is the too small a piece of *Sauer.* Set aside at least two to two and a quarter pounds at a batch; freshen it up with a pint of cold water; about noontime add 1½ quarts more cold water and mix with the necessary flour into a stiff sponge or *Vollsauer.* When ready pour double the amount of water and make a stiff dough.

5. MR. WITTE: The cracking of ryebread happens most frequently to bakers which run a small business, say one batch only. Their *Sauer* often gets too old, and is not freshened up often enough. The fermentation must be kept alive and fresh and sponge as well as dough must feel smooth and firm to be healthy. If it feels woolly and mushy, the loaves will not stand up, and your unsightly bread will be the result. What you want to look out for is a cold fresh *Sauer,* a lukewarm, lively dough, plenty salt and thorough mixing.

6. MR. RAU: Every year during the months of June, July and August we hear complaints about cracking ryebread. Every baker should be able to find the cause, if his bread cracks, but the frequent inquiries in the tradepapers show that a good many bakers do not know the cause and are unable to find it. It is generally believed among the trade, that as soon as the new crop is in blossom the bread baked from old grain will crack, especially rye bread. It is assumed that the old rye has not its strength by this time; the same as old vegetables do not cook well any more when the new crop is nearly ripe. That new rye and rye flour used as soon as possible after being ground, makes the best bread, is an old established fact.

Bread Baking in America.

PREPARED FOR THE BAKER'S BOOK BY EMIL BRAUN.

The fundamental principles for bread making are: Good healthy yeast and good, sound flour. I will not say good, strong flour, because in some kinds of bread too strong a flour is detrimental to good results.

Yeast, however, is the very first consideration. The proportion of the quantity of yeast used is so small compared with the other materials used in a bread dough that the cost of the yeast is really of secondary consideration, and a baker can ill afford to run much risk tinkering with his yeast. There is often no reserve stock or supply of yeast on hand in a bakery, to fall back on in case of trouble, and dough requiring a certain length of time to ripen, the baker wants to be sure that his yeast is all right when he sets his sponge or dough.

Cleanliness is another fundamental point to be observed in bread making. The chemical analysis, age and ripeness of dough and fermentation generally have been treated very thoroughly in Volume I. While I have devoted much space to government experiments, etc., in the first volume, I will now give a number of practical, reliable formulas for all kinds of bread, rolls and buns, as they are made in this country. We may take up the home made or pan bread first. If sponge is set the dough is seldom given more than 1½ to 2 hours to rest. It should not be allowed to fall. As soon as it shows signs of breaking on the top it should be pushed down or cut over and may rest awhile longer.

For straight or off-hand doughs about the same may be said; doughs should always be kept young. Usual time is 4 to 5 hours.

Dough set with a ferment as a rule can stand much longer; it takes from 9 to 12 hours as a rule to ripen; but never should dough be allowed to drop and come up again, because the strength is then exhausted. It must be cut down or taken before it drops.

Of course with sponge it is different. Sponge is usually allowed to drop once, but then it must be watched so it does not drop the second time after it came up.

Prof. Wm. Jago, in his valuable work, "The Science and Art of Bread Making," writes about proper time of fermentation: "It has been already explained that for the production of the best bread, fermentation should be allowed to proceed sufficiently far to soften and mellow the gluten, but no further. At stages either earlier or later than this, the bread will lack both in appearance and flavor. It is therefore necessary to so regulate fermentation as to stop precisely at this point. Unfortunately no exact means are at present known whereby it can be determined with precision. The more stable a flour is the longer it requires to be fermented before this point is reached, since where flours of different qualities are being used the more stable should be used for fermentation earlier than the others. For in this lies the reason for using some flours at the sponge and others at the dough stage.

"The raising or leavening of bread is usually brought about by letting yeast develop in it. These minute plants feed upon sugar in the dough and in their growth give off alcohol and carbon dioxid gas, which latter, expanding with the heat, forces its way through the dough and thus lightens it. In order to give the yeast a better chance to work, the dough is usually 'set to rise' for some hours before it is put into the oven. There are many methods of growing yeast at home or in the bakery, but the compressed yeasts now in the market seem to give equally good results with so much less labor that their use, in the United States at least, is becoming almost universal.

The lightness and sweetness of bread depends as much on the way in which it is made as on the materials used. The greatest care should be used in preparing and baking the dough and in cooling and keeping the finished bread. Heavy, badly raised bread is a very dangerous food, and unfortunately very common, and probably more indigestion has been caused by it than by all other badly cooked foods."

As compared with most meats and vegetables, bread has practically no waste and is very completely digested. It is too poor in protein to be fittingly used alone, but when used with due quantities of other foods it is invaluable, and well deserves its title of "the staff of life."

Thus it is not white bread which causes the indigestion so common in America, but poor bread. Bakers' bread, prepared, as it is, by expert bakers, and under the most favoring circumstances, should therefore, and as a matter of fact is, much better than the general run of home made bread. It is the bread made in the kitchens that causes the most indigestion, not the bread made in the bakeshops. Some of the output of the latter is indeed poor stuff, but taking the bakeries as a whole, they are turning out a high quality of bread. Moreover this quality is constantly improving, and we believe that bakers do well to put more emphasis on the quality of their bread than on its cheapness. Keep up prices and quality—that's the best rule. Educate the consumers to associate good price with a good article.

A few pointers from Christian Huppmann, foreman in the Boston Baking Company, Washington, D. C., who is recognized as one of our best breadbakers in the country. He says: "For bread-baking I recommend the best Minnesota Spring Patents, which I mix with Dakota Hard wheat and with winter wheat; 2-3 soft or Minnesota spring patent and 1-3 Hard wheat, Kansas or Dakota flour and one part winter wheat. For instance:

10 sacks of Gold Medal (Minnesota Patent).
5 sacks of Garland (hard Dakota Wheat).
2 sacks of Peerless Patent (best Ohio Winter Wheat).

"All these flours are thoroughly blended and sifted, and make a beautiful loaf of bread. I never set any dough very warm, and do not believe in forcing doughs in hot proving room. It should be allowed to ferment and work by its own strength and the room where the dough is raised should not be over 70 to 75 degrees.

"Lard being so very high, Cotton Seed Oil is now used very extensively as a substitute."

On the last colored plate (No. 19) in this volume we show the leading American bread varieties. They are:

1. Twist Loaf.
2. Jersey Cream Malt Bread.
3. Vienna.
4. Small White Mountain.
5. Tea Biscuits.
6. Soda Biscuits.
7. Queen Loaf.
8. Boston Brown Bread.
9. Lunch Bread.
10. Corn Muffins.
11. Cottage.
12. Old Grist Mill Health Bread.
13. Milk Rolls.
14. Mothers' Best.
15. Split Loaf.
16. Sugar Buns.

Of course a good many of these bread varieties are known under different names in different localities.

Although there is considerable *"Hearth"* bread (such as Vienna and Rye) baked in the larger cities the characteristic American loaf is the *"Homemade"* baked in tins. *"Homemade"* or *"Pan"* bread I judge figures up to about 65 to 70 per cent. in larger cities, and 85 to 90 per cent in smaller cities and towns.

Straight Dough Bread.

NEW ENGLAND OR COTTAGE LOAF.

Fig. 106—New England or Cottage Loaf Pan.

(Straight Dough.)

11 quarts water.
3 quarts milk.
7 ounces compressed yeast.
10 ounces sugar.
1½ lb. shortening (good lard preferred).
14 ounces salt.
10 lbs. mush (boiled Indian or corn meal).

About 60 lbs. flour, which is based on a mixture of 3 parts spring patent and 1 part rich winter wheat.

DIRECTIONS.—The liquid in which yeast is dissolved should have a temperature of from 75 to 80 degrees Fahrenheit. Make dough not too stiff and let rest for 4 hours; push down well and let rest for ¾ hour, when it is ready to mould up. Don't let the dough get too ripe the first time, so that it falls by simply pushing your hand into it. It must have sufficient resistance yet, that is, has to be cut down. Some bakers cut 18 to 20 oz. of this dough in 6 or 7 pieces, mould them up like buns, set in round pans, and call it Cottage Loaf.

P. S.—A half pint good Malt Extract can be used in place of the sugar.

QUAKER BREAD.

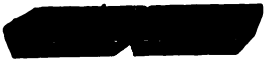


Fig. 107—Quaker or Malt Bread Double Pan.

15 gallons water (75 to 80 degrees).
16 to 18 ounces compressed yeast.
2¼ to 2½ lbs. salt.
1½ lb. lard.
1 to 1¼pounds good malt extract.

Mix into slack dough; use rather strong mixture of flour, say 3 parts spring patent, one part winter patent; part Kansas wheat may be added. Let dough rest first for 3 to 3½ hours. Push down once, let come up again. Don't give too much proof after moulding up. Bake in double loaves in tins; square tins.

VIENNA BREAD (Straight Dough).

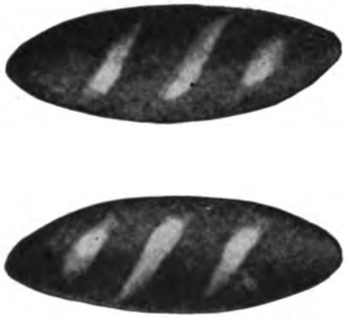


Fig. 108—Vienna Loaf.

8 gallons of water.
1¾ lbs. of salt.
3 lbs. of sugar.
4 lbs. of lard.
112 lbs. of spring wheat flour (the best).
¾ lbs. of yeast.

Have your dough from 80 to 84 degrees Fahrenheit, let lay 4 hours, when it is ready to press down. and cut over. Knock down 3 times yet, when it will be ready to work up into loaves. This dough lays as a rule 8 to 8½ hours. 1-3 or ¼ milk can be used. Give medium proof and bake in Vienna Oven.

RYE BREAD (Straight Dough).

4 gallons of water.

1¼ lbs. of salt.

1 lb. of potato flour (which should be boiled to a mush in 2 quarts of the above amount of water).

64 lbs. of your mixed Rye flour.

6 ounces of yeast. Temperature, 80 to 84 degrees Fahrenheit after made. Let lay 4 hours, knock down for first time, and then 3 more times, so it is 8 to 8½ hours old. Make up as usual and bake in hot oven.

How to mix your flour for above:

One sack of pure New York or Wisconsin Rye; one sack of Straight Patent (dark spring wheat); one half sack of best spring wheat patent, mix and sift together.

CREAM BREAD.

Take as much milk to the mixture as possible. To 18 gallons liquid at 85 to 90 degrees add:

1½ lbs. yeast.
3 lbs. 10 oz. to 3 lbs. 12 oz. salt.

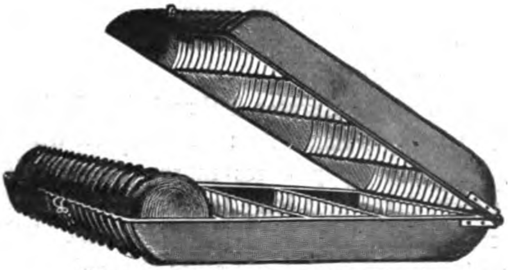


Fig. 109—Cream or Crimp Crust Bread.

6½ to 6¾	lbs. of lard.
3	pints good malt extract.
10	lbs. corn flour (dry or mush).
228	lbs. best Minnesota spring patent flour.

This dough may be kept somewhat warmer than common pan bread. Let dough rise once, until nearly ready to drop, then knock it down and let it come once more. Mould up in crimped pans at once and be careful not giving it full proof.

QUAKER OR MOTHER'S BREAD (Straight Dough).

A very reliable formula from a bakery where 5,000 to 6,000 loaves of it are baked every day.

8	gallons of water.
1¾	lb. of salt.
3	lbs. of sugar.
4	lbs. of lard.
98	lbs. of spring wheat flour.
¾	lb. of yeast.

Temperature, 80 to 82 Fahrenheit. Let lay 4 hours, knock down, work over, let it come up again and take immediately. In this dough I highly recommend a good Malt Extract, which will give the bread a better flavor and better color. Cut part of sugar out when Extract is used. Give medium proof, bake in not too hot an oven.

20th CENTURY OR GRANDMA BREAD (Straight Dough).

16	gallons of water.
4	lbs. of salt.
8	lbs. of sugar.
16	lbs. of lard.

256 lbs. of best spring wheat flour.
1½ lb. of yeast.
2 lbs. of malt extract.

Temperature, 78 to 80 degrees Fahrenheit. This will make a stiff and cold dough. Let lay 6 hours then knock down when it will be ready the first time; let come up 3 times more. Then roll through brake about 8 to 10 times, form into long loaves (box shaped) give medium proof (even moulds) and bake in a medium oven. This dough stands 10 hours and will never fail if made after these directions and you can make any kind of shape.

SPECIAL MALT BREAD.

The following formula is about the basis or standard for the special bread varieties baked by the large wholesale bakeries and extensively advertised and pushed under many different names, such as Mother's Best, Malt Pepto, Malt Cream, Grandma's Loaf, etc., etc.

15 gallons of water (at 90 degrees).
5¾ lbs. corn flour (dry).
(In some bakeries corn flour is scalded—mush.)
2¼ lbs. good malt extract.
3 lbs. salt.
2¼ lbs. lard.
22 ounces compressed yeast.
180 lbs. blended flour.

A very good mixture for this kind of bread is obtained from 3 parts Minnesota hard spring patent, 1 part Kansas patent and 1 part winter wheat patent.

As a rule this particular kind of dough is rushed along and expected to be ready for the oven in about 4 to 4½ hours from time when dough is mixed.

Observe the following rules: Do not add yeast until half the flour is mixed in; add lard when dough is at least half mixed. Work dough thoroughly and dry. When well mixed, let the dough mixer run ten minutes longer. Now put dough into the trough to raise. Allow the dough comparatively little space at first in the trough, pushing the board back gradually. In about 3 hours it is generally ready to work over. But it wants to be good and ripe, say, if you press on it with your fingers it must break around that place. In ¾ hour more it is ready to mould up into loaves. Give only light proof in tins and bake in medium heat with steam in oven.

A very good mixture for this kind of bread is obtained from 3 parts Minnesota hard spring patent, 1 part Kansas patent and 1 part winter wheat patent.

The following formulas have been prepared by the author of this book for the Malt Diastase Company, and are reliable:

MALT BREAD.

(For large bakeries.)

This kind of bread is made under many different names: Mother's Bread, Malt Pepto, Malt Cream, Mother's Best, etc.:

20 gallons water (90 degrees).
7½ lbs. corn flour (dry).
3 lbs. Standard Malt Extract.
4 lbs. salt.
3 lbs. lard.
30 ounces compressed yeast (Fleischmann's is used as standard yeast in the above mixture).
240 lbs. flour.

Observe the following rules: Do not add yeast until half the flour is mixed in; add lard when dough is at least half mixed. Work dough thoroughly and dry. When well mixed, let the dough mixer run ten minutes longer. Now put dough into the trough to raise. Allow the dough comparatively little space at first in the trough, pushing the board back gradually. In about 3 hours it is generally ready to work over. But it wants to be good and ripe, say, if you press on it with your fingers it must break around that place. In ¾ hour more it is ready to mould up into loaves. Give only light proof in the tins and bake in medium heat with steam in oven.

VIENNA BREAD.

Figure to each gallon liquid (1-3 milk, 2-3 water):
1½ ounces compressed yeast.
3 ounces salt.

1 to 1½ ounces Standard Malt Extract, according to strength of flour; don't add extract to sponge. This is just enough to give this bread a nice crust and good flavor and does not interfere with regular fermentation. Set large sponge, say for a 20-gallon batch, use 11 gallons of water to sponge, 9 gallons water and milk to dough; work sponge very good.

For Kaiser Semmel and Water Rolls you may use about the same as for Vienna bread.

NEW ENGLAND BREAD.

3 gallons water. (Straight Dough.)
1 gallon milk.
9 or 10 oz. compressed yeast.
½ pint Standard Malt Extract.
1½ lb. shortening (good lard preferred).
14 ounces salt.
10 lbs. mush (boiled Indian or corn meal).

About 60 lbs. flour, which is based on a mixture of 3 parts spring patent and 1 part rich winter wheat.

DIRECTIONS.—Mix the Malt Extract with the other liquids, which should then have a temperature of from 75 to 80 degrees Fahrenheit. Make dough not too stiff and let rest for 4 hours; push down well and let rest again for ¾ hour, when it is ready to mould up. Don't let the dough get too ripe the first time, so that it falls by simply pushing your hand into it. It must have sufficient resistance yet, that is, has to be cut down. Never use water too hot; rather warm your flour in winter and chill the liquid used by running through a colander with broken ice in hot weather. Malt Extract always helps the yeast along, therefore the temperature of water and dough may be kept down a few degrees below the usual heat.

Bread Baked with Ferment or Sponge.

The first factor to be looked after in baking fermented bread is yeast. Fermentation has been freely explained in Volume I., but a few formulas and suggestions relating to its preparation and use are still in place here. The preparation of home-made yeast and ferment varies greatly, and almost every baker using such has his own peculiar way of preparing it. To make it of any use to anybody else, the whole process of preparing the dough and baking the loaves has to be explained. However, compressed yeast is so reliable nowadays and the system of delivery so perfect, that it can be had fresh and be depended on in most any part of the country. To bake with ferment or home-made stock yeast requires considerable more skill and much more care than if compressed yeast is used.

DRY STOCK YEAST.

(From "Perfection in Baking," by Author of this book.)

Over two ounces of sweet fresh hops pour seven quarts of boiling water. Let it stand a while, then add one more quart of water until all the strength seems boiled out of the hops, at which point they commence to settle down below the surface. Mix enough of this liquid with eighteen ounces of bread flour and one-fourth of a pound of corn meal, one-fourth of a pound of rice flour, two ounces of crushed malt, into a smooth paste. Then add the rest of the liquid, and set aside. When partly cooled off add three or four handfuls of white sugar and one ounce of compressed yeast, or one pint of fresh, ready fermented yeast to start it. Set aside, where it will not be disturbed for at least twenty hours. Then strain and mix with sufficient flour into a stiff sponge. When well ripened throw out on a bench dusted with corn meal and roll or press out and cut in small, thick cakes, which are then dried in the fresh air, in a shady place. When thoroughly dry, pack away for future use. Keep away from heat and dampness. This is now used as mother yeast to start fresh ferment or new stock. One ounce to each gallon is sufficient in warm weather; in winter one and one-half ounces may be needed.

FERMENT.

To one peck of washed potatoes (with skin) add sufficient water to cover well. When soft put in wooden yeast tub, and mash with three pounds flour; gradually add the water left on the potatoes and then sufficient more clear water to make five gallons. When cooled to 80 degrees add three-fourth pint of old stock yeast or three ounces of compressed yeast. Set away and let rest undisturbed for about 10 or 12 hours, until it has fallen again. This ferment having the potatoes and peels in it you can notice a rim on the side of the tub after the ferment has risen and then fallen again. Before using it, strain. If the ferment works too lively add less stock yeast or less compressed yeast in making the ferment.

STOCK YEAST.

Boil 5 ounces of hops in 20 quarts of water for about 20 minutes. Have 5 pounds of bread-flour in the yeast tub; pour about 3 quarts of the hop liquor on the flour to scald it and stir it up well; after 5 minutes strain the rest of the liquid in the tub and when blood warm add 1 quart old yeast or one-quarter pound compressed yeast and set it away in medium warm place, where it must rest undisturbed for 24 hours. In summer a little salt may be added. After the above liquid has cooled down to about 160 degrees, before adding the yeast, you may add 2 pounds crushed malt.

MALT YEAST RECIPES.

Some time ago Mr. David Chidlow, Director of the Chidlow Institute of Baking and Milling Technology, Chicago, engaged his students in a series of culture of bacteria and yeasts. Some yeasts were made up according to methods in use by bakers and the results were published in the leading bakers' journals. A few of the best of these experiments will surely interest the bakers and are therefore republished here.

	No. 1	No. 2	No. 3
Water	7 gallons.	7 gallons.	7 gallons.
Hops	10 ounces.	6 ounces.	5 ounces.
Malt	20 pounds.	12 pounds.	5 pounds.
Salt	8 ounces.	6 ounces.	4 ounces.
Bran	0 ounces.	..0 ounces.	3 ounces.

The instructions with No. 1 are to boil the hops with 7 gallons of water 20 minutes, cool down the liquid to 165 degrees Fahrenheit, and then add the 20 pounds of crushed malt, to be covered up and remain covered for three hours; the malt liquid to be then strained and some cold water added to the malt to wash it, and then strained into the already strained extract. The 8 ounces of salt is then added and the whole made up to 7 gallons; cooled down to 80 degrees Fahrenheit; then stored away with two quarts of previous stock.

No. 2 recipe had practically the same directions, except that the malt liquid was to be cooled down to 156. No. 3, which has bran in its composition, gave instructions to boil the hops and bran, with the water; strain and cool down to 165; add the malt; cover up for two hours and strain; add one gallon of hot water to the malt to wash it; then add the salt and make up the total to 7 gallons.

These instructions have been followed and the yeasts made from them have been determined by our regular methods. One of them which determines the activity of the yeast is to find the amount of gas given off in a certain time of a certain amount of sugar.

No. 1 has been, on all occasions of test, the best of the three yeasts. No. 2 had too low a temperature for properly mashing the malt, and using a temperature of 166 degrees was much more serviceable. The yeast at the higher temperature for mashing being fairly equal to that of No. 1.

The tests for activity of Nos. 1, 2 and 3 showed that under certain conditions No. 1 gave 450, No. 2, 380, and No. 3, 320. All three yeasts exercise a radical influence in ripening dough rapidly, and either small amounts of this yeast should be used or a ferment used for making up the doughs. A flour that, with an equal strength in compressed yeast, could be raised like a sponge to 820 c. c. could only be fermented on an average of 560 c. c. by these rich malt yeasts, this effect being due to the amount of yeast required to be used.

SWEET, NUTTY FLAVOR IN BREAD.

The loss of or rather lacking of the old-time sweet nutty flavor is an endless topic of discussion among American bakers and millers. The competition is becoming keener from year to year among the wholesale bakers in our larger cities. Each one is trying to improve the flavor of his bread or create a special characteristic flavor of his own by the addition of malt extract and blending manipulations of different brands of flour. The growing popularity of straight doughs with short fermentation is really phenomenal. It seems to be the principal aim in making the bread from straight dough to preserve the flavor of the flour as much as possible. For that reason fermentation is carried on as rapidly as possible by using a large proportion of yeast. Malt extract is added to stimulate fermentation and give flavor, and soft doughs are used. But on the other hand it appears to the writer that our American bakers, while experimenting to improve the flavor of their bread, they are at the same time continually at work to reduce the cost of manufacture and some substitute cheaper material in the production of bread. To make a larger loaf for less money than competitors is the aim of many bakers. How to combine this aim with the fine nutty flavor is a hard problem to solve. The man who solves it will make a large fortune.

It is no secret that the bread consumed in this country is not as large per capita as it is in other countries. The writer has pointed out time and again before, that in his opinion the increase of the bread consumed rests with the bakers. We still hold to the opinion that people, rich or poor, are willing to pay a cent more for a loaf of bread any time if they get a loaf of particularly good flavor. A good, sweet, solid loaf, we venture to say, will be appreciated more by the consumers than a heap of wind, a large crumbly blown up loaf. Such offers as the "3 loaves for

5 cents" sort are only a temporary advertisement and a bait to draw customers for other goods to the grocery store selling this bread. It is certainly a detriment to the bakers' trade at large, wholesaler and retailer. But let the bargain bread go on, it must die out sooner or later.

We only advise the retailer and the wholesale baker to produce the best loaf they possibly can. Use the best of everything. If the yeast costs you 5 or 10 cents more a pound if you are convinced you have the best. Let us see into how many loaves are the 5 or 10 cents to be divided? Probably 150 to 200 loaves. If you can get the best of yeast for less money it is well and good, but experimenting to reduce cost of material does not pay, unless it is done on a small scale outside of your regular batches intended for your regular trade. Don't let them pay for the product of your experimenting. If your customers are used to your bread and rolls, they like to have it every day alike. If you have succeeded in improving the quality and are sure of the results, then only venture to introduce such improvement into your regular batch.

Another question:

"Do you use any butter in your bread?"

No doubt many will laugh at the question. But never mind them, just try it once. Put a piece of butter, good butter, into your bread dough and compare the flavor with a loaf from the other batch. "We can't afford to use butter in our bread," you may say; "why we would go bankrupt." No such thing. Suppose a retail baker bakes as many as five hundred loaves a day, and he uses 1½ to 2½ pounds of good butter in these five hundred loaves, will he hazard his business? We say no. The 2½ pounds of butter will cost him at the most 45 cents, and he saves the same quantity of lard which would cost at present price 30 cents. This leaves an increase of cost of butter over lard of 15 cents. Will that break any baker—15 cents increase of cost on 500 loaves? Will the 15 cents extra cost for butter improve five hundred loaves of bread? Well, try it and you will be able to judge for yourself. The more the quality of the bread is improved the more bread will be consumed, and with the increase of demand for the better bread the bakers are baking, the better bread trade will prosper.

SALT RISING BREAD.

In the evening scald 1 pound corn meal with 1 quart fresh milk, add 1 ounce salt, 3 ounces sugar and let it stand over night. It should be a batter like for buckwheat cakes, if too stiff add some cold milk or water. Next morning add ½ pound lard, 1 quart warm water, 1 quart milk, 1 ounce saleratus and about 12 pounds strong wheat flour to make a medium stiff dough. First add only 1 pound flour at a time and keep beating the dough well. The dough must be kept somewhat softer than regular wheat bread dough. After it has been completely mixed, let rest only about fifteen minutes, then mould into loaves, set to proof in greased tins and bake for about 40 minutes. This dough must be kept warm at all stages, and is baked in a hot oven.

SALT BREAD (Without Yeast),

1½ pounds washed potatoes are boiled with 3 to 4 quarts water, peel and mash them fine, add 3 pints of the potato water, 3 ounces brown sugar, 2½ ounces salt and ½ pound white corn flour or fine corn meal and let this stand for about 20 minutes. The temperature of this mixture should be about 85 degrees Fahrenheit. After it has rested the time mentioned above, add 1 quart fresh water at 80 degrees Fahrenheit and mix with sufficient strong Minnesota patent flour into a very soft dough. Let this rest in a warm place for 4 to 5 hours, then work it over with more flour until smooth and spongy. Let prove for one hour more, when it should be ready to mould into loaves. Large round tins are best adapted for this kind of bread, and loaves pressed flat so they cover the pan only about 1½ to 2 inches deep. Let them raise for about 40 minutes in a warm place and bake in medium heat.

SELF RAISING BREAD (With Baking Powder).

5 pounds Minnesota spring patent flour, 5 pounds rich winter wheat flour, 8 ounces good baking powder, 3 ounces sugar and 2 ounces salt sifted together two or three times. Rub into this ½ pound rich lard and four ounces butter, softened. Mix all with 4½ to 5 quarts cold milk to a medium stiff dough. Mix only light and form into loaves at once, place them in greased tins, press even, wash tops with milk and put at once into hot oven. When raised and tops commence to take color, shut off the heat.

HOMEMADE BREAD.

For homemade or New England bread with sponge take: 10 quarts water at 80 degrees Fahrenheit for sponge with 4 to 5 ounces compressed yeast and sufficient flour. Sponge must be kept soft; let it raise the second time, which should not take more than 3 to 3½ hours. Then brake the sponge up well with 5 quarts warm water or part milk, 8 to 9 ounces salt, ¾ pound lard, 1 pound sugar or 6 ounces good malt extract and finally mix into a medium stiff dough with the necessary flour. Let dough raise well; in summer it should take about one and a half hours; in winter it may stand two hours; push the dough down once and let stand about 20 minutes longer, before moulding. A mixture of 2 barrels of strong Minnesota spring patent flour and 1 barrel good rich winter wheat flour is preferable for this bread.

Keep plenty of soft lard on hand to grease the bench, your hands when moulding the loaves and if made in mixer, grease the mixer before taking out the dough.

A GOOD HOMEMADE BREAD.

Set soft sponge with 6 to 7 ounces compressed yeast, 3 gallons water at 85 degrees Fahrenheit and sufficient strong spring patent flour. Let the sponge drop once and come up again which should take about 3 to 3½ hours. For dough add one gallon milk and 3 quarts water (80 degrees Fahrenheit), 14 to 16 ounces salt, 1 pound lard, 1¼ pounds sugar, or 10 ounces good malt extract. Make slack dough which should stand about one hour and a half; then push down or cut over and let stand about half hour longer. A mixture of 2 barrels of strong spring patent and 1 barrel rich winter wheat flour is the best mixture. Some bakers add one barrel "straight" spring or Kansas flour. Mould up and give good proof in tins, before baking.

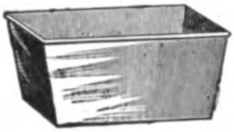


Fig. 110—Homemade Bread Pan.

MILK BREAD.

For sponge take ½ pound compressed yeast, 10 quarts water (76 degrees Fahrenheit) and the necessary flour. Let it drop once and come up again. For dough add 10 quarts milk, 4 quarts water at 78 to 80 degrees, 10 to 12 ounces salt, ¾ pound lard, 4 to 6 ounces butter, 1½ pounds sugar and sufficient flour. A mixture of 2 barrels strong Minnesota spring patent flour and 1 barrel rich winter patent gives good results, but 1 barrel sound Kansas patent may be added to good advantage.


Fig. 111—Milk Bread Pan.

If malt extract is used, take 6 to 8 ounces to above batch and only ½ pound sugar, or sugar may be left out altogether.

DOMESTIC BREAD.

(With ferment.)

Make sponge with 5 gallons ferment, ¼ pound salt and sufficient flour.

When it falls the first time add 10 quarts water, 1 pound salt, ½ pound good malt extract, or 1¼ pounds sugar, 1¼ pounds lard.

Take ferment for sponge at 85 degrees; for the dough at 80 degrees. Let dough only come once.

This dough can stand a strong flour.

CHEAP HOMEMADE BREAD.

Set a soft sponge with 2 pails (20 quarts) ferment, ¼ pound salt, ½ pound sugar and sufficient flour. When it drops (in about 3 hours) add 1 pail water, 1 pound salt, 1¼ to 1½ pounds sugar (or ½ pound malt extract), 1¼ to 1½ pounds lard. Mix with flour to a medium stiff dough. Let prove for one and a half hours. Push it down and give it about a half hour more time to prove. Heat the water (ferment) for sponge to 85 degrees, for dough at 80 degrees. To make it still cheaper, add to the dough 5 pounds scalded rice flour (mush) or corn flour mush. 6 to 7 ounces compressed yeast with 20 quarts water may be used in place of the ferment.

For the ferment take 5 pounds potatoes boiled soft with a gallon water; mash them in the ferment tub with 3 pounds flour and some of the potato water, add sufficient water to make 20 quarts in all. When cooled to bloodheat add ½ pint stock yeast or 2 ounces compressed yeast and stir up well. Set away undisturbed for about 10 hours. When it falls, it is ready.

FOR MILK ROLLS AND BUNS.

Take to the dough some milk, more sugar and lard or a piece of butter.

POTATO BREAD.

Twelve pounds of potatoes with skins left on (but washed very clean), boil with about 7 quarts of water. There should be about 1 gallon of water left when the potatoes are soft. Peel them and mash very fine, rubbing through collander. Add the potato-water. When cooled off to about 80 or 85 degrees Fahrenheit (according to temperature of the shop and flour), add 2½ to 3 ounces compressed yeast, which has been dissolved in one pint of tepid water. Pour all into trough and set to medium soft sponge with sufficient strong spring patent flour. Beat this sponge up well to get plenty of air into it. It should be ready in 2 to 2½ hours. Take it young, don't let it fall the second time. Now add 1 gallon more water (at 76 to 78 degrees) 6 to 7 ounces salt, one-half pound sugar, 5 or 6 ounces lard, and sufficient strong spring patent flour to make into medium stiff dough. Do not add all the flour at once, beat up well to get the air into it and add more flour gradually. Work dough well through when stiff enough. Then cover over and let raise. Push down once and let it come up again for a half hour. Mould up and scaling it and let prove for awhile before remoulding into round or square loaves ready to put into the pans. Don't give too much proof.

YANKEE RYE.

Take 5 quarts from white bread sponge, add 3 quarts water, (90 degrees Fahrenheit) 1 pint dark molasses, 3 ounces of salt, about 1-3 pint good malt extract, about 8 pounds of rye flour and enough soft spring wheat flour to make a soft dough. If you have a piece of "sour" left from day before (say ½ to ¾ pound), add this to the sponge and a few pounds of flour and let stand a short time, before you make the dough. Mould up in long loaves, and set in long narrow deep tins, 3 inches wide on bottom and a little wider on top ,and about 4 inches high, which will give a loaf to slice just the right size for sandwiches; grease tins thoroughly. If your trade likes the flavor of caraway, you may add a handful of caraway seeds to dough.

COLUMBIA BREAD.

(Without Yeast.)

12 pounds patent flour, 1¼ pounds powdered sugar, 3 ounces salt, 6¼ ounces cream tartar, 3 ounces soda, 5 quarts milk, 12 ounces lard. Dissolve the soda and salt in the milk; rub the lard well into the flour, jumble altogether and beat to smoothness, put into box shaped covered pans about 3½ x 6 inches, 3½ high and bake in solid oven.

A RELIABLE GUIDE.

The following table was prepared by C. J. Tillford & Son, bakers, for the use and convenience of the members of the New York Retail Bakers' Association, and shows the number of loaves of bread a barrel of flour will make, taking as a basis two hundred and eighty pounds of dough to a barrel.

No. Whole Loaves per Bbl.	Weight of Dough in a Loaf. Pounds.	Ounces.	Left Over. Pounds.	Ounces
373	—	12	—	4
344	—	13	—	8
320	—	14	—	—
292	—	15	—	—
280	1	0	—	—
263	1	1	—	9
248	1	2	1	0
235	1	3	—	15
224	1	4	—	—
213	1	5	—	7
203	1	6	—	14
194	1	7	1	2
186	1	8	1	0
179	1	9	—	5
172	1	10	—	8
165	1	11	1	9
160	1	12	—	—
154	1	13	—	14
149	1	14	—	10
144	1	15	1	—
140	2	—	—	—
135	2	1	1	9
131	2	2	1	10
128	2	3	—	—
124	2	4	1	—
112	2	8	—	—
101	2	12	2	4
93	3	—	1	—
86	3	4	—	8
80	3	8	—	—
74	3	12	2	8
70	4	—	—	—

VIENNA BREAD.

For Vienna bread always set a large sponge and beat it well; for instance, if you want to make a batch of 20 gallons liquid, use 11 gallons of the sponge and pour the remaining 9 gallons for the dough. Use at least half milk. Figure for each gallon liquid 1½ ounces compressed yeast, 3 to 3½ ounces salt. 1 to 1½ ounces good malt extract may be added for each gallon to the dough, just enough to help giving this bread a nice crust and better flavor. The sponge is not allowed to drop; it is taken when it breaks.

Dough is kept young. Push it down, after it is near ready the first time, let stand again.

FRENCH BREAD (Sticks).

To 200 pounds flour take about 64 quarts water (or water and some milk). Set sponge with 40 quarts water, 1¼ pounds yeast, 110 pounds flour. The sponge must be watched so it can be taken as soon as it shows signs of drop.

For the dough take the remaining 24 quarts water, 3 pounds salt, about 90 pounds flour; the dough must be worked thoroughly. Let it come up twice. Water for sponge 80 degrees Fahrenheit; for dough, 78 degrees.

Take good Minnesota spring patent flour, or mix 2-3 of this flour with 1-3 softer flour.

This bread is moulded into long sticks, set between cloth and baked on the hearth in steam oven. In hotels it is often baked in long tins.

SNOWFLAKE BREAD.

You have to set a large sponge and let it get very old. Take say three-fifths of all the liquid given in formula for sponge and only add two-fifths to dough. Let sponge stand six to seven hours and set it about the same temperature as the heat in the shop.

To each gallon of water take two ounces of compressed yeast, three ounces of salt, four ounces of lard, three ounces of sugar. Dough very stiff. As soon as dough is taken from mixer, pass it through rollers, and then mould up at once.

The dough for Snowflake bread must be mixed very stiff and mixed well, and a dough-mixer for doing this is almost a necessity. Also the sponge must be very old, as old as possible, almost on the point of getting bad. Dough very stiff and run through the rollers 12 to 15 times, getting most of the life out of it is one of the rules.

RIPENESS OF DOUGH.

Ripe, overripe, unripe, are all intermingling terms. A dough that would be overripe for two pound loaves is only ripe for rolls or one that would be just ripe enough for very crusty bread, baked in a hot oven, would be overripe for very crumby bread; but if this crumby bread happened to be put in a cool oven, it would probably develop a bad flavor. Therefore, heat of oven and size of loaf are very important items to consider in the day's baking. Heat decomposes acids, and the acid of a ripe loaf is increased or decreased accordingly by different temperatures of oven, and the crust will always be sweeter than the crumb of a ripe loaf for that reason.

AERO BREAD.

In Melrose, Mass., a bread is made which depends for its distinctive character on a patented distilled water. Mr. A. J. Chase, the patentee, says concerning it: "Aero bread is made without milk, shortening or anything except Aero Distilled Water, a little salt and somewhat less yeast than is generally used. With good flour the best bread ever tasted can be made with this pure soft oxygenated water. Bakers here are using it in their homes instead of their own. The method of procuring the Aero Water is patented, and the bread is protected by Trade Mark. I have been some years in perfecting all the details for making this bread, and have got it perfect. The Aero Toast is something delicious and appetizing, so too are the Croutons for soups, beef tea and other uses. Then to use up every crumb so that nothing is wasted we dessicate the fragments and granulate them for puddings or to be eaten with milk as a cereal or for dressing for meats or fish. The yeast element is entirely eliminated from these three articles. In this state of sweetness they will keep in any climate for any length of time."

BRUNSWICK LOAF.

(From Jas. Y. Watkins & Son, New York.)

This makes a nice loaf for lunch or for sandwiches. A rather close and rich dough is required. Pans are from 12 to 24 inches long.

2 gallons water (85 degrees Fahrenheit).
8 ounces salt.
12 ounces sugar.
1½ to 2 pounds lard.
26 pounds mixed flour (half winter wheat, half spring wheat).
3 to 4 ounces yeast.

Four ounces malt extract may be added; all made into smooth dough, which must be worked well and thoroughly. Let rest 3½ to 4 hours, work over, let come up again and knock down once more; in all, dough should have about 5½ hours, then scale and mould into loaves, give only medium proof and bake in medium heat.

FRUIT BREAD.

To each 16-quart pail water use 8 ounces yeast, 1½ quart molasses, 8 pounds raisins, 4 pounds currants, ¾ pound salt, 1 pound sugar, 1½ pound lard, ½ ounce spices, some egg color. Set large sponge with two-thirds of the water, the yeast and some strong spring patent flour. To the dough you can take softer flour; do not make dough very stiff and let come up twice. Bake in tins.

DOMESTIC BREAD.

With Glucose or Glycerine.

The following formula is given in the M. B. Book of New Orleans:

1 barrel spring wheat patent flour.
41 quarts liquid.
12½ pounds cottolene.
2¾ pounds compressed yeast.
1½ pounds sugar (granulated).
5½ pounds glucose.
1¼ pounds salt.
6 quarts potato yeast, made without hops.

Sift the flour into the trough, make a bay in one end. To the glucose add 2 quarts of hot water to dissolve it, add some milk and heat all to 80 degrees Fahrenheit (in winter higher), dissolve in it the yeast and sugar and salt. Pour in trough with the potato yeast and set with enough of the flour to soft sponge. Let stand ¾ hour, then add more water and milk to make in all 41 quarts, mix with the rest of flour and the cottolene to dough. Mix in trough or in kneading machine thoroughly—passing it through the brake two or three times is a great improvement. If you have no brake it wants thorough kneading.

It is best to try small batches first, to learn about proving it right, as this must be learned by observation. In place of glucose 1 pound melted glycerine can be added slowly, during mixing of dough.

SNOW FLAKE BREAD.

You have to set a large sponge and let it get very old. Take say three-fifths of all the liquid given in formula for sponge and only add two-fifths to dough. Let sponge stand six to seven hours and set it about the same temperature as the heat in the shop.

To each gallon of water take two ounces of compressed yeast, three ounces of salt, four ounces of lard, three ounces of sugar. Dough very stiff. As soon as dough is taken from mixer, pass it twelve to fourteen times through rollers, and then mould up at once.

QUICK LOAF.

Dissolve 2½ pounds yeast in 2 gallons of water at 90 degrees Fahrenheit, add about 2½ pounds of flour and ½ pound of sugar. Leave stand about 15 minutes just for yeast to get a start. Take 12 gallons of water of about 105 to 110 degrees Fahrenheit (according to temperature of flour), when dough is finished it should be 87 degrees Fahrenheit. Salt 4 pounds, let stand only 1 hour, then cut back, giving another half hour rest; also give good proof after moulding. The whole process, from the setting yeast to the baking, is done in about 4 hours.

GLUTEN OR WHOLE WHEAT BREAD.

Twelve quarts water (warm), 5 ounces compressed yeast, 1 ounce salt, 1 quart molasses; mix with sufficient gluten or entire wheat flour to soft dough and give not so much proof as for white bread.

BOSTON BROWN BREAD (Straight Dough).

Mix 2 pounds cornmeal, one pound ryemeal, one pound graham flour, one pound wheat flour ½ ounce salt. Dissolve one ounce compressed yeast in two quarts of water or milk and mix all. If too stiff, add little water, a half to one pint molasses, make dough about the consistency of corn-muffins. Put in well greased, deep tins with cover; do not fill much over half full. Set into a pan containing water to a depth of one and a half inches so they will steam from bottom. Bake three or four hours in medium heat, when the water should be all evaporated. You can take yeast a little short and use buttermilk or sour milk instead of fresh milk or water for mixing and add a heaping teaspoonful of good baking soda to it. (See Figure 8, Colored Plate 19.)

BOSTON BROWN BREAD (Sponge).

Fourteen quarts water (lukewarm) 1½ quarts of stock yeast or 3 to 4 ounces compressed yeast set to medium stiff sponge with sufficient rye and yellow cornmeal. When it cracks on top add ½ gallon water (90 degrees Fahrenheit), 3 quarts molasses, 5 ounces soda and 5 ounces salt. Use 4 pounds cornmeal, 4 pounds graham flour, 2 pounds coarse rye and sufficient wheat flour to make soft dough. Scale off at once into the greased tins. Let stand about ½ hour and bake in cool oven.

Boston Bread can also be made from prepared flour, already mixed with baking powder, using water or buttermilk and molasses to taste. I prefer to take very little, but the best, molasses and add some burnt sugar color to darken.

BOSTON BROWN BREAD.

1 pound graham flour, 2 pounds rye flour, 3 pounds yellow corn meal, 3 pints light colored molasses, 5 pints water, 2-3 ounces soda, 1 ounce cream tartar, 1 ounce compressed yeast, salt. Will make about 12 small loaves. Bake about 1 hour in medium oven.

GRAHAM BREAD (Without Sponge).

¾ pound yeast, 7 gallons lukewarm water, 6 pints dark molasses, 10 ounces salt, 15 pounds graham flour and sufficient wheat flour to make medium soft dough. Let stand over night (6 to 8 hours). Scale off into loaves in the morning without working the dough much, and mould into loaves. Have tins greased well. Give not too much proof, bake in medium heat.

GRAHAM BREAD.

3	quarts water.
1½	pints molasses.
3½	ounces yeast.
2	ounces salt.
4	pounds graham flour.
6	pounds bread flour.

Rub the yeast with 1 pound of the flour and 1 quart of the warm water together in a small bowl and let rest for 15 or 20 minutes. Then add all the water, a small scoop full of the flour and let it raise in warm place for one hour, add salt and molasses and mix with the rest of flour to soft dough, which should stand 5 to 6 hours.

GRAHAM BREAD (With Sponge).

To 2 quarts of sponge from white bread add 1 quart warm water, ½ pint dark molasses, 2½ ounces salt and sufficient wheat flour to make soft dough. Let stand about 2 hours. Mould up and bake as above.

VIENNA BREAD FOR SMALL BAKERS' TRADE (England).

Two ounces yeast, 1 quart water, 1 quart milk, 1 ounce sugar, 1 ounce salt, and 9 pounds finest Hungarian flour. Put in a sponge, with the milk and water at 90 degrees Fahrenheit; yeast, sugar and flour to make a batter sponge. Let this rise and fall, and then make the dough. Powder the salt on to the sponge, and mix with enough flour to make a slight dough. It will be ready for molding in an hour. When the loaves or rolls are molded, put them away out of the draught. Make the oven hot, but not rash or scorching, as that will not only color the rolls too freely, but probably destroy more steam than there is to spare; nor must the oven be a cold dead heat, because then there will not be enough disengaged heat to catch and rapidly set fast the wet surface with which the steam has covered the dough. While the rolls are proving, and the oven is heating, the steam also must be "getting up" in the boiler. Arrange to have the oven, steam, and rolls all ready at the same time; then wash the rolls over with a thin paste or wash by scalding a little flour with boiling water; turn about 15 to 20 pounds of the steam into the oven, and then, with the steam still going into the oven, cut the rolls and put them quickly in, and shut the oven-door, closing every aperture that would let the steam out. The rolls must be put into the steam, because, if the surface be allowed to get dry in the oven, it will be next to impossible for any amount of steam to cause a polish. There may be plenty of steam available, in which case shut it off after the bread has been in the oven a few minutes.—*Bakers' Times.*

A GOOD NEW ENGLAND LOAF (Straight Dough).

The following reliable formula is used daily in a large retail bakery with good success.

11	quarts water.
3	quarts milk.
7	ounces Fleischmann's yeast.
1½	pounds lard.
1	pound salt.
12	pounds mush (scalded Indian meal).
52	pounds flour.

For mixture they use 3 parts Minnesota spring patent flour and 1 part winter wheat flour.

When all the materials but flour are mixed they should have a temperature of 75 degrees Fahrenheit. Of course, if the flour is very cold a higher temperature is necessary. This dough should make 80 loaves to be scaled at 1 pound and 2½ ounces each.

The same baker gives the following points to be observed:

Set all doughs cool, but use plenty of yeast. Keep dough young, push down once or twice before it is ready. Keep to an even temperature of about 85 degrees in the doughing room. Dough should never be so ripe that it falls when you push your hand into it. My parole is: Cool water means health for dough; warm or hot water, poison and destruction for dough.

BRAN WATER IMPROVES BREAD.

An experienced baker made the following statement:

"If you soak a quantity of bran in the water to be used for the bread dough you will realize from 7 to 8 per cent. more bread from each batch of dough. The bran contains some gluten, which is dissolved during the soaking and is introduced into the dough with the water.

Although the loaves may not be quite as white as the regular bread it is more wholesome and has a better flavor.

TO GIVE VIENNA AND RYE BREAD A GLOSS.

Cracknel biscuits are dipped in boiling water before baking which gives them a gloss. If dumplings would be put into a bakeoven, after being boiled, they would also be glazed, i. e., have a fine, rich, glossy crust. Lye or salt pretzels are also boiled in a lye solution before they go into the oven, because a rich, glossy crust is desired. The boiling water, acting upon the surface of the dough, converts the starchy matter at the surface of the loaf first into "dextrine," a gummy substance. Dextrine is produced by the action of heat upon the starch. But first a hot water or steam bath is necessary to moisten or soften the surface. The heat of the oven will then dry or bake it, and leave a gloss on the loaf as well. It is even customary to wash the loaves first before peeling in the oven.

Mr. John Blandy, of London, explains the process thoroughly. He writes:

"When the loaves or rolls are moulded, put them away out of the draught. Make the oven hot, but not rash or scorching, as that will not only color the rolls too freely, but probably destroy more steam than there is to spare; nor must the oven be a cold dead heat, because then there will not be enough disengaged heat to catch and rapidly set fast the wet surface with which the steam has covered the dough. While the rolls are proving, and the oven is heating, the steam also must be "getting up" in the boiler. Any quantity will do; as a rule the more the better—from 40 pounds; not dry steam, or hot vapor, but wet steam newly generated from a good body of water, the boiler being half or two-thirds full. Arrange to have the oven, steam, and rolls, all ready at the same time; then wash the rolls over with a thin paste or wash, by scalding a little flour with boiling water; turn about 15 to 20 pounds of the steam into the oven, and then, with the steam still going into the oven, cut the rolls and put them quickly in, and shut the oven-door, closing every aperture that would let the steam out. Note particularly.—The rolls must be put into the steam, because, if the surface be allowed to get dry in the oven, it will be next to impossible for any amount of steam to cause a polish. There may be plenty of steam available, in which case shut it off after the bread has been in the oven a few minutes."

WHOLE MEAL BREAD.

Bread made from meal with addition of the bran and germ of the wheat in place of using white flour has been extensively advertised in late years. However, its consumption is rather limited. The greatest objection to whole meal arises from its being more liable to getting heated and becoming musty on account of the presence of the germ. The germ is principally composed of soluble albuminoides, which act on the starch in the flour. Although the whole meal contains all the nutrition of the wheat kernel it must not be allowed to get old after being ground. The cerealin contained in both bran and germ acts upon and converts the starch in the flour into dextrine during the process of breadmaking, and the albuminoides are softened to a great extent, which causes this kind of bread to become soggy and heavy very easily. As a rule it requires a longer time to bake it thoroughly. A larger percentage of yeast is necessary, as fermentation must be carried on at a lower temperature than usual and the loaves should not be raised too much before baking.

BREAD FROM BANANAS.

A common food article in the West Indies is a flour made from the bread fruit. The fruit is cut into "pegs," or strips, and dried in the sun, then ground to powder in a mortar and sifted. This flour makes a very convenient and highly nutritious addition to the hamper of provisions the negro usually takes with him when traveling far from his home, and he well knows the art of making it into a variety of appetizing dishes. The plantain is sometimes treated in the same way, as well as the banana, which gives a sweeter and richer flour than either the plantain or bread fruit. It is estimated that the banana has forty-four time more nutritive value than the potato, and is twenty-five times more nutritious than good white bread. This fact has induced the French Government to send a commission to the United States and Central America with a view of investigating the adaptability of the banana plant for extensive agricultural operations in the Congo in the production of cheap food for the working classes in Belgium. Should this commission report favorably on the subject of their investigation, a new and vast industry will be established, which interests the United States very closely, from the fact of Porto Rico and Cuba possessing hundreds of thousands of acres on which the finest varieties of the banana can be successfully grown. It is highly probable that another industry will grow up from the association of this country with the West Indies. The banana in its candied form is a delicious sweetmeat. Many people prefer it infinitely to dried figs. It is simply made. The ripe banana is cut into thin slices and laid in the tropical sun until it becomes a sweet, semi-gelatinous mass. The slices are packed in boxes with a dusting of fine sugar between each layer, and are ready for shipment. The process, though not elaborate, requires care and watchfulness, without which the product may be inferior and unattractive. But if the curing and packing are properly done, and the cured fruit is put on the American market, it is not improbable that it will soon take the place of the fig for dessert purposes.—*Fruitman's Guide.*

PARKER HOUSE ROLLS.

1½ gallons milk.
2 quarts water.
12 ounces compressed yeast.
20 eggs. 3 to 4 oz. salt.
1½ pounds butter.
¾ pound lard.
1 pound sugar.
3 ounces malt extract may be used and only half the sugar.
Little egg coloring.
Set dough warm. This dough can also be used for buns.

PARKER HOUSE ROLLS (Quick Dough).

Five quirts milk, 3 quarts water (about 85 degrees Fahrenheit), 10 to 12 ounces compressed yeast, 1 quart eggs, 1 pound butter, 1¼ pounds lard; ¾ to 1 pound sugar, 2 ounces salt, egg color. Some bakers make Parkerhouse rolls considerably cheaper by omitting butter and eggs and using more egg-coloring. Give them some shape as in above mentioned formula.

If you want to take bread sponge for roll dough, use to 10 pounds of the sponge, when ready, 2 to 3 quarts of milk or part water and allow ¾ pound sugar, 1 pound lard (or part butter), 2 to 2½ ounces salt, break up sponge well and let dough not get too old.

Currant buns, cinnamon buns and different kinds of buns may be made of this dough by giving different shapes and adding different spices.

SPONGE FOR BREAD, BUNS AND RUSKS.

Set a stiff sponge of 1 pound compressed yeast and 9 gallons of warm water (85 degrees Fahrenheit), let stand 3 to 5 hours; until it falls the first time. If all the sponge is to be used for small stuff, part milk can be used.

For bread dough add 10 quarts more water (85 to 90 degrees), 1½ pounds salt, 1½ to 2 pounds sugar, shortening to suit taste and sufficient strong flour. Let dough come twice.

BUNS AND RUSKS.

Take for each 10 pounds of the above sponge when ready 1 pound sugar, 14 ounces shortening, salt and flour. Work dough well; some warm milk may be added.

ALBANY ROLLS.

To each 20 pounds of above sponge take 1 pound sugar, 1 pound lard, salt and mix with flour enough to make smooth dough.

GERMAN BUTTER ROLLS

See page 276, Volume I.

LUNCH BUNS.

To 10 pounds of bread sponge, add 3 pints of milk, 1 pound sugar, 1 pound lard (or part butter) or other shortening, 1¼ ounces salt, some egg-coloring may be added. These buns are either washed with egg-wash or with butter and dipped in coarse sugar, after they are molded up and then set on large tins to raise, or they are glazed with water-icing as soon as baked.

SUGAR BUNS.

Set soft sponge with one gallon water (80 degrees Fahrenheit) or part milk, 6 ounces compressed yeast and sufficient flour; flour should be blended, using one-half strong spring-patent and one or two kinds of cake flour (winter wheat). Beat sponge well. For dough add 3 to

4 pints more milk, ¾ pound butter and lard, 1½ pounds sugar, lemon, color, mace, 2 ounces salt. Work dough well, with part of the flour, before you add all the shortening. Hold dough soft and push back twice. Proceed in usual way.

MILK ROLLS (Without Sponge).

Set stiff dough late in the evening of 4 ounces compressed yeast with 4 quarts milk and 5 quarts water (65 to 70 degrees), 3 to 4 ounces salt, 5 ounces sugar, ¾ pound butter and lard mixed (or all lard), and sufficient flour. In the morning cut out the dough, break off in pieces, mould up same as for buns, let spring a little; then press down in centre with thin rolling pin, wash with melted butter or lard and turn one-half over, same as for Parkerhouse rolls. Set on greased tins and raise in proofbox. They may be washed with milk wash, before going into the oven. Oven must be hot, so they do not bake too slow. If malt extract is used, take for above quantity 3 ounces and omit sugar.

NEWPORT ROLLS.

Some people like baking powder biscuits, but would like more crust on them. The following recipe will prove a good seller for such trade: Three and a quarter pounds of blended flour and three ounces of baking powder sifted together; rub dry into the flour half a pound of butter (or good hard lard), one ounce of salt; mix with one quart of milk into a smooth dough; if too stiff add a little more milk. Then roll out one-half inch thick, cut with large scolloped cookie cutters, wash with melted butter on the edge, double over like turnovers, press slightly together, wash with egg wash and bake to golden brown in good heat (400 degrees, Fahrenheit thermometer).

GRAHAM GEMS.

Bake like biscuits from either formulas given above for Graham Bread. Roll up like biscuits, set to raise in gem tins and do not bake too hot.

FINGER ROLLS OR LADY WASHINGTON ROLLS.

Dissolve 4 ounces yeast in 2 quarts of warm milk; add ½ pound lard and butter, 6 ounces sugar, 1½ ounces salt, 1 more quart milk, 1 quart water, and mix all into a smooth, medium, stiff dough. Take a blended flour, half Minnesota spring patent and winter wheat flour. Work the dough well and set to raise about 2½ hours. Break off in small pieces, mould up round and cover with cloth; let them stand for about 15 minutes. Then mould in finger-shape and set close together on greased tins. Before baking wash with egg.

COFFEE CRESCENTS (Muerbe Hoernchen).

To 20 pounds of roll or bread dough take 2 pounds butter, 1 pound lard, 10 eggs, ¾ pound sugar; mix well and make into crescents. Also see Vienna Baking, page 334.

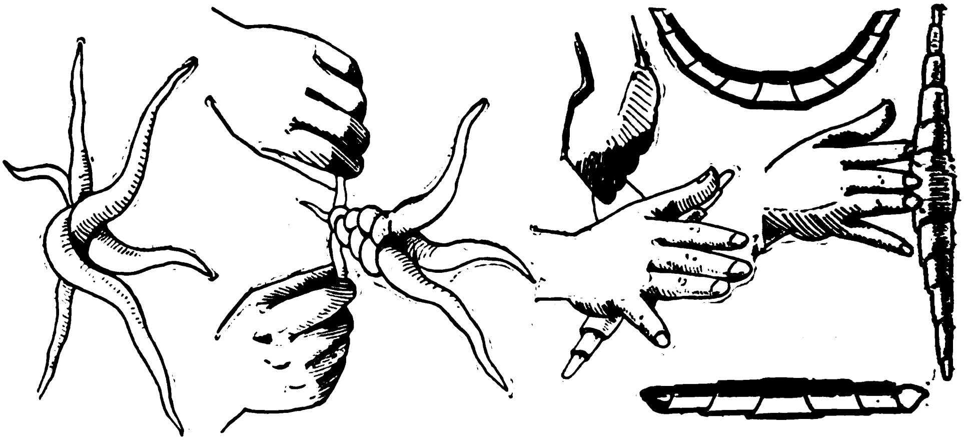


Fig. 113.—Moulding Crescents.

TEA BISCUITS. I.

6½ pounds flour, 6 ounces baking powder, 1½ ounces salt all sifted together. Rub 12 ounces lard dry into the flour and mix all into a light dough with 2½ quarts of cold milk. Roll out 1½ inches thick, set close together and wash with milk; prick with a fork or docker and bake in solid heat.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¼ nat. Size

SODA BISCUITS. II.

15 pounds flour, 2 pounds lard, 6 ounces cream of tartar, 3 ounces soda, 4½ quarts cold milk, ½ pound sugar, 1 pennyweight ammonia, 2 ounces salt; mix cream tartar and soda with flour. Mix dough more thoroughly than for mixture No. I. and let the biscuits stand for 8 to 10 minutes before they go into oven.

MARYLAND BISCUITS.

Take 4 pounds of old dough from day before and break up with 1 quart warm water, add 1½ ounces salt, 1½ ounces sugar, 1 pound lard and 6 pounds winter wheat flour. Mix into a stiff dough, roll 15 to 18 times through rollers or beat with rolling pin until smooth and close. Make up into round biscuits and set on tins. Dock them with fork or docker and bake in hot oven. This same dough makes a good biscuit for sandwiches. Roll out a sheet ½ inch thick, dock and cut with large biscuit cutter.

MARYLAND BEATEN BISCUIT.

Into one pound cake flour rub 3 ounces of lard and ½ teaspoonful of salt and one tablespoonful of sugar. Mix with a half pint cold water into a stiff dough. Knead for about 10 minutes, then take the rolling pin and beat the dough hard, turning over and over, until it is light and puffy. When you break a little piece off it must be snappy like cracker dough. Brake off small pieces now and mould up into round biscuits. Cut a little off on top in the centre and turn the biscuit over. Set them on slightly greased pans, two inches apart each way and let rest a few minutes, then press a dent in centre of each with your thumb. Prick with fork and bake in a quick heat. It should take about twenty minutes. The edges will crack like crackers and the biscuits should be light and smooth.

CORN MUFFINS. I.

Mix together ½ pound sugar, 6 ounces corn meal, 6 ounces butter and lard mixed, 4 to 6 eggs, 1 pint cold milk, last 18 ounces wheat flour with one ounce good baking powder, pinch of salt. Have deep gem tins well greased and heated.

CORN MUFFINS. II.

3 pounds sugar, 18 ounces shortening (butter preferred), 1½ pint eggs. 1¼ ounces baking soda, 2½ ounces cream of tartar, 2 quarts milk 2 pounds corn meal, 3½ to 4 pounds pastry flour. Follow instructions given above.

CORN BREAD OR JOHNNIE CAKE.

Same mixture as above, only add about 3 ounces more sugar and bake in long, flat tins. Dough should be a trifle softer than for muffins.

RAISED DOUGHNUTS.

To each 6 pounds of bread sponge (same as used for buns) add 14 ounces shortening, ½ pound sugar, salt, mace for flavor and egg color to make a soft, smooth dough. 3 to 4 eggs can be added. When raised fry in lard or oil.

BISMARCKS OR JELLY DOUGHNUTS.

See Volume I., page 276.

DOUGHNUTS OR CRULLERS.

Mix 1 pint of eggs or yolks, 2½ pounds sugar, 10 ounces shortening, salt, mace and vanilla flavor; add 2½ quarts milk and 8 pounds of pastry flour sifted with 4 ounces good baking powder.

A piece of bread or roll dough, broken fine with the milk, may be added to good advantage. Roll out, not too thick, cut out with cruller cutter and twist them. Let stand just a few minutes before putting into the hot grease. When cold, roll in a mixture of powdered sugar, cornstarch and vanilla powder or cinnamon. If you want to use sour milk, use double quantity of baking soda to above formula, and no cream of tartar.

FRIED CAKES.

Mix 8 eggs, 1½ pounds sugar, ¼ pound butter, 1 quart milk, salt, mace or vanilla powder and 4½ pounds pastry flour into which 2 ounces of good baking powder has been sifted. Mix only light so dough will not get tough. Roll out in a sheet ½ inch thick and cut out with round cutter which has a hole in the middle.

COFFEE CAKE DOUGH. I.

Set soft sponge with 14 ounces yeast, 7 to 8 quarts warm milk and water mixed and sufficient flour. Beat sponge well and keep warm. When it breaks add: 1½ to 2 pounds of butter and lard, 3 pounds sugar, 2 to 3 pints of eggs or yolks, lemon and mace, salt, and 3 quarts more warm milk. Beat together well and set to raise in warm place for 2 to 4 hours.

This is what we call a Stock dough, from which any kind of buns or coffee cakes can be made.

COFFEE CAKE DOUGH. II.

Set sponge with 5 pints warm milk and 3 pints water, ½ pound yeast, ½ pound sugar and sufficient flour (about 10 pounds). When it breaks add 2 more quarts milk, 1 pound butter, ½ pound lard, 1½ pound sugar, 1½ pint eggs, 2 ounces salt, flavor and sufficient flour. Dough should be worked up young.

COFFEE CAKE DOUGH. III. (Straight Dough).

6 quarts milk and 3 quarts water at 85 or 90 degrees Fahrenheit, 9 ounces yeast, 2 ounces salt, 3½ pounds sugar, 3½ pound butter or part lard, lemon, vanilla, 1 quart eggs. Mixed flour sufficient to make medium soft dough. Beat dough well and keep young.

CINNAMON KUCHEN.

Roll out pieces of above dough ½ to ¾ inch thick, to fit in large cookie pans, set to raise, prick with docker, wash with melted butter and sprinkle thick with sugar and cinnamon. Bake in medium heat and cut in squares.

STREUSEL KUCHEN.

Same as above, only sprinkle with the following Streusel: One pound of cake flour, a half ounce cinnamon, a half pound powdered sugar; add five ounces good butter, melted, rub all together well and press through coarse sieve.

BUTTER KUCHEN.

Same as Cinnamon Kuchen only before going into oven spread small pieces of butter over whole top of cake about 2 inches apart.

TURKHEADS.

Cream 10 ounces butter and 12 ounces sugar together; add 8 to 10 eggs, ½ pint milk and mix well with 12 pounds of stock dough No. III.

COFFEE WREATHS (Plain).

From Stock dough No. II. or No. III. cut even pieces, roll them in long strips, braid three together and form into wreaths. Set on large greased tins or each separate in round tin, wash with eggwash, bake in hot oven and ice while hot with vanilla water icing. You can also sprinkle them before baking with coarse sugar and blanched, sliced almonds.

VIENNA COFFEE CAKE.

Fermented Puffpaste.

Roll out a piece of Stock dough No. III., weighing 20 pounds, about one inch thick, spread with pieces of washed butter, same as for puffpaste, fold over and roll out same as puffpaste, folding it again. Let rest awhile and repeat rolling and folding twice. Then cut up in narrow strips and braid, forming into wreaths, pretzels, etc.

Before folding the last time you may sprinkle with sugar, cinnamon, raisins, citron and currents. Keep in cold room.

CINNAMON BUNS.

A piece of coffee-cake dough I, II, or III, roll out nearly one half inch thickness into a strip 10 to 12 inches wide, wash with melted butter, sprinkle with cinnamon sugar and washed currants; roll up, press down and cut with scraper into slices ¾ inch wide. Set them cut side up, on greased pans, give light proof and bake in medium heat. While hot, wash with water icing.

SNAILS, PRETZELS,

Same as above, only form into different shapes. For finer trade you can use the Vienna coffee-cake dough (puff paste).

BREAD AND BISCUITS.

Made with Sour Milk.

The following formulas were prepared by the author of the "Baker's Book" for the Church & Dwight Co., for the use of Arm and Hammer and Cow Brand Baking Soda with Sour Milk.

Sour milk with baking soda or saleratus produces about the same results as cream of tartar and soda or baking powder.

EXCELLENT CORN BREAD.

Beat two eggs, the whites and yolks separately; take one pint of sour milk or buttermilk, two tablespoonfuls of sugar, one tablespoonful of butter, warmed so it will mix readily with the other ingredients, and a little salt. Mix these well together with the exception of the whites of the eggs. Put two-thirds of a teaspoonful of Arm and Hammer Soda (or Saleratus), absolutely free from lumps, into a pint of corn meal and sift and stir them into the milk, etc., then after beating the whites of the eggs, add them also. Butter a pan thoroughly, and bake in a moderate oven.

DOUGHNUTS (Sour Milk).

One cup sugar, two eggs, four tablespoonfuls of soft butter. Beat up light. Add one teaspoonful Arm and Hammer soda (or saleratus) dissolved in a little cold water, one large cup sour milk, one-half teaspoonful salt. Then add two cups flour sifted with one teaspoonful cream tartar. More flour may be required. Let the dough rest a while, then roll out half an inch thick and cut with doughnut cutter. Fry in hot fat and sprinkle with sugar.

RYE AND MEAL BREAD.

Sift together two cups rye meal, one and a half cups Indian meal and one teaspoonful salt. In one cup water and a half cup buttermilk dissolve one even teaspoonful Arm and Hammer soda (or saleratus), add a small cup New Orleans molasses. Stir in the meal a little at a time; beat all up lightly and add two tablespoonfuls melted butter. Pour at once into greased large tin, set into steamer and steam for three hours, then bake for about thirty minutes longer in oven to give it a good crust.

POP OVERS.

Rub together a cup and a half of sifted flour, a pinch of salt, a tablespoonful of sugar and a tablespoonful of butter. Add three eggs, beaten light, a cup and a half of milk and a pinch of Cowbrand soda. Bake in deep gem-pans well greased.

JOHNNY CAKE.

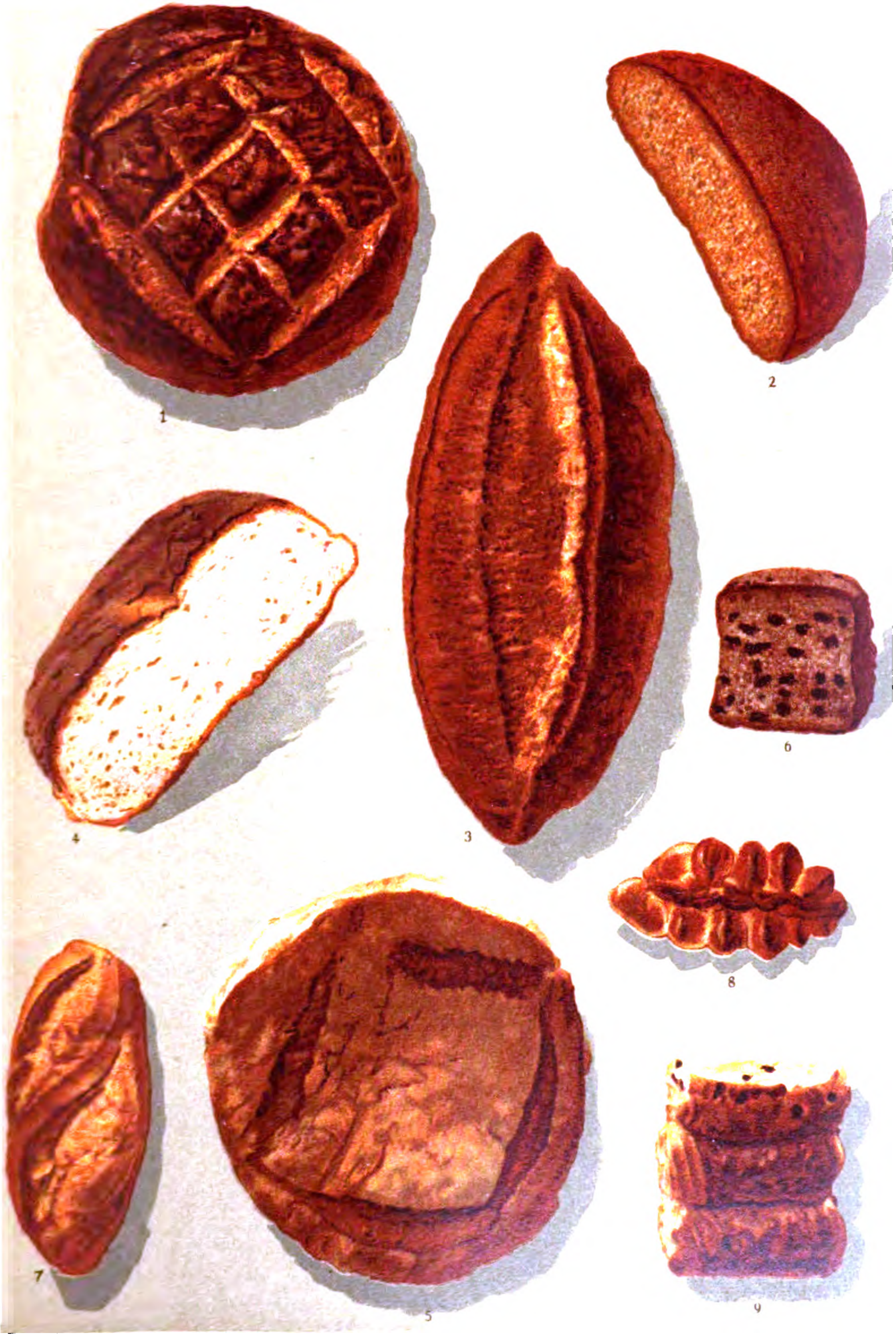
Sift together one cup and a quarter wheat flour, two cups Indian meal, two tablespoonfuls of sugar, one teaspoonful salt. Mix together with two cups of sour milk and one teaspoonful best baking soda (or saleratus), dissolved in a little cold water. Add now to the batter three tablespoonfuls of soft butter and one to three eggs. Pour into well buttered tins and bake thirty minutes in a brisk oven.

GOLDEN CORN MUFFINS (Mrs. J. Braun).

Three ounces yellow corn meal, two ounces sugar, two ounces lard or butter, two eggs, all mixed and beaten. Add half a pint of milk with a quarter teaspoonful Arm and Hammer soda (or saleratus), half a pound of flour sifted with a half teaspoonful of pure cream of tartar and a pinch of salt. Have the deep gem-tins well greased and heated, then fill them half full with the batter.

If you want to use sour milk, take a half teaspoonful Arm and Hammer soda (or saleratus) more and omit the cream of tartar.

BELGIUM



¼ nat. Size

deep tins. A rich spongecake mixture is used, with plenty of eggs, but no yeast, seasoned with aniseseed. Fig 8, made after special formula, contains a large percentage of gluten, but no yeast. Fig. 9 is very nourishing for infants.

Fig. 10, 11, has a wide reputation; is very tender and is served ex tensively with tea or wine. Keeps well and is exported to all parts of the world. Fig. 12, baked in shape of a long roll, when one day old, each roll is cut in halves, iced with a rich egg frosting, flavored with vanilla powder, and then returned to oven until frosting is nicely browned. Fig. 13, baked in large tins, sliced, not too thin, rolled in vanilla or cinnamon sugar after being toasted. Fig. 14 contains almonds, is baked very hard; served with wine or liquers. Fig. 15, made principally of Graham flour; little or no sugar is used. Served with butter. Fig. 16. Like anis-zwieback (Fig. 7) only substitute vanilla and ground almonds for aniseseed. Fig. 17. Like infant's food (Fig. 9). Not rich in material, but very nourishing. See formula for Army-Zwieback.

Germany manufactures more Zwieback than any other country. The firm of Harry Trueller, in Celle (Hanover), operates, perhaps, the most complete plant for the manufacture of this specialty. The old style of hand work has been nearly altogether replaced by ingenious, modern machinery. The materials used are all of the very choicest quality. Special kneading machines make the dough, which is then carried to dividing, or cutting machines, cutting the dough into equal parts, which are then moulded up into desired shapes, round or long, and placed on pans. These are placed upon racks and rolled into the proving room. From here they go into the patent steam oven. The baking requires only a few minutes. Direct from the oven the pans are carried by a traveling belt into the cooling rooms. From here the zwieback is sent by elevators to the next floor where automatically working cutting machines cut the zwieback. This being done, these slices are brought in specially constructed cars in the roasting room; really the most important part of the factory. The zwieback slices are automatically placed on to the shelves by a so-called traveling or chain oven. When they have traveled slowly through the whole length of the oven, they come out a golden brown, toasted to perfection on the opposite side. Each one of these roasting ovens has a capacity of toasting 100,000 zwieback every 24 hours. From here the finished zwieback slices are carried to the packing rooms, which is also done automatically, and where they are packed into neat packages, or in boxes, ready for shipment to all parts of the world.

GERMAN MILK ZWIEBACK.

- 8 lbs. cake flour.
- ½ lb. sugar.
- 1 lb. butter (softened).
- 2 oz. compressed yeast.
- 8-10 eggs.
- Salt, milk.

Set a soft sponge with 2 pounds of the flour, the yeast and sufficient warm milk. When the sponge breaks, add the rest of ingredients. Add flour gradually and beat the dough well. Flavor with vanilla sugar, or grated lemon-rind, or both. Add only sufficient milk to make a medium stiff dough and set to prove in warm place, where it is protected from draught. Push down twice.

This Zwieback can be made up in different shapes. It may be baked in long, oval tins, narrow long tins or moulded up into long rolls, or round buns, which latter two kinds are pressed down evenly, after having proved a while, slightly grease tins.

CARLSBAD ZWIEBACK.

For each 2 pounds of flour use about 1 pint of milk, ¾ ounce compressed yeast, 1-3 ounce salt. Make straight dough; mould up like small round buns. When baked, let stand one day; then cut in halves and toast in oven.

VIENNA ZWIEBACK.

For 10 pounds of flour take 5 pounds butter (softened), 2½ pints eggyolk or take whole eggs, which have been beaten with 1 pint sweet cream, 10 ounces compressed yeast, 5 pounds sugar, 1½ ounces salt. Mix into a stiff dough, adding whatever warm milk required. Beat the dough well from 20 to 30 minutes. Set away to raise in warm place. When placed on the moulding table, break in small pieces of about 1 ounce each. Roll them out in fingershape 3½ inches long, set close together on greased pans in rows the whole width of the pan, leaving about 2 inches space between each row. Give them very little proof. Wash with milk and bake in medium hot oven. When baked, let stand a day, if possible; then slice them and dip in powdered sugar mixed with powdered vanilla, and toast them in cool oven; be cautious so the sugar does not melt.

ANIS ZWIEBACK.

Beat 4 pounds of sugar with 40 eggs, like spongecake (warm mixture). Mix in carefully 4 pounds dry, sifted flour and 2 ounces aniseseed. Take half rich winter wheat flour and half spring wheat. Roll out in long rolls and bake on greased tins, or in long, deep, narrow tins. Slice and toast.

AMERICAN ZWIEBACK.

3 gallons milk.
½ pound compressed yeast.
5 pounds good butter.
9 pounds sugar.
1 quart eggs.
4 ounces salt.
Vanilla and lemon flavor.

Dissolve the yeast in 1½ pints of the milk (warm) and make a small sponge with sufficient of the flour. Then add 1 gallon of the milk and more flour to make a larger sponge. Set this away again, covered, in warm place to prove until it falls in centre. Now add gradually the sugar, butter, eggs, milk, flour, salt and flavor.

Work dough thoroughly until it is smooth and blisters. Let prove again, but not too much, as dough must be young. Proceed as mentioned in previous formula.

GERMAN ARMY ZWIEBACK.

The following formula is furnished by the department of provisions of the German army: 2 kilo. wheat flour, 6 gramm. caraway, 20 gramm. natron bicarbonicum (saleratus), 20 gramm. salt, 1 kilo. water (at 40 degree C.) is all mixed well in kneading machine, passed through brake several times and immediately moulded, placed on tins and baked at once without further proof; should bake about 35 minutes.

ARMY ZWIEBACK (Improved).

Formula—28 kilo. mixed wheat flour, 2,800 gramm. fine sugar, 420 gramm. compressed yeast, 280 gramm. salt. Set the sponge with the yeast, about ½ kilo. water and 5 kilo. of the flour, and let rest 40 minutes. Then add the rest of the flour and then ingredients. Knead well and set away to prove for about 30 minutes. Then proceed as above mentioned.

Zwieback should only contain 7½ per cent, water on an average, after being toasted.

FRIEDRICHSDORFER ZWIEBACK.

For a mixture of 6½ pounds of flour take 9-10 eggs, 10 ounces butter, 14 ounces sugar and 6 ounces yeast. Proceed as mentioned in previous formulas. Make straight dough with sufficient milk.

HOLLAND ZWIEBACK.

1 quart of milk, 4 ounces of yeast, 5 eggs, 6½ ounces sugar, ½ pound of malt extract, ¼ pound butter or lard, about 5 pounds flour, 1-3 oz. salt.

Set sponge with milk, eggs, yeast and flour. When half risen add sugar, extract, shortening and salt and little more flour. Let raise, push down 2-3 times, break and roll up like buns, press flat, and turn the mould over each one. When brown on top, which can be seen through holes of moulds, they are done. Each biscuit is cut in two and again toasted brown on cut side.

The moulds are made of Russia iron, they are round, about ¾ inches high and have a diameter of 3 to 3¾ inches. The bottom is perforated with a number of small holes. In place of moulding them up, like buns, the dough can be rolled out in sheets and cut out with cutter just a trifle smaller than the moulds.

SALT AS A DETERRENT IN YEAST FERMENTATION.

(*From Proceedings of American Association for the Advancement of Science.*)

BY KATHERINE E. GOLDEN, OF LAFAYETTE, IND.

In the fermentation of bread, salt is always one of the ingredients, not used, however, for any effect it has on the fermentation, but merely as a flavoring. To determine the effect the salt has beyond the flavoring, some experiments were carried out, using sponges, doughs, and lastly solutions containing no flour.

In the first set of experiments six different sponges were made, containing equal quantities of flour, water, yeast, and salt, varying in quantity from one per cent. to five per cent. of the water used. One sponge had no salt added; this to be used as a control. In mixing the sponges the salt and yeast were added to the water before the flour so as to ensure a thorough mixing. The sponges were placed in an oven at 23 degrees C., and observations taken at intervals of half an hour. A second series was conducted at 37 degrees C. and a third at 40 degrees C. For ease in reading slight variations in the fermentation, the sponges were mixed in long test tubes of nearly uniform diameter. In the corresponding numbers of the three series the fermentation action was fairly uniform, that is, there were practically the same differences between one per cent. and two per cent. whether fermented at 23 degrees C. or 40 degrees C. The following table shows the average of the three series, the figures showing much regularity in the action. As the quantity of salt increased from one per cent. up, the action of fermentation was checked in a corresponding ratio. These sets of experiments were repeated three times, and showed very slight variations in the results, so that the set of figures given are typical of the action:

INCREMENTS OF FERMENTATION IN INCHES.

Experiment.	Per cent. Salt.	Half Hour.	One Hour.	One and One-half Hour.	Two Hours.
a	0	.666	1.375	1.708	1.583
b	1	.542	1.292	1.625	1.625
c	2	.456	1.200	1.500	1.666
d	3	.345	.958	1.375	1.375
e	4	.313	.875	1.250	1.375
f	5	.146	.292	.438	1.666

A series of experiments with stiff doughs was then conducted; and in the doughs, as in the sponges, the salt acted as a deterrent, though the slight variations that could be seen easily in the sponges could not be detected in the doughs as broader and firmer vessels had to be used for the mixing.

In these experiments where flour entered as an ingredient, it would be impossible to determine whether the yeast was acted upon directly by the salt, or indirectly by the action of the salt upon some constituent of the flour required by the yeast. To obviate this difficulty in interpretation a series of experiments was made, using Pasteur solution with cane sugar, These were carried on in fermentation tubes. As in the former experiments, equal quantities of the solution and of the yeast were used in each. The salt varied from one to four grams, or 4, 8, 12, and 16 per cent.

respectively of the solution used as the tubes held 25 cc. solution. The control formed sufficient gas to displace the solution in the tube in twenty-three hours, the 4 per cent, tube took thirty-seven hours, 8 per cent. took thirty-eight hours, 12 per cent. forty-seven hours, while the 16 per cent. took seven days.

The fermentation in this series was weak, due probably to the yeast which was from a dry yeast cake, and though there was a gram used in each tube, this gives only a small quantity of yeast, as the cake contains much more corn meal. In the next series a compressed yeast was used, one-half gram in each tube. The action of fermentation was more vigorous and more regular than in the former series. The observations were taken every quarter hour.

Exp.	% Salt.	Volume of Gas in CC.												
		Hours: ¼	½	¾	1	1¼	1½	1¾	2⅞	2¾	3	7	20	23
a	0	3	2	3	2½	3	3	2½	6	....	....	....	....	....
b	2	4	2	1½	2	2½	2	2	6	3	....	....	....	....
c	4	1	1	1½	1	1½	1	1½	4	4	2	6½	....	....
d	6	....	....	....	....	1	2-5	3-5	2¾	1¼	1½	15½	2	....
e	8	....	....	....	....	....	....	....	....	....	....	6	12½	2½

The figures in the table are the number of c.c. of gas generated in the given periods of time, and show clearly that, as the quantity of salt increased, the vigor of fermentation decreased.

In the next series of experiments the quantities of the yeast and the solution were the same as in the preceding, but the quantity of salt was decreased; this in order to determine how small a quantity could be used and still get a deterrent action, 1, 2, 3 and 4 decigrams of salt, or .4 per cent., .8 per cent., 1.2 per cent., 1.6 per cent, respectively of the solution were used. In this set the control started fermentation but very slightly ahead of those containing the salt and then kept that same amount ahead, but there was no appreciable difference between any of the others.

The experiments indicate that salt has a deterrent action upon fermentation, even when used in very small quantities, and that after a certain quantity of salt is used, the action is in a direct ratio with the quantity of salt used; also that the action is directly upon the yeast, and does not depend upon other ingredients of the sponge.

Boutroux made some experiments upon leaven, using tartaric acid. In France a different method from ours for fermenting the bread is used. There a portion of the dough is kept from one baking to the next to be mixed with the fresh dough. In Boutroux's experiments he used the tartaric acid in the leaven and in the dough, and found that the dough fermented more vigorously when the acid was in the fresh dough than when in the leaven. He then tried leaven in acid and neutral wort, and obtained vigorous growth in the neutral wort, and but slight growth in the acid wort. He states that salt in dough should act like tartaric acid, that it retards the fermentation when it is used in any but very small quantities.

Jago found that salt retarded the fermentation of the dough, but he found no difference in the action between a 1.4 per cent. salt solution and a 2.9 per cent.; but found that a 5 per cent. solution retarded the fermentation very materially. He advises using the salt in the last kneading. This is practicable where a sponge is first made, then the dough; but many persons make a stiff dough at once, and if the salt were kept for the last kneading, it could not be mixed thoroughly with the dough, but would be more liable to stay in pockets. The experiments indicate that where a sponge is used and a quick fermentation desired, the salt would better be added in the last stages.

THE SCIENTIFIC PRESERVATION OF BREAD.

Prepared for "The Baker's Book" by Henri A. Sévigné.

Until about the year 1890 the bakers of this, as well as foreign countries, gave little, or no thought to the preservation of bread, after baking, and seemed to care only for two things, namely, getting the goods out as quickly as possible and at as little expense, regardless of consequences, which were sure to follow.

It seems strange that a baker after having gone to the expense and trouble of building a bakery and equipping it with the best and most expensive ovens, machinery and all other appliances necessary for the successful carrying on of his business (not to mention the fact, that the raw materials purchased are of the highest quality) should allow his product to be handled in the most careless and dangerous manner, by shop employees as well as drivers of the delivery wagons, and last, but not least, the grocers and their clerks; never seeming to give one thought to the fact, that bread (the most *susceptible*, to contamination, of any article of food), *should have a covering* that would guarantee its delivery to the customer in a cleanly and healthful condition, and especially since it can not be sterilized, having been previously cooked.

It has been discovered by eminent bacteriologists, that bread many times has been the means of conveying some of the most deadly disease germs, while if it had been protected by a germ proof wrapper, composed of wax paper or other suitable material, it could not have been the medium of transmission.

In all the world of the pests that annoy man most, the common house fly, may be considered the worst. It not only defaces walls, tumbles into our milk, and annoys us generally, but worst of all, is a conveyor of contagious diseases. During our late war with Spain, the camps of our soldiers were infested with the dreaded typhoid, and it was firmly asserted by the sanitary officers, who inspected the camps, that the offensive condition of the latrines were caused by the common fly which carried pestilential germs. It is a well known fact that flies like sweetmeats and especially bread. In every bakeshop, flies swarm by the millions and while we quarantine against yellow fever and cholera, we permit the filth and germs of the street to be conveyed and trodden all over our bread, despite the knowledge that the common fly lives and breeds on stable manure, decayed meats, fish, and sewage.

Within the past few years bakers have become more enlightened on the subject of disease germs and are taking steps to improve the sanitary condition of their plants, more especially since the public rebels against the uncleanly methods employed by so many bakers.

Many bakers have in consequence adopted the method of wrapping their bread in wax paper and it is needless to say, that in every instance the results have been most gratifying, because the public is always interested in an article that suggests cleanliness and healthfulness.

I shall endeavor to describe in brief detail the scientific reasons for the wrapping of bread and shall beg to submit the following, which is the result of long observation and exhaustive experiments, by some of the most eminent bacteriologists in America and Europe.

As I proceed I shall be obliged to refer to some of the most celebrated tests, conducted by eminent authorities in this line of work, and in doing so, I extend apologies and acknowledgment to these gentlemen.

FIRST: Bread leaves the oven with a hard crust and soft humid crumb, but it does not remain in this state for a period longer than from one to one and a half hours, as a change quickly takes place, the more rapid in proportion with the smallness of the loaf. The crust will grow soft and elastic yet the crumb will become hard and friable unless evaporation is arrested by enveloping the loaf in a practically air-tight and water-proof wrapper.

At the end of twenty-four hours the bread has acquired the temperature of the surrounding air (about 64 degrees F.) and the weight has decreased about one-sixteenth and is quite stale.

This loss of water, so small in comparison with the amount in the bread (forty to forty-five one hundredths per cent.) would not cause so great a change were there not OTHER changes. If a loaf of bread contains less than thirty per.cent. of moisture, it is STALE; staleness is not wholly due to loss of moisture, but is largely due to a special molecular condition which develops (about 80 degrees F.) during the cooling, and continues until the temperature falls below 60 degrees F.

In fresh bread, water is in the free state, but in the course of time (when exposed to the gases present in the air) it combines chemically and causes staleness.

It is also due to the chemical or physical combination of the moisture with the albuminous material which the bread contains. This is theoretically the cause of staleness given by Koenig, who is the best authority in the world.

Experiments have been made to demonstrate whether oxygen could pass through paraffine paper. A sterile culture tube was taken and inoculated with aërobic bacteria. (Aërobic bacteria are bacteria which demand oxygen for their growth.) This was then closed with paraffine paper. At the end of a week a copious growth of these bacteria had taken place, thus demonstrating that oxygen would pass through the paper. Summing up the results of these experiments it has been demonstrated that bread preserved by the waxed paper process maintains its moisture, its porosity, possesses the usual nutritive properties of fresh bread, does not contain an excessive amount of water, remains sterile and free from bacteria, and in some way maintains its palatable qualities.

It has been asked why bread protected with wax paper should remain fresh without becoming stale, longer than unprepared bread, supposing the only difference between the two breads to be that the preserved bread is covered by a waterproof wrapper.

I can only answer that by a theory; the theory is that the paraffine paper has through its pores a species of osmosis, by which there is a mutual interchange of oxygen from the air and water which is moisture, from the bread, and also that this process is a much more gradual one than takes place when bread is freeely exposed to the air.

Besides staleness, bread undergoes other very important changes, due to micro-organisms, which render it unfit as an article of food; thus bread is attacked, unless protected by a microbe and water-proof wrapper (not the ordinary porous papers) from dampness, by the ordinary "fungus" (Penicillium Glaucum), which rapidly develops and covers the surface of the loaf with a white velvety mass (invisible to the naked eye), the filaments of which run through the minute crevices of the crust, and spread inside the loaf.

It has been my experience that if they do not appear in a week they will not appear at all. This is simply confirmatory of the fact that paraffin paper excludes bacterial or fungus growths.

Allowing that the flour or wheat used, was previously injured by this "Fungus" or contained its spores, the heat required to bake it (284 degrees F.) is sufficient to sterilize the bread.

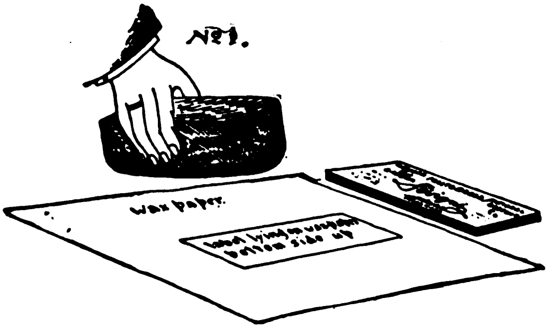
There are sometimes tiny red spots that appear on the crust of bread and rolls (not visible to the naked eye), caused by the "bacterium" called, Micrococcus Prodigiosus, which flourishes if allowed to be kept in a dark place (example, box or other dark receptacle).

This "bacterium" is very sensitive to light, therefore, the advantage of a transparent wrapper, such as waxed paper.

Bread cannot be kept as healthful and cleanly without the operation on some such protective rule as herein described.

Gluten Loaf Partially Wrapped.

HOW AND WHEN TO WRAP BAKERS' BREAD.



First, purchase the best Wax Wrappers, which are made expressly for bread and therefore the best adapted for the work.

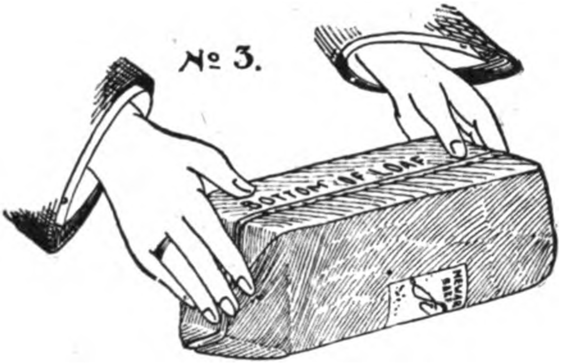
Ordinary waxed paper is not so suitable to do the work properly.

Then place a Wrapper on a smooth surface (putting on a label), placing a loaf on the paper, bottom side up (if printed paper is used, leave out the label), as in Fig. 1. The loaf is then enveloped as in Fig. 2, folding the edges in a double seam (as shown in cut), which draws the wrapper around tightly and makes a practically air tight covering.

NOTE.—The loaf is bottom side up during this time.

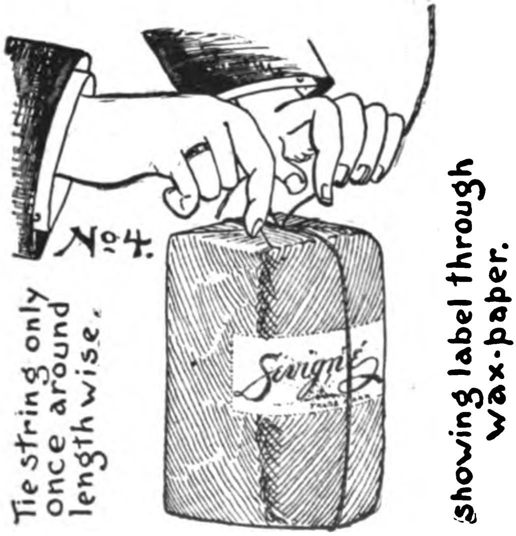
After having folded in one end, as in Fig. 3, the loaf is turned up as in Fig. 4, and the last folds turned down; then the twine is tied around lengthwise, *once*, as shown in Fig. 4.

Bread should *never* be wrapped while *hot*, for it will steam; rendering



it unfit for food. To determine the proper heat at which it should be wrapped, place the *back* of your hand on the *top* of the loaf, and if it can be borne without pain, the bread is sufficiently cool to wrap without danger of steaming. This rule applies to 99 cases out of a 100.

If a little care is exercised when learning, a person soon becomes able to wrap very rapidly. Avoid the practice of holding the loaf against you and tying the twine lengthwise and crosswise, for that is an unnecessary process and waste of one-half the twine.



Unless bread is properly wrapped, a baker has wasted time and money. "What is worth doing at all, is worth doing well." *An attractive package appeals to the average buyer of anything, especially bread.*

Milk.

(From *Das Bäckerbuch.*)

In every bakery where the finer breakfast breads are prepared, milk is a very important ingredient and therefore requires the full attention of the baker.

Milk consists, in a normal condition, of 87.75% water, 3.4 % fat, 3.6% caseous matter and albumen, 4.5% sugar of milk, 0.75% mineral salts. The specific gravity of milk is 1.031, the boiling and freezing points nearly correspond with those of water, that is 212 degrees Fahrenheit and 32 degrees Fahrenheit, respectively.

For the general inspection of milk the lactometer and the milk scales are only sufficient to a certain degree, as an addition of water up to twenty per cent. will not be indicated by these scales; this is accounted for by the fact that by skimming milk the specific gravity is increased, but can be made normal again by the addition of water.

To some extent the color of the milk will indicate its purity, and a drop of pure milk dripped on the finger nail will retain a round, beadlike shape, while watery milk will spread in irregular form.

As nearly all other food products, milk is subject to decay, caused either by age or through the influence of high temperature. And this decay is always caused through the influence of bacilli which are formed in the milk itself or reach it from outside. Milk becomes sour through the influence of a bacillus on the sugar of milk. Blue milk is caused through the influence of a bacillus on the caseous substance of the milk, forming aniline blue. The cause of red milk is generally to be found in morbid condition of the udder of the cow from which it is drawn, but instances of bacilli causing this condition are also on record. Bitter milk is mostly caused through the fodder, while at times diseases of the udder are responsible. Slimy milk is produced solely by the influence of bacilli. Another cause of bad milk is the presence of excrements of the cow, and where such a condition is suspected the baker should, in the interests of his customers, submit a specimen to chemical analysis.

In case any of the vessels in the bakery have contained decayed milk they should be thoroughly disinfected, a cheap and safe process is this respect is to paint the vessels with *pfumfly primon kulk* and then rinse them in boiling water.

The souring of milk can be somewhat prevented, or at least delayed by the addition of sodium carbonate in the proportion of one teaspoonful to a quart of milk. Carbonated milk is now largely used. It is prepared by submitting ordinary milk to a pressure of a few atmospheres with oxygen and carbonic acid gas, and then bottling like mineral waters. It is claimed that milk can be preserved perfectly sweet in this state for about sixty days.

We produce herewith a suitable and simple cooling apparatus, which has proved useful in small bakeries. The illustration explains itself except that it may be mentioned that the pails rise and fall in the tank according to the weight of the contents and that a simple contrivance prevents the tipping of the pails.

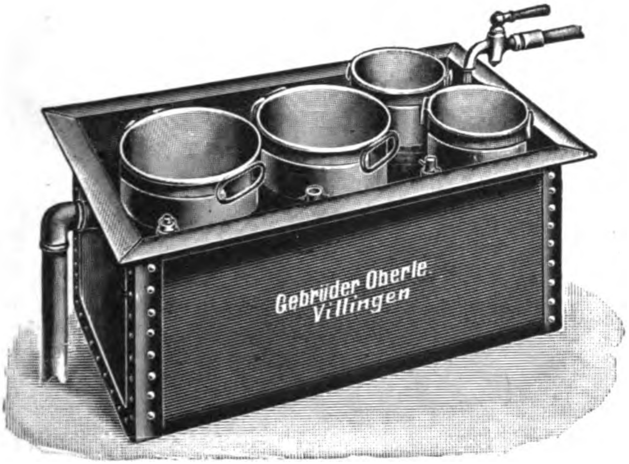


Fig. 411.—Apparatus for cooling mlk.

Warm milk which is cooled in this apparatus in one hour would require fully eight hours' cooling in a cellar to reach the same low temperature, provided the water circulating in the tank does not exceed fifty degrees Fahrenheit.

MILK AS FOOD.

(Reprinted by permission of the U. S. Agricultural Department.)

INTRODUCTION.

A quart of milk contains about the same amount of nutriment as three-quarters of a pound of beef, namely, about 4 ounces. Six ounces of bread would likewise supply not far from 4 ounces of nutritive substances. To put it in another way, about one-eighth of the whole weight of the milk, one-third of the beef, and two-thirds of the bread consist of actually nutritive ingredients. The other seven-eighths of the milk and one-third of the bread are water, while the two-thirds of the meat which is not actual nutriment is mainly water, but consists in part of bone.

But while the quart, or 2 pounds, of milk, the 12 ounces of beef, and the 6 ounces of bread all supply like amounts of nutriment, the nutritive values are not exactly the same; in other words, they would not be equally useful for food. Either the milk or the bread eaten alone would make a better balanced food for man than the meat, because it contains the different kinds of nutritive ingredients, or nutrients, in proportions more nearly adapted to supply the wants of the body than is the case with the nutrients of the meat.

Milk contains all of the ingredients needed for nourishment; that is, it furnishes the materials which build up the body and keep it in repair, and also those which supply it with fuel to keep it warm and to furnish the animal machine with the power needed to do its work.

The composition of milk and other food materials, the kinds and amounts of different ingredients they contain, are found by analysis in the chemical laboratory. But (since analysis is a separation into constituent parts) a rough analysis of milk is made in the dairy and in the kitchen. When milk stands the cream rises. This cream consists of minute particles of fat, surrounded by casein and other substances. The cream is put in the churn and shaken, and the globules of fat gather together as butter. This separation of the butter fat is a partial analysis of the milk. When rennet is added to milk it is curdled. The ferment of the rennet causes the casein to coagulate, forming the curd. This is put in the cheese press, the liquid is pressed out, and the curd is changed to cheese, which contains the casein and with it fat and other materials which were in the milk and were entangled or inclosed in the coagulated casein. The whey from which the curd has been separated contains a kind of sugar, which can in its turn be separated from the fluid, and is prepared commercially and sold as milk sugar. After the sugar has been removed there still remains in the milk considerable amounts of mineral compounds.

If at the outset the milk had been heated, the water might have been evaporated and the casein, fat, sugar, mineral salts, and other materials would have remained as the milk solids. These together make up the nutrients of the milk.

When milk is used for food the casein and allied compounds serve the body for building and repair, and are also used for fuel. The fat and sugar are the chief fuel ingredients. The mineral compounds aid in forming tissue, and have other uses as well, but they are needed only in small quantities.

The value of milk for nourishment is not as well understood as it should be. Many people think of it as a beverage, rather than a food. To understand its nutritive value, and how it compares with other food materials in this regard, we must consider, briefly, the nature, composition, and uses of food materials.

COMPOSITION OF MILK.

The chief bulk of milk is, of course, made up of water, the amount of which may vary even in ordinary unadulterated milk from 90 per cent. in a very poor product to 84 per cent. in an unusually rich milk. The corresponding solid matter, or "total solids," varies from 10 per cent. to 16 per cent. This solid matter, or "total nutrients," is made up of protein, fats, carbohydrates, and mineral matter. The proportion of these vary within certain limits; but, roughly speaking, one-twentieth of the total solids are mineral substances, one-fourth protein, three-tenths fat, and four-tenths carbohydrates.

The protein compounds of milk.—The principal nitrogenous compound of milk is casein. This, when the milk is drawn from the cow, is in a form which is called caseinogen, but undergoes changes which bring it into the form of casein. For convenience it is here referred to in all its forms as casein. In chemical composition the casein differs from the other protein compounds of milk in that it contains both phosphorus and sulphur. Besides the casein there is a certain amount of albumin present, called lact-albumin, or albumin of milk. This is more or less similar to the albumin which occurs in blood and in white of egg. The quantity of albumin is very much smaller than that of the casein, being on the average about one-seventh of the total protein. There are other nitrogenous substances occurring in milk, but in insignificant quantities. The total protein of milk should not vary in any great degree. It will average not far from 3.3 per cent. of the whole milk, or about 25 per cent. of the total solids.

The fats of milk.—The fat of milk is commercially the most important of its constituents, since it is the source of butter and enters largely into the composition of cheese. Chemically speaking, the fat of milk, or butter fat, as it is more often called, consists of several different fats. The chief of these are the same fats that make up the bulk of fat meat (tallow, lard, etc.), as well as many vegetable fats. They are called stearin, palmitin, and olein. Besides these three fats there are others in smaller amounts, but of considerable importance, since it is to them that the flavor and aroma of the butter is due. The amount of fat in milk varies widely, the amount of normal milk depending upon various conditions, some of which are mentioned beyond. The amount of fat should not fall below 3 per cent., and, except in unusually rich milk, will not exceed 5 per cent. Good unadulterated milk from a herd of well-fed cows should average not far from 4 per cent. of butter fat, or about 31 per cent of the total solids of the milk.

The carbohydrates of milk.—The chief compound of this class which occurs in milk is lactose, or sugar of milk. Milk sugar is similar in chemical composition to cane sugar, but is not nearly as sweet. It is largely used by physicians and pharmacists as the basis of powders and pills. In amount it ranges from 4 to 6 per cent., but on the average may be said to be 5 per cent., of the milk, or about 38 per cent. of the total solids.

There is a considerable variation in the composition of the milk of different animals. The richest milk appears to come from the dog, the poorest from the horse. Human milk is richer in sugar and poorer in protein than cow's milk, but the fuel value is about the same. These facts are brought out in the following table:

Comparative composition of various kinds of milk.[1]

			Total solids.						
			Protein.						
Kind of Milk.	Water.	Total solids.	Casein.	Albumin.	Total protein.	Fat.	Carbohydrates. (milk sugar.)	Mineral matters (ash).	Fuel value per pound.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Calories.
Woman	87.4	12.6	1.0	1.3	2.3	3.8	6.2	0.3	319
Cow	87.2	12.8	3.0	.5	3.5	3.7	4.9	.7	313
Dog	75.4	24.6	6.1	5.1	11.2	9.6	3.1	.7	671
Ewe	80.8	19.2	5.0	1.5	6.5	6.9	4.9	.9	503
Buffalo	81.4	18.6	5.8	.3	6.1	7.5	4.1	.9	506
Cat	82.1	17.9	3.1	6.0	9.1	3.3	4.9	.6	400
Goat	85.7	14.3	3.2	1.1	4.3	4.8	4.4	.8	365
Llama	86.5	13.5	3.0	.9	3.9	3.2	5.6	.8	312
Ass	89.6	10.4	.7	1.6	2.3	1.6	6.0	.5	222
Mare	91.5	8.5	1.2	.1	1.3	1.2	5.7	.3	180

[1] König. Chemie der menschlichen Nahrungs- und Genussmittel, 3d ed., I, pp. 267-362.

CHARACTERISTICS AND PROPERTIES OF MILK.

The color and opaqueness of milk are due mainly to globules of fat, which are very minute and almost numberless. These are held in suspension in the liquid in the form of an emulsion; but, since they are lighter than water, after the milk has stood for some time they gradually rise to the surface, and thus accumulating form the cream. The action of the separator is on the same principle, only in this case the heavier portion of milk, *i. e.*, the water, casein, and sugar, are thrown as far from the centre as possible by the rapidly rotating machine, and the lighter cream, being thus forced to the centre, can be drawn off.

When milk has stood for some time, the milk sugar undergoes decomposition, whereby lactic acid is formed and the milk becomes sour. Accompanying this souring of milk, there is a change in its consistency and it becomes thick or curdled. The same change can be brought about by the addition of an acid, vinegar for example. If milk thus curdled is neutralized with some alkali, such as limewater or soda, the curd is redissolved. Milk is also curdled or coagulated by rennet, and the curd thus produced is utilized in the manufacture of cheese. This curd, unlike that of ordinary sour milk, is not dissolved by the addition of limewater or soda.

A scum forms upon the surface of milk when it is boiled. This is probably due to the coagulation by heat of the protein of the milk, chiefly its albumin, but perhaps to a slight extent its casein also.

Milk is slightly heavier than water, its specific gravity ranging from 1.029 to 1.034 at 60 degrees Fahrenheit. This means that while a quart of water weighs 2 pounds 1 1-3 ounces, a quart of milk weighs from 1.029 to 1.034 times as much, or not far from 2 pounds 2½ ounces. The specific gravity depends upon the proportion of water and other substances. Since the fat is lighter than water, the richer the milk is in butter fat the lower its specific gravity, provided, of course, that the other solids are not increased proportionally. It follows, also, that the removal of the fat increases the specific gravity, so that skim milk has a specific gravity of from 1.033 to 1.037. On the other hand, the addition of water to skimmed milk brings down the specific gravity.

VARIATIONS IN MILK.

Excepting meats, there is probably no one article of food which is liable to so wide a variation in its percentage composition as the milk supplied the consumer. The variations are so great, in fact, as to make it entirely possible that one man may pay nearly twice as much as his neighbor for the same amount of nutrients when both buy at the same price per quart. The causes of such variations are quite numerous and need be touched upon but briefly. The variation in composition of pure milk is due in a large degree to the breed or individuality of the cow, to the methods of feeding and handling, and the length of time since calving.

With regard to this subject Professor Voorhees says:

"The influence of breed is very marked, so much so that dairy breeds are classified into milk and butter breeds—that is, those which give a large quantity of poorer quality, and those which give a smaller quantity of a higher quality. * * * With the improvement of the stock by the introduction of recognized butter producing breeds of cows the quality of the product also materially improves."

In general young cows produce richer milk than old ones, though much depends upon the health and vigor of the animal. A well-fed cow gives more and better milk than one which is poorly fed, but the relative proportions of fat, casein, and sugar do not appear to be greatly influenced by the composition of the food. The average cow of a given breed possesses certain capabilities for producing milk, but does not reach her normal capacity of milk production unless she is well fed. When once she has a sufficient and well-balanced ration, neither the composition nor the amount of the milk yield seems to be greatly improved by either increasing the ration or changing the proportion of its ingredients.

The milk flow of a given cow is usually largest soon after calving; as the period of lactation increases, the flow gradually falls off, and, as a rule, the milk grows richer, i. e., the proportion of solids increases. The proportion of fat to the other solids in the milk of a given cow varies from day to day and from milking to milking.

Another cause of variation in milk is found in the temptation of unprincipled milkmen to adulterate their product. The chief methods of adulteration are (1) the addition of water, (2) the removal of a portion of the fat, either with or without the addition of water, and (3) the addition of preservatives. The two former methods result in a greater or less diminution of the food value, depending upon the extent of adulteration. The latter method does not detract from the total nutrients in the milk but it adds substances which, while not active poisons, may, when taken in the milk regularly in small amounts, produce deleterious results. The specific gravity of the milk is sometimes used as a test of its purity, but since removing part of its fat in form of cream raises and adding water lowers the specific gravity, one form of adulteration may counteract and cover up the other, and thus render this test alone unreliable.

The flavor of milk is frequently affected by the food eaten by the cow. It is a familiar fact that turnips when fed to cows give a peculiar taste or flavor to the milk.

The milk of diseased cows may be very abnormal in composition and may be the means of conveying disease. It is well understood that milk can act as a carrier of infection, and it is therefore of the greatest importance that especial care be taken in the dairy to insure the cleanliness of milk and to render its exposure to any germs of infectious diseases or to impure air of any sort impossible. It should be possible in all large cities, as well as in the smaller cities and country towns, to obtain some assurance that the milk received comes from healthy animals and receives proper care and attention after being drawn from the cow. This assurance should be obtained either by the public authorities, by the employment of honest reputable dealers, or by personal inspection and examination. The subject of the control and examination of the milk supply is treated at further length in Farmers' Bulletin No. 42 of this Department.

NUTRITIVE VALUE OF MILK.

Milk is peculiarly adapted for use as a food by man for several reasons. It contains all of the four classes of nutrients—protein, fats, carbohydrates, and mineral matter in more nearly the proper proportion to serve as a complete food than any other food material, although no one substance can furnish a complete food for an adult for reasons referred to beyond. It is in a form well adapted for varied uses either alone or more especially in combination with other food substances and in the preparation of various dishes for the table. Its use is already considered indispensable in many such cases and it might profitably be used in many more. At the price ordinarily paid for milk in our large cities it is a food of reasonable cheapness, and at the prices prevailing in small cities and country towns it is an economical food.

DIGESTIBILITY OF MILK.

In general, milk ranks as a very digestible food, but when we come to speak more definitely as to its digestibility there are difficulties of two kinds. One of these has to do with what is understood by the term digestibility; the other has to do with the differences of different persons in respect to their powers of digestion.

CREAM.

When the globules of fat rise in the milk, they entangle among them a considerable amount of milk which is removed with the fat as cream. Cream is thus the butter fat of the milk with some protein and carbohydrates due to the intermixed milk, and contains on the average about four and one-half times the amount of fat contained in an equal volume of milk. The amount of protein and of carbohydrates is slightly less than in the whole milk. The fuel value of a pint of cream is not far from 1,425 calories, or about the same as 1⅛ pounds of bread, or 1½ dozen bananas, or 4½ pounds of potatoes. Four quarts of whole milk would not furnish quite as much energy (1,300 calories), but would increase the protein over six times. It is thus seen that cream is valuable chiefly for its heat-giving properties and that the skim milk contains the valuable protein. When it is considered that a pint of cream retails at from 12 to 25 cents, and a pound of butter from 18 to 36 cents, and that the latter is worth two and a half times the former as a source of energy, it will be seen that cream is not, as a rule, an economical food.

SKIM MILK.

Even after average milk is skimmed it still contains nearly 10 per cent. (one-tenth of its weight) of solids or nutritive ingredients. The amount of fat left in skim milk varies greatly with the method of creaming. Ordinary open shallow pan setting leaves anywhere from one-tenth to one-quarter of the original fat of the milk in the skim milk. Deep cold setting removes the fat much more completely, so that Cooley skim milk has from a trace to three-tenths or four-tenths of one per cent. of fat. Separator skim milk has usually less fat than that from deep cold setting. It is not far out of the way to say that a pound of skim milk contains 0.034 pound protein and has a fuel value of 170 calories or a little more protein than the same weight of whole milk and about one-half the fuel value.

At first thought it may be difficult to understand how removing the fat increases the amount of protein, but the explanation is simple. One pound of whole milk contains on the average 3.3 per cent. or 0.033 pound of protein and 4 per cent. or 0.04 pound of fat. If all the fat is removed, there will be left 0.96 pound of skim milk containing 0.033 pound of protein, or about 3.5 per cent., so that 1 pound of skim milk would contain about 0.035 pound of protein. For the same reason there is a slightly larger proportion of milk sugar in skim milk than in whole milk.

The value of skim milk as food is not generally appreciated. Taken by itself it is rather "thin" and, to use a common expression, "does not stay by." The reason for this is simple: One has to drink a large quantity to get the needed nourishment, and, further, it is so readily disposed of that it does not satisfy the sense of hunger. But when taken with bread or used in cooking, it forms a very nutritious addition to the food. A pound of lean beef (round steak, for example) contains about 0.18 pound of protein and has a fuel value of 870 calories. Two and a half quarts, or 5 pounds, of skim milk will furnish nearly the same amount of protein and have about the same fuel value as the pound of round steak. Two quarts of skim milk has a greater nutritive value than a quart of oysters; the skim milk has 0.14 pound of protein and a fuel value of 680 calories, while the oysters contains only 0.12 pound of protein and have a fuel value of 470 calories. The nutriment in the form of oysters would cost from 30 to 50 cents, while the 2 quarts of skim milk would have a market value of from 4 to 6 cents and a value on the farm of from 2 to 4 cents. An oyster stew made of one part oysters and two parts skim milk would owe its nutriment more to the milk than to the oysters. Bread made with skim milk would contain more protein than when made with water.

The ingredient of our food which costs the most, has the greatest physiological value, and is most apt to be lacking in ordinary dietaries, is protein. Skim milk has nearly all the protein of the whole milk. By the removal of the fat in the cream it loses half its fuel value, but practically none of the protein. What is left has all the value of the whole milk for building and repair of tissue, for the making of blood and muscle and bone, and half the value of whole milk for supplying heat and muscular power. When these facts are fully understood, skim milk will doubtless be more wisely utilized. The ways in which a skillful cook can utilize skim milk in cooking are almost endless and the protein thus added to the daily ration is of the utmost importance.

A recent report of the Maine Station says in effect that the value of skim milk as a food is not generally appreciated. Taken by itself it is "rather thin," and one has to drink a large quantity to get the needed nourishment. Further, it is so readily assimilated that it does not long satisfy the sense of hunger. But when taken with bread or used in cooking it is a valuable food material. A pound of lean beef contains about 0.18 pound of protein or nitrogenous material, whose principal function is the formation of tissue (especially muscle) and has a fuel value (which is taken as a measure of the energy it will produce) of 870 calories. Two and one-half quarts or five pounds of skim milk will furnish the same amount of protein and have nearly the same fuel value as a pound of round steak. Two quarts of skim milk has a greater nutritive value than a quart of oysters. This amount of skim milk will contain 0.41 pounds of protein and has a fuel value of 680 calories, while the oysters contain only 0.12 pound of protein and have a fuel value of 470 calories.

According to a recent report in the journal of the British Dairy Farmers' Association, skim milk materially increases the yield of bread and consequently the profits in bread making. It was found that 280 pounds of flour would take up 175 pounds of water in mixing the dough and yield 94 loaves, there being a loss of 71 pounds of water during baking. The same quantity of flour would take up 210 pounds of skim milk and yield 110 four-pound loaves, the shrinkage during baking in this case being 50 pounds. The water bread is said to sell for 10 cents and the milk bread for 11 cents per loaf. Assuming that the above quantity of skim milk was worth $1.64, the skim-milk bread would yield a profit of 86 cents more than the water bread.

At its annual show held in London in October, 1899, the association conducted tests on the value of skim milk for making scones and pancakes. The dough for the scones was made from 14 pounds of American flour, 11 pounds of sour skim milk, 3 ounces of bicarbonate of soda, and 3 ounces of cream of tartar. This dough was cut into pieces weighing 6 ounces, rolled out and baked on a hot iron plate, yielding 25 pounds of scones. The mixture for pancakes was similar in composition, but thinner, 14 pounds of flour being mixed with 16 pounds of skim milk and the same amount of leavening material as before. This batter was cooked on a hot greased plate, yielding 30 pounds of cakes, there being practically no evaporation in baking. The large amount of skim milk utilized in proportion to the flour is noteworthy. If the scones and cakes are sold, the skim milk has practically the same commercial value as the flour, since very nearly equal quantities of the two materials were used.

The Maine Station has recently studied the comparative value of bread made with water and with skim milk. The average composition of the two sorts of bread was found to be as follows:

COMPOSITION OF BREAD MADE WITH WATER AND WITH SKIM MILK.

Kind of Bread.	Water.	Protein (Nx6.25).	Fat.	Carbohydrates.	Ash.	Heats of Combustion (fuel value)
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Water bread........	39.44	8.93	1.07	49.69	0.87	2,694
Skim milk bread....	37.97	9.98	.94	49.82	1.29	2,710

It will be seen that the bread made with skim milk contains about 1 per cent. more protein than that made with water.

Experiments conducted in Switzerland some years ago showed that skim-milk bread was quite completely digested, differing little from other bread in this respect. The Maine Station compared the two kinds of bread by digesting them with a pepsin solution. It was found that they differed very little, somewhat over 94 per cent. being digested in each case.

It thus appears that the skim-milk bread contains more protein than water bread, and is as completely digested as the latter.

The Maine Station points out the fact that the use of skim milk in bread making utilizes a valuable waste product of the dairy, and calls attention to other profitable uses which may be made of it in the household, as follows:

In the preparation of soups, such as potato, celery, tomato, green pea, and green corn soups; fish, lobster, clam, and oyster chowders, bisques and stews, skim milk will (satisfactorily) replace the whole milk that the directions for preparing usually call for. Skim milk makes as good white soups as whole milk. Bread mixed with skim milk is more nutritious than that made with water. All kinds of quick biscuits, griddle cakes, etc., can be made with skim milk as well as with whole milk. In most kinds of cake skim milk will be found a perfect substitute for whole milk. If the skim milk is sour, so much the better for cake and quick bread making, as only half the cream of tartar* called for in the receipt will be needed.

SKIM MILK IN BREAD MAKING.

It is a common practice to use more or less milk in mixing bread dough, since it is believed that the quality of the bread is thereby improved, says C. F. Langworthy. Frequently skim milk is used instead of whole milk. Doubtless comparatively few persons realize that skim milk has a fairly high food value and that its use makes bread more nutritious, in addition to improving its quality. It must be remembered that when the cream is removed the milk is deprived of only one of its constituents, namely, fat. It still contains practically nutritious casein and other nitrogenous materials, as well as the sugar and ash originally present, in addition to about 0.3 per cent. of fat (good whole milk contains from 3 to 5 per cent. fat).

BUTTERMILK.

Besides skim milk, there is another important by-product resulting from the manufacture of butter—namely, buttermilk. In many places this is used as a beverage to a considerable extent, and thus used furnishes more nutrient than almost any other beverage except whole milk and skim milk, unless it be cocoa and chocolate. To many persons buttermilk is much more palatable than whole milk or skim milk. The average composition of buttermilk is quite similar to that of skim milk,

*The addition of baking soda gives good results; no cream of tartar is then needed.—E. B.

though it contains slightly less protein and sugar and a very little more fat. The fuel value is almost the same, about 165 calories per pint. An ordinary glass of buttermilk would contain as much nourishment as half a pint of oysters, or 2 ounces of bread, or a good sized potato.

Buttermilk represents the milk that was entangled among the globules of fat as the cream was separated from the milk. During the manufacture of butter from cream the fat globules are brought together and removed, leaving the buttermilk. Buttermilk is thus seen to be practically the same thing as skim milk, only as a rule it is sour, owing to the cream being soured before churning.

MILK IN POWDERED FORM.

Prepared for the "Baker's Book" by

J. H. CAMPBELL, PH. D.

For more than fifty years efforts have been made by the scientists of nearly all the civilized countries to separate the water from milk, and secure the solids in such condition, that by the simple addition of water the milk could be restored with all its original properties unimpaired, and unchangeable by time or the extreme variation of climate.

These efforts proved unsuccessful for many years. A proportion of the water could be readily removed, but when concentrated to about one-sixth of its original bulk the pasty condition of the mass rendered it unmanageable and complete dessication became impossible without subjecting it to such a high temperature that the character of the product was completely changed, rendering it insoluble, incapable of coagulation by rennet and reducing the digestibility by pepsin. The nearest approach to dessication was condensed milk. A dry product seemed impossible without the sacrifice of all the valuable constituents of milk except the casein, and this was preserved only in an altered form after treatment with acids and alkalies which thoroughly changed its character and impaired its nutritive qualities.

Joseph H. Campbell, Ph. D., a native of Pennsylvania, but for years a resident of New York City, who has spent a great deal of time in the study of the petroleum products, turned his attention to organic chemistry some time ago, devoting himself especially to the products of the dairy.

The development of the dairy interests of this country has reached enormous proportions. The butter industry is largely being concentrated at creameries, and in most cases the best of the milk is wasted. If the milk could be utilized so as to recover the solids in a dry, soluble, sterilized, and truly peptogenic condition, the product at half the price of butter per pound would be more valuable than the butter interest itself, as the milk would yield but four pounds of butter to the 100 pounds of milk, while the solids would furnish nine pounds of the dry powder, and the annual value would run into hundreds of millions of dollars, creating a new industry exceeding in value the wheat crop of the United States.

But even more than this was realized that the recovery of the solids of milk in a dry condition would furnish milk to the tropical regions where it was heretofore unobtainable; would permit an addition to the rations of the soldier and the sailor in the most convenient form, with the least possible waste; would furnish properly balanced rations to all classes at the cheapest rate, and would be a general boon to humanity

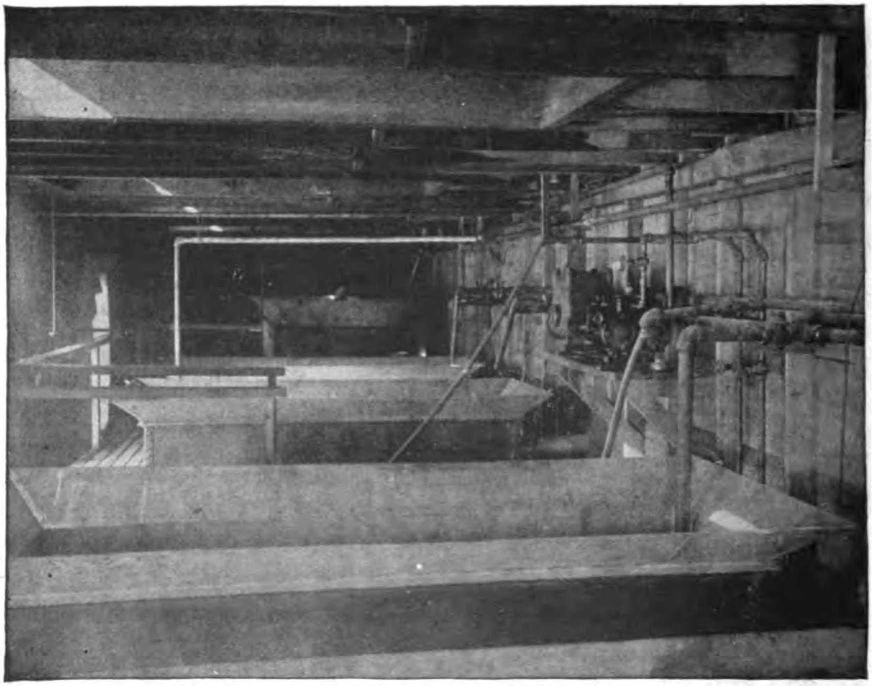


Fig. 115.—Concentrator Room, Showing Sterilizing Vat and Four Concentrators.

in maintaining vigorous normal health, allaying suffering, promoting longevity, and reducing infant mortality.

The process of development was slow; difficulties were presented at every turn, some of which for a time seemed insurmountable. But after nearly three years of labor and expenditure of nearly one-half million dollars success crowned the efforts, and powdered milk, or NUTRIUM, as it is known, became a reality, and its manufacture is now a flourishing industry, fully protected by Letters Patent of the United States and other countries.

The views herewith presented show the various stages through which the milk passes at one of the mills of the National Nutrient Company preparatory to its shipment to their Jersey City, N. J., plant, where it is ground, bolted and packed. In this plant there are four of the largest pebble mills in the world used in grinding the granules. The finished product resembles fine wheat flour in appearance, and is packed suitable for transportation to all parts of the world.

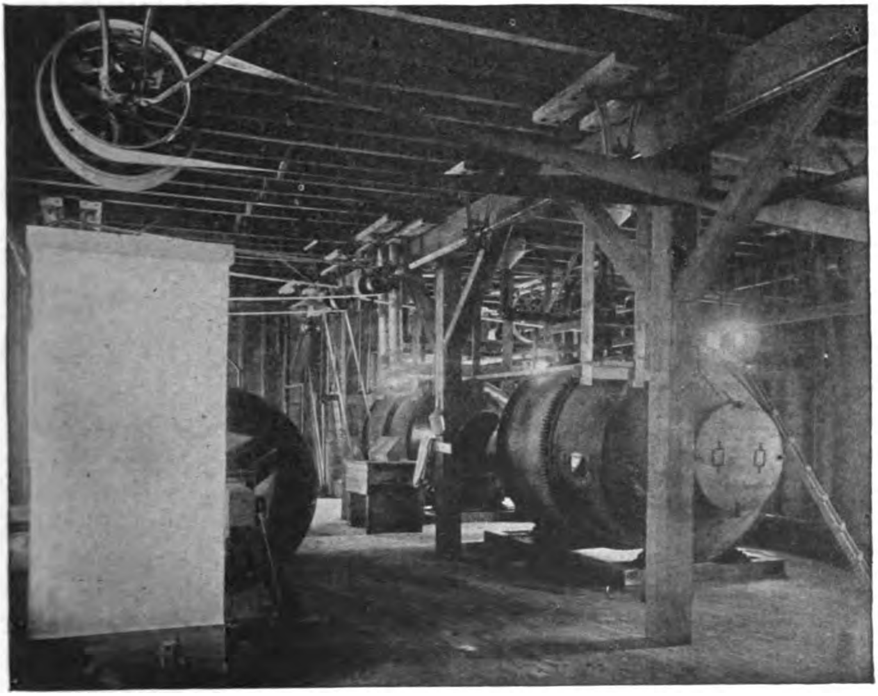


Fig. 116.— Granulating Room, Showing Roller Drums and Necessary Apparatus for Working Same.

In one view is shown the copper, tin-lined, concentrating vessels. The milk is pumped into a large round copper, tin-lined, vessel where it is agitated and heated by sterilized air blasts preparatory to its being pumped into the four (4) rectangular concentrating vessels. These concentrating tanks are provided with a circulating medium of hot water surrounding them, and coils in their interior. They are also provided with pipes and fan shaped nozzles for the introduction of sterilized air below the surface of the milk. This air is under pressure and is allowed to escape when the tanks are filled with milk, and causes the water to be driven off in vapor, and giving to the milk a violent rolling motion, greater than if boiling. The milk is thus renduced to about one-sixth of its original volume. As the product becomes concentrated the temperature is lowered. The opening of a valve permits the milk (now in a pasty condition) to fall into the large roller drums with tapered ends shown in another cut, and which are located on the first floor. These roller drums are tin-plated and are perfectly smooth on the inside, with cone-shaped ends. An air blast is then introduced into the head of the drum, the latter revolving about two turns per minute, carries the pasty product up on its sides, and as it approaches the top it falls back through the dried atmosphere; the air thus carries away the moisture. This paste soon becomes too heavy to be carried up by the revolving of the drums and rolls into a large mass, the cone-shaped ends cause it to move unequally, twisting and grinding it into small particles. These are then conveyed to the drier drums, where the dessication is completed.

The drier drums have a novel construction. Sterilized air is forced through a central shaft having lateral arms extending down into the mass, where the constant rolling of the drums exposes all parts to the dessicating air. When the product is dry it is then conveyed to a grinder, which reduces it to irregular granules about the size of wheat grains.

One of the offices of powdered milk is to cheaply furnish other foods with the protein in which they are deficient, thus restoring the balance which is essential to health.

The successful reduction of milk to the form of powder is an achievement of much importance to the baker, confectioner, and ice cream manufacturer, and particularly to those engaged in the business in a large way. They are enabled to secure their milk supply without any possibility of interruption and at a much lower cost; this latter is due to the fact that NUTRIUM can be shipped and handled so much more economically than can the milk in its original liquid form, that is, the price being regulated largely by the available amount of the product, and the advent of NUTRIUM making it possible to transport milk to any distance without any danger of its becoming rancid, naturally gives to the great centres of population a much larger territory from which to draw their milk supply. Another item that it would not do to lose sight of in accounting for the difference in price, is, that NUTRIUM being in a dry imperishable form, there is no expense for ice to keep it fit for human consumption.

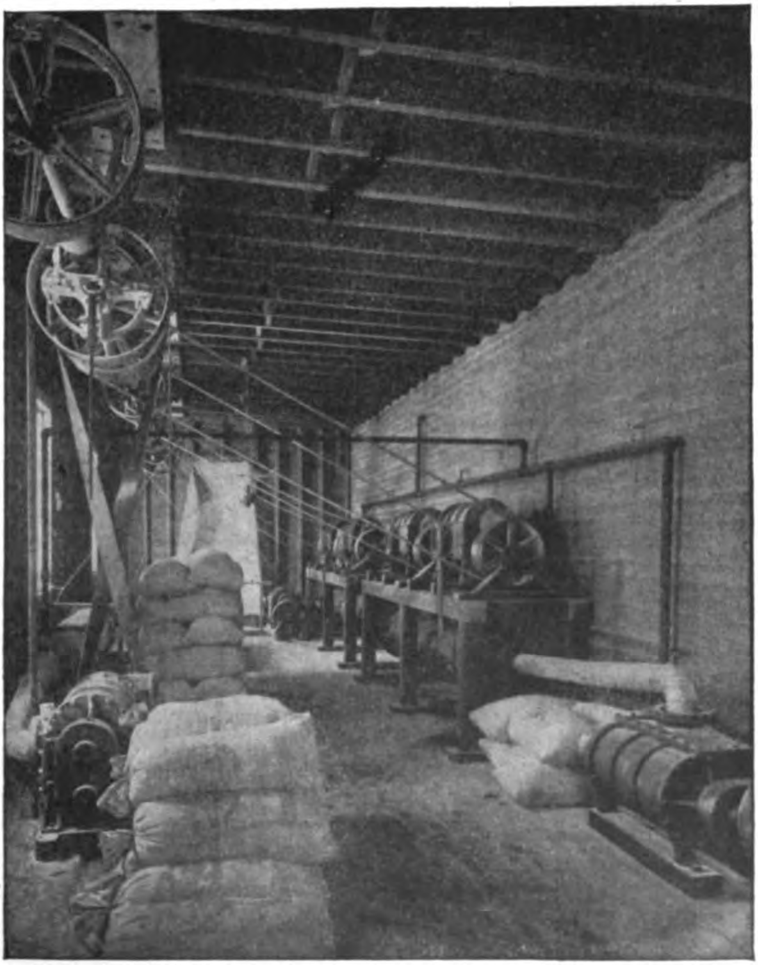


Fig. 117.— Blowers and Air Sterilizing Apparatus.

Because of the conditions surrounding the handling and production of liquid milk it is particularly exposed to contamination, furnishing, as it does, an ideal pabulum for the multiplication of the bacteria which gain access to it, while, on account of its color and opacity, it retains a delusive appearance of purity. The dangers attendant upon the use of liquid milk, unless it is thoroughly sterilized, are so apparent that it seems hardly necessary to go into the matter in detail, but a few short remarks on the subject may not be out of order. To large consumers of milk the proposition that they first thoroughly sterilize all the milk they use before mixing it with any of their products, would be an astounding one, and no wonder; it would necessitate an increased expense for a plant in which to do this sterilizing, his labor account would be increased, for intelligent labor would have to be employed in this plant, superintended by a competent man in this line; in fact, the increased expense would be so great that it is practically impossible for a baker, confectioner, or ice cream manufacturer, to use liquid milk, and have it freed from the impurities with which it is infected, for no matter how carefully the milk is collected, nor how sanitary the conditions surrounding its handling, the very nature of the product makes it peculiarly subject to contamination. Even supposing this milk has been sterilized, it will keep in such condition but a very short time if exposed to the air and the expense for refrigerating accommodations is another item that should not be forgotten. And worse than all, the character of the milk, by any known method of sterilization is materially altered, and to such a degree that it cannot be used for many purposes.

These facts regarding the danger of using unsterilized liquid milk apply of course to the milk used in the household, and, in fact, more so, for while a large consumer may to a certain extent dictate to his milk man the care to be taken in handling his milk, and may even employ a man to see that every care is taken in the production, handling, and transportation, it is not possible for the small consumer and the head of each family to do this.

This powdered milk, or NUTRIUM, is sold in three grades, that is, containing different percentages of cream, which is another point of great convenience, as it enables the consumer to get just what percentage of cream he may need, that is, in some products he may need a milk with a greater percentage than is necessary in others, for instance, in making bread, as great a percentage of cream would not be necessary as in the making of fancy cakes.

The product containing the least amount of butter fat or cream is sold on the market under the trade name of NUTRIUM. This product, like all the others, is absolutely pure, free from all the impurities to which the liquid milk is subject, containing all the non-fatty solids of the milk, and a percentage of the fatty solids, or the cream. For bread making this product is recommended by the patentee, for the non-fatty solids, and not the butter fat, is what the bread maker needs.

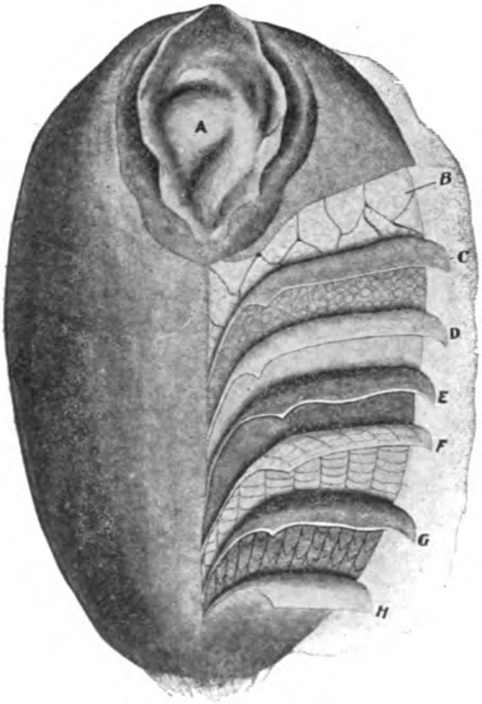
The product next in line, as to the amount of cream contained, is sold as "B-5," and contains all the non-fatty solids of the milk, together with a larger percentage of the fatty solids. This product, on account of the increased amount of butter fat, or cream, is more suitable for making fillings for custard pies, in the making of the fancy cakes, and ice cream, and wherever a product with a fair amount of cream is needed.

Cream Granules, or B-20, as it is known by the trade, contains a very much larger percentage of butter fat, or cream. This grade of NUTRIUM, while it may be used in all branches of the baking, confectionery, and ice cream business, is especially suited to the making of very fine ice cream, milk-chocolate, and is used by some bakers for custards, instead of the B-5. In explanation of this preference we would say that custard may be made with different qualities of milk, so in deciding which product would be the most suited to his use the baker takes into consideration his own peculiar needs.

Another point that it seems to the writer would be interesting to the milk consumer is, that these products are not recovered from three different grades of milk, but from one grade, and that is, the ordinary milk of commerce.

Wheat.

Structure.—The wheat grain (Fig. 118) is a small oval seed, which can be easily thrashed from the stalk on which it grows. Its six outer layers are known to the miller as the bran. Of these, the three outermost form what is called the skin of the grain and constitute 3 per cent., by weight, of the entire seed. The three remaining layers of the bran form the envelope of the seed proper. The outer one is known as the "testa," and contains the greater part of the coloring matter of the bran. Inside it lies a thin layer of membrane. These two together form 2 per cent., by weight, of the entire grain. The innermost layer of the bran, called the cereal or aleurone layer, is made up of rectangular cells, filled with a nitrogenous substance known as cerealin or aleurone. Its weight is



A—Germ
B—Starch Cells
C—Gluten Cells
D—Inner Coat of Bran
E—Testa, Coloring Matter of Bran
F—Endocarp
G—Epicarp
H—Epidermis

Fig. 118.—Kernel of Wheat.

about 8 per cent. of that of the entire grain, making the total weight of the bran about 13 per cent. In milling it is exceedingly difficult to separate these three inner layers of the bran. Within the cerealin layer lies the endosperm, as the portion of the grain adjacent to the embryo is called, which constitutes the larger part of the grain and consists of irregular shaped cells containing starch granules. At the lower end of the grain, almost surrounded by the endosperm, lies the germ of embryo. A portion of the embryo is called the scutellum. This serves a special purpose in germination. When the grain has thoroughly ripened and has been placed in favorable conditions, this embryo will develop into a new plant; as it begins to grow it will feed upon the starch and other substances in the endosperm.

Composition.—The five outer layers of the bran contain very little except cellulose, a woody, fibrous substance forming the cell walls. When burned, the ash of bran is found to contain a fairly large proportion of phosphoric acid, potash, and small amounts of other mineral matters. The cereal layer is, of all parts of the grain, the richest in nitrogenous substances, the chief of which is the cerealin from which it takes its name. The endosperm contains, besides the cellulose of its cell walls, large quantities of starch, a little sugar, and a nitrogenous substance known as gluten. The germ contains cellulose, nitrogenous substances, sugar, and a very large proportion—9 to 12 per cent.—of fat.

Grain, being hygroscopic—that is, having the power of absorbing water from the atmosphere—varies with the weather in the amount of moisture which it contains; similarly, wheat grown in a wet season or a humid climate holds a larger percentage of moisture than the same kind grown under drier conditions. Thus English wheat contains 3 or 4 per cent. more water than American. From comparison of many analyses, the average weight of the water in the grain is found to be about 12 or 13 per cent. of its total weight.

Different kinds of wheat also vary as to the amount and quality of gluten which they contain. As gluten is one of the most important constituents of the wheat, the baker should know the character of the gluten in the flour he uses. The so-called "hard" wheats are rich in gluten of a strong, tenacious character, while "soft" wheats contain less gluten and proportionately more starch. The gluten of hard wheat can be mixed with large amounts of water, and produces a large loaf from a comparatively small quantity of flour. Soft wheat, on the other hand, while it does not yield so large a loaf, makes a bread containing less water, and having a milder and more agreeable flavor.

It is useful for those interested in milling to know what parts of the grain will be most valuable in yielding a nutritious flour capable of making a white, well-raised loaf. In considering the nutritive value of flour let us remember the principal kinds of nutrients which the body needs: (1) The nitrogenous substances, called protein compounds or proteids, typified by the white of egg and the lean of meat, and chiefly represented in wheat by the cerealin and the gluten—these are the tissue-building materials of our food, though they also furnish energy; (2) the carbohydrates, principally starch and sugars, found mainly in the endosperm, and serving the body as fuel to produce energy for warmth and muscular work; (3) the fats, occurring principally in the germ of the grain, and being valuable to the body as fuel, and (4) mineral matters, seen in the ash, especially that of the bran, and providing material for bones, teeth, etc. We must also bear in mind that it is not only the chemical composition of a substance which determines its food value, but also the amount of nourishment which the digestive organs can extract from it—in other words, its digestibility.

The abundant cellulose in the bran and the coloring matter in the testa tend, if left in the flour, to give it a coarse, dark character very detrimental to the appearance of the bread. Accordingly, until recently, that flour was quite generally considered the best which had the least of the bran in it. Lately, however, much stress has been laid on the nutritive value of the mineral matters and the cerealin of the bran, consequently a great effort has been made to get a fine flour which shall include the entire wheat grain. Such flour can not produce as white a loaf, and, what is still more to the point, it is doubtful whether the cerealin is thoroughly digested by the human stomach; moreover, the sharp, rough particles of the cellulose in the bran are said to irritate the membranes of the alimentary canal and thus to hasten the passage of the food through the intestines. This would tend to diminish its digestibility, although it might be advantageous in counteracting a tendency to constipation. It would seem, then, that the value of bran in flour, unless it can be ground more finely than at present, is at least questionable. The germ, though rich in fat and ash, is also of doubtful value in the flour, as it tends to darken the color, and its fat occasionally grows rancid and spoils the taste.

The endosperm is by far the most important contributor to the flour. In its starch lies the chief nutritive ingredient of bread. The gluten, as the principal nitrogenous constituent of wheat is called, is equally necessary; mixed with water it forms a tenacious, elastic body which expands under the pressure of the gas from the yeast until the dough is full of gas-filled holes whose walls of tough gluten do not allow the gas to escape, and thus make the dough light and porous. The more gluten a flour holds, the more water it can be made to take up in dough, and the greater will be the yield in bread from a given amount of flour. Hence flours are classified as "strong" or "weak" according to the proportion of gluten which they contain and their consequent ability to yield bread. Gluten has also a highly nutritive value as an easily digested proteid.

VARIETIES OF WHEAT.

It is, perhaps, scarcely necessary to state that practically everyone, at least among those who handle flour, knows that we produce throughout our vast wheat area two great families, or distinct types of wheat, namely what are known as winter wheat and spring wheat. As indicated by the name, one is planted in the fall and grows gradually throughout the winter; while the other is seeded early in the spring and ripens in the summer. Naturally, therefore, it follows that each of these great types is raised most successfully in an entirely different latitude from the other.

It is, perhaps, pretty generally understood by the public at large that the winter variety is raised to the best advantage in a climate that is not excessively cold in the winter, or, unless the plant is well protected by a blanket of snow, it is exposed to the vicissitudes of the weather, and yet, strange to say, the best flour producing wheat is not raised in a really warm climate. In other words, the most desirable grades of winter wheat have recently come from the central west, just west of the Mississippi river, notably in Missouri, Kansas and Oklahoma and to a moderate extent from Texas. Of course, in former years commercial supplies of winter wheat came mainly from the older States east of the Mississippi river, but naturally as the population in these States increased the area devoted to wheat raising was reduced, while living requirements were gradually growing.

Subsequently. and until recently, the commercial supply of winter

Hard Wheat. Bearded Wheat. Polish Wheat. Wonder Wheat.

Fig. 119.—Varieties of Wheat.

wheat came principally from Ohio, Indiana, Illinois and Michigan, not to mention California, which does not compete in markets east of the Rocky Mountins, but of late the flour States named have been asked in a measure to furnish much wheat outside of their own boundaries.

There are, moreover, two distinct varieties of winter wheat, namely, red winter and white winter. The former is by far the more important, because of its greater abundance and great popularity among millers. The white winter is raised to a moderate extent in middle and eastern States, notably in New York, but largely in Michigan and California. The berry is large and plump and it produces a white and handsome appearing flour, but, nevertheless, it is not universally liked by millers, as there is generally a preponderance of stock in the flour, and hence an absence of strength, an element most desired by bread bakers, but of course, it makes a flour that is useful for pastry, etc. In the red variety there are two important sub-divisions, namely, soft and hard winter.

The soft red is produced largely in the old States east of the Mississippi river, but especially in Ohio, Indiana and Illinois, but also in Missouri, Kentucky and Texas. In the latter State, however, there is raised a fair proportion of hard winter. The soft red produces a white flour of attractive appearance, but with a larger percentage of starch than gluten, and hence it has not the strength found in the flour made from hard winter. It is, therefore, popular for family baking and for making pastry and cake. The hard winter grows extensively in Kansas, but recently Oklahoma red produces a white flour of attractive appearance, and a fair quantity has also been produced in Texas, as above stated. This wheat yields a flour that is slightly darker in color than that from the soft winter or the white wheat, but it is a stronger flour, and hence produces a greater quantity of bread to the barrel, and it is naturally well liked by bakers here and in Europe, especially in the United Kingdom. The white wheat raised in California is of good color, but soft and full of starch and produced to a considerable extent on irrigated soil and in many instances has to be wet before it can be milled successfully. It is generally soft and has an abundance of starch which renders it fit largely for pastry and family use.

In some respects the spring wheat crop has, of late years, been more important commercially than the winter, because a comparatively larger percentage of it is shipped out of the States in which it is raised. It therefore has more influence relatively as a price factor. Moreover, the bulk of the spring crop produces a flour that is popular with bakers, both in this country and in Great Britain.

As in winter wheat, there are likewise two kinds of spring wheat one soft and the other hard. Similarly, too, the hard spring is preferred to the soft, as it produces a strong flour in which there is much gluten and of course little starch. It has been found that the best grades of hard wheat are raised from new soil and where the winters are long and cold. Therefore, the best wheat has come from the "three big States"—Minnesota and the Dakotas. In the past these three States have contributed between half and two-thirds of the total spring yield. Formerly Minnesota was considered the home of the finest hard wheat, but recently it was found that owing to constant usage the soil was becoming worn out, and hence the wheat was growing softer and the flour showing less strength. In short, the newer the land the stronger the wheat, and as a consequence some fine grades of hard have recently come from the Dakotas, especially North Dakota.

RYE.

The grain of rye is darker in color than that of wheat, but is otherwise similar in appearance. It differs, however, in one important particular—its gluten has not the same elastic, tenacious quality and does not yield so light and well-raised a loaf. Although this fact that its dark color makes it less desirable than wheat flour, it is second in importance as a breadstuff. It is more easily cultivated than wheat, especially in cold countries, and consequently costs less. In many parts of Europe it practically replaces wheat among the poor and in the rations furnished the army. When it is milled entire, as it usually is, it contains more protein than wheat flour, but is probably less completely digested. Wheat and rye flour are often used together in bread.

CORN, OR MAIZE.

This cereal, commonly known to us as Indian corn, and on the Continent of Europe as maize, or Turkish wheat, is a native of America.

Fig. 120—Corn or Maize.

Fig. 121.—Oats.

It is commonly grown in North and South America, northern Africa, India, and southern Europe, especially Italy and the Balkan regions, and is slowly being introduced into other European countries. The skin of the kernel is thin and tender, the endosperm abundant, white, and mealy, the germ comparatively large. See Fig. 120. The kernels are generally white or yellow. Compared with wheat, maize is rich in fat, poorer in cellulose and protein, and about equal in carbohydrates, mineral matters, and moisture. Most of its fat is in the embryo or germ, which is often removed in milling to prevent the flour or meal becoming rancid. Maize flour makes very nutritious and appetizing unleavened bread, hoecake, johnnycake, etc. but this dries so quickly that it must be eaten fresh. Maize flour contains no tenacious gluten-like proteid, and therefore can not be used alone to produce a good loaf raised with yeast. Much corn bread and other foods made from corn meal are eaten in the United States. In Italy corn-meal mush, or "polenta," as it is called, forms the principal article of diet of the peasants in large districts throughout a considerable part of the year. In Servia the unripe corn is eaten much as we use it, and corn-meal bread and mush are staple articles of diet.

MUMMY WHEAT.

The *Practical Confectioner and Baker* says that French bakers and millers have been following the interesting and practical experiments of M. Maspero, the celebrated Egyptologist, with great interest. He recently delivered a lecture on the seeds and plants found in Egyptian sepulchres, and dating from 4,000 years before our era. He stated, for instance, that there was nothing authentic in the legend of grains or barley or wheat known as "Mummy grain," raised from seeds found in the said tombs. Alphonse de Candolle did not believe either in "Pharaohic wheat," derived from grain 5,000 years old. They could not have retained any germinative faculty. M. Gain has tested the alleged experiment of the Comte de Sternberg, who claims the origin of the legend, having made two grains of "mummy wheat" germinate—all a mistake. M. Gain affirms that the samples of mummy wheat which he has examined presented, exteriorly, nothing very remarkable; the color was reddish black; the cellules secured intact, but each cell had undergone a chemical change, attesting that all germs were dead since a long time. The embryon had undergone a complete transformation, too. So ends the controversy relating to the germinative faculties of so-called "mummy wheat."

BARLEY AND OATS.

These cereals are so seldom used in bread that a short description of them will suffice. In general structure their grains are not unlike those of wheat; in barley the proportion of the bran to the entire grain is about 21 to 79, in oats 44 to 66; the percentage of moisture in them is much lower than in wheat; their gluten is even less tenacious than that of rye; though flours made from them without bran contain a high proportion of nutritive ingredients, they also contain a large amount of indigestible cellulose and are quite unsuited to yield a light, attractive bread.

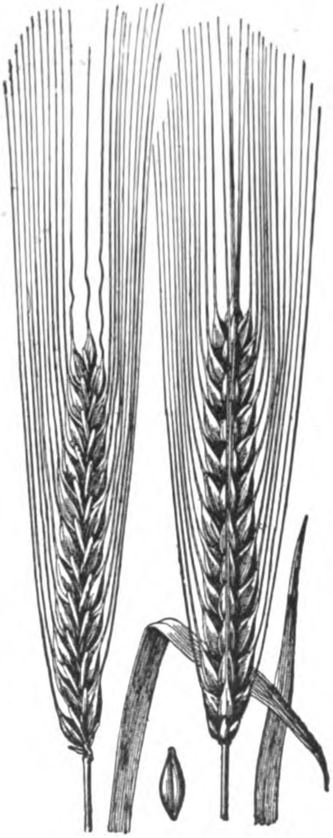


Fig. 122.— Barley.

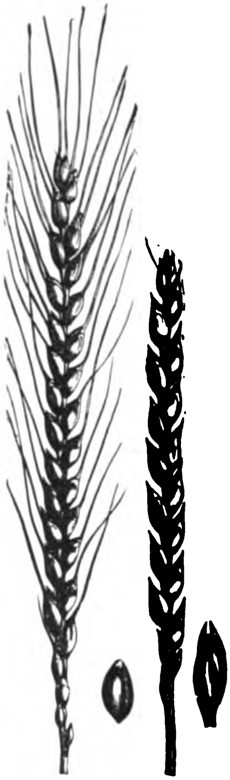


Fig. 123 Bearded and Common Split.

THE "MANNA" OF THE DESERT.

In a recent number of *La Nature* is an interesting note by Mr. Henry Castroy on the manna of the desert, which played such an important part in the history of the Jews. At the present day Arabs who are compelled to traverse the sandy desert wastes of Arabia not only feed their camels upon this little known food, but also consume it themselves. The "manna" is really a fungus, the thallophyte, either canona esculenta or lichen esculentus. The fungus is very abundant and is found upon the sand after every rain, sometimes in great mounds or heaps. It is of a gray color and is about the size of a pea. It breaks with a mealy fracture and the taste is rather agreeable and somewhat sweet. The analysis shows that the fungus has the following composition:

	Per cent.
Water	16
Nitrogenous matter	14
Non-nitrogenous matter	29
Carbohydrates	32
Fat	4
Mineral matter	5

The analysis demonstrates the fact that the manna, while not a complete food in the strict sense of the term, is still rich in certain kinds of food material and it is capable of sustaining life for a time.

BREAD FRUIT TREES.

Of the various trees that produce fruit which is used as a staple article of food by man may be mentioned those of the genus Artocarpus (a word meaning "bread fruit") of tropical countries.

The bread fruit tree (Artocarpus incisa) of the southern part of Asia and the South Sea Islands bears a roundish fruit of the size of a melon, rough on the exterior, marked with hexagonal knobs, and of a green color. The pulp of the interior is whitish and of the consistence of new bread. It is roasted before it is eaten, but has little flavor. The best varieties contain no seeds, the tree being propagated by shoots that spring from the roots.

Grades of Flour.

From an article by PROFESSOR H. W. WILEY, in the *American Grocer.*

The different grades of flour are based more upon their color and general appearance than upon their nutritive properties. It often happens that low-grade flours—that is, those which make a rather off-colored bread—are more nutritious than the highest grade and whitest flours, which make the whitest bread when judged by chemical data alone. A great many people prefer a delicate cream tint to the flour and bread rather than a product which is pure white. One of the largest milling firms in Minnesota writes me that the highest grade flour which it makes is used for the family trade, being what is called a patent spring wheat flour, used largely in the Northwest, and corresponding to the winter wheat patent flour used in the Southern States. The next grade produced is called high-grade bakers' flour, used extensively by bakers in this country, and also exported in large quantities to Great Britain and Holland. The lowest grade of flour produced is known as red dog flour, which is used largely for feeding domestic animals.

Another miller writes as follows:

"We are sending you one and one-half pounds each of our patent, family and bakers' flour. Each of these flours is what is commonly known as a blended flour. They are the result of careful consideration and experiments by us, for the purpose of producing a patent and a family flour that will combine strength and the quality of retaining moisture of spring wheat flour and the sweetness and tenderness of the winter wheat.

"The flour is manufactured from choice, selected hard spring wheat and from several kinds of winter wheat of the finest quality obtainable from various sections of the country, and is combined in such proportions as to produce a flour which will fulfil, we believe, the requirements of that we are seeking after.

"The patent produces a bread that raises well, retains moisture, and is at the same time tender and sweet and eminently fitted for a family flour, to be used for the production of both bread and pastry of superior quality. The family flour does not produce as white a loaf of bread as the patent, but is in other respects like the patent. The bakers' or low-grade flour is a dark family flour, which is to-day very largely used by the people who desire a sweet, nutritious and palatable loaf of bread at a low price, without regard to the fact that it is not as white as the bread to which they have been accustomed in better times.

"I am not sure that you desired information as fully as the above, but feel that we are sending you a set of samples practically unique in their line, which will produce results, in the hands of a good baker, that are surprising."

FLOURS WITH SPECIAL NAMES.

In looking over the names of the flours which have been analyzed, we find that there are many which have special names. Graham flour is a term which was originally applied to the coarse, unbolted flour which was made by crushing the whole wheat. Strictly speaking, the term graham flour should convey the idea of a flour made from well-cleaned and dusted wheat, ground but not bolted. Flours, however, are often sold as graham flour in which the bolting process has been carried to a greater or less extent. The true graham flour would contain practically the same substances as the wheat kernel itself, and in the same proportions.

Entire Wheat Flour.—This name would naturally carry the idea of a flour corresponding to the graham flour above. It is, however, a trademark for the flour produced in a special manner, by grinding the whole wheat after the removal of the outer coverings. It therefore contains all of the ingredients of the wheat grain, save those which are found in the outer coverings.

Gluten Flour.—This is the name of a product which is sold very extensively, and which is supposed often by purchasers to contain no starch. From the analysis made this is found to be a very grave error. The gluten flour is probably a flour made from those portions of the endosperm lying nearer to the exterior of the grain, and which are known to contain a larger quantity of proteid matter than the interior portions.

It is well that we should not be deceived by the trade names of the flours which are offered for sale. As is seen above, the ideas which the name of the flour conveys are not always realized in the article itself. It is quite important, if we wish to know the nature of a flour without making a chemical examination thereof, that the actual steps which have been followed in its preparation be traced and the character of the cereal employed be known. Experts may be able to tell the difference between the soft wheat and hard wheat flours, or even between blended flours, but ordinary purchasers usually rely upon the grocer or upon the name for the information in regard to the flour which they desire.

PROPERTIES AFFECTING THE COMMERCIAL VALUE OF FLOUR.

Aside from its nutritive properties, wheat flour has a commercial value depending upon its color and texture and upon the quantity of gluten which it contains. The character of the gluten also varies largely in different varieties of wheat and in wheat grown in different localities. The gluten of the hard spring wheats appears to have the best properties for baking purposes, but it cannot be denied that the very best bread in the world is made from the soft winter wheat of France. The method of manipulating the loaf, of fermentation, and of baking must therefore be admitted to have quite an important bearing upon the constitution of the finished loaf. It general, however, a flour is sold almost exclusively with regard to its relative appearance with other flours, and its color, as very few purchasers make a test of the quantity of gluten contained.

PREFERENCE OF BAKERS AS TO FLOUR.

Bakers prefer a flour with a high percentage of tenacious gluten, which permits of the formation of a loaf containing a maximum percentage of water. With a flour rich in gluten it is possible to get a good palatable loaf, without any evidence of excess of water, containing as high as 40 per cent, of moisture.

The baking of bread is an art which is most successfully practiced by professionals, and the American method of home bread-making is not to be too highly commended. The ideal flour for bread-making is one which contains a sufficient quantity of gluten to produce a porous and spongy loaf, but not one which permits an excessive quantity of moisture to be incorporated in the loaf itself.

Flours differ not only in the quantity of gluten in them, but also in its qualities. Some varieties of wheat furnish a gluten which is more tenacious than others, and thus produce, of course, a more desirable flour. In practice, however, where the best methods of bread-making are followed, it cannot be said that the hard spring wheats afford a better variety of bread than the soft winter wheats. The excellent character of the

French bread above referred to is an evidence of the fact that the soft winter wheats are capable, with proper manipulation, of furnishing as high a grade of bread as is desirable.

TYPICAL AMERICAN FLOURS.

From a careful study of the data obtained it is possible to arrive at a correct idea of the composition of typical American flours of the classes indicated above..

HIGH-GRADE PATENT FLOUR.

A high-grade American patent flour has, approximately, the following composition:

	Per cent.
Moisture	12.75
Proteids (N X 6.25)	10.50
Proteids (N X 5.70)	9.50
Moist gluten	26.00
Dry gluten	10.00
Ether extract	1.00
Ash	0.50
Carbohydrates (N X 6.25)	75.25
Carbohydrates (N X 5.70)	76.25
Crude fibre	0.20

COMMON MARKETS WHEAT FLOUR.

It is evident that flours commonly placed upon the market in bulk in any given locality will vary in composition according to the composition of the wheat from which they are made and the kind of milling process by which they are produced. If the flours in any given locality are formed from the wheats of the neighborhood, they would evidently partake of the character of those varieties of wheat. It is probable that as a whole, the flours which are exposed for sale in a market like that of Washington will be representative of the flours of the whole country, as very little of the local supply comes from the wheat grown in the vicinity. The data obtained, therefore, from the analysis of a large number of samples bought in the open market may be relied upon as giving a fair indication of what a typical common market bulk flour is. The composition of such a typical flour, as indicated by the data, is approximately as follows:

	Per cent.
Moisture	12.25
Proteids (N X 6.25)	10.20
Proteids (N X 5.70)	9.30
Moist gluten	24.50
Dry gluten	9.25
Ether extract	1.30
Ash	0.06
Carbohydrates (N X 6.25)	75.65
Carbohydrates (N X 5.70)	76.55
Crude fibre	0.30

BAKERS' FLOURS.

The typical American flour which is sold under the name of bakers' flour, and which, as a rule, is regarded as somewhat inferior to the high-grade patent flours,* has a composition which, as determined by the analysis made, is approximately represented by the following numbers:

	Per cent.
Moisture	11.75
Proteids (N X 6.25)	12.30
Proteids (N X 5.70)	11.20
Moist gluten	34.70
Dry gluten	13.10
Ether extract	1.30
Ash	0.60
Carbohydrates (N X 6.25)	74.05
Carbohydrates (N X 5.70)	75.15
Crude fibre	0.20

Again we are struck here with the practically identical composition of the bakers' flours with the high-grade patent flours. The chief differences are found in the fact that the bakers' flours are drier, containing about 1 per cent. less moisture. They have, too, a distinctly higher percentage of proteids as compared with the high-grade flours, due to the fact, doubtless, that large quantities of the outer part of the kernels enter into the composition of these flours. The quantities of gluten are more than correspondingly increased, which indicates that the glutenous heart

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*The author of this work refers to article " Baker's Flour," page 452.

of the proteids tends to accumulate in flours of this character, and this is due to the nature of the milling process and to the separation of the various parts of the wheat kernel. The quantity of ether extract is also higher than in the high-grade flours, showing a less perfect degermination of the grain during the milling process. The ash is also slightly higher than in the high-grade flours, while the carbohydrates are somewhat lower, due to the higher percentage of proteids.

In a general comparison of bakers' flours with high-grade patent flours it is seen that the nutritive ratio is much narrower in the bakers' flour, and the percentage of proteids higher. Judged by the common theories of nutrition, therefore, the bakers' flour would make a bread better suited to the laboring man, while the high-grade patent flours would form a bread with a greater tendency to produce fat and animal heat.

MISCELLANEOUS FLOURS.

In Class IV wheat flours have been collected of the miscellaneous samples, which, by reason of their names or descriptions, were not capable of classifications with the three preceeding grades of flours. These flours largely represent the product of small mills, and are derived from the most diversified sources. As would be expected, they show among themselves a considerable degree of variation, although the mean composition does not differ very greatly from that of the previously described grades. The typical flour of this miscellaneous class, judged by the data which have been obtained, will have the approximate composition:

	Per cent.
Moisture	12.75
Proteids (N X 6.25)	10.30
Proteids (N X 5.78)	9.35
Moist gluten	26.80
Dry gluten	10.20
Ether extract	1.05
Ash	0.50
Carbohydrates (N X 6.25)	75.30
Carbohydrates (N X 5.70)	76.25
Crude fibre	0.25

The important feature of such a typical flour is its almost exact identity, from a commercial point of view, with the high-grade patent flours. The averages of the two classes are so nearly alike that they could be interchanged with each other with no appreciable modification of chemical composition. This fact emphasizes in a most marked degree a point which has been brought out in the previous discussions, viz., that the commercial value of flour depends almost exclusively upon the nature of the milling process and upon the color and general appearance of the flour, and has little or nothing to do with nutritive properties.

WHAT IS GLUTEN?

Gluten is the spinal column of the cereal group, or, more fancifully, it is the Prince of Proteids in the household of Cerelia, says Professor N. C. Parshall. These metaphors express at once the paramount importance which this chief element of the edible grains possesses in the dietary of man. Not only is it the backbone of the cereal class, but also of every minute seed that grows among the wild grasses, from which really our cereals sprang, and that gives the bird its power of wing and tissue and tunes its vocal lays. It stands related to the vegetable kingdom as does albumen to the animal kingdom. Gluten has also been termed by a happy turn of thought "the lean meat of the vegetable kingdom."

Without this unique element in our domestic grains bread making would almost be impossible, at least, the bread would be valueless as a nutrient, as the residue would comprise mainly starch and water, which, though good in their individual directions, are not of themselves able to sustain life. It is, therefore, the glutenous principle in wheat and other grains which has established them as indispensable food substances for nearly all races of men. Especially is this true of the wheat grain, which carries gluten in its greatest richness and perfection, and on this account has penetrated to the remotest bounds of civilized and semi-civilized nations as the "staff of life," and is also not unknown and availed of by many barbaric tribes.

Gluten is a viscid, tenacious, cohesive substance, found chiefly next to the bran coats and in the central portion of the grain, and gives to dough adhesive quality and adaptability for the fabrication of bread and other household dishes. It is of a grayish color, and when extracted from the flour is called crude, or gum gluten, and it may be further refined by removing the hard cellulose, or cell walls, that surround the gluten granules. The process of isolating the crude gum is comparatively simple, it consisting of kneading the flour with water and afterward washing it to remove the starch. To procure absolutely pure gluten, which, of course, would be unsuitable as a regular article of diet, requires a more elaborate process. No milling device hitherto employed has been able wholly to separate the gluten from the starch. This, however is readily accomplished in the great starch factories, where, as not elsewhere, both the gluten and the starch may be profitably handled as separate articles of commerce.

Gluten is not a definite substance, but is composed chiefly of gliadin, glutenin and soluble salts. Different authorities disagree as to the number of proteids contained in it—for example: Fitthausen states that by extracting gluten with diluted alcohol he obtained three proteids—gluten-fibrin, plant-gelatin and musedin; but Osborne and Vorhees state in *The Chemical Journal* that only one proteid soluble in dilute alcohol exists—viz., gliadin, and one proteid insoluble in dilute alcohol, called glutenin.

Gliadin has appeared before the scientific world in different states of purity and under different names, as plant-gelatin, mucedin, mucin and gluten-fibrin. It was first called gliadin by Taddei on account of its resemblance to glue. It is soluble in dilute alcohol, but insoluble in absolute alcohol. It is slightly soluble in cold water, but the presence of salts greatly lessens this solubility. It is also soluble in very dilute acids and alkalies. In the hydrated condition gliadin is a soft, sticky substance. With cold water it acts as a binding material, and makes the gluten tough and coherent.

Glutenin in the pure form is a grayish white, non-sticky mass. On drying at 100 degrees it forms a slightly brownish horny material. It occurs in wheat grain to the extent of 4 to 4.5 per cent. It is insoluble in dilute alcohol, water and saline solutions, but soluble in dilute acids and alkalies. It has appeared under the names of zymom, plant-fibrin, gluten-casein and gluten-fibrin. Gluten owes its solidity to the glutenin, which forms a nucleus to which the gliadin adheres and thus prevents it being washed away. Gluten also contains a slight amount of mineral matter, chiefly soluble salts, which prevents the gliadin dissolving. The estimation of gluten in flour may be effected in several different ways, the simplest being to wash the starch away from the flour and weigh the residual gluten, but as the results obtained vary with the amount of washing, length of time of standing, etc., it is desirable that the flour should be mixed with a certain amount of water, allowed to stand for a definite time, etc. Variations of this process are given by Allen ("Commercial Organic Analysis," vol. iv., page 76) and by Wanklyn and Cooper ("Bread Analysis," page 43). In the latter method the authors make corrections for the ash (0.3 per cent. on the flour), and for the fat (one per cent. on the flour). Gluten may be estimated in flours, breads, biscuits and other preparations by estimating the total nitrogen, either by Kjeldahl's process or by a combustion of a small quantity of the substance with copper oxide and then multiplying the percentage of nitrogen by 6.33, which gives the percentage of gluten.

On the principle that vegetable substances generate ammonia when subjected to the action of a boiling solution of potash and potassium permanganate, Wanklyn estimates the gluten in flour by a modification of his well-known ammonia process in water analysis. L. Reed describes a colorimetric method of estimating the gluten in flour based on the principle that nitric acid acts on albuminoids to produce a yellow nitro-compound. The flour is systematically treated with colorless nitric acid, and the color produced is compared with that produced by a standard flour.

To estimate the starch, convert two grammes of flour with 20 c.c. of sulphuric acid and 200 c.c. of water for three or four hours, neutralize the liquid with caustic soda, and estimate the sugar by Fehling's solution, and the results give percentage of sugar and starch together, reports Mr. Fielden.

GLUTEN FLOUR.

Samples of gluten flour have recently come under our notice in which starch was present to the extent of fifty per cent., reports Maurice Priest and Wm. Partridge, in *Sanitary Record.* It is surprising to find upon the market a large number of such so-called gluten flours.

As this is a subject which vitally concerns the health of diabetics, and yet receives so little attention from members of the medical profession who have the dieting of diabetic persons, we do not wonder that many bakers and manufacturers of diabetic foods take advantage of this inactivity and place upon the market with impunity forms of diabetic food which contain so large a percentage of starch as to be fatal to the successful treatment of the disease.

Patients, too, ignorant of this fact, consume as much as they think fit of these fictitious gluten breads, taking it for granted that starch and sugar are both absent from the preparations, often doing themselves more harm than if they took normal quantities of ordinary bread.

There appear to be great differences of opinion as to the proper definition and composition of gluten bread. Those concerned with its manufacture generally state that it is composed solely of gluten, except for a little fat which is left in by some methods of preparation. On the other hand, many medical and chemical authorities on the subject think that bread composed entirely of gluten may often be advantageously replaced by a preparation retaining one-fifth or one-sixth of the starch of the flour incorporated with it.

Pure gluten bread frequently fails to satisfy the craving which diabetic persons possess for starchy matters which is greatly increased by total prohibition of starch, and preparations made solely from gluten are in addition hard, brittle, and usually have an unpleasant doughy taste. This being so, in cases of mild diabetes, where patients respond to treatment, gluten breads containing a small percentage of starch might be found valuable.

We see from trade literature that certain manufacturers advertise their bread as retaining a certain percentage of the original starch, and we think that this practice might be carried a step further, and different grades of bread containing varying amounts of starch should be prepared, each loaf to possess a label indicating the percentage of starch, so that medical men may alter the composition of the diet in accordance with the requirements of the case. But the amount of the bread should most certainly be regulated, as harm is done if excessive amounts, containing even a small proportion of starch, be taken by the patient.

Not only gluten bread, but diabetic foods generally, need revision to a large degree, as very erroneous ideas as to the composition of the diferent foods are prevalent. Cownley points this out in a list of such so-called gluten articles, which he showed to contain very varying and in most cases large percentages of starch.

To make a good gluten loaf, Dr. Gordon Sharp advises that the flour should be washed until nearly all the starch is removed, and then mixed with bran and made into a loaf. He also mentions that oatmeal washed for several hours, and then served with cream, will be found a valuable article of diet for diabetics.

For the separation of gluten from flour several processes may be resorted to. A centrifugal method is mentioned in Journal, Society Chemical Industry, 1900, page 918; but the simplest, and perhaps the most reliable, is the following: A strong flour is made into a stiff dough, with water only, and allowed to stand for nearly an hour, and then carefully kneaded in small portions at a time. The starch escapes in a milky solution, leaving the gluten behind as a soft, sticky mass. When the washing water becomes clear it shows the absence of starch. If the gluten be washed in running water it will retain a little fat, but will be free from starch and sugar. The kneading under water is most conveniently done in muslin bags.

Gluten is also produced as a waste product in the manufacture of starch, but in this case the full value of the gluten is not always obtained. The "sour" process is an example of this, which is carried on in the following manner: The grains having been coarsely ground, are moistened with water and allowed to stand for a few days until fermentation sets in, when more water is added and the putrefactive fermentation continues for several weeks, until all the gluten is dissolved. The latter is then washed out of the starch. Obviously here there is some loss of gluten, at whose expense the fermentation goes on.

Another process, which is used chiefly in the case of rice and maize grains, is based upon obtaining the solution of gluten in a three per cent. solution of caustic soda, the starch granules being insoluble, the gluten being afterward precipitated by an acid. Gluten is generally baked in the form of small rolls or buns, which swell to an enormous extent during baking, and the section of such a loaf shows large empty cavities. The proportion of gluten in flours varies from eight to eighteen per cent., the average being about twelve per cent. To get a flour rich in gluten the soil should contain a sufficient but not excessive amount of nitrogen. A hard wheat (yielding a strong flour) contains more gluten than a soft wheat. Gluten constitutes a most valuable part of wheat flour and is an extremely valuable foodstuff. As prepared by washing flour till free from starch it is an adhesive, sticky, elastic mass, with a brownish or grayish tinge, but when freed from water it is translucent and colorless, and it is said that about ninety-six per cent. of such gluten is digestible.

The new light which has in recent years been thrown upon the physiology of digestion, together with the great food reform movement which, within the last two decades, has made such rapid and gratifying progress, naturally directed attention more sharply to the cereal foods, and more recently still to gluten as the chief constituent of all the cultivated grains. It was soon perceived that the cereal group, which had theretofore been utilized almost wholly in the form of flour or meal for bread making and such other homely dishes as each household might devise, afforded, through new and improved methods of milling or of cooking processes, or both, almost unlimited scope and opportunity for the betterment in form. nutriment and palatability of all foods of the cerelean class. The grains consequently became a subject of deep study and experimentation. The Yankee genius for invention was brought into full play. New and improved mechanical devices were constructed, capable of thoroughly dissecting the grains and separating or combining the various elements at pleasure. It was like the discovery of a new element in nature. Science and experimentation went hand in hand. Each year new food producing concerns sprang up in all parts of the country, vying with one another in the strife to reach the maximum of excellence and popular favor for their products. At the present day not fewer than three score and ten large firms in different parts of the United States are engaged in supplying the people cereal preparations in almost endless variety, from which may be made at once or in a few minutes numberless tasty, delicious and health and strength-giving dishes, according to the formulas furnished by these firms. Our long and full line of cereal foods, cooked and uncooked, highly glutenized and plain, mixed or simple, have certainly added considerably to the home consumption of the products of the American grain farm.

BLENDING FLOUR FOR FLAVOR.

The following article, written for *The American Miller* by Mr. David Chidlow, will be found of interest to bakers as well as to those for whom it was primarily intended. The strong competition existing among many bakers in large cities to produce well flavored bread opens up a field for flour blending to produce flavor. The phenomenal growth of straight doughs during the last two years, on the principle (as introduced generally by the Heissler & Junge Co., of Chicago), of using malt extract and taking the dough "young," has been most surprising. It even threatens to cross the ocean and displace a system of fermentation that has been considered stable.

One of the most peculiar features of this "home made" bread, as it is generally named, or "Quaker Bread," as patented by Heissler & Junge, is the fact that they are demanding the highest class flours made, in the belief that such flours give the highest flavor and other qualities desired. Looking at the question from my standpoint as a student of malt extract, fermentation and flour, I feel surprised that bakers should overlook the advantage of winter wheat flours as blends with the high spring patents already in use. The essential aim in the straight dough bread is to preserve the flavor of the flour as far as possible intact; the secondary aim is to get a large loaf. To these ends fermentation is carried rapidly forward by using a large proportion of yeast; malt extract is added to stimulate fermentation and give flavor, and soft doughs are used to permit the easy expansion of the dough; and strong flours are wanted to withstand expansion.

From a theoretic standpoint the baker loses value by adopting this standpoint of work. It might be argued that the baker is simply supplying a public demand. But is such an argument sound? Is he not rather endeavoring to supply something as near to home-made as he can? The nearer he reaches that ideal the more trade he commands. The housewife adopts a different system. In the first place, her yeast is not so pure; it has more bacteria in it, and her flour is not so strong. She usually ferments through two stages—sponge and dough. The excessive bacteria and double stage of fermentation form a degradation of an already weaker flour, modified again, though, by the fact that she uses a very much larger proportion of yeast. The product of this system is what the baker aims to imitate or replace.

A peculiarity of a mixture of yellow winter wheat flour and gray spring wheat flour is that almost invariably they take more water to form a dough than the two would separately, and that the mixture gives more gluten than the sum of the two would separately.

I have found the mixture of Washington soft yellow flour with spring patents gain nearly four per cent. of water-absorbing power and add nearly three per cent. to the gluten. In all of such mixtures the value of the flour was increased in flavoring properties. The change that takes place is due to the action of the soluble albuminoids of the softer flour on the gluten bodies of the harder. Malt extract during fermentation has a very similar action on the spring patents, under the conditions that home-made bread is made; but this action is quadrupled under the same conditions, if such a blend as I have indicated be used.

MACHINES FOR DETERMINING NUTRITIVE VALUE.

Dr. J. A. Wesener, of the Columbus Food Laboratory, has invented machines which determine the nutritive value of any grade of flour, predict with certainty how many loaves will be made to the barrel, how bulky will be the average loaf, and how dense or porous. His device represents a year of experiments. Dr. Wesener is a deep student of both physiological chemistry and food chemistry. He holds a professorship in animal food chemistry in both the Harvey Medical College and the College of Physicians and Surgeons.

Judging flour values has been ridiculously crude up to the present. When a baker wished to know how many loaves of bread a certain grade of flour would bake, he bought a barrel and converted it and then counted the product. It long since came to be taken as a standard that a barrel, containing 196 pounds, would average 323 loaves. Whether each new purchase of the same grade or not would fulfil this expectation has had to be a matter of chance. It has been far more obscure how well any sample of flour would average up in nutritive value, porosity, fermenting power, strength, and color of dough, gluten, and ash percentages—all of which determine whether bread is good or not. Dr. Wesener's devices, although almost as simple as ordinary popguns, record all these tests beautifully.

Dr. Wesener's new appliances are as simple as they are revolutionary. Two separate brass cylinders, not larger than big hand syringes, and a graduated "vernier" caliper for measurements, comprise most of his equipment. These operate on principles as simple as the apparatus. It has been found out that the nutritive value of a flour depends more upon the "tenacity of its gluten" than other considerations. That is to say, the ductile power the dough has to pull out into strings like taffy is greatest when the food value of the flour is highest. When dough will not stand the usual test in this respect its nutritive properties are inferior, it is said, notwithstanding a high percentage shown in gluten. It seems that the gluten, when dough is brittle, is of inferior food value. This same test also directly determines what volume a loaf will show from given weights of dough. Thus two of the most obscure points hitherto in making up flour into baker's products are cleared up by the same instrument. The fermenting period and fermenting capacity are also of utmost importance, and these are registered by another simple instrument.

"When we wish to test a flour," said Dr. F. W. Robison, the assistant of Dr. Wesener, "we deal with small quantities, as they give results as accurately as big tests. Because flavor is adventitious and has nothing to do with quality and the nutritive value of cereals, we leave out salt, sugar and flavoring. Part of the flour is properly mixed with distilled water, set aside with ordinary baker's yeast to rise, then kneaded thoroughly with the remainder of the sample and it is now ready to put in the cylindrical 'mold.' It is put in the bottom of this brass vessel, a piston crowded down upon it, and the lid screwed on. Now the mold is put in the incubator, where the dough rises rapidly from the expanding gases and the piston rod is forced out at the top. When 45 degrees of rise is registered by the piston the 'time of rising,' or 'fermentation period,' has been shown by the clock. The mold is then transferred to the electric oven, which is heated to 220 degrees centrigrade. The bread continues to rise as it bakes; it is there twenty-five minutes, and when removed the piston shows again by registering the additional rise just what will be the size of the pound loaf."

By the old time method of measuring the baked loaf, when a baker wanted dimensions he took a tape line and passed it around the loaf in three directions. If the heat had caused the loaf to rise up like a camel's hump at one end it can be easily seen the old plan had its serious disadvantages. By simply reading the two registrations of this piston at the two stages of its ascent and quick reference to a standard scale the whole story can be set down in figures for the barrel of flour.

RYE FLOUR.

A kernel of rye is of about the same build as a kernel of wheat, but the form of the kernel is different. A bushel of rye weighs fifty-six pounds, as compared with a bushel of wheat weighing sixty pounds. Practically all of the rye raised in this country is winter rye; that is, it is sown in the fall, the same as winter wheat, and harvested about July 1.

Rye milling has been a gradual evolution from the days when all that was required was a run of stone and a reel, to the present time, when, as in this plant, advantage is taken of every modern milling convenience in the manufacture of the flour. The mills that manufacture rye flour may be divided into three classes:

First—The strictly rye mill, the mill that is especially equipped and built for the manufacture of rye flour, such as the one operated by ourselves (there being only very few such rye flour mills in the whole of the United States).

Second—The rye mill, which is operated in connection with a wheat mill, in which the rye is ground on a separate system from the wheat, and in which the rye business is a side issue.

Third—The grist mill, that makes everything from patent wheat flour to chop feed, on the same machines.

A grain of rye contains a certain amount of flour and a certain amount of feed. The problem that confronts the miller is to separate, as perfectly as possible, the flour from the feed. To do this requires fully thirty per cent. more machinery and power than is required to mill the same amount of wheat flour. It is quite evident that mills of the first class can make a more perfect separation than their competitors, for the reason that they are built and operated for that express purpose. Mills of the second class could give the same results, except that, being operated as a side issue to wheat milling, and often for the purpose of working off wheat low grades, neither the attention nor equipment is given that is used by millers of the first class. Owing to the special flow of stock through the mill required in rye milling, and the special equipment of the machines used, you will find the results obtained by some third-class mills comparatively poor. You will find stock in their flour that properly belongs in their feed, and in their feed stock that belongs in the flour. No mill can make both good rye flour and good wheat flour on the same machines, and the same system. The quality of one must be sacrificed to the other.

We are now writing wholly in regard to pure rye flour. The blending of rye flour with wheat flour is an entirely different subject, and we will tell you about that some other time. Suffice it to say that every rye mill in the United States, little or big, turns out more or less blended flour. It is a legitimate branch of the business, and there is no reason why it should be treated as a secret sin, about which nothing should be said.

Pure dark rye flour corresponds to a straight wheat flour, and is all of the flour contained in the rye, or one hundred per cent. Now, this one hundred per cent. of straight rye flour is composed of, say, seventy per cent. of patent rye flour and thirty per cent. of rye low grade. Therefore, in making a patent rye flour, the rye low grade is merely eliminated from the straight rye flour, and we have remaining a rye flour much whiter in color than the straight, but less strong in taste and odor of rye, for the rye low grade that has been taken out contains the strong rye germ. The greater the percentage of low grade rye taken from the straight flour, the whiter the patent will be, and also, incidentally, the more expensive.—Circular of the Blodgett Milling Co., Janesville, Wis.

FOOD VALUE OF RYE AND WHEAT MIXTURES.

In the course of some investigations on the food value of different admixtures of rye and wheat, I came to the conclusion that the soluble albuminoids of rye were specially active in converting starch into sugar, writes Professor Goodfellow in "Practical Confectioner and Baker." The soluble albuminoids of nearly all the cereals have this diastasic action, but vary greatly in the degree to which the conversion is carried. Various admixtures of wheat and rye were experimented with and the results compared with mixtures of wheat and other cereals. In all cases the same wheat was employed, the quantities of sugar in the meal being carefully estimated, and similar analyses being made in the case of the rye, barley, oats, maize and rice used.

The following table gives the quantities of sugar in the original 50 per cent. mixtures before treatment:

Mixture	Percentage of Sugar
Wheat and rye	3.85
Wheat and barley	2.75
Wheat and oats	3.16
Wheat and maize	2.85
Wheat and rice	2.59

The mixtures were then digested thoroughly at 130 degrees F. for eight hours and the percentages of sugar ascertained again.

The following table gives the total percentage and the increase in order of merit:

Mixture.	Original Sugar.	Sugar after Treatment	Increase.
Wheat and rye	3.85	8.95	5.10
Wheat and maize	2.85	5.37	2.52
Wheat and barley	2.75	4.89	2.14
Wheat and oats	3.16	4.56	1.40
Wheat and rice	2.59	2.73	0.14

From these experiments it would appear that a combination of rye and wheat is the most active of the cereals with regard to diastasic properties. No experiments were made to ascertain what proportion of the increase of the sugar was due to the *inversion* of the non-reducing soluble carbohydrates of the cereals, as distinct from the conversion of starch, but control experiments were made with mixtures of 50 per cent. of starch and 50 per cent. of the same cereals mentioned above, the starch being gelatinized before treatment.

The mixtures were digested for eight hours at 130 F. and the following were the results in order of merit:

Rye and starch	2.06	6.56	4.50
Wheat and starch	1.26	4.83	3.57
Maize and starch	1.02	3.51	2.49
Oats and starch	1.18	3.45	2.27
Barley and starch	1.03	3.24	2.21
Rice and starch	0.26	0.48	0.22

The results of these control experiments confirmed the earlier ones, except in the case of oats and barley, in which a discrepancy was observed, and the complete gelatinization of the starch did not appear to have any marked effect on the degree of conversion. Of course no permanent conclusion should be drawn from these isolated experiments, but they are interesting as indicating the power which cereals possess of converting their own starch into sugar under proper conditions, but future experiments may show that the variations are so great under different circumstances that no decided rule can with accuracy be laid down.

The characteristic flavor which a proportion of rye imparts to wheat bread may be partly due to this fermentive action, whereby a sweeter loaf is obtained, and the better keeping qualities of the bread may be partly due to the increased percentage of soluble carbo-hydrates present. Rye in itself is slightly richer in sugar than wheat, and certainly contains a greater proportion of soluble albuminoids.

The following analyses of the two typical samples will serve to show these differences clearly:

	Wheat.	Rye.
Water	12.61	12.78
Starch	63.57	59.29
Fat	1.48	1.43
Sugar and other soluble carbo-hydrates	3.21	5.06
Insoluble albumin	9.63	9.72
Soluble albumin	4.92	6.35
Cellulose fibre	2.86	3.39
Ash	1.72	1.98
	100.00	100.00

Rye is thus seen to contain 1.84 per cent. of sugar and 1.43 per cent. of soluble albuminoids more than wheat. The addition of a small proportion of rye not only improves flavor, but renders the bread more digestible and nutritious.

The various preparations of corn flour which are now advertised so largely are lately being sold under fancy names for the addition to household flour for bread-making purposes. One variety is self-raising, and it is claimed that when added in proportion of 1 part to 6 parts of wheaten flour by weight it produces bread which is easily digested even when new. There can be no doubt that the mixture of a small proportion of corn flour to ordinary flour confers certain well-marked properties on the resulting bread, the most important of which is a retention of moisture for a longer period than ordinary bread, but unless the corn flour contains a due proportion of nitrogen it lowers the nutritive value of the bread.

Ordinary corn flour is manufactured from maize (*zea mays*) or rice (*oryza satava*), the former cereal being more commonly employed for the purpose. As prepared in the ordinary way it consists almost entirely of starch, as the following analysis of a well-known brand shows:

Analysis of Corn Flour (*Goodfellow*).

Water	9.85
Proteids	1.61
Starch	88.12
Ash	.42
	100.00

Sugar and dextrin were entirely absent. It is clear from this analysis that the addition of such a flour to wheaten flour for bread-making purposes lowers the nitrogenous ratio, and consequently the nutritive value of the bread. At the same time the bread unquestionably keeps moist far longer than that made from wheaten flour alone. I am unable to discover, by the most careful digestive experiments, any improvement in the digestive qualities of bread containing corn flour. If anything, the reduction by the digestive juices is somewhat slower. Another very important point is that the percentage of phosphates is reduced by the addition of corn flour. In whole maize the ash contains nearly 80 per cent. of phosphate of soda, while corn flour only contains about 4 per cent.

EFFECT OF FUMES ON FLOUR.

Flour is very susceptible to fumes and odors. Bakers sometimes forget this and fail to store their stock of flour properly. Then when their bread is poor, they blame the flour merchant when the fault lies entirely with themselves.

A New Jersey baker recently thought he could improve the kalsomine he was having applied to his place by putting in it a strong solution of carbolic acid and chloride of lime. He acted on the happy thought, but when the day's baking was finished the bread tasted as if it had come out of a quarantine station. Flour is so sensitive that the best millers never eat onions until after the mill shuts down, and head millers are always particular what brand of perfumery they use on their handkerchiefs.

F. B. Gutrie, an expert, recently made an investigation of the effect of exposing flour to the fumes of burning sulphur. The *Bakers and Confectioners' Journal* reports the result. A few ounces of sulphur were burnt in an airtight wooden box with a lid which fitted closely, and was weighted down to make it nearly airtight. The flour was suspended in a calico bag from the under side of the lid. The whole was left to itself for six hours. The flour was then emptied out and left in the open air, with frequent stirring, in order to allow the sulphurous acid to escape.

The flour that had been exposed to the fumes of the sulphur was apparently unaltered in appearance. On attempting to wash out the gluten from the dough, to determine the gluten contents, a slimy, sticky mass was obtained, which washed away between the fingers without leaving a trace of gluten. On attempting to determine the strength it was only possible to make a dough containing 36 quarts of water per sack, at which point it became quite sticky and unworkable, though unlike dough made under similar conditions from ordinary flour in being quite hard and heavy.

The baking test was a complete failure. It was impossible to prepare a proper sponge, the dough becoming very sticky and impossible to handle. It was not possible to obtain a light dough. The fermentation in the sponge was very slight, and on baking the loaves hardly rose at all, and produced a heavy sodden crumb without texture. It would appear that the action of sulphur fumes on flour is to affect the composition of the gluten.

BAKERS AS BLENDERS.

(*The opinion of an English Baker.*)

The question as to whether it pays to blend one's own flours may be answered in the affirmative, the cheapness of foreign flour compared to the home-milled flour being one of the strongest claims for the baker blender, writes an English baker in the *British Baker*. The chief thing to consider with flour blending is to get strength, color, and flavor. This, as a general rule, can be done by noting the characteristics of the different kinds of flours. For strength you will need some American spring wheat patents (which are at a low price now); as a general rule, these cannot be beaten for strength, whilst they have not got the flavor that home-made flour has got. You will, therefore, need to have either some American winter wheat patents (generally good color) or some Australian or French flour. All these are soft flours, but they have the flavor the American spring has not got. About two-thirds of American spring, with one-third of the other soft flours, will make a good blend. If you are going to use a lot of American spring you will require to use a little malt extract to give flavor. The water-absorbing powers of spring American are very much in their favor, and it is therefore very profitable to the baker to use it if possible. It makes a large, bulky loaf, but the bread eats chaffy if other flours are not blended with it. The American winter wheat patents are generally of good color and good flavor, but are very soft, the water-absorbing power being low. French flour is also soft, but of good flavor, whilst Hungarian flour is good both for color and flavor. At the price of 5d. I am afraid you will not be able to use much Hungarian, but then, a little roller whites would assist the flavor. The best way of blending is to take your general brand of home-milled, note the price, then take the price of foreign flours, and, having got a selected blend together, test for color, strength, and flavor against the home-milled. American spring wheat patents are quoted at 21s. 6d., and lower grades as low as 17s. 6d. It should be no difficulty for you to get a suitable blend at the price you mention.—FACTOR.

TESTING FLOUR WITH THE MICROSCOPE.

The following method of determining the baking value of flour by means of the microscope was originated and described by a Spanish scientist some years ago in Die Muehle of Leipzig. The microscope used had a magnifying power of 60 diameters. The cuts shown are not very good, but show the characteristics of the flour with sufficient accuracy to be a guide.

As small as possible a quantity of flour is taken upon the point of a penknife, and placed on a drop of water, on an object glass. (By simply looking at the particles of flour, they must appear to be floating singly in the water. When too much flour is taken, a dough-like mass is immediately formed, which is useless. The slight pressure of the glass which covers the object removes a portion of the water, while the flour—according to its properties—shows various characteristic phenomena.

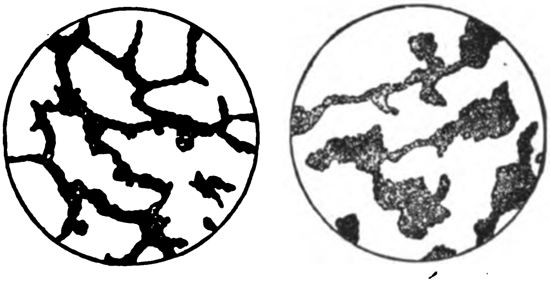


Fig. 124.—Flour Under the Microscope

In good flour it will be observed that the gluten, which appears to be surrounded and protected by particles of starch, will change its texture the instant that it comes in contact with water. It expands and spreads in all directions, and to a certain extent surrounds all particles of starch which it encounters, forming a network, as is shown in Fig. 1. It retains this form after the water is evaporated for many hours, and even for days, although in the weakest points it will be drawn together or ruptured. The whole mass has a uniform color, and neither grains nor stains can be observed.

With medium qualities of flour the same change takes place, but much slower; the gluten expands, but whether it wants sufficient force, or whether the particles of starch adhere too firmly among one another, it is certain that a uniform network is not formed. There also remain accumulations of starch, which in their interior contain yellowish masses of fats and gummy substances, which were not put into motion by contact with water, as is the case in good flours. Fig. 2 shows the form in which this kind of flour generally appears during the first half hour of observation.

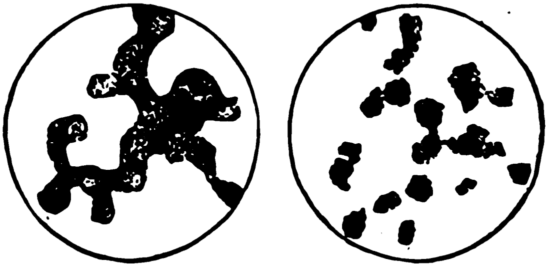


Fig. 125.—Flour Under the Microscope.

In poor flours, as the water is removed by pressure of evaporation, the flour absorbs water, and contracts to form small lumps. It shows no tendency to separate gluten, or that the latter would surround the starch.

Hence it happens that the particles of starch, the gluten and the particles of bran essentially remain in their original position. The formation of a network, or of fine threads, can only be observed here or there in small groups in the field of view.

Fig. 3 shows the appearance of poor flour surrounded by water, and Fig. 4 shows the same, after the water has been evaporated. It will be seen in the latter figure that there is not the slightest cohesion, not even a tendency of any kind for the particles to combine.

HAZELNUT FLOUR KEEPS BREAD FRESH.

A German baker is accredited with mixing ground hazelnuts with his bread-flour, which he claims will keep the bread fresh for a long period. In preparing this hazelnut flour the kernels are first freed from the skin and then ground very fine by special process. It is added to the wheat flour in a proportion of 10 to 25 per cent., but care must be taken that the mixing is done thoroughly, as it is important that the fatty elements of the nuts shall prevade the whole mixture. The flour thus mixed acquires a property which enables the bread or other goods made from it to keep much longer than if ordinary flour is used. The fatty or oily elements prevent the absorption of moisture to a great extent, and, consequently, also prevents the formation of mould, mildew or similar growths. In addition to this, it is claimed, the albumen and fat in the hazelnut enhance the value of the flour, because of their nutritive qualities. However, we have not heard anything recently about the success of these experiments and doubt whether it is used to any extent abroad. Perhaps it would pay some enterprising American baker to make experiments on these suggestions.

BAKERS' FLOUR.

For many years the bakers' trade was subjected to a very inadvertent misrepresentation by the millers and the press regarding the grades of flour used by all the honest, conscientious bakers, large or small, throughout the country. Nearly every mill, in fact, the market quotations in the milling and financial papers quoted the inferior brands of wheat flour under the brand of *"Bakers' Flour."* By branding what is supposed to be each mill's most inferior grade as "Bakers' Flour," the quotation of which, on the markets of the world, is, of course, proportionally less than that of high-grade patent flour, the bulk of which is used by bakers of this country. The first energetic protest, which created quite an agitation and revolt among the bakers, was made by Mr. Chas. Schneider of Washington, D. C., in a letter send to the *Northwestern Miller* at the beginning of 1895. Mr. Schneider pictured the injustice to bakers in its true light, when he wrote:

"The millers have always made, and are making, a low grade of flour, which they call 'bakers'.' There is very little of this flour used by the bakers, as I, for one, use in my establishment about 16,000 barrels annually, and, of the 16,000, there are only 300 barrels of this 'bakers' flour.' During the recent agitation of the bread question, which was conducted by the newspapers of this city, some weeks ago, these newspapers, in figuring up the baker's profits, always took the price of this 'baker's flour.' The public in general is under the impression that this flour is made especially for the bakers, and that this is the only kind the bakers make use of. Otherwise, it would not have the name of 'bakers' flour.' Why not give this flour another name—one which would not embarrass the baker nor mislead the public?"

The *Northwestern Miller* promptly took up the matter and took side with the bakers, by abandoning the misnomer "Bakers' Flour" in quoting the lower grades, heretofore known under that title. The *Northern Miller* wrote at the time:

"To retain the brand of 'bakers',' in the face of the protest of the American baking trade, is not alone being unprogressive; it is equally stupid and shortsighted. There is a sentiment among the bakers, as among other classes, and it should be respected. The sentiment is strongly expressed against the misnaming of this flour, and millers awake to the situation should be prompt to acknowledge and respect it. The proper name for bakers' flour is 'clear' flour, and, henceforth, in these columns, that word will be used in connection with the brand formerly known as 'bakers' flour."

The *Bakers' Helper* also took active part in the controversy at once, and in a short time the leading bakers throughout the country raised a vigorous protest and demanded correction of the deceiving injustice. The protest was the more justified because just about that time the press and public alike were rather antagonistic to the baker, and figured his profits according to their own resources of information, using the low grade of flour branded as *"Bakers' Flour,"* and which is the cheapest, as a basis for calculations in figuring out the cost of manufacturing bakers bread, to the detriment of the bakers. Now, if the bakers of this country are the millers' best customers, why should the miller thus reflect upon the bakers by branding an inferior grade of flour with their name, thus publicly indicating that that grade is mostly used by bakers of this country, while, if the truth were known, by far the greater portion of that special grade of flour would be found to be shipped to foreign countries.

The agitation was quite successful at the time and to-day the fact is well established that every progressive baker uses the best grades of patent flour obtainable. The baker who still buys cheap inferior flour is not only in the minority; he is, by working against his own interests, considered a fool, and not to be feared as a successful competitor. Making cheap bread out of cheap, inferior flour is an illusion, and every baker calculating on the basis that cheap flour makes cheap bread is deceiving himself. The very best of flour, and the use of the very best modern machinery produces the greatest number of loaves of bread from a barrel of flour, and besides makes the best loaf.

Many of the leading bakers have also abandoned the idea of mixing one or two brands of cheaper flour with their best patent flour. Blending such flours together, the result may be a good loaf; but, as they have to rely on the A No. 1 strong spring patent to offset the weaker or darker cheap flour, will they gain anything by the manipulation? Will the cost per loaf, when baked, be more if they use five barrels of an A. No. 1 Standard Spring Patent flour instead of three barrels of A. No. 1 and two barrels of a cheaper, weaker flour?

Of course in a large wholesale bakery equipped with a modern laboratory for testing every brand of flour, as to its value for flavor, color, gluten, etc., a perfect "*blend*" can be obtained and may be used to advantage. However our leading flour mills have realized the fact that to merely grind wheat into flour was not all that is necessary in flour-making, and they have found that something had to be done to insure absolute uniformity from day to day. The most uniform and most reliable flour, the flour producing the best flavored, best colored loaf and containing the largest percentage of gluten at the same time, was the problem confronting the modern miller and the result was the installation of a flour-testing department, where chemical analysis and practical baking tests could be made. The modern miller practically endeavors to do the blending during the grinding of the grain, thus offering the baker a perfect flour fully guaranteed to run uniform from day to day, and relieving the baker of experimenting with or changing his brand of flour every little while. Of course one certain brand of flour, even if of the highest quality, does not suit for every kind of bread. The main purpose of this article is to remind the honest, progressive millers and bakers of their duty, to continually agitate the fact, wherever they have the opportunity, that the baker of to-day uses the very best flour obtainable and that the price of flour is a secondary consideration with the American baker, as a great number of people still have the wrong idea, that the bakers use a cheaper grade of flour than the brands of so-called "Family flour."

PATENT VERSUS STRAIGHT FLOUR.

A correspondent of the *American Miller* writes: "Considerable printers' ink has been used of late to educate the milling fraternity up, or back, to the old idea of producing a straight grade of flour. There are some who argue against the division of the inside of the golden grain on the ground that it is an unjustifiable act of man to interfere with and attempt to improve on Nature's perfect handiwork.

"This is the veriest folly, as man separates any and every product and leaves what he does not want, utilizing the portions he considers of value in whatever percentages and grades that suits his fancy or his needs.

"Then the claim is made that there really never was any good reason for dividing the product of the wheat berry into patent, bakers and low grade. We hardly think those millers who made the first patent flour, or even those who for ten years after its introduction found barrels of gold dollars in its manufacture, could be made to believe that this method of dividing flour into two or three grades was not superior to the old straight flour system of the past ages.

"This patent flour was not all moonshine, for there are the financial results, positive and substantial proofs to the contrary. Had the millers maintained their original practice, the patent flour market would not be in the demoralized and unsatisfactory condition that it has been in and promises to continue in for the future. The statement that it was a novelty soon bound to wear off will not hold. The basis for this 25 to 40 per cent. of patent flour, from good No. 1 hard wheat, had a good, firm foundation, and it brought $2 per barrel more than the old-time straight millstone flour. Made in this manner to-day this patent would bring 50 cents and more per barrel above a straight flour.

"Passing by our Model Bakery, I noticed the unloading of patent flour made in the extreme Northwest. In answer to my inquiry I am informed that such flour cannot be made by the mills in this great Buckeye State. Through one bad crop year and into the next did these winter wheat millers flounder around, losing trade daily, until forced to admit spring wheat into their cold looking winter wheat mills. But, alas, the same policy was pursued; the fine flour theory was steadily adhered to for the sake of color. Great and small, they are all in it trying to see who can produce the finest and whitest flour.

"All of the fair-sized mills going into the manufacture of patent flour tended, of course, to lower the extremely high price. Then the patent from No. 1 wheat was brought into competition with patent from No. 2 and lower grades of wheat. But it did not stop here; the percentage of patent taken out of all grades of wheat was increased to a point beyond all reason, thereby lowering the quality. No more disastrous, unbusiness-like move was ever made in any manufacturing business that had as good a thing as patent flour proved to be. Those mills that are to-day making a flour claimed to be as good as any patent, and running from 75 to 95 per cent., are fooling nobody but themselves.

"Why is patent flour that is a real patent better and worth more than other flour? It is better because it contains the strongest and most nourishing portion of the wheat berry, and for this reason it brings more in the world's markets. This baker here gets this granular patent, made 1,000 miles away, because it raises and makes a beautiful loaf of bread, and produces twenty-five or more loaves to each barrel."

THE STORAGE OF FLOUR.

Translated from the Original Report of Mr. Jos. Fritsch, in Sarajewo.

Storage Room for Wheat Flour.

Our flour room (mehlboden) has a capacity of eight carloads and is divided into three compartments for different brands. The flour is emptied and sifted before dumped into the bins, for which purpose we have two sifting machines; one for fine white flour, the other for the darker, common flour, and the meshes in the sieves are accordingly fine and coars. Besides a good ventilation a skylight is provided. The floor is of small tile, the room airy and lofty and is reached by a broad stairway, the steps being wide and low.

STORAGE ROOM FOR RYE FLOUR.

This room has a capacity of five carloads of flour, and is partitioned off and otherwise arranged similar to the above described storeroom.

The flour stored in these bins must be frequently turned over with wooden shovels. If stored in bags, the same must also be changed around from time to time and not be packed too close together, and not be piled up too high, so the air can circulate between the bags and between the rows.

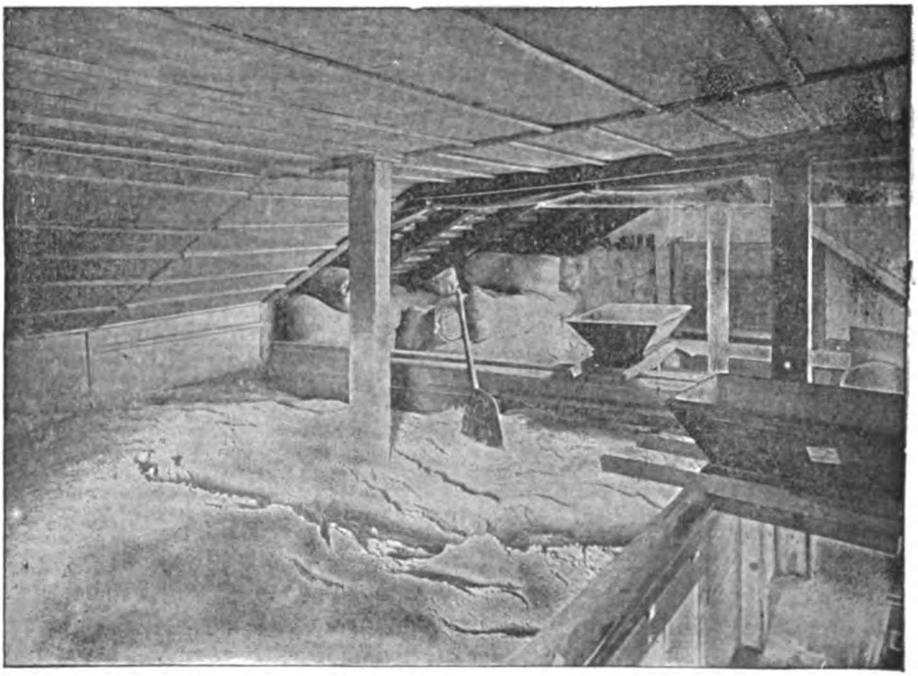


Fig. 126.—Flour Bins. (Bread Bakery of Joseph Fritsch, Sarajewo.)

Flour should be kept in a good airy room, away from all disagreeable odors. Flour is very susceptible to absorb the odors of things placed near it. For instance, put one or two barrels of flour in your trough and put a small basin with kerosene not far from it. Even if you close the trough up for a few hours you will readily discover that all the flour in the trough is tainted with kerosene, although the flour and kerosene have not been in direct contact with each other; paint or kalsomine has the same effect. The place where flour is stored should be kept as clean and sweet as it is possible to make it, with an even temperature, and good ventilation. One baker wanted to make sure his extermination of bugs and all vermin and added some carbolic acid to his whitewash, which he applied to the walls and ceiling on a Saturday afternoon after the work was all done. But, behold, when he wanted to start work on Sunday evening every pound of flour in the barrels and in the trough was so thoroughly saturated with the smell of carbolic acid that it was unfit to use.

DOES OLD FLOUR MAKE BETTER BREAD THAN NEW FLOUR?

Bakers are of different opinion about this point. Personally the writer prefers a wheat flour one or two months old, but not older. In Europe it has been an old custom of the bakers to buy flour ahead and store it loose in large bins in the garret (Mehlbaden). This is, however, done away with in most modern bakeries, and flour stored in bags. One of the principal rules for storing flour is: a good circulation of fresh air, but no exposure to sunlight. The trouble with old flour generally begins when the new wheat begins to grow in spring. Rye flour, however, is always at its best when fresh from the mill and when the new crop is nearly ripe in the fields, it is often difficult to get good rye flour. It may interest our readers to read the opinions of other bakers on this point, and we reprint here a few letters sent to the *Bakers' Helper:*

OLD FLOUR MAKES THE BEST FLOUR.

Mr. Wm. A. Hale writes: "After a practical experience of thirty-five years, twenty-five as foreman in some of the best shops in London, New England, and on the Pacific coast, I am of the opinion that flour from two to four months old is preferable for bread-making to flour fresh from the mill. It will make bread with a finer grain and of better color. The older flour gives the better yield. I am satisfied that flour (say) four months old, will yield from eight to ten pounds more bread to the barrel than flour fresh from the mill. When I was a boy, my father was a boss baker in the west of England, and he had a contract to furnish an institution with bread at so much per four-pound loaf. It was necessary to get all he could out of an English sack of flour (three of our barrels are equal to two English sacks), and it would vary according to the age of the flour from three to four four-pound loaves. From what I learned then, and from experience of a very late date, I am fully convinced that flour fresh from the mill is not in the best condition to use."

Mr. C. Hassler writes: "My experience of thirty years of dough-making convinces me that flour of any age is better for bread bakers than new flour. There are four reasons for my belief: First, it requires a soft dough, which is a great saving; second, it requires less yeast, as aged flour has more driving power; third, owing to a soft dough, it will make a monster loaf of bread; fourth, it will make a whiter loaf of bread."

BEST RESULTS FROM NEW FLOUR.

Mr. W. E. Bruce, of Lansing, Mich., prefers new flour; he writes: "In regard to the question: 'Does fresh flour make better bread than flour that has been kept for several weeks or months?' I would say this: Ask any baker who has never had the experience of using fresh ground flour and he will say that flour with age is the best flour to use. Ask him why, and he will say that flour improves with age. In my twenty years' experience as a baker, I have always had the same opinion until recently. I am using about one thousand pounds of flour per day. The flour I get comes from a mill here in the city. Ofttimes the flour I set sponge with in the afternoon is ground in the morning. I am having better results from the fresh flour than I had from flour with age. It seems to be stronger. Since reading the article, I have secured a sample of the same brand of flour with age, and compared it with the fresh ground; I took two ounces of each, and I found that one ounce of water mixed with the fresh flour produced a stiff dough. It took one and one-fourth ounces of water mixed with the flour with age to produce a dough of the same consistency as the other. Now the difference might be in the process of milling. I use nothing but fall wheat flour, and I certainly have better bread from the fresh flour than I had with flour with age."

Flour Storage (J. Schmalz's Bakery).

Rope in Bread.

Prepared for the *Baker's Book* by EMIL BRAUN.

What is "ROPE" *in bread?*

About ten years ago complaints about a mysterious bread disease known as *"Rope"* were brought to the notice of the millers' and bakers' journals and since then this peculiar pest of the bakeshops has been steadily broadening its area of activity in all parts of America.

In Europe as well it has made its appearance and from Australia came reports about "Rope" in bread, and even in Africa and India it is fairly well known, the conditions in these countries being more favorable to its development. There seem to be more theories concerning "Rope" or *"Cobwebs"* in bread than concerning any other disputed point in the baking business. Scientists, however, all agree that it is a bacterium, or bacillus. Prof. Wm. Jago, in an article in the *Bakers' Helper,* writes:

The scientific explanation of "rope" briefly is this: There are certain minute organisms which, given a suitable medium and suitable conditions for development, so change the constituents of bread as to convert them into a sticky india-rubber-like mass. When the bread is in this condition, if pulled asunder it draws out into string-like pieces and hence the origin of the term "rope." At the same time the bread acquires a most repulsive odor and taste. In the absence of these conditions, or in the absence of the specific "rope" organisms, the state of ropiness cannot be produced. Such is the view which modern scientists take of the nature of this particular bread disease. It may be well to indicate the species of evidence on which this theory is based. First of all, there is no doubt that ropiness is a species of putrefaction; any one who has ever smelt ropy bread will agree with this. Now putrefaction, as a general phenomenon, has been most conclusively proved to be the result of action of certain organisms, belonging to a group known as "bacteria." However putrescrible a liquid may be, let any bacteria present be destroyed and the access of external ones prevented, then that liquid will remain perfectly free from putrefaction for an indefinite time, however favorable all other conditions may be for the rapid progress of such changes. Not only is putrefaction thus definitely associated with bacterial life, but so are other disease changes and also industrial operations. Among the latter the conversion of sugar into alcohol and carbon dioxide gas by yeast is one

THE BAKER'S BOOK

¹/₆ nat. Size

of the most familiar to the baker. Now, it would be very strange if ropiness in bread were the one exception to the general causes which govern the production of putrefaction, and therefore there is a strong *a priori* reason for ascribing it to the action of bacteria.

For further than this, ropiness is a disease which affects not only bread. but also at times beer and milk. The latter two being liquids render it more easy to detect and isolate any organisms which may be present, and consequently such organisms have been recognized and identified as the agents of ropiness in these substances. Ropy bread also contains organisms of a similar character. As Mr. Childow says, any further and detailed proof of this association of "rope" and bacteria "would be practically all Greek to the ordinary reader." Those who deny or refuse to accept these views, must in these matters work out their own salvation; as the reasons given for the origin of ropiness, and the suggestions for its cure, are based on the generally accepted ideas of its nature.

Discussing an article of Mr. G. H. Vass on *"Rope,"* the *American Miller* says: "He contents himself with stating that rope is caused by a ferment, but whether it is the *'pediacoccus cercoisice,'* as Jago calls it, or the *'bacillus subtilis'* of Blandy, he evidently cares not. contenting himself with a study of the conditions under which *'Rope'* appears and how to avoid or neutralize them." German scientists claim that *"Rope"* is caused by the potato bacillus (*Bac. mesentericus fuscus Flugge*), which are present in the flour.

Practically the same theory of rope is held by the best authorities in Europe. A Berlin medical man, Dr. Lebbin, published a contribution to this subject as supporting the theory that the cause of rope is strictly bacteriological.

It is caused by a kind of bacillus which belongs to the series known as potato bacillus. These are small, forked organisms, which are everywhere in the ground. and which owe their name to the fact that they were first discovered in potatoes. Globig states that he had to boil the potato bacilli for five and one-half to six hours in 100 degrees Centigrade (212 degrees Fahrenheit) to kill them. Heats of 109 to 113 degrees Centigrade were borne by them for three-quarters of an hour without injury. Between 113 and 116 degrees they were killed after twenty-five minutes; between 122 and 123 degrees, after ten minutes; at 127 degrees after two minutes, and at 130 degrees almost immediately. During the process of baking the crumb of bread is submitted to a heat of from 100 to 102 degrees Centigrade, and therefore it is not certain that the bacilli can be destroyed.

Nine kinds of these bacilli have been discovered. They come from the ground, and are more likely to be in the bran than in the wheat. This is the reason why graham bread and rough military bread are of a glutinous character. Moisture and warmth conduce to the growth of the bacilli. They flourish best at from 26 to 28 degrees Centigrade. As soon as the bread cools down to 23 degrees their increase is barely perceptible.

Dr. Lebbin, in his article, states that there are animalculæ in every loaf, but that their development depends largely on temperature. Consequently ropy bread is most observed in the hottest months of the year, and ropiness may be retarded or prevented by keeping new made bread in a cool place. Not only should everything in the bakery be thoroughly cleansed and the walls whitewashed with fresh slacked lime, but particular attention should be paid to secure quick cooling of bread and storing in a cool place.

The time most favorable for development is in the hot damp weather when the air is loaded with moisture and is very warm. Such weather as we may expect from July to September constitutes the period of its greatest activity. I have known it to be present in a bakeshop all the year round, as shown in the bread; but in the winter time it would only show in some kinds of bread after three or four days, while in summer it would make itself known in from thirty-six to forty-eight hours. It usually disappears when cold weather comes on, and begins to become active during the late spring and early summer months.

In Australia, where the seasons are reversed from ours, Mr. G. H. Vass observes that it appeared in December and disappeared about the end of February. The time of its appearance was the hottest portion of the year, with the thermometer ranging from 100 to 115 Fahrenheit in the shade. It will be seen that this summer rope made its appearance with the advent of excessive heat. Evidently Mr. Vass thinks the avoidance of rope reduces itself to a question of how to make bread in a locality where the temperature is excessively hot. "To sum up," he says, "my aim would be to work at a temperature of between 80 and 86 degrees, have as short a process as possible, avoid potatoes or malt extract or sugar in any form, use the maximum of salt and bake well in the oven." He would use ice and cold water and pay particular attention to the cleanliness of the utensils.

WHAT CAUSES "ROPE" TO DEVELOP IN BREAD?

The theories advanced to account for its appearance in bread are legion. Some years ago the London *Miller* contained a complaint from a baker in India who stated that he had periodical attacks of "rope" in his bread; he stated that these attacks became severe when the moist, hot winds became prevalent, but he was at a loss to account for the source of the difficulty and asked for assistance for its elucidation.

We intend to publish here a number of reports and experiences of bakers,, who have been troubled with "*Rope*" and also reprint the opinions and theoretic researches of experienced scientists, who have made this threaded bread disease their special study. These articles are intended to provide the baker with a knowledge of the scourge with which he may become acquainted, when least expected, and supply him with means to prevent loss and trouble by giving him the experience of others in preventing its development and ridding the shop of it, if too late to prevent its appearance.

Although the great majority of bakers are yet entirely unacquainted with this dreaded plague, yet those bakers who have had "*Rope*" in their bread never forgot the experience and can tell sad stories of trouble and pecuniary loss. The wife of a baker in Newark, N. J., told the writer some time ago, that her husband nearly went insane over the trouble they had with rope. He would be up every night, watching as for burglars, and in daytime he could not find rest, and would be watching in fear, if any customers would bring back the bread they bought. For a few days all would go well then the plague would break out anew, and more severe than before. Some bakers have had mild attacks of it without being acquainted with its character. A mild case of "Rope" makes its appearance in bread about two or three days after being baked; then the center of the loaf becomes soft, mushy, and by breaking the loaf you can notice thin, white spiderweb-like strings, which characteristics first gave the disease the name "*Rope.*" In many cases, however, the intensity of "*Rope*" increases and becomes so active that before the loaves are fairly cooled off they will get all soggish in the center and have a most disagreeable odor and a nasty taste. The peculiarity of "*Rope*" is that it appears in some bakeries only in certain kinds of bread, and the truest explanation of its character to be given is the reprint of letters from those who have suffered from the disease:

The following paragraph appeared in the *American Miller:*

"It seems that the trouble with bread known to the bakers as 'rope,' is quite general in some parts of the Northwest. Not only has it made its appearance in Chicago bakeries, where, as a correspondent states, it cost one firm over $10,000 to get rid of it, but we have heard of it in towns near Chicago and also in Wisconsin. The serious part of it from the miller's point of view, is that the trouble is instantly charged up to the flour, and causes the grocer and miller no end of trouble. In fact, most of them become convinced that the trouble is actually in the flour. As an inquirer stated last month, the bread becomes sour and musty after a day or two, and after the lapse of three or four days it gets 'soggy,' smells horribly and the interior becomes stringy or 'ropy,' whence its name. In fact the bread looks and feels as if returning again to dough, which in fact is about what it is doing. This disease is propagated by the process of fermentation. Its appearance may be due to climatic conditions. At least it appears to be a warm weather disease exclusively. About the only thing to do is to change all the utensils used for breadmaking, pans, board, etc., place the bread in a different place and keep it in a different receptacle, and thoroughly cleanse all the old utensils. The yeast might also be changed as a precaution. The time of frosts is near, and when they come there will probably be no more complaint. Nevertheless millers and grocers are likely to have an ugly time with customers until the relief comes. A little inquiry among users will show that 'rope' acts like any other germ disease, and that some houses escape entirely while others receive the contagion by unknown means. But it is not in the flour. In fact a little investigation will show that the same kind of flour, even from the same barrel, will produce sweet bread in one family and 'ropy' bread in another."

An English baking expert gives another view of the matter which we reprint here, namely, that of sanitary conditions in the bakeshop. The communication is giving in detail, as it may meet the conditions or experiences of others as dealing with one of the possible phases:

"The disease is not inherent in the flour or in any of the ordinary materials used in bread-making, any more than cholera or any other infectious disease is inherent in a healthy human being. But it arises from much the same causes in the first instance, viz., bad sanitation and want of cleanliness in the bakehouse, which, when once developed, is as infectious in bread, when brought into contact with sound, wholesome bread not made in an infected bakery, as is the plague to humanity. The germs of the disease are first generated in the mixing and kneading troughs, which, if not thoroughly cleaned daily have dough left that finally develops the disease, and thus infects every batch afterward made. So it spreads over every surface on which the infected bread is laid. A warm, close atmosphere stimulates its action, while a clear, cold, bracing one helps to rid the bread of it just the same way as with all infectious diseases. The remedy is the thorough cleansing and scalding of every utensil in the bakehouse, together with the walls, floor, etc., besides every surface on which the infected bread has laid. This done the 'ropy' bread will disappear forever, and will not be found in the bakehouse kept as clean and well ventilated as all such places ought to be.

"The poor millers whose lives have been made miserable by the unclean bakers charging the flour with being the cause of the trouble, may rest at peace so far as this charge is concerned. I feel much sympathy with them. About forty years since, when milling in New Zealand, I had a very bad half hour from this very question of 'rope' being charged to our flour, by a German who was considered the best baker in Auckland. He brought me a loaf which was so nasty that the smell of it nearly made me ill. Neither I nor the baker, as he said, had ever seen or heard of such bread before, and I was quite puzzled to account for it. Of course he declared the flour to be the cause. As soon as the baker had left the office, I went into the mill to talk the matter over with our old experienced foreman. On my describing the loaf he smilingly said: 'Oh, it is the "rope" sir. It has nothing whatever to do with the flour, but arises simply from the want of cleanliness in the bakehouse. The remedy is the thorough cleansing and scalding of every utensil and surface, not only in the bakehouse, but in the shop also where the bread had laid a few hours after the disease has developed in it.' I sent for the baker at once and told him the cause and remedy. He acted upon the suggestion immediately. He never had a 'ropy' loaf afterward. This was my first and last experience with the disease, which, as I have said, gave me a very bad half hour. My fears were soon dissipated by our foreman's knowledge."

The experience of a Michigan baker is interesting. He writes to the *Bakers' Helper* as follows: "We do not know what is meant by 'Rope,' but we had a lot of trouble with a car of flour that we had a year ago last summer, and we are very positive that it was the flour and nothing else. Our bread looked as good as it ever did, but, after it was twelve hours old, it would become stringy and begin to swell, and as it grew older it fairly rotted inside. We had no trouble with any of our product except that which we made out of this flour. We tried five different kinds of flour alongside of this one, the same night and the same process, and the one would be bad and the rest good. A month after we were over our trouble, we took some of this same flour and mixed up twenty-five loaves in a bowl by itself and we found the same trouble with it. What it was we do not know, but we do know that we had no trouble at all as long as we did not use any of this flour."

Another letter from the same baker says: "You may rest assured that anything any chemist or baker could tell us, could not for a moment make us believe that it was anything else than the flour, as we tested it very thoroughly both alone and side by side with other flour. Even our ryebread (for while we use about three-fourths rye flour and the other fourth spring wheat) had the same trouble, but not until it was two or three days old. while our white bread would show it in twelve hours, and if one mixed this flour with other white flour it would show itself in a corresponding length of time according to the percentage of it used.

One baker writes: "Presently I noticed the bread, after being drawn, had a peculiar flavor, not very strong at first, but when about twelve hours old anyone could detect it; and when it was twenty-four to thirty-six hours old it was a sticky, dark, and an evil-smelling loaf. On breaking the loaf apart it would draw out like thick paste; even a bright knife run into it would come out as if you had stuck it into a gum-pot, and the mass smelled something terrible."

Several years ago trouble with 'rope' occurred in a Wisconsin town. It was discovered that flour from eight different mills were used in town, one or more of them being Minneapolis mills. Rope occurred just the same, no matter what flour was used. in some kitchens, while the kitchens where it was absent made good bread with any flour. In a suburban town near Chicago, where probably twenty or more different brands of flour were used, made all over the West, Northwest and Southwest, rope showed itself entirely impartial in some kitchens, no matter what brand was used, while in other houses no trouble was experienced at all. Clearly the flour has nothing to do with rope.

Mr. Mainer, a young beginner, writes: "I have bad luck with my bread; here is the way I do: I make a straight dough, never a sponge. When I mix it over night, the bread turns out all right; but when I mix it in the day, after the bread then gets two days old, it gets sticky and smells bad, not sour, but it fairly stinks. Now could you tell me is it the flour or the yeast? I use Fleischmann's compressed yeast and it always seems to be all right. Or, is it from putting it into a close cupboard after it is baked? I bake it ten loaves in a pan, and when the dough is mixed, I let it stand about four hours."

There is no doubt about it, the trouble with this man's bread is "rope." Being a peculiar, mysterious bread disease as it is, his case seems to be still more puzzling, because, according to his statement, only the bread baked in daytime is thus affected. However, as he states, "or is it from putting it into a closed cupboard after it is baked." Now, if he means to say that the bread he mixes in daytime, and as I understand, is baked toward evening, and kept in a closed cupboard until next morning, while the bread mixed and baked during the night is taken off from the shop fresh in the morning, we very likely have the "spooks" nailed right in that cupboard.

"As was to be expected, the summer's excessive heat has produced much complaint of 'rope' in bread," writes the *American Miller.* "A Fort Wayne, Ind., baker sends a loaf of bread and a sample of the flour from which it was made. The bread showed a very characteristic case of rope. It was nicely baked on the outside and was light and flaky, but the interior, after standing a couple of days, presented a mass of stringy fermenting matter. The flour from which it was made answered all tests for first-class flour, but that is nothing unusual, for it is pretty well settled that the flour has little or nothing to do with the manifestation of rope."

In conclusion of a series of articles on *"Rope"* in the *Bakers' Helper,* David Chidlow writes:

"In order to more fully realize the application of the laws and principles laid down in the foregoing articles, it is suggested that the typical cases of rope in the bakeshop as practically dealt with should be described, such cases to cover respectively a large, medium, and small bakery. We will, therefore, take them in that order for description of methods, prefacing the description with a few remarks covering the general field of rope conditions.

"It seems a very peculiar condition, yet it is common, that the cleanest bakeshops are most liable, and very dirty ones least liable to rope. Many writers seem to suggest the opposite condition, usually arguing that rope would disappear if cleanliness were observed in the bakeshop and its surroundings; but in my experience and observation, covering over twenty years (during which period most of such cases would come under my notice either directly or indirectly), out of fifty or sixty cases I cannot recall more than two that occurred in dirty shops, the majority, and also the worst, appearing in the cleanest shops. It is important to bear this in mind, because a baker may assume that because his shop is clean he is not in any danger.

"The commonest source of infection, assuming there is no active development in the bakeshop (I say active advisedly, because the rope spores are apparently always present, and only wait proper conditions or largely augmented numbers to develop to sensible perception in the loaf), will be from bread already affected delivered to a store and laid beside non-infected bread, the latter returned as stale and carrying with it the active spores which have power to create conditions favorable to its development. Secondly sources are proximity to stables and dairies and the milk supply. But after all one of the primary conditions of its growth is very soft dough, the secondary ones being warm, moist atmosphere, and other favorable conditions. So that if general conditions seem favorable for rope the points necessary to observe are: tighter doughs, more yeast, more salt, dough temperature medium high. and the adoption of active interference with the development of rope outlined in foregoing articles and following suggestions.

"There is considerable delicacy among bakers who have suffered rope about having it made public. Of course a large section of the trade know the immediate cases, but my own knowledge of the feeling urges me to respect it fully, and for that reason cannot give names, nor even indicate the immediate locality, where such distinction might easily suggest the individuals referred to.

"A large bakery firm in one of the middle Western States had suffered very much from rope, and on investigation, propositions were made suggesting steps for its reduction. The conference was held on Friday, and arrangements were made to be on hand at nine o'clock on Saturday morning, with instructions to have on hand muriatic acid. four ounces of potassium sodium fluoride, and ten pounds of sulphur. On Saturday morning the wood troughs and boards were washed with a mixture of one part of muriatic acid to nine parts of water, washed with water and dried with cloth. The iron troughs were washed with a solution containing one ounce of the fluoride to five gallons of water, then dried. All trough lids were left off the troughs. Entrances to the flour loft above the bakeshop were carefully closed, as also were the windows of the bakeshop. About half-a-pound of sulphur was put on each of nine old pie pans. These again were placed upon bricks, and a little live coal dropped on each plate and the doors closed for about six hours. The bread room was well swept and dusted. and all closed places opened for free access of fumes; windows and other sources of cummunication with bread room were closed. and eight old pie pans containing about half-a-pound of sulphur were distributed through the room. a few live coals placed on each dish and the doors closed. This work was done simultaneously with the bakeshop. After about six hours, windows were opened from the outside. and after another hour the doors were opened. and the breeze allowed to blow through the shop and bread room to air it thoroughly. As an additional precaution, for a week following all the water used for breadmaking had dissolved in it fluoride in the proportion of 1 to 250.000 or about one ounce to two hundred gallons. This treatment immediately reduced the rope, although it was quite possible to get traces of it within a few days if conditions favorable for its development were set up.

"The medium sized bakeshop was located in Chicago; in this case the bread affected was that baked only on one floor, and a large amount of flour had to be protected from the sulphur fumes; for this purpose sacks were dampened and placed carefully over the flour extending clear down to the floor. The washing of the troughs was not carried out because this case was not considered severe enough to require it. This bakeshop was about twenty feet wide by sixty feet long. Five pans containing about three-quarters of a pound of sulphur each were distributed over the shop and fired. This was done on Saturday morning, and the place closed up till the evening, then well aired. This entirely reduced the rope without any other treatment.

"The case of a small bakery was one located in California, doing about thirty barrels weekly. The flour was kept in one end of the bakeshop: there was no bread room; the bread was drawn from the oven into boxes and left in the bakeshop; the stale bread, or bread not taken on the wagon, was kept in a spare trough in the bakeshop. It was in this trough that the rope first showed itself and finally became the source which infected the entire bakeroom. It was only on very warm days that it affected the bread badly. The flour was covered with empty but dry flour sacks, and four pounds of sulphur were burned in four parts; the bread trough was taken out of the bakeshop and washed with lime water. This treatment eradicated the rope entirely, but the flour was somewhat affected with the sulphur fumes. After this experience, damp sacks were used to cover any flour liable to be reached by the fumes. The bread trough was afterwards washed out and kept outside the bakeshop to prevent a repetition of the slow growth of rope.

Another baker who has had trouble with rope in bread during the summer states his conviction that the trouble could be avoided by longer baking and a cooling off of the bread. This is in line with the views expressed in the *American Miller* by an expert. His belief was that rope is caused by a second process of fermentation, which is assisted by an excess of water in the bread. His remedy was to use less water in the dough than ordinarily and to bake thoroughly, so as to expel as much of the moisture as possible. This theory has certain elements of plausibility which could easily be tested.

CAN ROPE BE PREVENTED?

"Frost does away with the trouble. There is no chance for frost in August, but in its absence everything used for making bread should be vigorously cleansed and scalded. The receptacle for the bread should be treated the same way. A miller, some of whose patrons suffered a couple of summers ago, says that in most cases this proved efficacious, but the cleansing must be thorough. The taint left anywhere from the mixing pan to the bread box, will propagate the evil. The bread, when baked, should be placed in as cool a place as possible. It has never been suggested, but if Professor Lebbin's theory is correct we should think a good soaking and scrubbing in ice water might kill the bacilli on the baking utensils."

It has also been argued that rope is caused by uncleanliness in the bakery or bread making utensils. This likewise has been disproved. Investigations have proved that rope has occurred in bakeries where extreme cleanliness was almost a fad. So in private houses, the neatest of housewives have had trouble, while the other kind haven't. How the disease propagates itself from kitchen to kitchen, if it actually does so, is unknown. It often acts like an epidemic, but that may be due to like atmospheric conditions. Nevertheless it is well known that it is easily propagated.

CONCLUSIONS ABOUT "ROPE."

Before the trade papers took up the discussion and inquiries about *"Rope in Bread,"* there were thousands of bakers, yes the great majority of them, who never observed or even heard of such a bread disease. The average baker, when first attacked by this mysterious bacillus refuses steadfastly to believe that *"Rope"* in bread is caused by anything else than the flour. Some, however, come out frank in stating that it was probably or likely due to uncleanliness. No two hardly agreed in their statement and conclusions.

If it were not such a serious matter for the fellowtradesmen, whose shops were thus infested with this dreadful pest, it would be really amusing to read the different stories and note the difference of opinion. To dispel the cause of Rope to the flour, a milling journal defends the millers' side with the following statement: "In an Illinois town, a few years ago (one of those towns with no mill), but where each of the dozen grocers sell a different brand of flour, almost every family in town had 'soggy' bread. The grocers went crazy, almost, until suddenly the thing ceased entirely. How could that be explained on the bad flour theory?"

Mr. Chidlow suggests that a large water content in bread in most cases seems to be the most inviting cause of ropiness.

Professor Jago thinks this accounts for the more frequent appearance of *"Rope"* in America than in England.

A miller in the Northwest writes: "As we had some complaint of ropy bread, made from our flour, during the hot weather, I had the flour examined and baked by the Chidlow Institute. According to their analysis the flour was not to blame.

"I examined some of the ropy bread and came to the conclusion that the rope developed because the loaf was not well enough baked through the center, so that the very hot spell made it ferment again. If the bread had been cooled off and kept in a cool place, I am satisfied that it would not have become ropy.

"To prevent rope during hot weather I would advise that bread be baked a little longer than usual."

Another baker writes: "Ill-conditioned wheat is, in my opinion, at the bottom of the trouble, what a Michigan baker says is enough to show that the difficulty was not with the bakeshops, utensils, etc., but with just one particular lot of flour. I never heard of any cases on record where bread becomes 'ropy' when made from Pillsbury's flour, or flour from any other large, high-class mill. The man who buys the wheat is the responsible party."

This man's statement corresponds somewhat with the theory of the German scientists, who claim it to be a species of the *potato bacillus,* which comes from the earth and gets into the wheat shell.

Here is the experience of another baker who blames potatoes and compressed yeast for his trouble:

"I cannot believe that flour is the cause of rope, for I think any baker should be able to tell if he has bad or spoiled flour before he uses it. My experience leads me to say this confidently, to avoid rope in bread *you must avoid potatoes and compressed yeast.* By this I don't mean to run down compressed yeast, for I know it to do good work; but would advise never to use it unless it can be had perfectly fresh.

"Now to show you that rope originally springs from those two articles, let all concerned try for themselves. Take potatoes and flour, as one would use to make yeast. Let it stand for a few days to get stale and you notice rope starting from it. Take compressed yeast and let it get stale and you will notice the same thing. Now, all you need to do is to use any of this yeast for your sponge, and rope is bound to be in the bread.

"I paid for my experience, and no one can ever persuade me to use Irish potatoes or compressed yeast again under any circumstances.

"I commenced bread baking in 1866, but have never stopped trying to learn. With the new processes of flour making we can't always stick to our old habits."

An English baker, writing about "Rope" in *Cakes,* says: "Rope in cakes flourishes best when the temperature has reached over 80 degrees Fahrenheit in the shade. Another point is the difference between beetroot sugar and cane sugar in the manufacture of cakes. In using the latter I have never seen a case of rope. In support of this, I will quote from a book by Mr. Blandy. The quotation is 'that it takes exactly twice as long to ferment cane sugar as grape sugar; in point of fact the process of converting the cane sugar requires as much time as the conversion of the glucose into alcohol.' In conclusion, I suggest that rope in cakes is produced by some organism coming in contact with the saccharine matter contained therein after it has been manufactured."

Another English baker blames the baker and unripe dough; he says: "I notice the discussion which is going on in the *British Baker* on this subject. I do not see one person who has got the correct idea—namely, that rope is caused by the baker himself. The bread, or dough, is put into the oven before it is ripe, or what we call ready. If the baker will only let his dough come properly he will never have rope.

"I have just had a very good illustration of this. I took the contract for supplying the Fleet this year in Tor Bay. another baker offered to bake a certain quantity for me. The very best superfine flour was used. They went to work to bake by night, got the dough in oven quickly—before it was ready—and when it came to hand it was a very poor loaf, and heavy. I had to return the bread. I knew perfectly well that it would go ropy. We had flour which cost 3s. per sack less. and we turned out a beautiful loaf. The dough was well come before being put into the oven."

Here is another London baker's view: "Some years ago it was my misfortune to be at work in a bakery where rope would assert itself in most of the goods produced. It was then put down to the troughs being old, and germs being in the crevices and corners, where they had ample scope for doing their work. Well, new utensils were procured, and all ingredients fresh for the occasion of making cakes without rope; but alas! rope was there. So much for uncleanliness. In the 'Open Letter' referred to we find it put very plain 'neither bad yeast, nor bad flour, nor dirty trough, will individually, by itself, give rope.'

"Sir, I have yet to learn that to be a doubter is to be an unbeliever. My reason for having 'doots' is, it has not been made clear to my mind that by increasing the temperature beyond 86 degrees Fahrenheit (at which both viscos-fermentation and healthy ferments flourish best), you will arrest the viscos-fermentation, and at the same time promote the healthy ferment.

"Now, it has been shown how wide-spread this trouble is, as 'Rope' attacks a variety of other substances besides bread, such as milk and worts in breweries. One thing is generally agreed upon, that is, that "Rope" is a microbic disease, and that it does not develop in *dough* or bread until baked. Whether the original bacillus or the conditions that favor the development of "Rope" in bread are present in the flour, yeast, water or any other substances they never seem to develop until after the bread is baked. Mr. Chidlow, who has made extensive researches into the nature and cause of this bread disease says:

"Taking a loaf or ropy bread at any stage of the rope development and keeping it at a temperature of 200 degrees Fahrenheit for two hours, entirely destroys the rope bacterium. If the bread that has been drawn from the oven of a 'ropy' bakeshop be drawn under such conditions that the loaf can be preserved from contact with the bakeshop air, it will not develop rope. On the other hand, if a culture of rope bacteria be inserted in the corner of a fresh loaf, and kept in a warm place, from 100 to 130 degrees Fahrenheit, it will develop rope.

"Some things favor rope more than others. Small quantities of salt in bread, with large quantities of sugar, favor the development of rope; large quantities of salt tend to delay development. There is no doubt that bread containing large amounts of water favor the development of rope considerably; although there are cases that show as great a development of the rope in bread containing less water, than other types of bread that were free of rope, such as where a tight dough made a close textured, slowly cooling loaf."

By going over some of the statements and facts, as related by the different bakers, who had "Rope" in their shops, it seems difficult to get a standard remedy which can be applied to all cases alike. The charge of the English baker, that "Rope" never develops when high-grade patent flour is used, is disproved by Mr. Chidlow, when he states: "Flours that make the best loaves are the most liable to development of the disease." However, large celled loaves, like the French and Vienna, which dry out quickly, and where the air has free access to all parts readily, and cools it down quickly, these bacteria have less opportunity for development than in the home-made or Pan bread loaves with more moisture and finer texture, because they take much longer to cool.

Two of the principal factors in the development of *"Rope"* are *Heat* and *Air.* Rope is seldom, or never, heard of during the winter months, but appears frequently in damp, mucky or hot weather. Pure, fresh air also helps to prevent "Rope," while a damp, heavy atmosphere, infested with microbes and bacteria favors its development. Professor Jago confirms this theory with a convincing story, related in *The Bakers' Helper,* he says:

"The present writer had some years ago an interesting confirmation of this. He was lecturing in London on certain bread-making processes, and for purposes of illustration had some loaves baked for him by a baker friend. These were brought to him by appointment at an office on an upper floor of a business building. They arrived just hot from the oven and were in every way triumphs of the baker's art. They smelt perfectly sweet, and evinced not the slightest vestige of any sour odor. One loaf was broken from the batch and taken while still warm to the lecture room. This was warm, and crowded with an audience of about 400 people, with certainly not sufficient ventilation for such a number being present. After about two and a half hours the loaf was cut as an illustration of the particular method by which it was made. To the lecturer's horror, it was found to be sour, and this part of the lecture was got over as unobtrusively as possible. The interesting point is that next morning the three loaves which had been kept in the cool office in pure air were found to be perfectly fresh and sweet. The only difference between these loaves was that one had cooled slowly in a warm and no doubt microbic atmosphere, the others rapidly in a pure atmosphere. Nevertheless this difference was sufficient to cause the one loaf to become sour."

As above stated no definite remedy, which can be applied in all cases of "Rope in Bread" has as yet been found, but the best precautions against "Rope" in bread and the best treatment after "Rope" has been discovered in a shop are: pure, fresh air and perfect cleanliness in every respect throughout the shop.

The characteristics of "Ropy" bread can be summarized as follows: The bread, when baked, first looks all right, after a few hours it becomes tainted, then if left for some hours longer, it becomes sour and smells musty, and if the mysterious bacteria, at work in such particular infected loaf is allowed to proceed in its work, the loaf at last gets "*soggy,*" smells horrid; when broken apart, the interior is all stringy or "ropy," and in fact it looks and feels as if turning into dough again. The disease must be or appears to be propagated by and during the process of fermentation, but its development is largely due to climatic conditions. At least it appears almost exclusively during hot and damp weather. The "rope"-creating bacteria, if present in the dough, can not be killed during baking. Every loaf contains more or less bacteria, some of which are not destroyed by the exposure to the enormous heat of 220 to 250 degrees while in the oven. The "rope" bacteria appears to be still more tenacious and seems to thrive in the strongest heat.

It is satisfactory to learn from some investigations of M. Maljean that the interior of a loaf is quite free from micro-organisms; on the other hand, Dr. Ufflemann found that in some bread he examined one microbe called the potato-bacillus, had actually been able to withstand the prolonged exposure to this high temperature, and had subsequently made its presence very unpleasantly felt in the interior of the loaf. It had doubtless been introduced with the potato-flour, an ingredient which some bakers make use of.

History of Milling.

Translated from *Das Bäckerbuch.*

The oldest known process of converting grain into flour is the pounding of the kernels in mortars. In the ruins of Theben a large tablet, covering a whole wall was discovered, which gives a fair illustration of the milling as carried on by the old Egyptians about 2500 B. C. See Fig. 127.

Fig. 127.—Tablet illustrating milling, 2500 B. C.

The two men to the right are busy pounding the wheat, the third one is sifting it, the other two are filling the mortars again. Fig. *e* shows a

Fig. 128.—Women pounding grain.

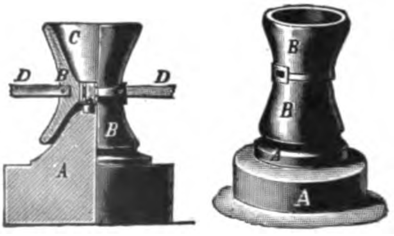


Fig. 129.—Old Roman Handmills.

sieve, turned upside down and the cyphers in the upper corners give a description of the process. The grain was usually roasted first whereby the hulls would easily separate.

The old Grecians and Romans used the same method in their households, but the pounding was done by the women, as shown in Fig. 128, which is a reproduction from the picture on an old Grecian vase. The bakers and millers used the handmills. See Fig. 129.

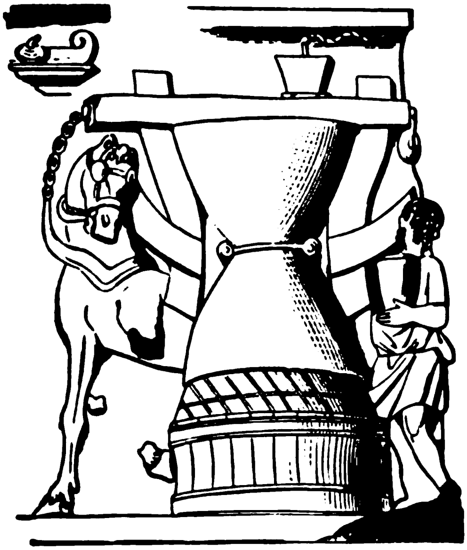


Fig. 130.—Ancient Mill.

Fig. 131.—Mill and Mixer.

According to other tablets the power for these mills was frequently furnished by horses. Later on the windmills came into use, also the use of waterpower.

OLD MILLS AND NEW.

The milling industry is so closely identified with the bakers' trade that we feel that the *Baker's Book* would be incomplete without some illustrations of flour mills. We therefore present cuts of a modern mill of the highest rank in this country. We also reproduce cuts of mills of an older date. These are especially picturesque in their scenic effects. The mill and the miller, it may be added, figure largely in art, poetry and romance. But to more practical purpose are the great modern mills with outputs of thousands of barrels a day, whose product supplies the wants of a vast population and reaches the ends of the earth.

Milling has become one of the greatest industries of the country. All of the millions of bushels of wheat raised in the United States go through these mills for production into flour. How many mills there are we do not know, but counting all the small ones scattered through the different States there must certainly be thousands of them. But the bulk of the flour product comes from a comparatively small number. The old-fashioned country mill is interesting still by reason of its picturesqueness, but it is no longer formidable in a business sense.

THE MAKING OF ROLLER-MILL FLOUR.

The process of making flour in the modern roller-mill is thus described: The blended grain is raised to the upper floor, and passes through machines which separate any foreign matter, such as chaff, stalks, small, valueless grain, and barley, from the bulk. The partially clean grain is carried into a scouring machine, where it is thoroughly brushed. This process removes all loose dirt and other impurities. Through each machine used in the cleaning process a forced draught of air passes, still further helping in the cleansing of the grain. Before the purification is considered complete, another process is undergone. After the scouring machine is passed the grain finds itself in garners which feeds the mills' down shoots. On these shoots are magnetized plates which stop, and extract any metallic substance which might be in the grain, such as nails, for instance! It is now that the mills are reached. These mills are a series of chilled iron rollers which break and crush the grain, each pair of rollers crushing smaller than its predecessor. The first rollers are grooved, and are used more especially to break the grain so that it may be easier dealt with, and powdered by the smooth rollers. The effect of the crushing on the grain is to break the hard husk. and let out the interior in the shape of powder. Both the husk, with what there is left in it, and the powder (at the first stage called semolina) are taken into other machines which separate the broken wheat and coarse semolina from the fine semolina and germ. These two portions are treated separately. The broken grain and large semolina are passed through other broken rollers and other dressing machines, until nothing is left unpassed through the dressers but bran. This is, for the purpose of human food, discarded. The finer particles that pass at each sifting from the dressing machines are taken on to a large silk-covered cylinder. and sifted, the different grades or sizes being again separated. These particles are crushed by rollers, and separated by fans until one common grade is obtained. This is called best white flour.

A SKETCH FROM AN OLD GERMAN RECORD BOOK.

Marx Leutner the miller, of the Brother house, at Nuremberg (from 16th century.)

THE FIRST ROLLER FLOUR MILL.

The Washburn-Crosby Flour Mills, of Minneapolis, Minn., are so closely identified with the introduction and development of the "new process," or roller system of making flour, in this country, that its history is practically that of the growth of this industry. It was C. C. Washburn who first introduced the Hungarian rolls, in place of the old stone process of grinding wheat.

This process was carefully guarded for a year. Then the small hundred-barrel test mill was torn down to make room for a complete remodeling of the plant and changing to the roller process. It was only upon seeing the machinery carried away from the mill that the other Minneapolis millers are said to have learned of this Hungarian process. The methods by which the Washburn-Crosby Company have attained such pre-eminence are therefore of interest to the public, as well as the flour trade, and one must have been from top to bottom of their famous Mill "A," to be able to give a description of them. Their system of mills consists of five, all situated on the west side of the Mississippi River, and on the canal leading from it, at St. Anthony's Falls, in the heart of the city, on which all the Minneapolis mills are situated, except two on the east side. Mill "A" is located on the site of the original mill of that name, which bears a tablet with the names of the victims, stating that it was completely destroyed, by fire and explosion, on May 2, 1878, which literally left not one stone standing upon another, and that not one life was saved of the fourteen men who were employed in the mill, to whose memory a magnificent monument has been erected by the milling fraternity of

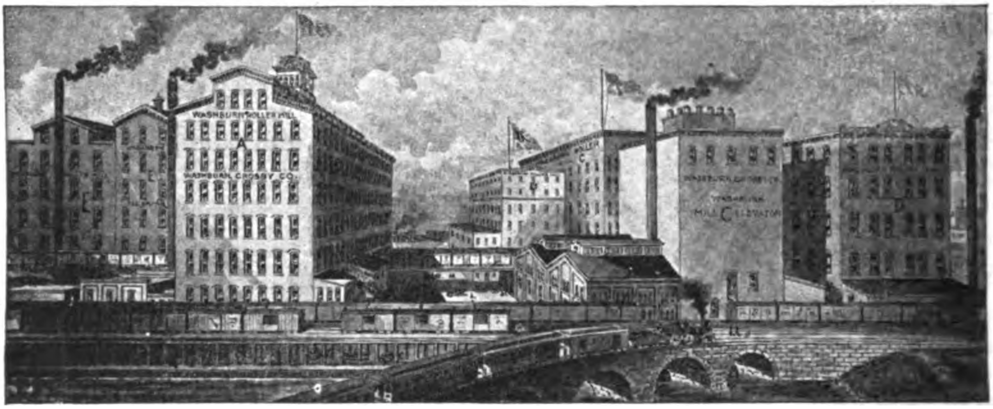


Fig. 132.—The Washburn-Crosby Mills.

Fig. 133.—Sketch from an old German record book (1504.) The legend reports that as punishment for grinding flour on a Sunday, this poor woman's hands stuck as if smitten to the handmill until St. Hedwig appeared and by her power released her.

Minneapolis in Lakewood, the beautiful cemetery of the city. The rebuilding of this mill marked an era in the flour industry, which had been extra hazardous, owing to the previously unknown danger of spontaneous combustion of mill dust. This mill was rebuilt, with "cyclone blowers," or dust collectors, every machine in the mill being supplied with suction tubes, which carry this dust out of the mill and render explosion impossible. All other flour mills of the country have since adopted them.

The destruction of this mill came at a very unfortunate period of milling history, for at this time there was no flour exported by the large millers of the country, the export trade being entirely in the hands of New York brokers, who would label any flour they could purchase with brands that would bring a premium. This system naturally brought American flour into a very humiliating position, for the foreign buyers found such wide differences in the same brand that they could trust neither brands nor firms. Ex-Governor Washburn determined to change this and after a hard fight succeeded in gaining the confidence of the foreign purchaser.

In order to secure the bakers' trade it was impossible to use barrels, for they had become accustomed to the use of sacks on account of narrow passages leading to their baking rooms. Some jute sacks were made abroad and sent to the mills. As an experiment they were packed and shipped back, it being the opinion of many that the flour would be ruined by the moist sea air if packed only in sacks, but the first shipment proved a great success, and thus the export trade began. It was at this time that the "A" Mill was destroyed, but ex-Governor Washburn foresaw the future of Minneapolis milling more clearly than any one of his time. He immediately began the rebuilding of the "A" Mill upon dimensions which were utterly unknown to the milling world of those days. The impossibility of marketing such an output and the ruin of all connected with the enterprise were prophesied on all sides. Upon the completion of the "A" Mill the Washburn-Crosby Company again took up the export trade, and thus this firm was the first to place its flours directly upon the foreign markets and gained the confidence of the purchasers abroad as they already had of those at home by the high quality of the flour and its uniformity. Like all the flour mills of Minneapolis, the Washburn-Crosby Company's are built of a granite obtained near by, and of the same character as the immense blocks used in the construction of the two dams, at St. Anthony's Falls, excepting one brick mill of this company, and a small one belonging to another. Mill "A" is 250 feet long by 100 feet wide and eight stories high, with a capacity of 9,000 barrels of flour daily, and a grain storage capacity of 100,000 bushels. It has 200 rolls and 50 stones, the latter having always been used for finishing their fine patents, in order to give them high color, as well as to attain the chief aim of their milling process, namely, uniformity, as well as standard, thus making their brands absolutely reliable as to quality. Their next largest mill is "C," 160 by 100 feet, and seven stories high. The capacity of this mill has just been nearly doubled, and is now 7,000 barrels, with a grain storage of 60,000 bushels. Mill "B" is 90 by 70 feet, six stories high, 2,500 barrels daily capacity, with 20,000 bushels grain storage. Mill "D" is 90 by 75 feet, and six stories high, with the same flour and grain capacity. Mill "E" is 90 by 70 feet and five stories high, with 2,500 capacity of flour and 25,000 for grain.

The present total capacity of this company's mills is 25,000 barrels daily. The increase has been made, not only by adding new machinery to Mill "C," but by putting in extra rolls here and there in all the other mills, wherever space permitted, whereby the additional capacity has been obtained. Contracts have been let for 8,000 barrels' additional capacity, which will make a total of 33,000 barrels of flour daily capacity. These mills are all run by the same methods and kept up to the same standard of uniformity in quality. Mill "A" and two others have their own dynamos, and produce their own electricity for lighting all the mills. They have in addition to these mills two cleaning and storage houses, one 75 by 150 feet, the other 55 by 100 feet, both seven stories high and built of stone. Here all the cleaning and screening is done outside of the mills, which are thus kept free from the dust of the wheat. It has also a four-story machine and carpenter shop, about completed, where all the work of repairing for their mills will be done. Wheat is supplied from the cleaning houses to these mills by screw conveyors, and from which it is elevated to the top of the building and drawn into the rolls as wanted. These rolls, like those of most other mills, are situated on the second floor, while the reels and scalpers are on the top floor, from which they are carried down through the different stories in separators and purifiers until the process is completed. Mill "A" does not use the plan sifter, but reels instead, although the former have been adopted in Mill "C." The milling of flour consists only of four processes, but of 15 grinds and reductions after the wheat is cleaned; and the machinery for this occupies the whole mill except the packing-room, which, like other mills in Minneapolis, is on the third floor, or above the rolls, in order to be on a level with the railroad tracks by which their shipments of flour are made and wheat brought into the mills. This company makes eight divisions of its middlings, these divisions being according to size, to enable all impurities to be more easily removed. As in nearly all merchant-mills, the flour is packed in sacks for export; while over half the home trade is thus supplied, including jute, cotton and paper bags of all sizes from those holding 98 pounds down to 3½ pounds, as they are cheaper and more easily handled; and the proportion thus put up is increasing every year, while the use of barrels is decreasing. All changes that have been made recently in rolls at these mills have been from the smaller to the larger sizes, as the power required to turn the large roll is proportionately less than small ones, and they break more wheat, according to their surface, as well as save room. For the economy also of room one-half of Mill "A" is run with an upright engine of German make, bought at the World's Fair. It is of the marine type, of 4.000 horse-power, and runs the mill almost noiselessly by rope drivers.

The new part of Mill "C" is thoroughly modern and an example of the highest and best type, up to date in every particular, and is the largest mill using the universal bolter, having 23 of these machines, for which a much larger capacity is claimed, a saving in space and power, with superior bolting qualities, as well as cleaner. The Washburn-Crosby Company was the first in this country to use washing-machines for wheat, which were first imported from Great Britain about five years ago. The use of washers for certain varieties of wheat means cleaner stock throughout the mill.

Besides the advantage of water-power, the Minneapolis mills claim superior facilities for chemical, microscopic, baking and other tests of both wheat and flour. Another advantage claimed for the millers in Minneapolis, which is the best sample wheat market in the country, and which will help to maintain their supremacy, is the ability to buy wheat on the track the year around; while in most milling centers they are compelled to carry stocks after the close of navigation. In regard to the advantage, once claimed by Minneapolis, of being able to ship flour down the Mississippi River, I am told by one of the largest millers here that the railroads have virtually driven the Mississippi steamboats out of this business. Formerly they used to ship by rail from here to St. Paul (the head of Mississippi navigation), paying $7 a carload for hauling it there and transferring it to the Mississippi packets. Now they are able to ship as far south as New Orleans, all rail, at within a few cents per barrel of the river rate; while deliveries are certain and more prompt by the former, and a saving of handling at destination is more than enough to make up for the difference in freight.

As to the advantage claimed by Minneapolis millers (and apparently with truth) for their superior flour-inspection system, the laboratory of the Washburn-Crosby Mills has been found one of the most complete systems yet seen, and a description of the same will not only be of interest to the trade, but also to the consumers of flour, showing what progress has been made by these Minneapolis mills in reducing flour-making to an absolutely scientific basis. There are five different processes by which they inspect wheat and flour. The first one is a chemical test of wheat before milling to find the proportions of starch and gluten. This is used chiefly in testing the new crop of wheat or on wheat from new sections of country before purchasing the same. This is called the starch test, which is for wheat only, and is used as well for milling wheat as for purchasing it, as it enables the mixing of different kinds to secure uniformity of product. This test is made daily. The second test is for moisture, not only in wheat, but in flour and bran. In the case of wheat it is used before buying, not only to get good weight, but not too much

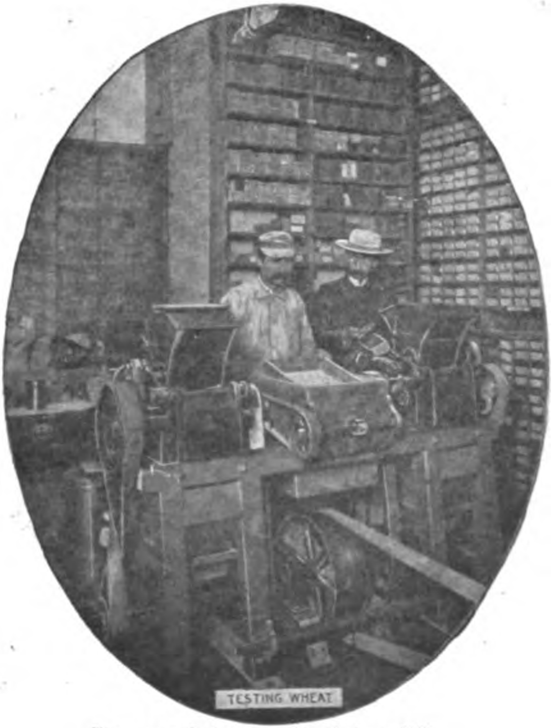


Fig. 134.—Laboratory in Modern Mill.

moisture, which weakens the gluten and the keeping qualities of the flour. This test for flour is for its keeping qualities, and for bran also. In this same testing-room they have an experimental laboratory, in which several new processes are being developed, to find what wheats accomplish the best results in milling and to ascertain not only the amount but the quality of the gluten, as some wheats with plenty of gluten don't make good flour, as its two component parts are found in different proportions in different wheats. There is another room, known as the testing-room for flour, which requires samples from each mill six times daily. The first process here is to sample the flour by comparing it with the standards established before being doughed up. This test is for color only; the second test is for strength and color, and is made by weighing an equal amount of samples of flour from each mill and doughing them up separately and pulling them to judge of their strength, the amount of water used in this process being weighed as well as the flour. These dough samples are then broken and laid upon glass plates, to be examined for their color. Baking test No. 3 is made by weighing out flour, water and yeast, in equal amounts, for each loaf of bread, which represents each sample of flour from each mill. All are then mixed in a dough, set to raise in proving-chests, heated by electricity, where perfect uniformity of temperature is essential to good results. Then it is left standing until properly fermented, when it is worked down, put in pans and set to rise till ready for the

Fig. 135.—Laboratory in Modern Mill.

oven, which is heated by electricity for greater uniformity than any other method, as well as for cleanliness and celerity of handling. After the loaves have been cut and inspected for size of loaf and weight, which indicate the strength of the flour, and for color, they are given to the poor daily, five families being thus kept in bread. This completes the five tests; but in addition samples of flour made every day from each of the mills are kept on file for reference for one year.

The Washburn-Crosby Company also controls a system of grain elevators known as the St. Anthony & Dakota Elevator Company, whose president is W. H. Dunwoody, and managed by P. B. Smith, separately from the mills, although the great bulk of wheat bought by the line finds a market through the Washburn-Crosby Company. The Washburn-Crosby Company has a terminal elevator in Minneapolis, known as the St. Anthony, with a capacity of 2,000,000 bushels, independent of their elevator capacity connected with the mills, and given above. The St. Anthony & Dakota Company owns 160 country elevators, with a capacity of 5,000,000 bushels, making a total capacity controlled by the Washburn-Crosby Company of 7,000,000 bushels. All these elevators are situated on the line of the Great Northern Railway, running through Minnesota and into the Red River Valley, thus drawing upon the best milling wheat sections of the Northwest. These elevators were located before the consolidation of the independent roads, now in the Great Northern system, consisting of the St. Paul, Minneapolis & Manitoba, the Eastern Minne-

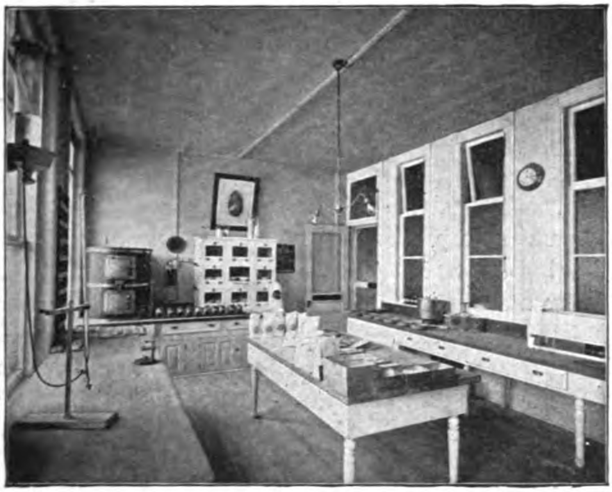


Fig. 136.—The Baking Tests in Electric Ovens.

sota, the Willmar & Sioux Falls and the Duluth, Watertown & Pacific roads. The average annual handlings of grain by the St. Anthony & Dakota Company are 10,000,000 bushels, independent of the St. Anthony terminal elevator in this city.

In addition to the one hundred and sixty country line houses and one terminal elevator owned and controlled by the Washburn-Crosby Company, they operate, in addition to their large milling plant at Minneapolis, a mill situated at Great Falls, Montana. This mill has a capacity of 500 barrels daily, which is by far the largest mill in the State of Montana. To supply this mill they have erected an elevator with a capacity of 100,000 bushels adjoining the mill, in which wheat is accumulated in order to keep the mill fully supplied at all seasons. Great Falls is famous for its magnificent water power, and when the power there is fully developed it will compare favorably with Niagara Falls.

The Washburn Mills pay out daily over $60,000 for the purchase of wheat. Their pay-roll amounts to $2,000 daily. The combined purchases of Minneapolis mills average about 225,000 bushels daily and the combined pay-roll about $4,500. The Washburn Mills paid out last year for packages over $800,000, and it has been estimated that all the mills in Minneapolis combine to pay out over $2,000,000 simply for the packages in which they ship the flour.

The Washburn mills enjoy the privilege of having free use of water-power under leases granted by Governor Washburn when he first erected mills in Minneapolis, and, by having these free-mill powers, possess a decided advantage over other mills situated on the Falls; but, in addition to the excellent water-power facilities, they are fully equipped with the most improved modern steam plant, which they ever keep in readiness for immediate use. Additional power can be obtained from the Water Power Company at about $1,000 per annum per mill power on long time leases, but the extra rate for temporary use of water power is fixed at a rental of $5 per day, 24 hours, for mill power, equal to about 70 horse-power. The relative cost between the use of water power at $1,000 per annum per mill power and the cost of steam power as developed by modern engines is largely a question of the price of coal. While the extreme capacity of the Minneapolis mills is about 78,000 barrels daily, 60,000 is about the average, as well as the present production when all the mills are running, and the total production of Minneapolis last year was 16,000,000 barrels. The lowest price paid for the ordinary day laborers in their mills is $1.75 a day, and the top $3.10, for skilled day labor, the average being $2, which is as high as any milling center in the country; but the great advantage claimed for the mills at Minneapolis is their close proximity to the wheat fields of the great Northwest, the extent of which is unknown to the great majority of people in this country. The Red River of the north, its tributary and numberless small rivers and small lakes emptying into it, make the valley of that name (which ranges from 50 to 60 miles wide) the Nile of America, to which only can it be compared for richness of soil and abundance of crops. The Big Stone Lake, which is the source of the Minnesota River, and Traverse Lake, one of the sources of the Red River, are connected by a small river, 15 miles long, which forms the divide between the water shed that empties into Lake Winnipeg and eventually into Hudson Bay, and that which empties into the Mississippi by way of the Minnesota River. But every spring, when the snows are melting, before the more northern outlet through Lake Winnipeg is open, the waters of this north divide are dammed up with ice and thrown back into all the tributaries of the Red River until they overflow the Red River Valley until Hudson Bay opens. This produces an annual overflow like that of the Nile, which saturates these otherwise arid lands, making them the most productive in the country without irrigation. This is the secret of the great productiveness and fine wheat of the Red River Valley.

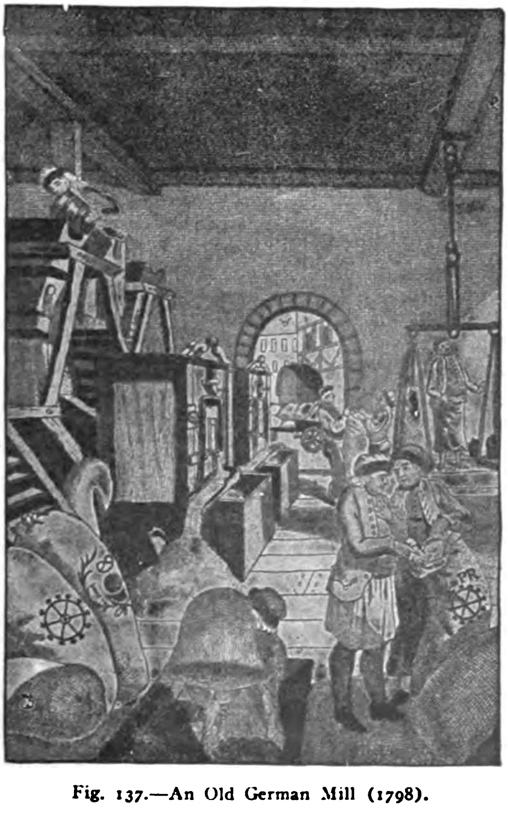


Fig. 137.—An Old German Mill (1798).

Flour Mill Machinery.

THE UNIVERSAL BOLTER.

Sieve bolting machines now constitute the most important part of the bolting system of every mill, and among all machines of the sieve class the Universal Bolter easily stands first.

The essentials in a sieve bolting machine are strength, rigidity, durability, compactness, economy of power, ease of balancing, freedom from mixing and scouring action on the stock, perfect separations, effective and durable cloth cleaning devices which will clean the cloth perfectly without unnecessary wear, and easy removal and replacement of any individual sieve without disturbing other sieves. These sieve bolters meet all of these requirements, and none meets them more perfectly than the *Universal Bolter.*

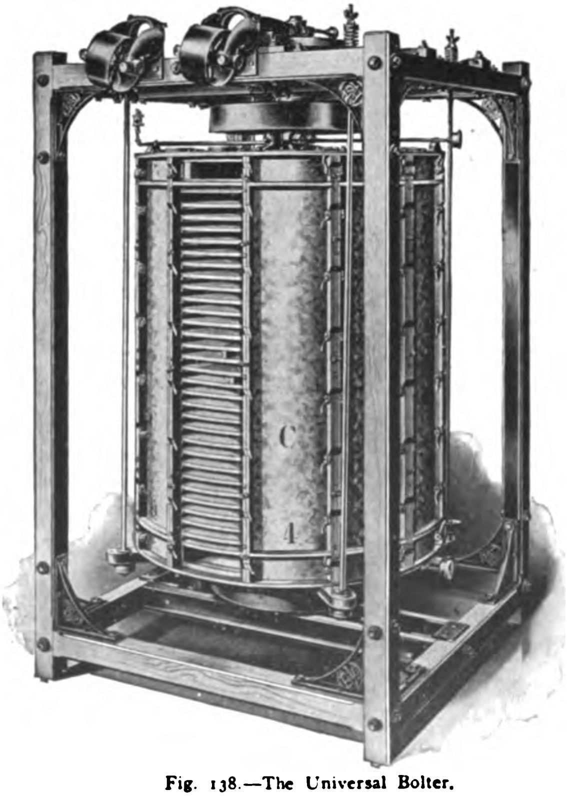


Fig. 138.—The Universal Bolter.

Figure 139 shows the Universal with one section of the case removed, showing one vertical section of sieves in place, and also one of the feed compartments at the top and one of the discharge compartments at the bottom. Any one sieve can be removed and replaced without disturbing the rest, and this of course is true of each of the other sections. The sections of the case are very easily and quickly removed.

The case is a very important feature of the machine. it is made double with an air space between the two walls. This effectually prevents the cold external air from condensing the moisture carried by the air inside of the machine. This is very essential, as condensation would cause dough to collect, interfering with the action of the machine and rotting out the cloths. By preventing condensation the interior of the machine is kept dry and in perfect condition at all times.

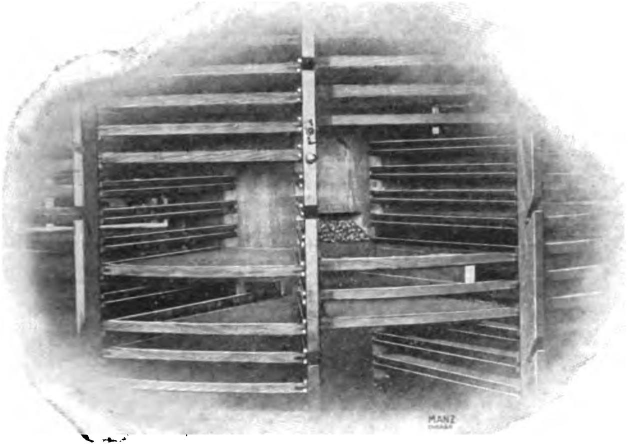


Fig. 139.—Section of Interior of Bolter.

When all the sections of the case are in place and clamped they act like a hoop, binding all parts firmly and making all joints tight. A cloth lining prevents leakage between the outer ends of the sieves and the casing. Each section of the case is numbered for convenience and ensuring each being used in its proper place.

ALLIS ROLLER MILL.

DESCRIPTION OF SPECIAL FEATURES.

The solid iron frame not only makes the machine very substantial, but also keeps the main wearing parts rigidly in position and prevents any displacement of parts on account of unevenness of floors or settling of building, to which machines with skeleton frames are unavoidably liable. The inside surface of the frame is well coated with shellac to prevent flour from adhering.

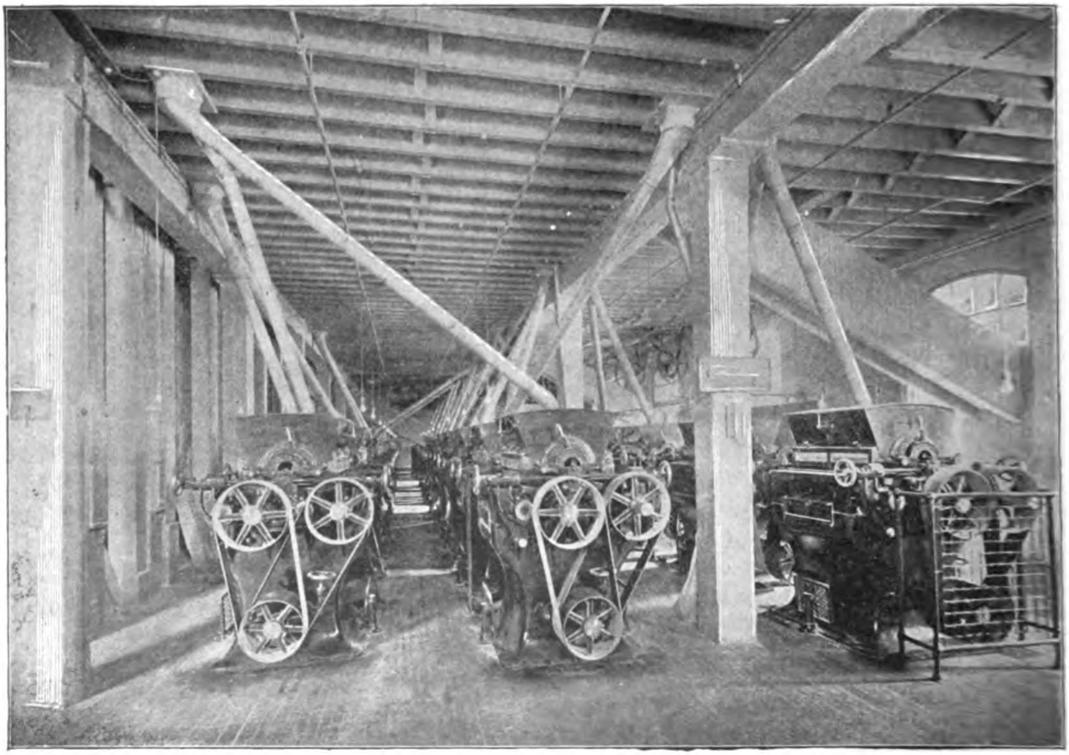


Fig. 140.—Allis Roller Mills.

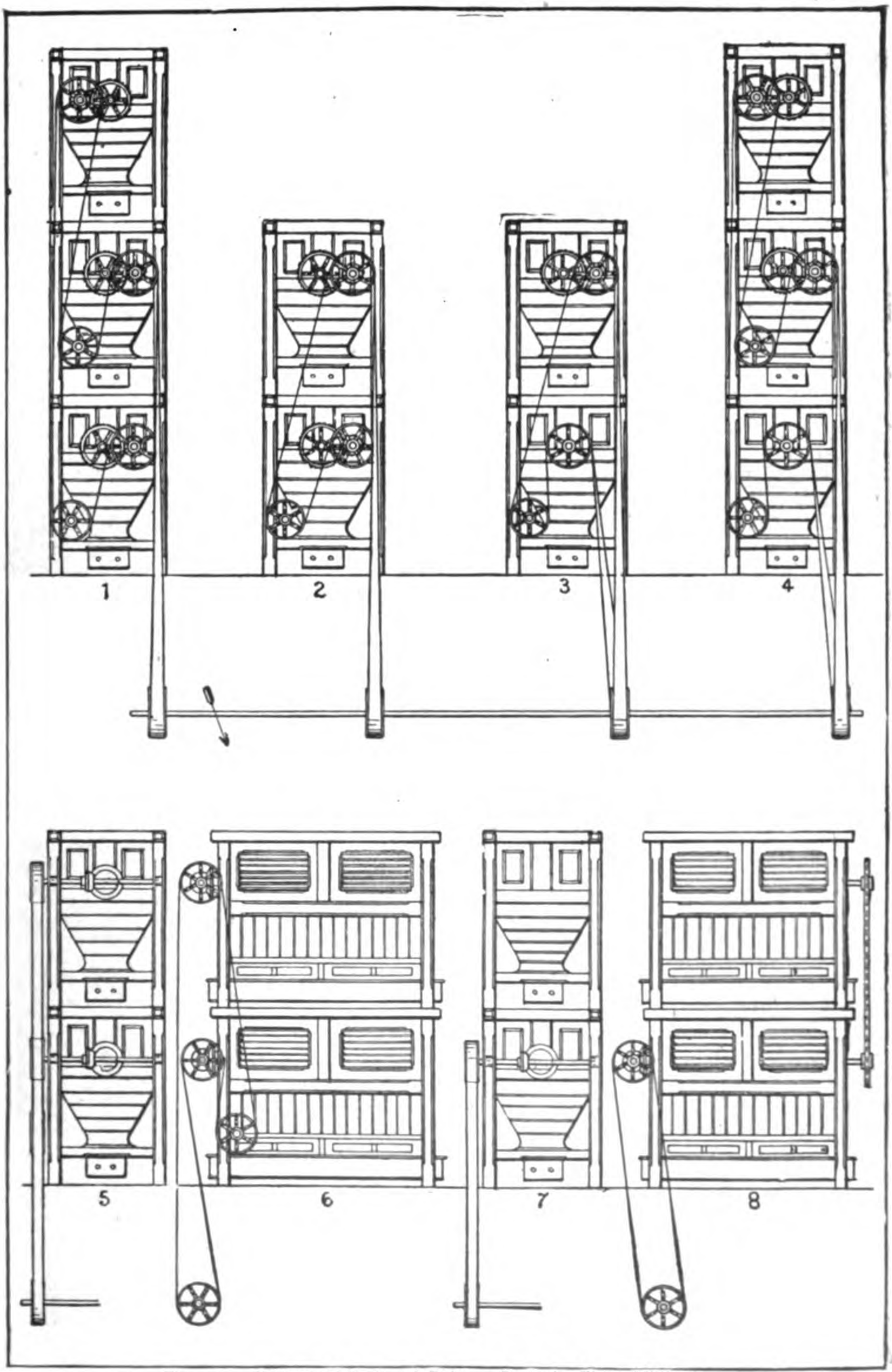


Fig. 141.—Various Methods of Driving Reels in Flour Milling.

Modern Baking.

Prepared for the *Baker's Book* by EMIL BRAUN.

Although not claimed to be absolutely authentic, it is estimated from reports from various sources, that of every hundred barrels of flour turned into bread in this country, less then fifty barrels is handled by the professional bakers. This is a perceptible gain over the estimates given before the introduction of machinery, the building of modern and sanitary bread factories and the enforcement of sanitary bakery laws, when the proportion of the flour consumed assigned to the baker was only a trifle over lies twenty-five per cent. It lays mainly with the bakers to keep on raising the percentage of bread baked by the regular professional bakers, until ultimately home, or house baking becomes a thing of the past and a lost art.

There is nothing that will increase the use of bakers' products more than well appointed and clean bakeries, with the arrangements suitable for daily visitors, and in a condition to please the most critical patron. This is necessary to secure a large per cent. of the desired additional trade. It would be a pleasure for a neat, critical housewife to secure all her bread and pastry from a clean, well appointed bakery. People in general like to do business with a man who is very considerate and attentive to all the desires and tastes of his patrons. His clean, well appointed establishment makes it quite the proper thing to do business with him, and he becomes prosperous through recognizing the demands of his patrons and those who will becomes his patrons.

It is to be said to the credit of the Master Bakers' Associations that they all urge their members to live up to the sanitary laws and regulations and encourage the enforcements of such laws, and it is every member's duty to report any members of the trade violating any of the sanitary laws and rules pertaining to the bakery. To a great many people the bakeries look to be all right as long as they appear to be in a fairly good condition, and the dirt, disorder and unsanitary features are taken as a matter of course. However, there is another class whose members are very numerous and quite a factor in the food consumption, and must be reckoned with. Their standard is on a much higher plane, and their requirements regarding their food are more exactly and particular. No exacting amount of argument will convince such people that a loaf of bread is cleaner than the shop in which it is baked, who baked it, or the store in which it is displayed and sold, or the driver who delivers it. There is the main secret laid bare; you find every successful bakery, and particularly every bakery store where high prices are charged for the goods, clean and inviting. But still a number of these sucessful bakers neglect to carry their pride further and they do not enforce such cleanliness in the shop and pay no attention to the appearance of the men and, their apparel. The shops are not thoroughly cleaned often enough, and the mixers and utensils in general neglected and of a sloppy appearance. Flour dust and grease spots, eggshells and waste paper is allowed to accumulate on the floor and in corners, principally in cake shops. The larger wholesale bakeries or bread factories as a rule are not only equipped with all the latest modern improvements, but the sanitary rules are carried out very strict and the whole building from cellar to roof is kept scrupulously clean, including the men, who have their private lockers and are supplied with facilities to take a refreshing bath at any time. In many up-to-date bakeries this feature has been made one of the rules, and the men are compelled to take a bath and change their entire clothing before starting to work. The wash is frequently furnished by the firm. While the large bakers are far ahead in this respect of the average smaller bakery, *i. e.,* cleanliness and sanitary and general improvements, it is a singular fact that their product has so far been grossly neglected in the salesrooms of their selling agents, the grocers and delicatessen stores, which apparently are beyond the control of the baker regarding the handling of the bread, cakes and pies. Here is where the retail baker has the advantage over the wholesale baker, as he can display his goods to better advantage and please the eye of the customer. The space in this work is too limited to go into further details in this matter, but we will reproduce some views and descriptions of modern bakeries, both large and small.

In the last ten years so many so-called "model" bakeries have sprung up everywhere that it has become almost impossible to keep track of them. First along they were considered a distinctive city institution—white elephants—maintained at a great expense and principally for public show and advertising purposes. To-day, however, nearly every town of respectable size has its model bakery, and not infrequently two such institutions compete lively for the local trade. But the model bakeries which are really "model" in every way are still comparatively few. It may also be remarked here, that of late a more friendly feeling has been established between the proprietors of larger bakeries and they exchange ideas and visit the different plants, sometimes traveliing hundreds of miles to see a new machine or other new improvements in practical use.

American Model Bakeries.

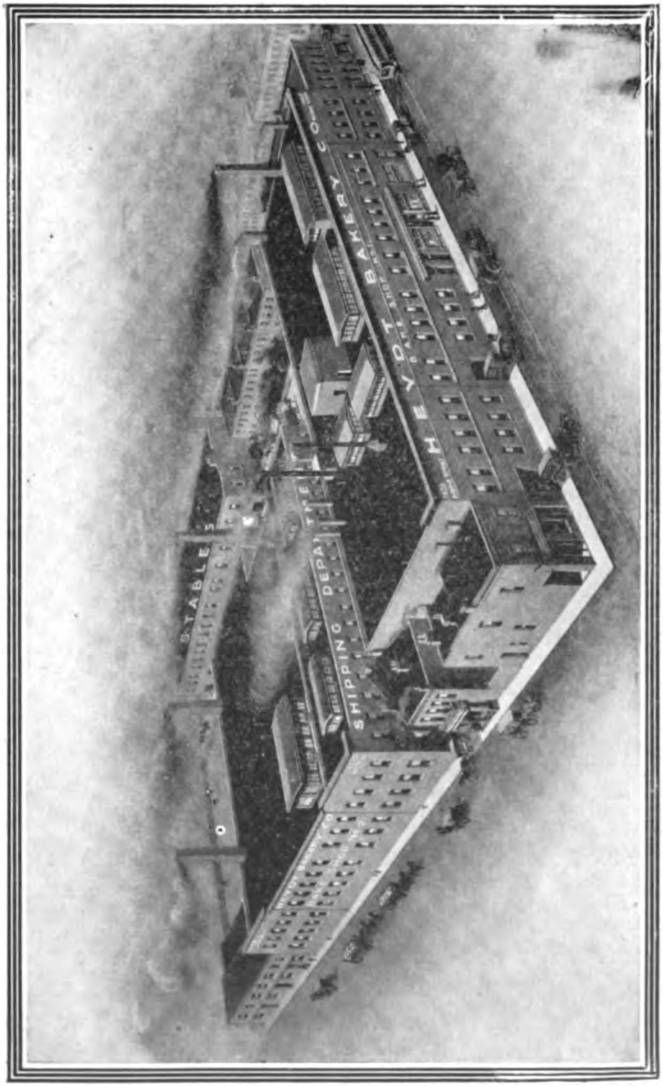
We reproduce here an illustrated sketch of the new J. B. Heydt bakery in St. Louis, Mo., from a neat, interesting booklet published and circulated by the above named firm. Mr. J. B. Heydt started in the baking business about twenty years ago in a small shop with one oven, one wagon and one horse. To-day, after making extensive additions, the plant covers nearly a whole city block, covered with modern buildings, fitted up with all the latest devices for making palatable, healthful bread. The firm has twenty-five city delivery wagons and one hundred horses; employs two hundred workmen, delivers bread to nearly 2.000 stores and expresses bread to a great many towns in eleven different States.

Fig. 142.—Main Office (Heydt Bakery).

One of the most important matters observed is the cleanliness, observed in every particular, The author of this work has found that the best way to give a correct description of the above named plant, is to reprint the contents of the J. B. Heydt bakery's own statement:

Health bread can only be made from absolutely pure ingredients. We subject all our flours to microscopic and chemical analysis; in this way we ascertain that the flour is free from bran, impurities or starchy adulterants, and that the flour is rich in proteids or nutritive properties.

Ordinary bread, unless aided, will not digest in the stomach. Its decomposition, being left to extraneous agents, is always imperfect or retarded. In order to meet this condition and make a self-digesting bread we employ an extract of malt. Of this we use daily the enormous



Heydt Bakery (St. Louis, Mo.).

quantity of from 400 to 500 pounds, combined with over 200 gallons of pure, unadulterated milk. This malt extract contains in itself the same elements as the gastric juices of the stomach as well as their digestive properties. It thus assures a complete digestion of the bread within itself. A self-digesting bread of this nature has the most healthful effect upon the stomach, especially as the malt extract also acts as a corrective and remedy in case of digestive disorders arising from any source. Thus Heydt's bread is also a perfectly safe bread for invalids, since in digesting itself it not only causes no strain on impaired organs, but even assists and stimulates them to the performance of their proper functions. Self-digesting bread is also a perfectly safe food for infants. In fact, our bread is not only safe, but beneficial, regardless of the state of health of the individual.

Fig. 143.—Retail Department.

The next important matter is cleanliness. In cleanliness we claim we have reached the highest state of perfection by using granitoid and hardwood floors, enameled-surface brick walls, and by constant scourings with live steam and continual whitewashing we destroy all germ life.

Our bakers wear white suits while working. We see that they are extremely neat in person and sound in health.

The next question is fermentation. The only ferment we use is pure vegetable yeast, and we use this in infinitesimal quantities. The lightness and whiteness of our bread is obtained by the excessive beating and kneading in patented ærating rotary machine dough mixers, and the extra length of time this mixed dough is allowed to remain in our stationary tempered dough room.

Few people have a right conception of how modern health bread is made. They think flour and water is stirred up any old way, and the result may or may not be a success. But, on the contrary, modern bread making has brought to bear the advances in physics and chemistry. Twentieth century health bread is scientifically made. Our goal has been to make bread that would tickle the palate, strengthen the body and build up the brain. It has taken years of study, a great deal of experimenting, and lots of money; but we feel that at last we have attained our goal, that we produce the best bread that is possible.

The bread-making art is complicated, and we can but suggest our modernized process: First the flour. Flours from different parts of the country are blended, so that the blend contains the requisite proportions of proteids, fat, carbohydrates. This blended flour is then screened through a rotary flour sifter that leaves only the cleanest and finest of flour.

From the flour sifter the flour is conveyed in a closed dust-proof flour pipe to the dough mixer.

With these dough mixers we have worked the greatest improvements in bread making. You will note in the illustration of one of these dough mixers that it is a huge iron trough, of capacity to hold five barrels of flour; requires twenty-five horse-power to operate it. Revolving inside

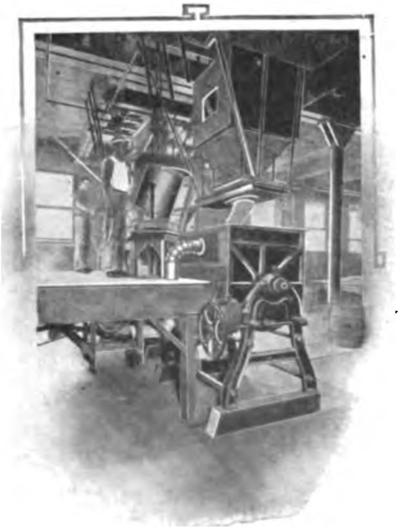


Fig. 144.—Dough Mixer and Beater, No. 4.
(Known as the Corby New Process Mixer.)

Fig. 145.—Dough Brake and Work Bench.

Fig. [illegible].—Flour Reel.

Fig. [illegible].—Flour Blender.

this iron trough are iron arms or paddles, which agitate and shred the dough, bringing every particle of the gliadin and glutenin together, forming the all-essential gluten in the dough. The dough is pulled and spun around these revolving arms until it becomes semi-transparent, leaving not a particle of dry or raw flour to make the disagreeable flour lumps in the bread, or indigestible starchy masses. By means of an air blast we inject pure oxygenated air into the mixing dough, thus aerating and making what might be termed self-raising bread.

A recent addition to our bakery is an improvement we originated—an improvement that is only used by one other bakery in the world, and that in Washington, D. C. This improvement is our dough room, built like a large refrigerator. The ceiling of the room is laid with two series of piping; one set of pipes is for ice-cold brine for refrigerating, the other set of pipes is for steam for heating. Thus we are able to keep this room at an exact, unvarying temperature during any season of the year. The dough is laid in troughs in this dough room for a specified time, at a specified and unvarying temperature.

The dough is accurately weighed into loaf sizes. This is run through an improved bread-moulding machine, thus doing away with handling with sticky fingers, also insuring each loaf of uniform size, shape and tex-

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[illegible] part of a bakery. Our [illegible] the rear, keeping all coal [illegible] impossible for any of the [illegible] as the fires are built [illegible] passing through tubular [illegible] arrangement also allows [illegible] heat can be regu- [illegible] into the ovens, giving [illegible] of the bread. Every [illegible] out these fourteen [illegible]

[illegible] the White Bread De- [illegible] Department. We [illegible] department and specialized [illegible]

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y of

ture. Naturally, the ovens are the most important part of a bakery. Our ovens are of special design; they are fired from the rear, keeping all coal dust and smoke from the baking room. It is impossible for any of the sulphurous coal gases to enter the baking chamber, as the fires are built below the baking chamber, the heat and smoke passing through tubular flues under and over the baking chamber; this arrangement also allows of delicate manipulation of temperature, so the oven heat can be regulated to a degree. We also, at times, inject steam into the ovens, giving proper moisture and enabling us to color the crusts of the bread. Every forty-five minutes, day and night, year in and year out, these fourteen ovens are refilled.

Our plant is divided into three departments; the White Bread Department, the Rye Bread Department and the Roll Department. We have machinery specially adapted for each department, and specialized workmen who only work in one of these departments; of course, a man making but one kind of bread all the time becomes an expert in his line.

Bread making is not a matter of chance, the ingredients are correctly weighed, the temperature of each ingredient, and the mixed batch of dough is ascertained, the dough is laid for raising an exact length of time at an exact, unvarying temperature, the loaves are weighed into exact quantities, and are machine moulded into exact sizes; these are

Fig. 148.—Dough Beater, No. 2.

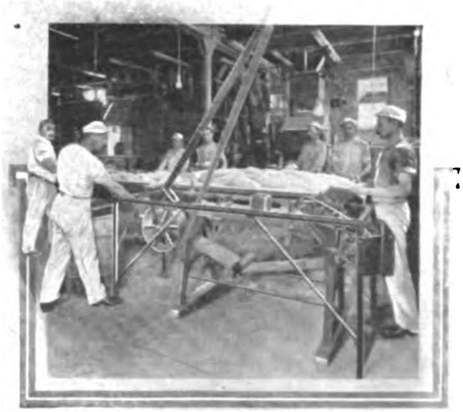


Fig. 149.—Moulding Machine and Work Bench, No. 1.

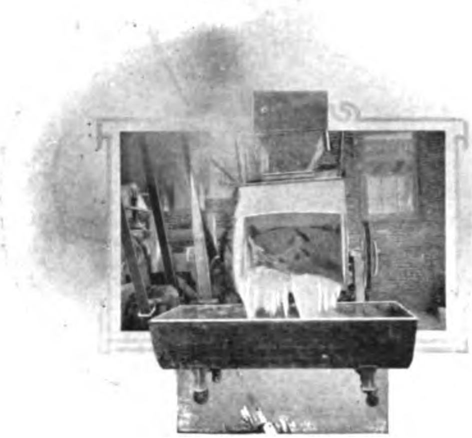


Fig. 150.—Dough Mixer, No. 3.

Fig. 151.—Moulding Machine and Work Bench. No. 3.

placed in an oven at an exact temperature for an exact length of time. We employ men who do nothing else but record these temperatures, weights, etc., so that we now have on file records of each batch of dough mixed in our plant in the past seven years. This is one reason why our bread is always the same, always good; it never differs under our system; we have so perfected our bread making that we cannot turn out a bad loaf and it is a recognized fact, that we have one of the largest bakeries, and one of the model bakeries of the world.

Another very successful baking firm is that of J. Schmalz & Sons, of Hoboken, N. J., a minute description of which appeared recently in *The Bakers' Review*, from which we reprint the following:

Considered from the standpoint of scientific methods in every process of bread making their plant is one of the most model ones in this country. Every detail of the plant is managed on a scientific basis, and as a result, the cost of production is reduced to a minimum figure. Economical methods prevail throughout, a study of which by the average baker would prove a revelation. On every hand will be found the results of careful thought and a thorough knowledge of the requirements of an up-to-date business. Especially noticeable is the thorough mastery of trifling details usually overlooked even by the most modern concerns. Commencing on the top floor and throughout the plant, ending in the engine room, every method that goes toward making a perfect whole has been adopted, and as a result of this perfect organization the net saving from loss of power, waste and misapplied energy is enormous.

The greatest source of waste in a bakery is loss of time. This is, of course, guarded against in a general way in most bakeries, but few give the matter the attention given it in the Schmalz bakery. This is avoided in every possible way, particularly in the arrangement and methods for handling raw material. When the flour is received from the truck it is dumped direct on a continuous chain elevator, which carries it direct to the storage room on the top floor. When it reaches that point it is dumped automatically on a truck and is immediately stored in its proper place. Each truck passes over a scale and is weighed almost instantly. In this manner a perfect account is kept of the flour, and the saving resulting from weighing each lot often amounts to quite a respectable figure. On an average one thousand barrels of flour are used weekly and even though a shortage in lots is discovered only a few times a year the saving is considerable. By handling the flour direct from the truck to the elevator, a car of flour containing 280 sacks is unloaded, weighed and properly stored in an hour's time with the aid of three men. Were the car unloaded and handled entirely by hand the same process would require five men about ten hours. A little figuring will easily show the enormous advantage that this economical little method alone will give those who use it over competitors less progressive.

When the flour starts back on its downward journey to emerge again on the ground floor in the form of bread the same economical methods follow every stage of its process. Three flour bins with a capacity of

Fig. 152.—Moulding Machine and Work Bench. No. 2.

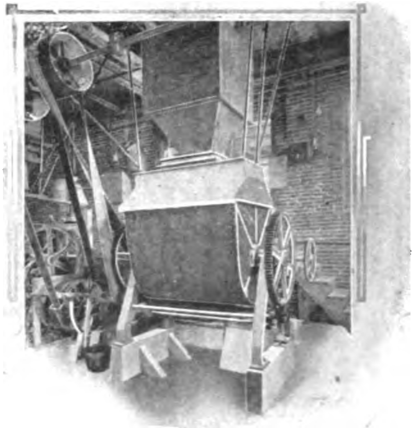
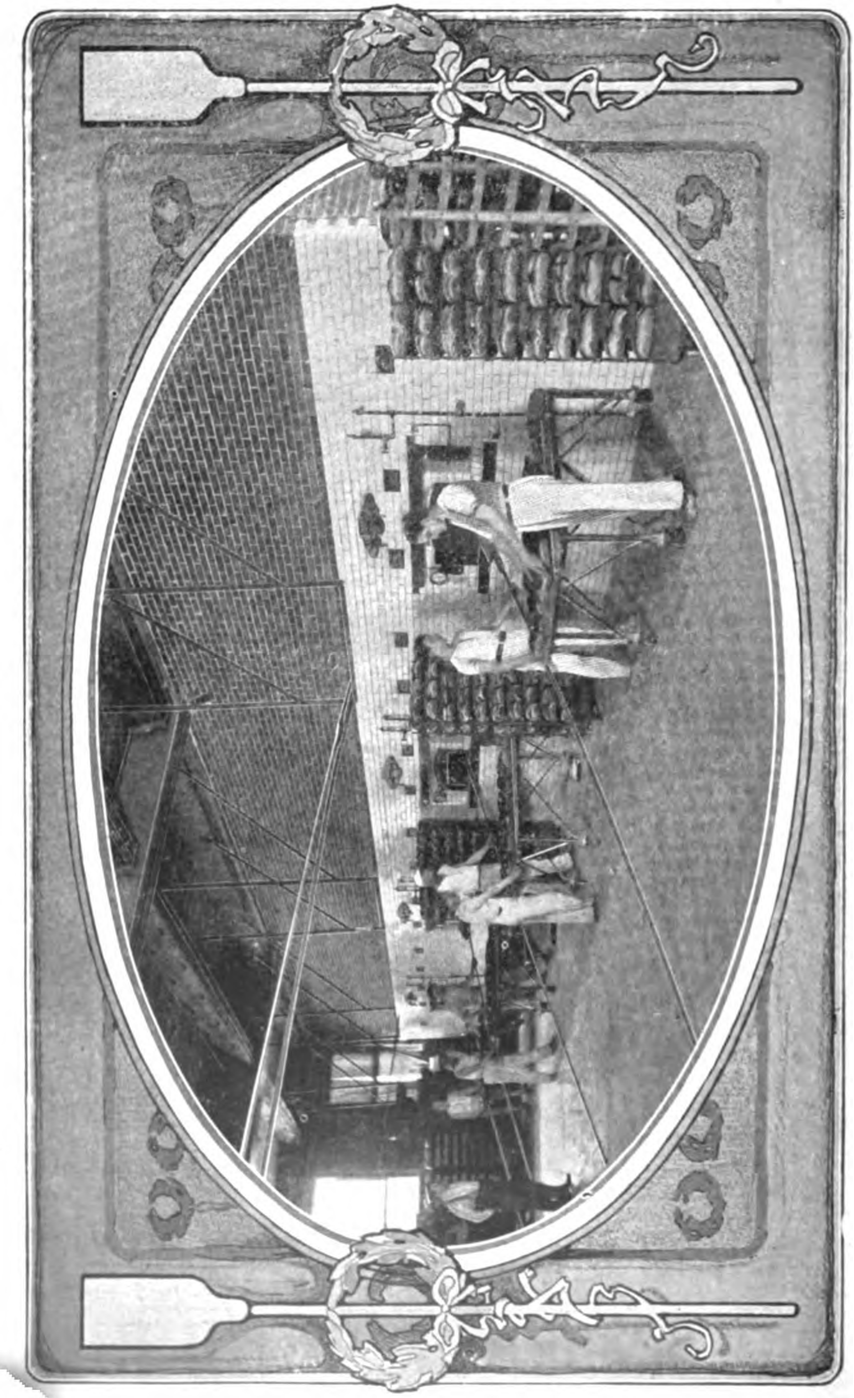


Fig. 153.—Dough Mixer, No. 2.



Oven Rooms. Heydt Bakery.

Fig. 154.—Ice Machine Shop.

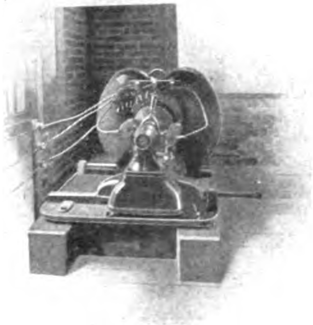


Fig. 155.—One of the 20-horse-power Motors.

fifty barrels each are used for the sifting process, after which it passes through a chute, is weighed and then dumped direct into the mixing machine without further handling. Large modern dough mixers are used exclusively and add considerably to the efficiency of the plant. The scaling system is used for all ingredients entering into each batch, which results also in a further saving. All water is weighed automatically in a fifty-gallon portable tank that runs on tracks above each machine. This method insures perfect uniformity in results and greatly facilitates the dispatch in mixing.

After the dough has fermented it is dumped through a chute to the floor below, where it is moulded and then passed to the ovens on the same floor. In the moulding department modern labor-saving devices are also used, which dispense with a considerable amount of labor. For their regular loaf the Thomson dough moulder turns out on an average of 2,000 loaves per hour when run to full capacity with a use of only two horse-power. For rolls, a Van Houton dough divider is used, which is also a great labor-saver easily figured in dollars and cents. With the aid of this machine one man can mould thirty-six rolls in the time usually required to cut one.

On the main floor opposite the moulding room a battery of Petersen ovens are used for the main baking. These ovens are of the most approved type and are fired entirely from the rear. The coal supply is delivered direct to each oven on tramway cars, which reduces the amount of handling to a minimum degree. An additional battery of ovens has recently been installed on the second floor consisting of two Petersen ovens, three Werner & Pfleiderer draw plate and one rotary oven manufactured by the Dutchess Tool Co. These are all built directly over the first floor battery, the same foundation being utilized for both. The coal for the second floor ovens is handled entirely by a chain elevator and tram railway system, which delivers it direct to each oven, resulting in a saving of the wages of several men. The ovens are all equipped with the Zaubitz pyrometers and electric lighting system.

The bread and stock room is connected with the wagon room by a chute which enables a direct delivery from the stock room to wagons, thereby saving time.

In every other department throughout the establishment the same progressive methods prevail whereby unnecessary expenses are avoided, which result in increased profits and a higher quality of the company's products.

Every detail of the plant is run entirely on a strictly scientific basis, whereby attention to trifling details results in an enormous saving from loss of power, waste and misapplied energy. By this method the maximum quality is produced at a minimum cost, which is undoubtedly the most important point to be gained in any competitive business.

Fig. 156.—Bread Room—Shipping Department.

Fig. 157.—Packing Room—Shipping Department.

Fig. 158.—Carpenter and Paint Shop.

Fig. 159.—City Loading Yard, No. 2.

Just how this is accomplished in the Schmalz bakery can be readily seen by carefully studying the architect's plans of this plant, illustrations of which we present herewith. These designs were drawn under the personal supervision of the senior member of the firm, Mr. John Schmalz, and his oldest son, Mr. Louis Schmalz, and are well worthy of serious study by all desirous of reducing bakery expenses or who contemplate building. While not copying the methods used in other establishments, they have studied many of their good points with profit, and have added many of their own gathered from extensive experience in the business. No detail has been overlooked that would add to the value of the plant, and throughout the entire establishment there is constant evidence of careful thought and a thorough knowledge of the requirements of a model bakery.

Figure 1 gives a clear idea of the general floor plan of the building and the logical arrangement of the different departments. This is the main floor of the building and is divided into main offices, store, bread room, scales, moulding room and main battery of ovens. The general offices are divided into two departments, the executive office being slightly elevated and built over the section marked "store" in the illustration. The drivers' lobby also connects with the general office, which is provided with every arrangement to facilitate checking drivers' returns, etc. The employees all enter the building through the drivers' lobby and register on an automatic time clock before going to their various departments. The main stairway is on the left, leading direct to all floors. The store building is, of course, used largely for the sale of stale bread, but it is made as attractively as possible, and is at all times kept immaculately clean. In fact, cleanliness is one of the most noticeable features throughout the entire establishment. This is impressed upon a visitor immediately upon his entering the building, and is noticeable from top to bottom. Even the entrance stairs and hall are spotless and give evidence of constant scouring. System prevails throughout, and nowhere is it possible to find tumbled up nooks and corners where dust and dirt can accumulate. And bread made under such cleanly arrangements is bound to taste sweeter and better even though the public never know of the extra expense it takes to follow such methods.

Fig. 160.—City Loading Yard, No. 1.

On the right of the main offices is the bread room, connecting with the main baking department. All bread is removed direct from ovens to steel bread racks, and arranged in regular order for shipment. This saves considerable time in handling and enables loading direct to wagons. The wagon room is on the right of the bread room, slightly below its level. The bread is loaded direct to wagons on an inclined slide connecting the two departments at the point marked on sketch approach.

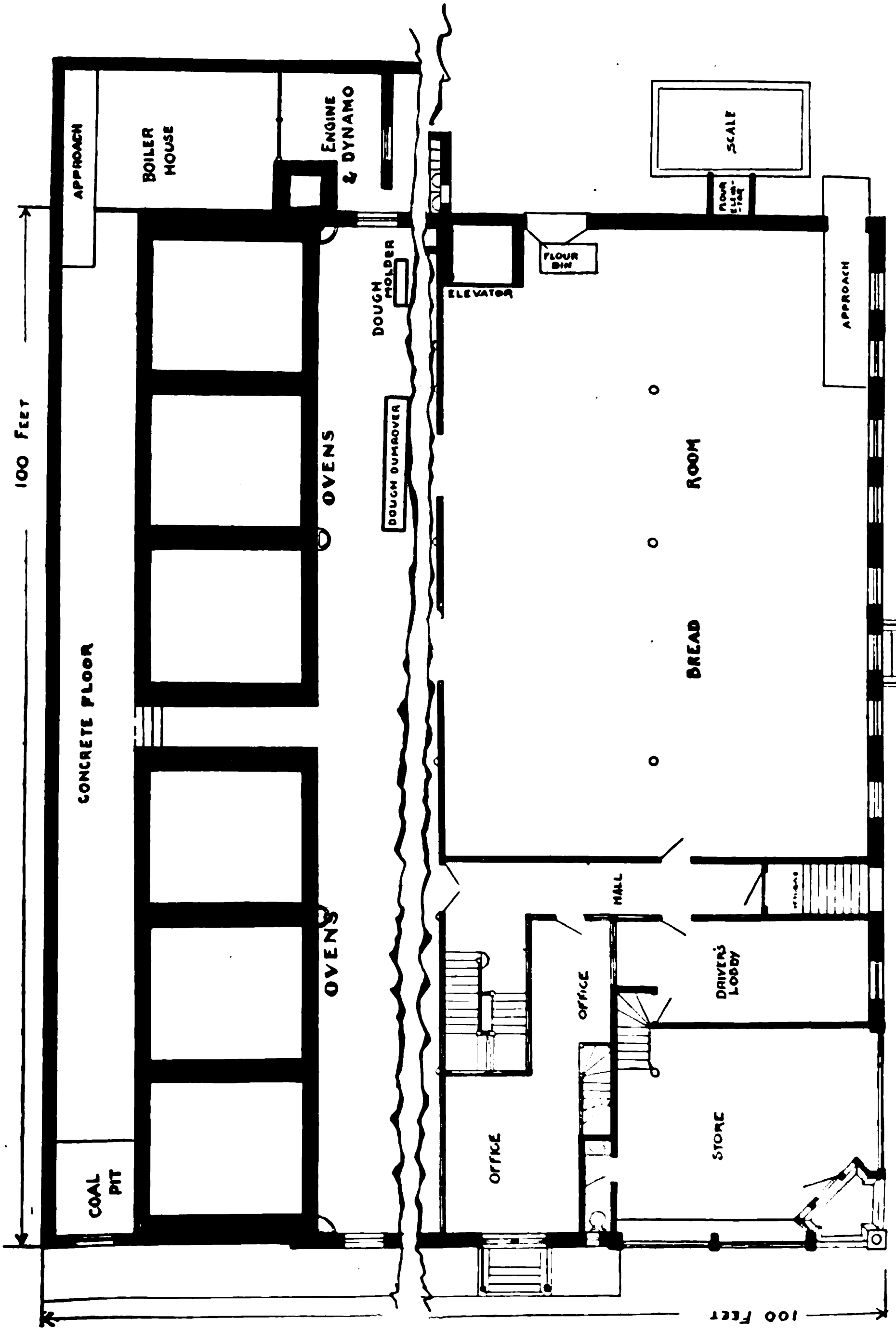


FIG. 161. J. Schmalz Sons Bakery. (1st floor)

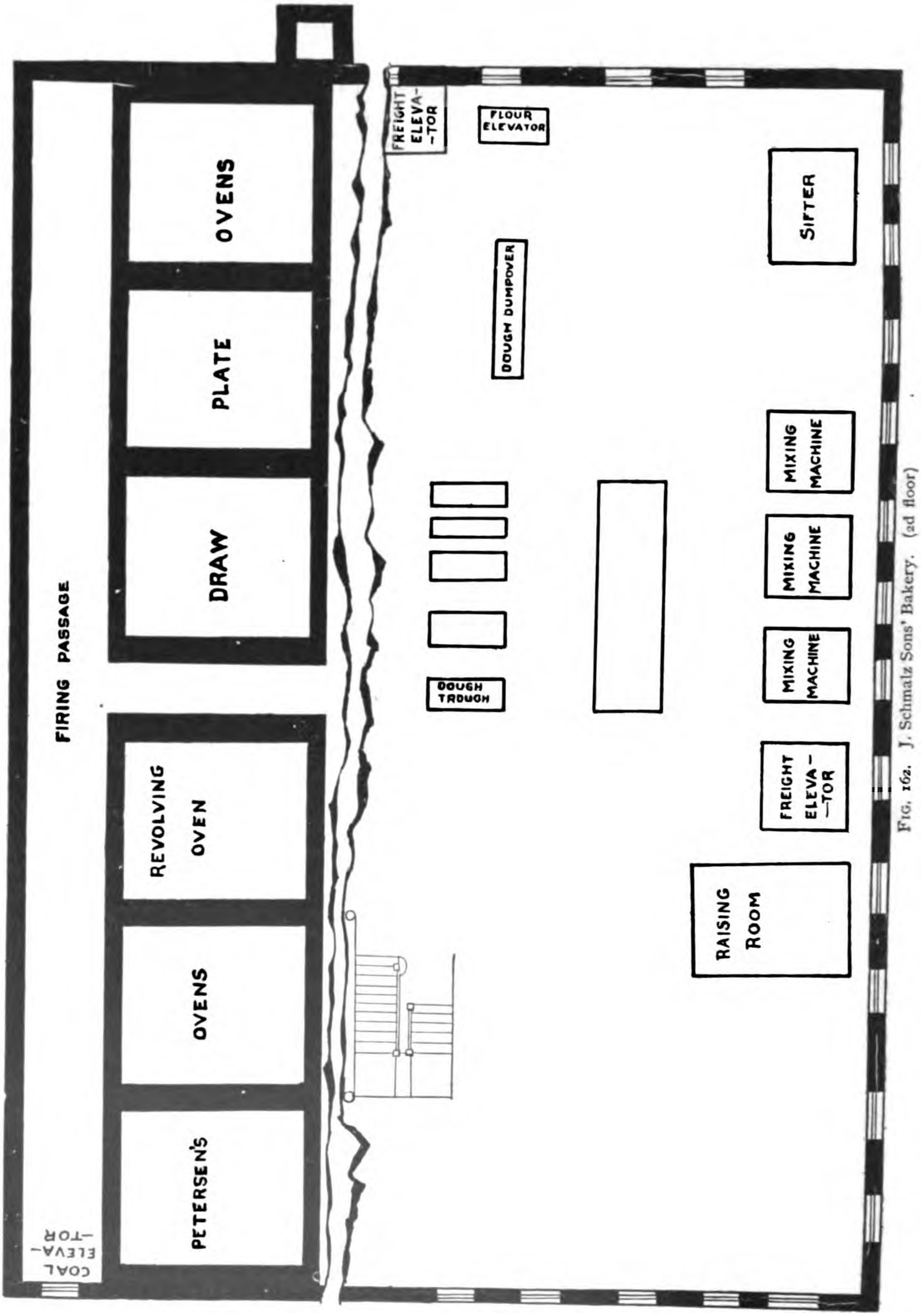


Fig. 162. J. Schmalz Sons' Bakery. (2d floor)

Mr. William Schmalz, one of the junior members of the firm, gave a very clear exposition of these ideas in an address delivered by him on the reduction of bakery expenses by the prevention of waste. Mr. Schmalz was the only member at the convention who said that he could make, and did make, cake-baking profitable, and the principal reason that he gave in support of his statement was that the business was conducted on the lines suggested above, whereby every expense was minimized, and every detail reduced to a practical, commonsense method. The cake and pastry department is in a different part of the building, removed from the bread plant, and is conducted on an entirely independent basis. The general management is different, and an entire new set of books is used for this department. In this way the operating expenses of the two establishments never conflict, and the loss in one department is never paid for by the other, as is frequently the case. Keeping them separate in this way seems to be the only logical way to make cake-baking profitable, as evidenced by this company's success. Mr. Schmalz's remarks on this subject at the convention were certainly received with unusual interest, and we hope at some future time to go more extensively into the matter, the subject being the one real knotty one that the trade has been trying to unravel for some time. A study of the methods used in the bread department, however, at the present time will do

Fig. 163.—Flour Elevator.

considerable toward making the matter clear. It's simply up-to-date bread-baking.

In the sketch shown in Plan 1 of the ovens but little space is shown for the operating room. This is due, however, to a reduction in size of the drawing, in which the scale of distance had to be overlooked. There is a clear space of 33 x 100 feet from the front of the oven to the opposite wall without pillar or post. This is unusually well lighted from each end by large windows, and is well ventilated. The story is 15 feet high and the ventilation is secured over top of ovens by a hood 8 feet high running the entire length of the building. This leaves a clear protective space of seven feet, carrying off all smell and gases and adding greatly to the hygiene of the plant and comfort of the workmen. Ashes from the oven are dumped into chutes from each oven on all floors and are carried direct to the basement without opportunity being given for them to scatter.

A very important factor to every one building a new bakery is being able to build an up-to-date establishment, small at first, but so constructed that it can be enlarged gradually from time to time in accordance with the requirements of the business, without confusion, and with the least possible expense. This problem was particularly considered in drawing plans for the building construction. As the building now stands, it is nearly twice as large in operating facilities as when first constructed. So rapidly did the business grow after the company was established in its new quarters that it became necessary to almost double its facilities within a very short time. A second tier of ovens was therefore installed on the second floor, with practically no change in foundations or other construction. The foundations for the first ovens were built with this fact in view, and the ground arches were of sufficient strength to support the new battery. The foundations are of concrete and brick. In the construction of these arches another economy is effected, the spaces being utilized for lockers and storage purposes. The entire main basement is used for storage, and is constructed of concrete, thereby preventing dampness. On the right and on the same level with the basement is situated the power-house, location of which is shown in Plan 1. Separate toilet rooms and lockers are provided for in this department, which is the neatest and one of the most well-kept ones in the plant. As much care is spent in keeping the engines, dynamos and floors clean as if the bread was made in the department. On the basement floor private lockers and bath for the workmen are provided, which, of course, have in recent years become a necessary adjunct to every modern bakery. The workmen must be absolutely clean and healthy at all times.

Another important point in the construction of that part of the building used for the ovens and baking is its fireproof nature, so constructed independent of the other building. This entire part is made of concrete and iron, and ordinarily it would be impossible for a fire to originate in this section. As is generally known, fireproof construction is too expensive for the average bakery, and by dividing this department in this manner every advantage is secured without a very large expense necessary for fireproofing the entire building. As an additional security, however, two fire lines with city pressure run through the entire building, with outlets on each story. With these safeguards it would be hard for a fire to gain much headway if discovered in reasonable time.

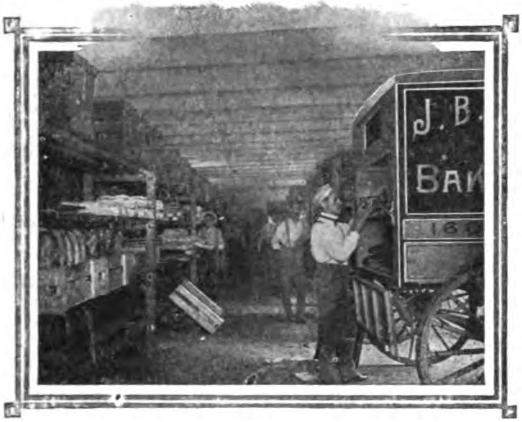


Fig. 164.—City Loading Yard, No. 3.

Plan 2 shows in reduced detail the general plan of second floor. On the right are three Werner & Pfleiderer draw-plate ovens, and on the left is shown two Petersen ovens and one revolving oven built by the Dutchess Tool Co. These latter are used largely for the cake and pastry department and handled in the establishment used entirely for this purpose. The freight and flour elevator are shown on the right and the stairs on the left of the sketch. A portable raising room is also shown on the left, which can be moved around as desired. These ovens are operated on the same principle as the ones described on the first floor. The row of large mixing machines are also shown in Plan 2, which do the work of the entire establishment. The sifter, leading from the top floor, is also shown, the flour being delivered direct to the mixing machines by an automatic weighing device which travels on an inclined railway above the mixers. This weighing system is one of the most economical contrivances for the reduction of expenses that has yet been invented for the bakeshop. All ingredients used in each batch of dough are automatically weighed by the scales before entering the machines. This includes water, which is filtered, weighed and dumped from a fifty-gallon tank. This results in great economy and reduces the result of each baking to an absolute certainty.

The top floor is used entirely for a stock room and carpenter and repair shop. Several expert workmen are constantly kept busy in this latter department, which is self-supporting, and, indeed, a profitable one. Nearly all of the wagon repairing is done here, and it can generally be counted upon to be done well. All of the company's bread boxes and pie cases are also manufactured in this department, and the results secured are frequently more attractive, and certainly more durable than can ordinarily be obtained for the same expenditure of money. A well equipped laboratory and testing-room is also maintained on this floor in which all materials receive careful consideration before entering into the company's products.

In order to obviate the necessity of a fourth story, which would have been required for the sifting and flour bins, a dome was built of light construction directly over the mixing machines for this purpose, thereby completing the common-sense principles followed throughout the establishment from cellar to dome.

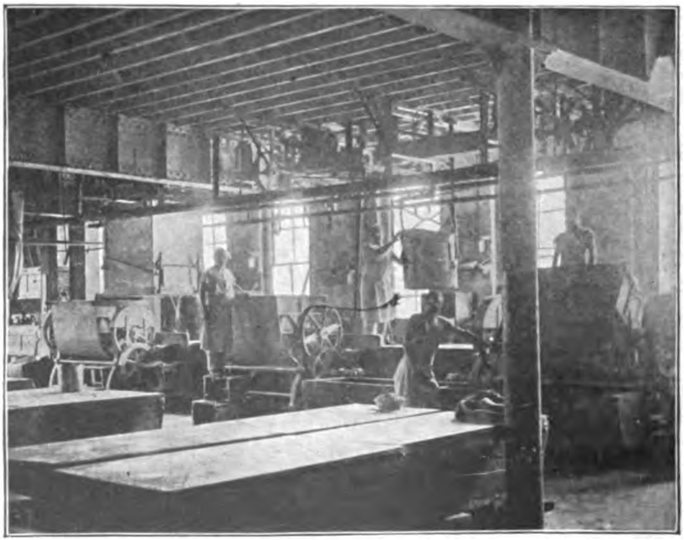


Fig. 165.—Flour and Water Scales. Schmalz Bakery.

Holland.

Translated from Original Reports Furnished by DIR. DR. ROETERS VAN LENNEP (de Haag'sche Brodfabrik), Gravenhage.

It is impossible to give the exact number of bakeries in Holland, but there may be about 3,000. According to numbers the small bakeries predominate, but if the entire production of the whole country is considered, the main part of it must be ascribed to the large bakeries. Especially in the larger cities, the steam bakeries, or bread factories, are the most numerous, and it is only in the smaller cities where there still exist many small bakeries. In Zütphen, a town with a population of 16,000, some years ago there existed fifty-six bakeries and a bread factory.

ORGANIZATION.

Holland has a central organization of master bakers named "Nederlandsche Brood Kocken-and Banketbakkersbond," with offices at Amsterdam, which consists of the small and a good many of the medium size bakeries and has a membership of over 900. The president of this organization is at present Mr. H. Franken, who is assisted by the son of the former President Siemons, who is well known by the trade throughout Europe. This organization maintains an official paper, the *Nederlandschen Bakkers-Curant.*

FLOUR AND FERMENTATION.

Principally brands of flour from domestic mills are used, but besides this principally American wheat flour is used in baking.

In Holland the white milkbread is mostly in demand, in the country districts and in the provinces of Groningen, Oberyssel and Gelderland rye bread is the principal staple.

In Rotterdam, Dordrecht and S'Gravenhage water bread instead of white milkbread, like that used in Belgium, is made and sold very cheaply.

Fermentation is exercised only through yeast, by making a ferment or sponge and kneading it into the dough.

As specialties we may mention "Kadetjes," small, soft milk rolls, Haag's rye bread, and sweet Haag's rye bread made with molasses.

The principal kinds of bread used in Holland are enumerated below, and which are illustrated on color plate 6 (Vol. I.).

1. Gebuild Tarwen melk brood (Bolted wheat milk bread, baked in capsules, weight, 1 kilo (No. 1, plate 6).

Fig. 166.—Bread Room (P. C. Kaiser's Bakery, Hague).

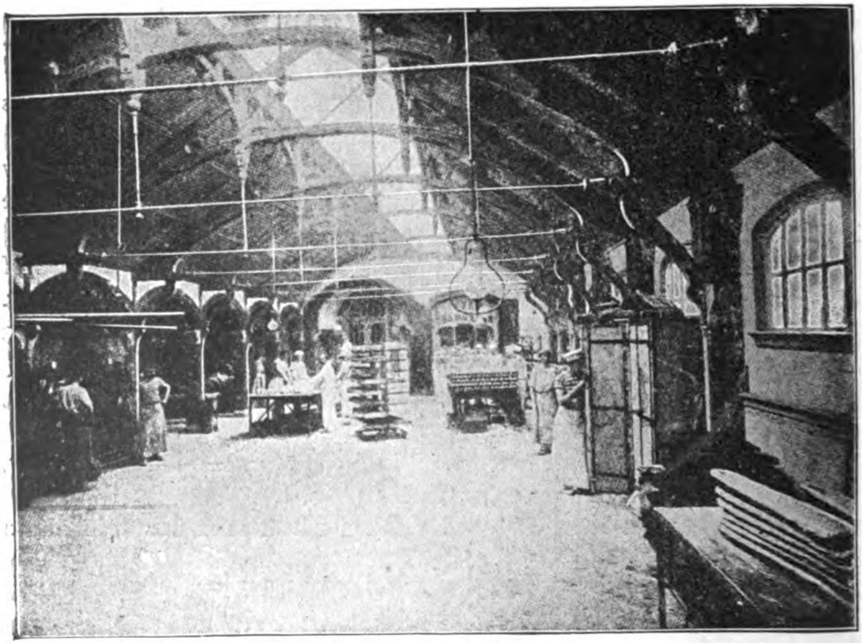


Fig. 167.—General View of Oven Room (P. C. Kaiser's Bakery, Hague).

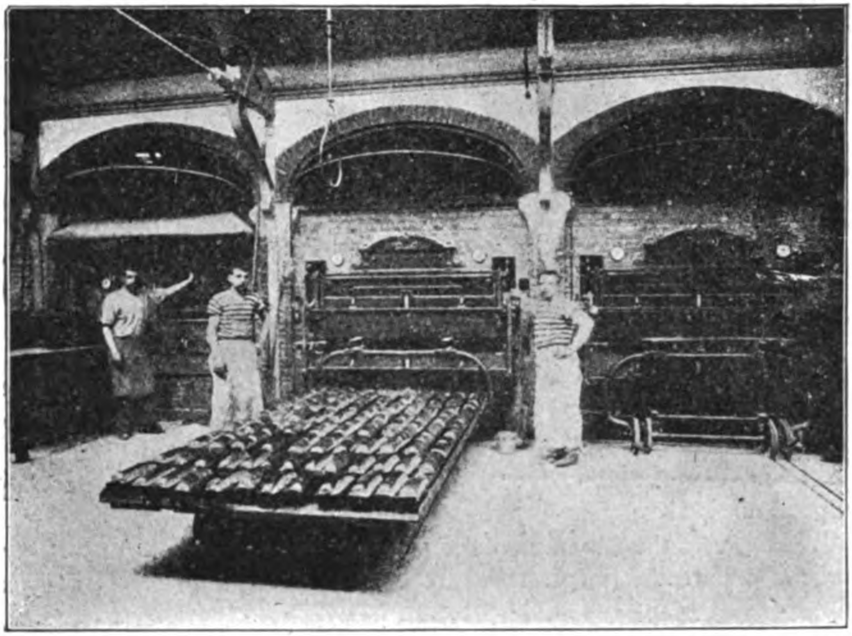


Fig. 168.—Baking Room (P. C. Kaiser's Bakery, Hague, Holland).

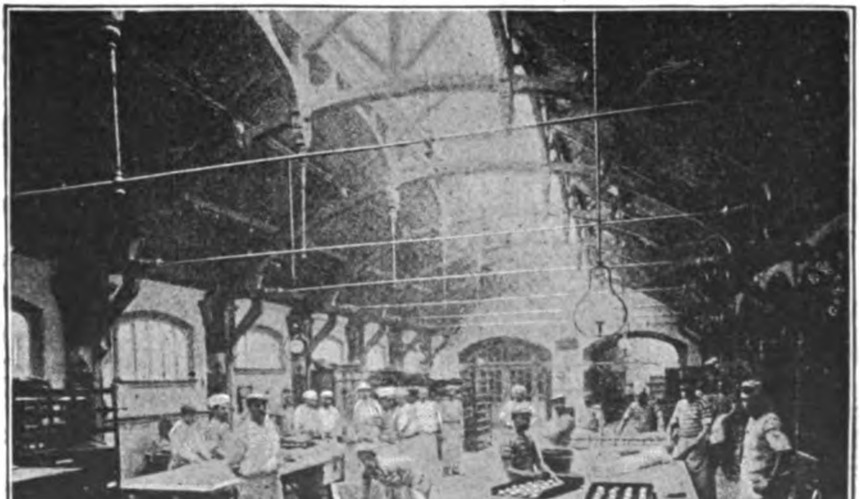


Fig. 169.—Bakehouse (P. C. Paul's Bakery, Hague).

2. The same bread, but baked on the hearth, weight 1 kilo.

3. The same bread, fluit: called flute, weight, 1 kilo.

4. Gebuild Tarwewater brood; bolted wheat bread, baked on the hearth, weight 750 grams. (No. 2, plate 6).

5. The same bread, fluit; called flute, weight, 750 grams. (No. 3, plate 6).

6. Gebuild Tarwemelbrood, geknipt fransch brood, weighs 50 bolted wheat milk bread, French bread cut with a pair of scissors (No. 6, plate 6).

7. Melkkadet; small milk bread, price one-half cent (No. 9).

8. Waterkadet; small water roll, price, one-half cent (No. 8).

9. Haagsch Soet Roggenbrood; Haag's sweet rye bread, weight, 1 kilo (No. 7, plate 6).

10. Vienna bread, "Casino," weight, 500 grains (No. 4, plate 6).

11. Ungebuildbrood or Kropbrood; unbolted coarse. bread, weight 500 grams. (Nos. 5 and 5a, plate 6).

Some of these breads are reproduced on colored plate 6, and the numbers in parenthesis correspond with the numbers on the colored plate.

Recipe to 1, 2, 3, 6.

One hundred kilos bolted white wheat flour; 2 kilos yeast, 2 kilos salt, 50 quarts milk, not skimmed.

The bread *"fluit"*; flute is baked twice, i. e., turned in the oven, so that all four sides get a crust.

Recipe to 4 and 5.

One hundred kilos white wheat flour, bolted, 2 kilos yeast. 2 kilos salt.

This bread is also manufactured in great quantities in Belgium.

Recipe to 7 and 8.

To each one kilo flour take 30 grams yeast, 20 grams salt, 20 grams sugar, 20 grams butter and sufficient water and milk.

Recipe to 10.

This Vienna milk roll, "Casino," called after its inventor, a baker with name Casino, is baked in tin capsules and is used for sandwiches.

For 10 kilos flour take 8 quarts full milk; otherwise the recipe is the same as for 1, 2, 3, and 6.

Recipe to 11.

Equal parts bolted and unbolted wheat flour and 2 kilos yeast; also 2 kilos salt for each 100 kilos flour.

RECIPE TO 9.

S'Gravenhagsche sweet rye bread is a bread made from coarse ry flour with an addition of molasses, that remains in the oven for about 18 hours and sprinkled with buckwheat bran.

Belgium.

About 2,000 bakeries are in existence in Belgium.

According to numbers the small bakeries predominate, but according to quantitative production the large bakeries furnish without doubt the biggest part of the daily output. In cities like Brussels, Antwerp, Ghent, Suttich, there are from four to five bread factories for each, some of which are of tremendous capacity. It is characteristic that in Belgium the largest bakeries are in the hands of political parties. Thus, there exist in Antwerp, for instance, a liberal workmen's bakery, a moderate socialistic workmen's bakery and an extreme socialistic workmen's bakery, a bakery of the liberal citizens' party and one of the Catholic citizens' party. All these bakeries are large establishments and in each more than 10,000 kilos of bread are manufactured every day.

ORGANIZATION.

The master bakers, exclusive of the bread factories, form a syndicate, l'Union syndicale des patrons boulangers.

FLOUR AND FERMENTATION.

Wheat flour is most largely used, domestic as well as American. Rye flour is used only in small quantities.

Pain de Benage (housebread), weighing one and two kilos, is manufactured in great quantities; this bread does not present a very inviting appearance, but is, nevertheless, made of a good quality flour. In restaurants the large French bread, as shown on Fig. 170, is consumed. Pistolets and other breakfast rolls are baked in the large cities in great diversity. During Christmas time Speculation is manufactured in enormous quantities.

Mr. J. Speltinckx, the director of "Volksbelang," Ghent, had the kindness to furnish us the following kinds of bread, which are illustrated on colored plate 13:

Fig. 170.—French Bread.

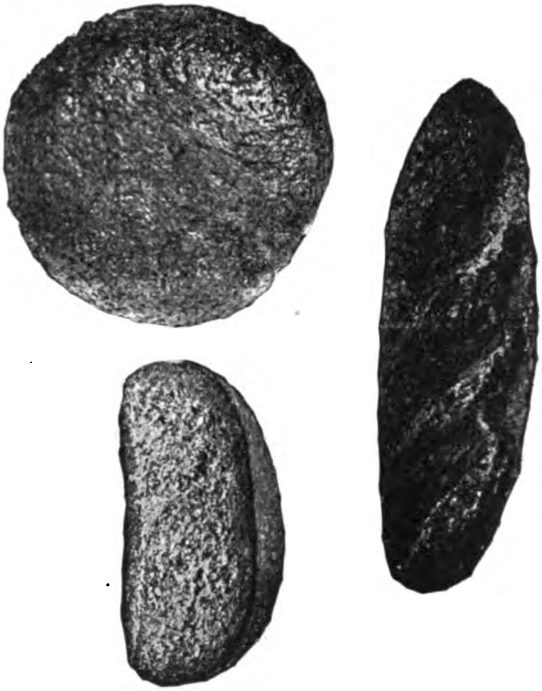


Fig. 171.—Rye Bread. (Avedyk).

Fig. 172.—Fine Bread. (Slashed).

Bread from Belgium.

1.—Galette—fine cut wheatbread.
2. Pain mélée—mixed bread.
3. Fluit—flute, long, torn wheat bread.
4 and 5. Pain de ménage—common house bread.
6 Raisin bread.
7. Impératrice—Empress rolls, small milk rolls.
8. Pistolet—small wheat bread.
9. Raisin wheat bread.

CO-OPERATIVE BAKERIES IN ANTWERP.

Many of the bakeries in this old city are of a curious co-operative and political nature which hardly have their counterpart anywhere else. One of these bakeries is known as Help u Zelve. This bakery has a large hall attached. The ground floor of the hall serves as a café. In the upper part are meeting rooms and a hall with a stage. This room has a seating capacity of some 2,000 people. The society has a gymnastic club, a choral and dramatic society, and a brass band. One or two meetings are held weekly in winter. The society is divided into 42 sections in different parts of the city. Each section has its own headquarters and its own convenient café where frequent meetings are held.

Originally Help u Zelve was a mutual aid society. Any man from 16 to 45 years can be a member. There are now 3,500 active members in the mutual aid society. The members pay half a franc, say 10 cents a month. In return for this they are entitled to the services of a doctor and the necessary medicines when they are ill. They also receive 1.5 francs daily compensation while ill and free burial. The Help u Zelve Co-operative bakery was started by the mutual aid society of the same name in 1897, the mutual aid society itself having been started in 1880. The bakery was started by 800 shareholders who contributed ten francs apiece. The bakery has shown a profit and each shareholder has received back five francs. The bakery has 13,000-odd customers, and these customers share to some extent in the benefits of the mutual aid society. They receive medical advice and physic gratuitously for themselves and their families, and in case of illness they receive one loaf of bread of one kilo daily. To attend to the wants of their customers the society has arrangements with seven physicians, also with one dentist and one oculist. Its apothecary's bill for the last six months was 3,084 francs.

The method of selling is this: The customer pays thirty centimes, about six cents, cash for each loaf of one kilo. The distributer gives the customer a ticket for nine centimes for each loaf of bread purchased. At the end of every six months these tickets are redeemed in cash. The sum of 195,777 francs was returned to customers by the society in the six months ending February 28.

The establishment is commodious and well arranged. In the oven rooms are eight large Double-Deck Straw-Plate Ovens, each capable of baking 236 loaves at a time. The largest trade is on the round loaves known as "*pain de menage*," though the bakery also makes a certain quantity of a bread known as "*pain du luxe*," which is made of the same dough, but each loaf is placed in the oven separately so that it is baked with a crust all round. *Pain de menage,* on the other hand, is made by placing the loaves close together so that there is a crust at the top and bottom, but none at the sides. The operation of loading up the oven as well as of taking out the finished loaves are accomplished very conveniently by means of a rolling platform which slides in and out of the oven. These platforms are pulled out of the oven, loaded up with bread, and then pushed back again and the oven door closed. When the bread is baked the platforms are again pulled out and a man with a peel board rapidly removes the finished loaves.

Adjoining the ovens are the large mechanical dough kneaders and the gas engine for driving the machinery. Next to this is the room where the dough is weighed and molded into shape. This operation is done by hand, but machines for doing the work may be added later.

Over the bakery is a warehouse capable of holding 3,000 sacks of flour. In one corner of the warehouse is a room in which the sacks are shaken. After being shaken the sacks are run through a sort of beating machine for removing the last trace of flour. The flour obtained from shaking and beating the sacks is used for making dog bread, as it is too black for bread dough.

The bakery has twenty-five porteurs or distributers, each with his cart and two dogs. It allows each porteur one loaf of dog bread daily. The carts hold from 500 to 600 loaves.

Adjoining the bakery proper is a fine warehouse. On the ground floor are a number of compartments separated by wire netting. There is one compartment for each porteur. The bread is run into these compartments on trucks and each porteur is made responsible for the quantity of bread delivered to his compartment. Overhead is a fine storeroom, with a capacity of 4.000 sacks of flour. The building has a tiled roof and a large water-tank, where the rain-water is collected. This is used by the men for washing and for various purposes about the establishment, but not for making bread.

In the office an accurate record is kept of all the transactions of the bakery. The list for one day shows that 21,981 loaves of one kilo had been baked on that day. The ingredients were 17,400 kilos of wheat flour and 106 kilos of rye flour; also 247 kilos of salt and 161 kilos of compressed yeast, known there, as in England, by the name of Dutch yeast. According to the balance-sheet of February 28, the assets of the company amounted to 947,783 francs. The principal items were property, including ground and buildings, 676,431 francs, and bakery equipment, 123.034 francs.

A still more imposing building than that of Help u Zelve is a bakery known as Het Beste Brood, in the Napelsstraat. This bakery has but six ovens instead of eight, as in the Help u Zelve bakery, and it is not so much of a political society as Help u Zelve. Het Beste Brood has 200 shareholders, the shares being at 100 francs each. The shareholders are entitled to four per cent. and the rest of the profit goes to the society. Its customers number about 8,000. It sells its bread nominally somewhat cheaper than Help u Zelve, but the rebate given is smaller and the price is brought down to the same net price. From the copy of the rules it appears that every member, who for the period of a year has taken all the bread necessary for his household from Het Beste Brood bakery, shall in case of sickness during ninety days in the year receive his bread free, reckoned at one loaf per day. If he takes less than seven loaves per week he only receives so much bread as he generally uses. The society is formed by the customers who take their bread from the bakery and subscribe a franc for a sort of membership book.

These co-operative bakeries were started by the socialists and specially by the advanced socialists. The latter have a society and a bakery called De Wacht. The socialists have one called De Werker. There is also another large bakery in Antwerp called the Groote Bakery. At Ghent there is a very large co-operative bakery known as De Vooruit, and there are large co-operative bakeries at Mons, Liege and other Belgian towns. Naturally the smaller bakeries suffer from the competition of these large establishments, and the middle class rather object to them, but the bakeries of the liberals and of the conservatives were somewhat forced into existence by the establishments of the socialists. The socialist bakeries endeavor to establish a reserve fund for strikes and to supply bread free to their customers during strikes.

Nothing but Belgian flour is in the warehouse of Help u Zelve; though some American flour is used, which has given satisfaction. The Belgian bakers do not pay much attention to the yield of bread obtained from flour, but more to the actual cost of the flour. The flour purchases are regulated by a committee of three of the directors.

The above sketch is extracted from an article of Mr. Kingsland Smith, in the *Northwestern Miller*.

Baking in Italy.

By Messrs. Del Negro and Parrocchetti, Milan.

It is impossible to give the exact number of bakeries in Italy, as there are absolutely no statistics of the trade, besides this, there is considerable home baking done in the country districts.

Small bakeries predominate; without doubt. large bakeries are few and far between; they are principally in the seacoast towns, such as Genoa, where there exists a large ship's cracker bakery. Outside these towns large bakeries only exist in Lombardy. There some of the bakeries are somewhat up to date, although many parts are still of the most primitive character. In the other parts of the country large bakeries are a rarity, being for the most part consum bakeries or bakeries belonging to large flour mills. It is, therefore, very difficult in Italy to drive the small bakeries to the wall, because customers are used more than anywhere else to have bread delivered in small quantities at the house and expect long-time credit.

As we have already said, there are several large bakeries at Milan, equipped with dough-mixing machines and partly, also, with steam ovens. For the largest part, the old-systems ovens are in use, even there where dough-mixing machines are a necessity (on account of the very stiff doughs that are peculiar to Italy).

In Italy work is also carried on during the night. In bakeries, where both common and fancy bread is made, the two branches are kept separate.

ORGANIZATION.

In almost every city the master bakers have some sort of organization, but there exists no national organization in Italy.

In Milan all the proprietors of bake ovens have formed a close co-operative society, which takes care of the members' interests and transacts whatever business is necessary with the city government. The society also fixes the average weekly market price and settles on the bread prices after consultation with the city authorities. All differences between employers and employees are settled by the executive committee of the society.

A very progressive step, which has rendered bakers good service, has been the establishment of a flour-testing laboratory, under management of a capable chemist, who has to examine all flour submitted as to its moisture or absorbing qualities.

Judge Luigi Baroni, councilman of the city of Milan, is the leading spirit of the master bakers' organization at Milan. and who has the interest of the baking fraternity at heart and has already rendered good service to them.

FLOUR AND FERMENTATION.

Rye flour is quite, if not absolutely, unknown to the Italian baker, but considerable common wheat flour is used for bread-making; in the country districts the farmers also use maize flour. The wheat flours mostly in use are No. 1 and No. 2, from which varieties the common bread is made in all kinds of shapes. For fancy breads and so-called Vienna bread flours No. 0 and No. 00 are used. For very common bread and bread eaten in prisons, flour No. 3 and No. 4 is sometimes taken.

There is very little difference in the preparation of the doughs, but there is an unlimited variety of kinds and shapes, as is the case in Tyrol and also in Spain. Without doubt Italy carries off the palm in the matter of variegated and fantastic bread-shapes. On colored plate No. 14 a number of these are shown, which were furnished by Messrs. Verga & Molteni, bakers at Milan.

The doughs, from which bread is made, are as a rule very stiff; the percentage of water being hardly 30 per cent. Only in Milan and Courd bread of less density is made. To properly work these stiff doughs dough-kneading machines are a necessity; very often bakers are compelled to use roller machines, which have also to serve as dough-breakers. Strong, well-built machines for very stiff doughs, as they are well-known in Germany and partly introduced into Italy also, would work this stiff dough without the addition of rollers, but they are not so well known. As bread is made from wheat flour and is very dry, only bread of little weight can be manufactured. because bread of greater weight would dry out too quickly and become unpalatable. 100, 200 and 400 gram are the weight mostly used for every-day bread made from wheat flour Nos. 1 and 2; still smaller are the finer qualities of bread, made from flour Nos. 0 and 00.

What we have so far said, refers only to the genuine Italian bakeries, and it must not be forgotten that Italy has become quite an international country through the influence of travelers and that there are bakeries in all larger Italian cities, which manufacture all imaginable kinds of bread. especially Vienna bread and rolls. In Milan, for instance, the better-class restaurants and cafés have formed among themselves a co-operative bakery, in which all kinds of bakery goods are made according to the Vienna system. German Rye bread as well as English loaves are obtainable in Italian cities that are much frequented by visitors.

The Italian baker, as a rule, uses a sour dough, which is freshened up about every four hours. For finer bread pressed yeast is frequently used, which is obtained from Paris and from a factory in Padua. The breads pictured on colored plate 14, which are made of flour No. 0, 00, 1, 2, and 3, are Vienna bread, workingman's bread and maize bread (so-called Pane di incotura).

In the seacoast cities large quantities of a certain Zwieback (Galette) are made, which require a very stiff dough. They weigh about 200 grams each.

As a specialty peculiar to the city of Milan we mention the celebrated "Panettone." a fancy bread, made up in the shape of a beehive, which at Christmas time, is exported by certain bakeries by the carload to all parts of the country and which takes the place of the German Christmas stollen. But Panettone are also made during the rest of the year by the better class of Italian bakers. They are prepared of a very rich dough, containing plenty of eggs, butter, sugar, raisins and the very finest of flour.

We reprint herewith part of an article by Mr. Chas. A. Green in the *Confectioners' and Bakers' Gazette*. London:

BAKERS IN ITALY.

That the average Italian bread is made the worst in the world, with the possible exception of that of Greece, is fairly well known, and it has kept up its reputation well; dark in color, and made in the shape of large buns about a foot in diameter, it is about as uninviting as it could possibly be made, yet, notwithstanding this, the natives want it so badly that in many towns rioting and looting of the bakers' shops for this bread that would not be eaten in the United States is of frequent occurrence.

Parliament has reduced the duty on wheat to 5 lire, which is equal to 4s. per cwt., and the duty on flour to 8 lire, or 6s. 4d. At Ancona the bakers refused to bake bread, and the public pillaged and burnt the bakeries, so the bread had to be baked in the military ovens.

The cake and small goods makers display more taste in their productions than the trade in England, in fact, their piping and ornamentation seemed to be equal to any in France, which country is notably in advance of England, as there are many opportunities of verifying.

The bakers' ovens are exactly the same now as they were before Christ, and more than 2,000 years of the highest civilization known to human beings have passed without effect on the baker of Italy, as there is really not the slightest difference between the ovens dug out of the ruins of Pompeii and those wood burning ovens used to-day in hundreds of country places at home.

Bakeries and ovens can be seen that were buried by the dust and ashes of the volcano Vesuvius in the year A. D. 79, and one can confidently say that with a few shillings' worth of repairs it would turn out equal to any wood oven in England, and one of our own bakers would find himself quite at home with it. Near the oven stood stone corn grinding mills. The grain was poured in at the top, and the upper millstone was revolved by means of poles stuck in holes at the side, being, of course, worked by human labor.

Two bakeries have been dug out at Pompeii, of which illustrations are shown in Vol. I., and they are nearly exactly alike, and each contains stone mills for grinding corn, showing that in this town, at least, every baker was his own miller, and it will, therefore, be safe to assume there were no tied houses in those happy days.

The conditions under which the employees work in Italian bakeries are not nearly so good as in our own country. Women deliver most of the bread, and in one small Alpine town, one can see a sleigh drawn by two oxen used for delivering bread, and it is nothing unusual to see a donkey, mule and ox harnessed together drawing one cart.

A baker's tomb discovered in 1838 is interesting; it is directly in front of the middle pier of the Porta Maggiore, one of the gates entering Rome. The baker who erected this monument to himself seems to have made a considerable fortune in his trade. According to the good old custom he was not ashamed of his calling, but built a species of trophy for himself out of the utensils of the trade by means of which he had attained to wealth and respectability. The hollow drums of pillars let into the superstructure, which rests upon double columns, seem to represent vessels for measuring fruit, and the inscription found beside them agrees with this conjecture, as it states that the mortal remains of Atistia, the wife of Eurysaces, were deposited in a bread basket. In fact everything was represented that appertained to a baker's trade.

This is rendered the more interesting from the circumstance of the tools and appliances represented being in many cases exactly the same as those in use at the present time—the bakers in Italy usually adhering to the customs transmitted to them by their forefathers.

The inscription on the architrave, stating this monument to be that of M. Virgilus Eurysaces, purveyor of bread, is repeated three times. A relief of the baker and his wife are to be seen on the right of the road.

Baking in Spain.

Translated from the Original Reports of MR. FRANCESCO HENCKEL (Firma G. Daverio) Barcelona.

It is impossible to give the exact number of bakeries in Spain as in that countries all statistics concerning the baking trade are missing. The city of Madrid, with a population of 450.000, claims about 280 bakeries. Compared with other countries, the progress in the baking industry is not manifest, as the Spanish bakers in Spain have been away behind the times.

The more south one gets, the more manifold becomes the shape of the sour bread, also smaller; in the country, though, round loaves of from 1 to 2 pounds are used almost exclusively.

A beautiful and rich collection of bread used in the capital, Madrid, the "pan de familia," has been furnished through the courtesy of Mr. Francisco de la Fuente, proprietor of the "Fahona de las Descalzas," and purveyor to the royal household.

These different breads are illustrated on colored plate 18, and are: *No. 1, libreta (from pound; Spanish, libra)*; *No. 2, pan de Castilla; No. 3, pan de Castilla; No. 4, Colones* (from Christopher Columbus); *No. 5, bonete* (from bonnet); *No. 6, trensa* (tresses); *No. 7, pan rajado* (split bread); *No. 8, rosca* (pretzel); *No. 9, panecillo* alto, or pan de taverna (high bread or wine-room bread); *No. 10, panecillo largo, or pan de mesa* (long bread or table bread).

Besides these there is a bread, "*bizcochata*," used, of almost similar shape as the Berlin Kneuppel, only a little broader, but of the same weight and color as all the rest; and the "*panecillo pinchado*," a round bread which has been pierced by a needle.

These different kinds of bread are used by families, be they rich or poor; with the exception of No. 10, they are all made of the same flour resp dough, and are characteristically Spanish.

Generally they weigh 250 grammes, loaves of larger weight, as for instance No. 1, are not so much in demand; those of 500 grammes very seldom.

The flour used is pure wheat flour from so-called soft wheat (65 to 70 per cent. drawn). The *panecillo largo,* No. 10, is very similar to the so-called French bread, and is highly esteemed by the public. It is baked three times daily, while the other bread is fresh only once or twice a day; the people generally prefer to ach the bread warm, and that is the reason why it is not salable the second day.

Bread No. 10 differs from others mainly in that the so-called strong flour has been used for making it with less sour dough, but with more water.

Besides these characteristic kinds of bread, "pan de lujo," "pan de Vienna," *i. e.,* luxury bread, Vienna bread, French bread, Imperial rolls, etc., are manufactured in all kinds of shapes, which are well known to most of our readers.

For the manufacture of these luxury breads, French or Austrian workmen are preferred.

Large bakeries are only found in some industrial centers; machines and bakeries working with machines of any consequence exist only in Bilbao and Gijon. In the first named city there are two bread bakeries with a daily capacity of 100 meter-zentner flour each. In this case wholesale manufacture is forced by the circumstances that bread of one and two kilo weight is most in demand.

Altogether different from this it is in Barcelona, where only small bakeries exist, and machines, such as dough-kneaders, dough dividers or modern bake ovens, are an unknown quantity. Experiments with modern bake ovens and machinery have proven fruitless, as there exists a certain prejudice, however unjust, against machine-made bread. Still, people demand a bread that looks well and has been well baked.

In Madrid, as also through the whole central and southern portion of Spain the small bakery predominates.

Mr. Francisco de la Fueoto, probably one of the largest bakers in Madrid, employs about twenty-five hands; but with the exception of a pair of rollers for the Spanish bread, everything else is worked by hand.

The same conditions prevail in all other bakeries. Wherever kneading machines are used, they are only so-called, as they are in reality nothing but mixing machines.

In a stationary tub (arranged to half topple over) an axis with iron fingers revolves, which mix the mass for about fifteen minutes; after this the dough is worked out by means of a pair of rollers. These are very primitive rollers with a horizontal, smooth pair of rollers; the dough, which is fed in from above is taken away below by hand and put again between the rollers. This operation is repeated about a dozen times, until the dough has a uniform consistency and is ready for further manipulation. This is therefore more like a biscuit dough, and the bread, in consequence, looks very much like biscuit. The motive power for such machines is usually furnished by mules or hand power; lately gas has been utilized and electric motors find their way into the bakeries. This roller machine is found throughout Spain and seems to be absolutely necessary to obtain the stiff consistency needed for the Spanish bread.

The loose dough is almost exclusively worked by hand, for the reason that good kneading machines are as yet unknown in Spain.

To offset this, there exists a machine called "Fresadora," which may be useful enough, but which, on account of its high price is not introduced frequently. The dough passes through a pair of rollers, which are not smooth but provided with wave-like grooves, and falls upon an endless ribbon, which conducts the dough on a second pair of rollers opposite the first one; after passing through this second pair of rollers, the dough again falls upon an endless ribbon, which runs next to the first one, to be conducted again through the first pair of rollers. Through being carried along in a thin sheet (about two to three cubic metres) on the ribbon, it is intended to aërate the dough. In this way the dough passes through each pair of rollers about ten to twelve times, gets a nice, brilliant appearance and becomes quite elastic.

Such a machine is not suitable for large bakeries, as it would take almost an hour's time to work through dough weighing about 200 kilos on the machine. Motive power needed, one horse-power.

There are very few bake ovens of modern construction in existence; almost all have stone foundation and arches, with a direct wood fire. A well-known brand of coal ovens is that called "Urpi," invented by somebody in Barcelona, which has a fireplace sideways, *i. e.*, to the right or left; next to the opening there is a fireplace on both sides; the fire goes directly through the oven, which can only be worked after the fire has burned down.

A quite well-known oven is the one manufactured by J. Srala in Bilbao, with round, movable base, *i. e.*, turning around on axis, made of fire-proof stones, thus it is similar to the system Boland.

There is no national organization of all the Spanish master bakers. In almost every large city there exists a "gremium," a local organization of master bakers, to protect their interests; but the workmen are also organized and strikes are of frequent occurence.

A general trade paper does not exist anywhere; only lately a baker journal, *El panadero,* has been started which is a private enterprise.

Something which exists nowadays only in large centers, is the rule here: that after a short while ago every large baker owns his own flour mill for private use only; many still stick to this custom, while some have their flour milled in the great, newly established mills or buy the ready flour outright.

Of late the Spanish baking industry is making greater strides forward, and especially is this true about the milling industry during the last ten years. New and excellent mills, especially in the coast cities, have been erected, for instance, at Barcelona, Valencia, Bilbao; and yet the interior has not stood back. So we find at Saragossa,, Madrid, and Valladolid, modern and up-to-date milling establishments. As these are mostly new works with steam power, it is evident that without exception the roller system was introduced.

The celebrated windmills of "La Mancha," against which once upon a time the renowned Don Quixote fought, have long since ceased to exist; the stones and milling gangs seem also destined to oblivion, except in out-of-the-way mountain hamlets; for, also in roller mills there are no stones used for certain operations, as is the case in some countries.

Inasmuch as only a few grades of flour are in demand, at most only three, sometimes only one grade, the whole milling system could be very much simplified and is almost everywhere quite automatic.

In the mills just mentioned wheat is almost exclusively milled; in the coast cities much wheat from foreign countries; flour is protected by an import duty of 12 pesetas—about $2.40 per 100 kilo.

Very little rye bread and maize bread is consumed, and only by the mountaineers of Galicia and Austria and the people in the country districts generally.

Flour is pretty high-priced and costs nowadays: Ia wheat flour, 65-70 per cent. drawn, from 38 to 40 pesetas (1 peseta equal to 20 cents), 100 kilo for so-called soft flour, and from 42 to 44 pesetas for strong flour (made from Russian or Aragon wheat). In consequence of this, bread is not very cheap and costs in cities like Madrid, Barcelona, Valencia, etc., 30 centimos (6 cents) a kilo for the so-called "pan de Familia," or family bread.

The Spanish baker generally uses a sour dough which, according to the weather, has to stand from 15 to 20 hours, after which time it is freshened up three times through the addition of water; the last freshening-up takes place two hours before it is used. The worked-out bread is left standing in the bake-room for about 20 to 30 minutes before it is put in the oven; the water used is fresh, that is, just as the well or the city hydrant furnishes it. Time of baking from 40 to 45 minutes.

For the preparation of the so-called "luxury" bread, artificial yeast, "levadura," is used, which arrives almost daily fresh from Paris.

The so-called "pan de Castilla," or Kastilian bread, is not as generally consumed as the "pan catalan," or Katalonian bread, which is similar to French or Belgian bread.

For explanation we may say that the "pan de Castilla" is made from soft domestic wheat flour, worked with sour dough and little addition of water, only about from 30 to 35 per cent. It is solid and without holes, and very little kneaded; but it is also without gloss because no steam is used in the oven; the color of the bread is light.

In Barcelona the so-called "pan de casa," house bread, in loaves of 1, 2 and 3 pounds, is more generally used, in round or long shapes. Besides this, small breakfast and restaurant bread, Vienna bread, etc., are consumed, as in all other countries.

Baking in Norway and Sweden.

Translated from original reports of MR. H. HANSEN, Christiania.

There are about one thousand bakeries in Norway, not counting the home bakeries.

Small bakeries everywhere predominate; but since the year 1895 machines and steam ovens have been introduced into many bakeries of Norway, thereby making a beginning with the manufacture on a large scale.

Up to the year 1899 only local associations were in existence, but in that year a national organization, with local associations as subordinate branches has been perfected.

The national organization is managed by an executive committee, consisting of seven bakers selected from the different parts of the country, namely, Christiania, Christiansund, Havanger, Bergen, Trondhjem, with offices in Christiania.

Rye flour of finest grades and wheat flour from American, Hungarian and German mills are commonly used.

The kinds of bread mostly in demand are: Rye bread, wheat bread, rye zwieback, wheat zwieback; outside of this the Norwegian bakeries show many varieties, and lately many foreign kinds of bread have been introduced, especially as luxury bread.

For rye bread sour dough is most commonly employed; otherwise compressed yeast is used everywhere.

The most important specialties of the Norwegian bakery, the rye bread so-called household bread (Hüsholdningsbröd), also the fülekager (Christmas cakes), Vörterkager (Spice cakes), and Franskbröd.

On colored plate 16 the following specialties are illustrated:

1, The new bread used by the army; 2, Franskbröd (price 4 cents); 3, Franskbröd (price 1½ cents); 4, Franskbröd; 5, Hüsholdningsbröd (household bread with an addition of bran); 6, Fulekager (Christmas cakes); 7, Franskbröd (price 6 cents); 8 and 9, Vörterkager (Spiced loaf).

About the conditions existing in the bread and cake bakeries of Norway, Dr. J. Reichborn-Kjennerud, an officer in the health department, has issued a small book in 1895, which had quite some influence as far as sanitary improvements in the bakery business were concerned, because it laid bare quite a good many nuisances, which the author had come across in the course of his extended experience. The health department then took hold of the matter and exercised a strict and often unjust supervision over the bakeshops and the conducting of the baking trade in general. Notwithstanding this, Norwegian bakeries pushed rapidly forward and will, on an average, stand a comparison now with the best in many other countries of Europe.

The first model bakery in Norway was equipped in the year 1895 by Werner & Pfleider, Cannstatt, for H. Hansen in Christiania, which has proven eminently satisfactory and has been widely imitated.

Fig. 173.—Label for Spicebread.

Dr. Kjermerud never lost his interest in the baking industry, and became an ardent champion for the introduction of a new rye bread; which has been tested during the army manœuvres. This new bread (No. 1, colored plate 16) is somewhat similar to the rye bread popular in South Germany and Austria, and is made from pure rye flour of 23½ Kleienabzug, fermented partly with sour dough and partly with yeast, put in the steam oven and afterwards fully baked with open drafts. The bread is very well received everywhere, and it is preferred to the old style kind.

a. Gerstal bread (Hüsholdningsbrot) is made either with sour dough or with yeast, formed into oval shape, then put on boards, and after a short proof on the boards, pushed on the boards into the oven between two fires so that the loaves get a thin, leather-like crust; after this it is cut on the bottom, turned over, washed on top, cut across with three or four slashes, put in an oven well heated and well baked. It is a nice bread of excellent flavor, but it is difficult to get it fresh as it easily dries out quickly, and as the boards on which it is placed first, are always burned, it follows that those bakeries where this kind of bread is made do not look as clean as the others.

b. Fulekager (Christmas cakes). Take one quart good milk, 500 grams raisins, 250 grams Sucade, 500 grams butter, 250 grams sugar, some spices, the best American or Hungarian wheat flour and compressed yeast. The dough is made up round, cut on all sides, flattened in the center, then washed with egg and baked in the oven after the bread.

c. Vörterkager (Spice cakes) are made from one-third wheat, two-thirds rye flour, one-half quart cane syrup to one quart of water, and yeast. Spices may be added to taste.

d. Franskbrot (French bread) is a roll dough, made from milk and finest wheat flour.

A Norwegian specialty, especially in the neighborhood of Bergen, are the "Vand Kringle" (water pretzels), shown in Fig. 174. They are

Fig. 174—Water Pretzels.

made from wheat flour with a little yeast, salt and water and the dough worked very stiff like zwieback dough, which is usually done by a brake. After forming them, the pretzels are cooked and baked in steam, same as the Laugenpretzels. These pretzels are baked in great numbers in the western part of the country and taken along on long fishing trips as staple bread.

A Swedish specialty, which has also found favor in Norway, is shown on Fig. 175, and is called:

Fig. 175—Knakkebrot.

Knakkebrot. This is made from flat-milled, very short rye meal, worked up with yeast, and is worked cold and thin, so that the dough is like grits. From this dough pieces weighing about 10 ounces are broken off, rolled out with a roller with edges which fix the thickness of the cakes, then primed through with another roller, which is provided with nails (docker). After this the dough is cut in round or square pieces and a round piece cut out of it, in centre or upper half, and put in the hot oven. After being baked, the bread is strung on long poles and kept in a drying-room until thoroughly dried out. In modern bakeries chain ovens for baking and kneading machines for the kneading of the dough are used. The rolling and pinning, as well as forming is still done by hand, as the dough is too thin to be able to use machinery. Knakkebrot is consumed throughout the whole of Scandinavia and the export is also quite extensive.

SWEDISH BREAD IN AMERICA.

It is not generally known that the sale and manufacture of Swedish bread in America has within the last few years developed into an industry of great importance. Only a few years ago when the Swedish people in America, desirous for the soft, Swedish bread, cakes and cookies of their fatherland, were forced either to make it themselves or be content with the antiquated variety shipped from home. But all of this has changed within recent years, and Swedish-Americans of to-day are daily supplied with the choicest cookies and bread of their liking, fresh from bakeries which have been built especially to supply their demand.

Oscar G. Petterson is the pioneer manufacturer of Swedish bread in this country, and the Petterson Swedish health bread has become a household word among Swedish-Americans. The output of this bakery in Cambridge, Mass., is the largest in the United States, and its products are widely known. Nearly all of the Swedish health bread sold in this country is furnished by this concern, and the capacity of the plant is being constantly increased to supply the demand. The present plant consists of an attractive three-story brick-structure, which is used exclusively for the bakery. Inside of the plant everything is arranged on the most systematic basis, and every corner is utilized to valuable purposes. Absolute cleanliness is observed throughout the plant. On the top floor the whole rye is first let down from bins and passed through grinding machines until thoroughly pulverized. From the grinders it is in turn transferred to the mixers, which proceed to prepare the flour for baking by converting it into dough. While fresh from the mixing machines, before there is opportunity for any settling of the heavier substances, the dough is taken in hand by a dozen or more men, who roll it into size and shape. The health bread is flat and circular in form, resembling a circular saw without teeth. The dough in this condition is then carried to the oven and baked to a crisp. When finished the loaf resembles a huge soda cracker baked brown, with a hole in centre. this is the Knakkebröd mentioned above. The oven used in baking is also similar to the kind in use for cracker baking, resembling a Ferris wheel constantly revolving. (Reeloven.)

As soon as thoroughly baked, the bread is then strung on poles which run through the hole in the centre of each loaf, and is then left in a specially-constructed drying oven. Experience has shown that the crispness of the bread loses its vigor if not thoroughly dried after baking, but by this drying arrangement, which is original with Mr. Petterson, the bread is as hard and crisp as could be desired. After drying, the finished product is then packed in boxes for shipment. The bread goes to all parts of the country, and the demand is constantly growing.

Swiss Bakeries.

TRANSLATED FROM ORIGINAL REPORT OF MR. HANS ABT, BASLE.

In Switzerland there are between 3,600 to 4,000 bakeries, not counting the home bakeries, of which there are quite a number.

Small bakeries without modern improvements or machinery are predominant to a great extent, and only in the larger cities, like Basle, Zürich, Lausanne, St. Gall, Luzerne, and in some places where there is a large concentration of work people, like Olten, Biel, Chaux de Fond, etc., there is some competition through coöperative societies and corporations.

ORGANIZATION.

There exists an organization of Swiss master bakers, which regulates the apprentice system and takes care of the other interests of the baking industry.

The officers of the Swiss master bakers' organization are elected every three years, and the headquarters are changed to a different city after every election.

FLOUR AND FERMENTATION.

Very little domestic wheat flour is used, the bulk being imported from Germany and Austria, and some from America. Comparatively very little rye flour is used, and this mostly mixed in a mixture with wheat flour.

For larger sized bread sour dough is used almost exclusively, but yeast fermentation is also resorted to sometimes. The latter is now generally used for smaller sized bread. Hop fermentation is also partly used. The working of the sour dough is similar to that prevalent in Southern Germany.

The following kinds of bread are predominant in Switzerland: House bread, English bread, Graham bread, Aleuronat bread, Rye bread, Maize bread, and, of course, finer table bread, made according to French, German and Vienna methods.

The Swiss house bread, or home made bread, differs from most other breads in being made from a very light and soft dough, into which has been kneaded as much air as possible. When thoroughly kneaded, the dough is broken, then only lightly put together and thrown on a molding table which must be well covered with flour to prevent the dough from sticking to it. The dough is so soft as to spread in all directions. After being cut up and weighed, the loaves are molded only very loose, and considerable flour will stick to it. Before the loaves go into the oven, the baker improves their shape to some extend with a few quick deft touches of his hands, but no effort is made to give the loaves a nice bloom or gloss. All the flour is allowed to stick to the crust. Flour being used very liberally on the bench and for molding the loaves, the bread will not get much bloom or glossy crust when baked, and no effort is made to brush off the flour.

A few of the principal specialties of the Swiss bakeries, especially those of the city of Basle, are illustrated on colored plate 17, and we herewith give their names:

1. *Bierschildlein* (beer sign).
2. *Wasserbrötchen* (water roll).
3 and 4. *Tafelbrot* (table bread).
5. *English bread.*
6. *Zwieback.*
7. *Basler Leckerli* (honey cake).
8. *House bread.*

"In Switzerland bread seems to play a more prominent part as food than in any other country except France," reported Consul-General Jo. T. Du Bois at St. Gall, some time ago. "It furnishes 70 per cent. of the nourishment of the 3,000,000 inhabitants in the Swiss Republic, and that the nourishment is wholesome and adequate is proven by the sturdy growth for which most of the Swiss are noted. It is doubted, owing to the careful enforcement of the anti-adulteration law of Switzerland and the prompt and vigorous protest of the people themselves when an infraction of it is discovered, whether there is any country in Europe that has, as a rule, purer and more wholesome bread than this Republic. But rigorous enforcement of laws and prompt resentment of the bread eaters have not, thus far, prevented adulteration taking place. Being the chief article of food, it has the widest market, and consequently offers the best opportunity for debasement. To increase the weight of bread is becoming quite an art on the continent of Europe. Some bakers soak the dough heavily with water and by quickly baking succeed in holding much of its weight. Others mix potato meal with the flour. This system does not necessarily make unwholesome bread, although it lessens its nourishing power."

NOTE OF AUTHOR: Soaking the dough with water must strike the baker as a unique expression, and no matter how much water is added to flour in dough-making, it cannot be called adulteration. The better and stronger the flour, the more water it will absorb.

Baking in Russia.

TRANSLATED FROM REPORTS OF MR. J. BARTELS, MOSCOW.

In European Russia, including the Baltic provinces, the former Kingdom of Poland, Finland, Siberia and the Caucasus, there are about 140,000 bakeries, of which there are in the capital, Moscow, about 390, in St. Petersburg about 340.

Very few large bakeries exist and the small bakeries predominate everywhere. Several factories wherein a great number of workingmen are employed, have established their own bakeries, which bake only for these workmen; of course, there are also large bakeries which bake for the army and navy; in Moscow, St. Petersburg, and also in Odessa there are a few large private bakeries which do an extensive business, but few are provided with modern machinery.

ORGANIZATION.

The master bakers are united in trade societies, and elect among themselves a presiding officer, the elder of the baking trade. Outside the bakers, the confectioners and conditors have also their own trade societies.

FLOUR AND FERMENTATION.

For black bread, coarse rye flour is used; for rye bread and fine bread, bolted rye flour. Wheat flour, from mixed spring and winter wheat, is also used for the better kind of bread, in the ratio of about 20 to 80 per cent. Sometimes barley flour is employed, but rye flour is without question the flour that is most largely used for bread baking in Russia.

A letter from a St. Petersburg baker, published in the Munich *Baeckerei*, contains some details about Russian flour and the flour trade in general, which are very interesting, and of which we here reprint a few:

"Our best flours, which come from the Volga districts, are as gritty as fine sifted sand, similar to the Manana grits (egg grits) well known in Germany. They are milled from the best hard wheat, and the best grade comes from the so-called Pererod wheat. But we have also soft milled flours, from so-called winter wheat, which are of an excellent quality. Of these the best grades come from Rostow, on the Don. Flours of lesser quality, which contain less gluten, are the so-called Little-Russian flours from the provinces Kiew, Cherson, Mohilew and the Polish provinces; anyway, all those flours that come from the Southwest of Russia. Here they are simply called southern flours, more often "Jewish flours," because the mills in these districts are principally owned by Jews. This flour is milled soft, some grades are half soft. Bakers do not like this flour very well because it contains so little gluten, but it is of good appearance and very white. These flours are principally used for Fastenkringel as well as for the so-called Sitny, a bread which is baked in large loaves and sold by the pound. These flours are largely exported; as most of these provinces are situated near the Black Sea, much of this flour goes to foreign countries, and France is an especially good customer for them. If our Volga and winter flours, which are usually from 1 to 1½ rubels higher in price, could be exported as easily and be quoted at lower rates, they could, according to my opinion, soon surpass the Hungarian flours in the public favor. Of course for us it is better as it is. The Jewish flours are, in so far, of great benefit to us, as they regulate the price here, being so much cheaper, and the market at St. Petersburg is usually flooded with Jewish flours as soon as the Volga flours, simply called Kruptschatka (coarse milled), are here, or the Rostow winter flours rise in price either through short crops, speculation or not enough supply. The flour trade in St. Petersburg is exclusively in the hands of the Russians and Jews. Every large mill has a depot, and an entire street, the Kalaschnikow Prospekt, is occupied only by flour dealers; every miller has his wholesale house and store in this street, only the Jews have no stores, they have depots instead, and usually sell on commission only and have the millers ship their flours direct from the railroad to the customers. Among the largest houses are some with German names also, descendants of colonists, and Schmidt Bros., Reinecke, Borel, and others, enjoy an excellent reputation.

"The first grade has a blue label, 'blue 1'; the second grade a red one. Then comes the third grade 'blue 2,' and the fourth grade, 'red 2'; the other labels are 'black 1 to 3.' The Jewish flours are numbered by ciphers, 0000 as the first, 000 as the second, 00 as the third, 0 as the fourth, 1 to 5, etc. Winter flours are also marked by numerals, 0, 1, 2, 3, 4, 5. Fine bakers only use the best grades. I, myself, use, for instance, Schmidt blue 1, Galunow blue 1, Baschkirow blue 1, Winter flour Nos. 1 and 2. We buy the flour usually in carload lots from the individual

NORWAY

1

2

3

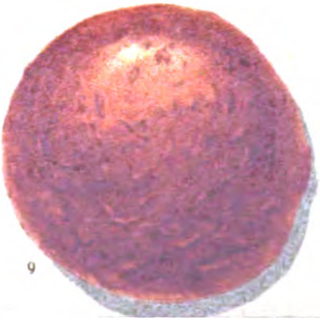
4

5

6

7

8



9

1/4 nat. Size

millers at carload prices, and then everybody takes as much as he needs, from every firm and grade 1 fader—12 sacks each.

"Of this we use according to our needs. I put the above five grades, 2 sacks of each, in the flour box, and sift as much as I want to use, and have large wooden shovels for this operation.

"Whoever has room enough mixes yet more grades together; baking is easier in this way, as one flour grade improves the other, and the bread will be more uniform.

"The most commonly consumed bread is the black bread, made from coarse rye flour, then comes rye bread, made from bolted rye flour, and white bread of all kinds and shapes. The ratio is about 75 per cent. black bread to 25 per cent. white bread.

"For black bread and rye bread sour dough is used, also for Barankis, but this sour dough is made from wheat flour; for all kinds of white bread, compressed yeast is used."

Fig. 176.—Russian Bread.

About fermentation, the above named letter has the following to say:

"Our flour is subjected to slow treatment, and for the reason that it is very coarse milled and needs a long time to dissolve. We take for one sack of flour about three-quarter pound of yeast (finest grade). The sponge stands from 1½ to 2 hours, then the dough is made for half an hour or longer, and then the dough is left standing again for 1½ to 2 hours. Of this mass the different doughs are again subdivided. First comes the French dough, after this 1½ to 2 pounds of sugar is taken (if Jewish flour is used, we need decidedly more sugar, as this flour does not color very well), 1½ to 2 pounds of butter, 5 to 8 eggs to each 100 pounds of dough. Further, the rose dough: 3 pounds sugar, 2 pounds butter, 15 eggs, and a little more for each 100 pounds of dough.

Thirdly, the sugar dough: 10 pounds sugar, 7 to 10 pounds butter, 60 to 80 eggs per 100 pounds of dough. Fourth, the Zwieback dough: 4 pounds butter, 4 pounds sugar. Of these four general doughs there are, according to the extent of the business, further specialties cut out; in my own business about 10 to 12 different kinds. There are fine bakeries where they have from 20 to 25 different kinds of small doughs. The working over lasts about one hour, after that the dough stands for 1½ to 2 hours (we speak now of the French dough), according to the needs of the flour, and then only after about 7 hours have passed after preparing the dough the bread is made. Outside of this common dough there is made exclusively from winter flour a dough of the consistency of thick soup for the so-called "Kalatschi," which are eaten principally during fasting days. The French dough and the Zwieback dough are worked dry without an addition of flour; to the rose dough, flour is added."

In colored plate 18 the principal specialties of the Russian bakeries are illustrated as follows:

1-6. Kringel—Baranki.
7. Pretzel—Krendel.
8-9. Milk rolls—Molotschuy chleb.
10. Kalatsch—Kalatsch.
11. Wyborg Kringel—Wyborski Krendel.
12. Horseshoe with caraway and salt—Podkoska.
13-14. Church bread—Prosfora.
15-16. Milk rolls—Molotschny chleb.
17. French white bread—Franzaski bjeli chleb.
18. Saltsticks or rolls—Solonaj bulotschka.
19. Ssajka—Ssajka.
20. French bread—Franzaski chleb.
21. Rose bread—Rosintschik.
22-24. Milk rolls—Molotschny chleb.
25-27-29. Zwieback—Ssuchary.
26. Rye bread—Picklewany chleb.

Especially noticeable is the Russian black bread for excellent quality, of which illustrations are given on Fig. 176. The bread is made in the following manner:

In a very large tub, which has a capacity of 7½ hundredweight of solid dough, a sour dough is made with one hundredweight coarse rye flour, which is left standing for eight hours. To this are added 250 pounds flour and about 100 liters warm water, then a full sour is made by two workmen, who stir the dough with long sticks. This full sour is again left standing for 2½ hours and covered, then 3 pounds salt and 200 pounds flour are added, after which four workmen finish kneading the dough with long sticks. This is done in such a way that the four workmen stand near the edge of the tub, lay the sticks crosswise over each other, and then run around the tub, holding the sticks in their hands. In this way a kind of stirring work is created in the tub. This work lasts for about half an hour, after which the finished dough is left to rest for about an hour. After the dough has rested, it is put on the table and the foreman divides it in bowls, each one containing twenty pounds of dough. The workmen have to knead these separate pieces thoroughly, put them together again and put each separate piece back again into the bowl. As soon as the whole dough is moulded up in loaves and proved, the work at the oven begins, which is done by the foreman. The loaves are thrown from the bowls on the peel, washed with a thin paste and then put into the oven; these ovens are generally so large that seven rows of seven pieces each can be baked at once. Each row is separated by a board and the bread pushed closely together. After being baked for three hours, the bread is taken from the oven, again washed with a thin paste, wherefrom it gets its glossy appearance. After the bread has cooled off for 8 to 10 hours, it can be cut with a damp knife. It is sold by the pound, and the Pud (=40 pounds) costs from 70 to 80 Kopeks (1 Kopek =½ cent).

A better grade of this bread is also made a kind of Pumpernickel bread by mixing 1½ hundredweight flour with 8 kilos malt, then adding 100 liters boiling water, and then covering the whole well and letting it get cool. To this is added a full sour from 100 pounds flour, which is well mixed with the first "sour," and left standing for three hours. At last the dough is kneaded with the addition of another 100 pounds of coarse flour, 100 pounds bolted flour, and 3 pounds of salt. This dough is left standing for two hours and then baked in the same way as the preceding one. Caraway seeds are strewn over these breads, of which the pud (=40 pounds) costs from 1 rubel to 1 rubel 10 kopek.

Birak is a popular Russian pastry, or rather a patty. It is made richer or poorer to meet the requirements of all classes. The poorer classes make a plain dough, similar to our piedough, and for filling they use cabbage, or berries, apples or potcheese. The better classes prefer a richer dough for their "Birak," and to each four pounds of dough about 1 to 2 pounds of butter, ½ to ¾ pound of sugar and 3 to 4 eggs are added. This dough is mixed and rolled somewhat like puffpaste. Finally a sheet is rolled out, placed on a baking tin, the center spread about 1 inch thick with whatever filling is wanted, and the ends of the dough pulled over the top and pinched together. After being washed with egg or milk. the "Birak" is placed in the oven and baked.

A favorite national dish are the Kalatsch, which are baked to sell for 3, 5, 10, 15, 20 kopeks, and even up to 1 rubel, and are eaten hot with Russian caviars. When moving to new places, they are used as a kind of gift, it being a Russian custom for friends to present the moving party with salt and bread as a wish that in their new lodgings they may always be plentifully provided with something to eat.

Baking in the Balkan States.

TRANSLATED FROM A REPORT FURNISHED BY MR. JOS. FRITSCH, SERAJEWO.

There are between 900 and 1,000 bakeries in Bosnia and the Herzegowina. The largest number is established in the capitals Serajewo and Mostar; there are between 30 and 40 bakeries in Mostar (capital of the Herzegowina), and between 180 and 200 in Serajewo (capital of Bosnia).

Not only in Bosnia and the Herzegowina, but throughout all the rest of the Balkan States small bakeries predominate. The only exception is Rumania, where large bakeries are begun to be operated through the establishment of coöperative bakeries at Bucharest, Galatz, etc.

ORGANIZATION.

There are two district classes of bakers in Bosnia and the Herzegowina, to wit:

a. Domestic (Bosnia) bakers who furnish the bread for natives (Bosniaks); and

b. Foreign bakers, who bake for the foreigners that have settled in the country.

Both are subject to regulations by the magistrates as a trade government, and have to observe all the local laws and pay the local taxes.

The native master bakers (class A) have as a rule no established business name; the arrangement of their bakeries is especially remarkable on account of the opening of the oven being situated right on the street front, so that the oven stick or peel, when in use, reaches way out on the sidewalk.

The foreign bakers (class B) have their established firm names and everything else is the same as in Austria.

The native bakers (Bosniaks) elect every year from their midst the eldest bakers among them as an executive committee; the foreign bakers have no organization at all. Both classes, as said before, are subject in every way to the municipal trade ordinances.

Generally flour from the mills situated in the country is used; the better and more pretentious class of bakeries uses flour furnished by the Elisabeth Steam Flour Mills Company of Budapest, as also that of Bernhard Back's Sons' Steam Mill of Szegedyn, which so far have furnished the best liked and most useful flour. Wheat, rye and also some maize flour are used.

Class A (Bosnian bakers) furnish the following kinds of bread for the native population: Haremski Chleb (Harem bread), Simit (a better kind of bread), Pogocar, Samun (the best liked bread in the Orient), Tepsias (housebread, baked in tins), Kaplanamala (breakfast bread), Pogocar Kiseliak (a favorite bread made with sour dough that is manufactured at Kiseliak, well-known in Bosnia for its mineral springs), Curek (housebread), Bosman Limicki (housebread for laborers).

Class B (foreign bakers) manufacture for the foreign population the following kinds: Housebread in the shape of rolls, made from half-wheat flour; round-shaped housebread, made from equal quantities rye and wheat flour; Krahan bread, made with sour dough from Kiseliak water (the mineral springs of Bosnia), Patent rolls, so-called Vienna rolls, usually eaten at the second breakfast, which contain caraway seeds, made from equal parts wheat and rye flour, Salt Stengel and Salt Kipfel, split rolls (so-called Syrian rolls), Water-butter Kipfel, Mohnstrietzel, Priosbread in different shapes, Kaiser rolls, Hospital rolls, Milk Kipfel, Lunchroom rolls.

The foreign element prefers the Kaiser rolls. All bakery products made with yeast are generally baked on tins, the native bread is baked on the hearth.

Bosnian bakers make ferment rye bread with sour dough, while for wheat bread they use partly dough and partly pressed yeast; the foreign bakers use pressed yeast exclusively.

The specialties of the Bosnian bakers, which are about the same as those from Turkish bakeries, are illustrated on colored plate 18, and are as follows:

1. Kaplama—Morning bread (price, 2 cents), made with sour dough.

2. Haremski Chleb—Harem bread. (price, 2 cents), made with yeast.

3. Elif—Breakfast bread (price, 2 cents), made with sour dough.

4. Samun—Favorite Oriental bread (price, 2 cents), made with sour dough.

5. Pogocar Kiseliak—Favorite Kiseliak bread (price, 2 cents), made with sour dough from Kiseliak.

6. Fedrahaplana—Health bread (price, 2 cents), made with sour dough.

7. Bosman—Bread for laborers (price, 10 cents), made with sour dough.

8. Cahia—Dinner bread (price, 5 cents), made with yeast.

Mr. Fritsch, of Serajewo, has furnished us the following additional information:

The Bosnian (native) bakers use flour furnished partly by steam mills, partly by domestic mills, which latter mill the grain flat with the bran,

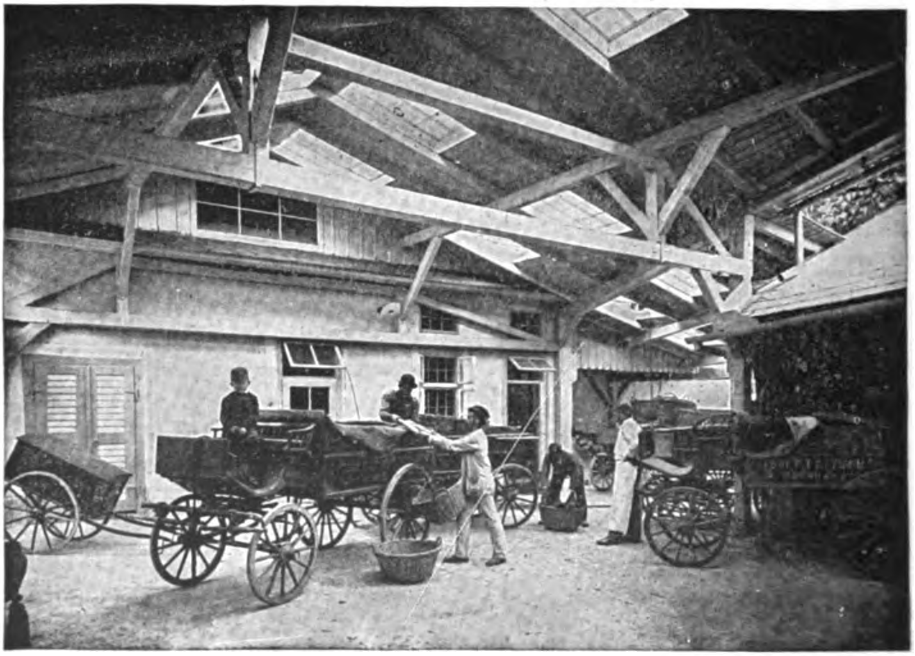


Fig. 177.—Loading Shed (J. Fritsch Bakery, Serajewo).

and which flour must therefore be sifted before use. Instead of using flour for sprinkling the boards or cloths, the native bakers take the bran. On account of this plain milling, the bread retains the moisture longer and has an agreeably sweet taste.

The Bosnian bread is made with 20 to 25 kilograms flour, then 50 grams yeast and some sour dough are added. The fermentation is kept up for two to three hours than a little more than half is filled out, after which a very soft dough is mixed, which is brought on the board after half an hour.

Bench work is quite different from the Austrian method. The workman sits (according to Oriental custom, with crossed legs, but without smoking) on the table beside the dough, which is still in the trough. This workman pinches pieces of dough out of the trough, weighs every piece on a scale that is standing nearby so that it has the required weight, and then throws the piece of dough to a second workman (Komsio) who sits near the table and who lightly presses the piece and puts it on the table to prove.

After the necessary proving, the bread is put on boards which are strewn with bran. Shortly afterwards the bread is brought to the oven and only then the dough is being given the desired form.

The Turkish oven is very primitive, but it is highly arched so that a workman, in laying a new hearth, can comfortably sit in the oven.

The heating of the oven is done from the back, and the smoke has to leave through the chimney above the front opening. The bricks for the ovens are commonly made from unburnt material.

The tools necessary for an oven in a Bosnian bakery are called in the native tongue: Lapata (key), Lachta (shutter), Serk (firecrux), Loha (firetong). The fire is not drawn out of such ovens as just described, but it lies in a hollow on the right side of the hearth, which is made for this special purpose and into which all remaining glowing embers are drawn. Light is made in the oven through the burning of lightly inflammable wood.

After everything is baked, the Bosnian baker cooks for himself or others, who are willing to pay for such service, different national dishes which are filled in earthen jars, covered with paper, by putting these jars into the oven.

As a further curiosity we might remark that the bread is not carried in baskets when offered for sale to the public, but on boards which the bread carriers balance on their heads.

The Baking Trade in Turkey.

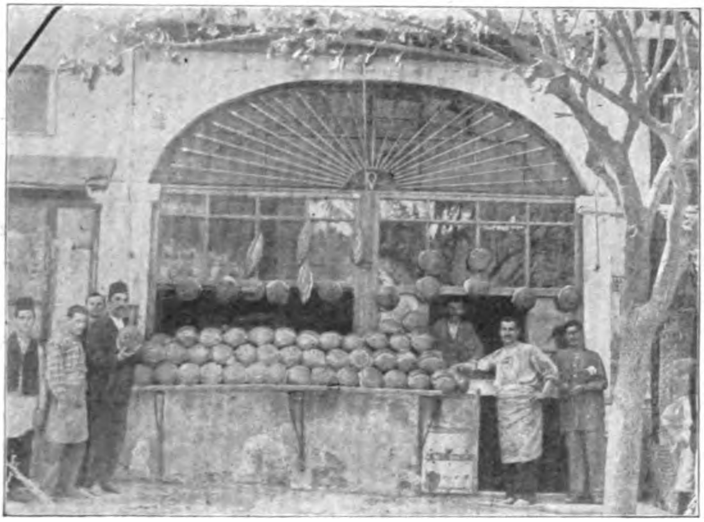
The following article is taken from an article published in *The Bakers' Helper* by Mr. M. H. Jucknavorian:

In Turkey (especially in the provinces) the bread is prepared mostly of barley, corn, rye and other cheap kinds of cereals, owing to the poverty of the inhabitants.

In the City of Constantinople there are 350 to 400 bakeries, of which the greater part belongs to Armenians, after whom follow Greeks and a few German Jews. There are three principal kinds of bread, which are prepared of leaven, as yeast is completely unknown to them. The first kind prepared for the public is made of wheat flour, and is a white, light, porous, round loaf with a thin crust; the diameter of the loaf is about ten inches, its weight is one kilo (two and one-fifth pounds) and its price at present is three and one-half cents. The second kind, which is mostly prepared for Turks, is made with wheat flour and bran. It is an elastic sheet of dough, without crust, a quarter of an inch thick by six inches wide and about eighteen inches long; its weight is one kilo: price, three cents. The third kind is prepared by wholemeal by governmental bakeries for the army; its weight is about three-fourths of a kilo; price, one and one-half cents. There are also a few bakeries which prepare Vienna bread for the high life only. This bread is baked in special ovens and in pans. A pound loaf cost five cents. Needless to say anything for their preparation for they are well known in America. The first inventor of this bread in Constantinople was Mr. Jacob Balian, who, after working a few years in America (unfortunately we are not able to mention the city and the factory where he worked and learned the trade), came to Constantinople to work under the supervision of Dr. Cyrus Hamlin, the American missionary, who had contracted to supply bread to the British army in Constantinople at the time of the Crimean war, though he was not a baker himself. These four kinds of bread, as well as all the other baking productions, are prepared only by human hands, machinery being unknown in Turkey.

BAKERS AND OVENS.

Generally a bakery has one oven, two sieves (which are seldom in use) and forty to fifty proving boxes one foot wide, six inches high and eight feet long. A bakery has also a gang of workmen, who work with each other; that is, when the bakery's master is not satisfied with one of them, he is obliged to send away all of them and take another gang. The latter consists of one master and his assistant, one baker (the workman that bakes the bread) and three or four workmen. They work all day and night the whole week without interruption. As to salaries, the master is paid about $12 per month, his assistant and the baker $10 each, and the laborers $6 to $3 each.



Fig, 178—A Turkish Bakery and its Workmen

To give you an idea about the ovens, we would recommend readers to look at some oven photographs of the ruins of Pompeii. (See Vol. I.) They are about eight feet high. The exterior of an oven is square and the baking space is circular. They are built large enough to take in 150 to 300 one-kilo loaves. They have neither dampers nor other mechanical instruments. The mouth of an oven is simply a hole, and a piece of sheet iron serves as a door. In the construction of an oven a large quantity of rock salt and pieces of glass are employed. A thick layer is put under the sole of the oven and over the crown, so as to reserve the heat. The oven sole is made of fire bricks four by nine inches, the crown with soft rubber (?) bricks ten by ten inches. To heat the oven they burn wood on one side in the baking space, and the smoke coming out from the mouth, passes through the chimney, which is constructed at the front of the oven just over the oven's mouth. When the oven is hot the dough is introduced direct to the oven sole with long peels. While the dough is in the oven, now and then some fresh wood is thrown on the ashes kept in the oven, and by the light of the burning wood the examination of goods in oven is done. After the first batch it is necessary to warm the oven again for the next batch, and so on. By this means they prepare 1,000 to 1,500 loaves per day. When the bread is ready the baker sells it in his place at the usual price, or he sends it to his customers' houses, putting the loaves into two large square baskets over a horse, and taking half a cent extra for transport.

Fig. 170—A Turkish Baker Distributing Bread to Customers' Residences

Besides bread-baking in Constantinople there is also local pastry trade. There are about 250 bakeries for pastry only. In this trade the use of chemicals is completely unknown, and, like bread bakers, leaven is the only fermenting agent used by them; but some of their productions prepared only with primitive materials (sugar, butter, milk, egg and flour) are considered even by Europeans as first-class goods.

The first kind is called "Baklava," which is an excellent pastry; it is very light and palatable; as a preparation it is almost like French puff paste. After preparing the dough with the best Hungarian flour, they open the dough to very thin sheets of six to eight square feet each, by a rolling pin. It is necessary to say that this (to prapare the dough into very thin sheets) is considered here a very important part in the work. The workman who can prepare sheets of dough as thin as possible is considered the best master. When the sheets are ready they put some butter over each of them, and afterwards they place them in baking pans on each other till half an inch in thickness; then, cutting to diamond-shaped forms, they bake them. As soon as the Baklava is taken out of the oven they pour boiled sugar over them, and so they sell it, plain or with double cream, at the price of 24 to 36 pence per kilo.

Fig. 180.—A Turkish Baker Selling "Beoreg."

The second is called "Beoreg," and is prepared like the Baklava, only they put meat, cheese and other things in the dough and sprinkle powdered sugar on them after they are baked.

There is another kind also, which is called "Simid." The Simid takes the same place in Turkey as the biscuit in Europe. It is in the form of a large ring ten inches in diameter and half an inch in thickness. It is simply bread dough with or without sugar, butter and egg. After the dough is prepared in the said forms, they are boiled like cracknels, then rolled in an oily seed called "Susam" (sesame seed) and then baked.

In Turkey there is only one factory of biscuit, which belongs to the family of Harootun Jucknavorian, who was in America at 1864 till 1872, and who worked in Belcher & Larrabee's factory in Albany, N. Y., came to Turkey with some machines and found one little biscuit factory in a very bad condition. Now the factory has a motor of eight horse power and has the capacity to produce ten to fifteen hundredweight of biscuits in ten hours. About forty kinds of cakes are made, some of which are Cracknels, Jumbles, Wine, Boston, Tourist, Ginger, Soda, Traveler, Petit-Beurre, etc. Mr. Jucknavorian, Sr., has retired now, leaving the work to his three sons, Haig, Mihran and Edward.

The baking trade also, like many other trades, is under the watch of the government, which determines the price of the bread, after consultation with the representatives of the bakers' union. The government has its special officials whose duty is to visit the bakeries regularly to watch over the weight of the bread and its quality. It is necessary to say that the governmental watch over the bakeries is only nominal, for in reality it is the union of the bakers which direct the work at their own will and to their own profit. This they can do by paying to the officials, who are always ready to shut their eyes to every wrong when they are well paid. In speaking about the union of bakers we must say that this union of bakers is not like those which are formed in America or in Europe. All the members of this union, without any exception, are uneducated, and their union is not formed for the progress of the trade, but only to gain as much more money as they can. This union is very strong, so every baker is obliged to join if he does not want to ruin himself in a short time.

Baking in the Tropics.

CUBAN BAKING AND BAKERIES.

No flour is baked in Havana except in the bakeries, and the city is well supplied with excellent bread, the product of 125 bakeries. It is estimated that the daily consumption of flour in Havana is 1,000 203-pound sacks. The long loaves made by the leading bakers in Havana are of excellent quality and wholesome. The loaves are some two feet in length, of the same size throughout and about as thick as a jelly roll. In fact, the bread as served on the table reminds one, in shape, of a jelly roll. The price of bread is ten cents (silver) a loaf. The bread is baked in half molds, and a long, narrow banana leaf is inserted in the dough before baking. When taken from the ovens the loaves show a crease where the leaf was placed. The leaf is easily removed, but small particles cling to the bread. The object of this is to allow the heat to bake the inside without burning the crust.

A bakery of the larger kind is expensively gotten up. There are large brick ovens and furnaces, all substantially built. The bakers are very particular about baking bread, and really are quite artful in their profession. Fermentation is natural and yeast is never used. American yeast manufacturers, who thought that, if gone about properly, the bakers would use compressed yeast in their bread-making had a hard time to convince the Cuban bakers. A representative, accompanied by American bakers, visited the Havana bakeries, explained the use of yeast, and showed the Spaniards that it was not necessary to allow bread to stand any considerable length of time before baking. All the materials of the Spanish baker were used and the result was a satisfactory showing. The use of yeast was elucidated to the fullest extent, but when it came to selling the yeast to the baker the reply was, "Poison." From bakery to bakery the same results were attained, but failure resulted so far as business was concerned. Efforts had been made at various times to introduce the use of yeast.*

The warm, humid climate of Cuba gives natural fermentation. The baker mixes his flour and makes his dough at nightfall. The first baking

*Within the last two years, the use of compressedyeast has become very popular.

is at four o'clock a. m. This bread is delivered in time for the early morning light meal. The dough is then set in the morning and the baking done in time for delivery in the middle of the afternoon. In the absence of yeast and baking powder the climate must be aided in a proper selection of flour by the baker. The flour has to be mixed to give the rising-power to the dough and the color to the bread.

Bread is divided into two general classes—lard-bread and water-bread. The lard-bread is the soft wheat flour bread. Water-bread is the mixed or spring wheat flour bread, requiring no lard. It is advantageous to mix the flours and make a blend so that they can use water-bread and save thereby the cost of the lard. Nearly all the bread now in use is of the economical kind requiring no lard. Some bakers continue to use a very small amount of lard in all kinds of bread. A strong extra fancy, a spring wheat flour or a low-grade is always kept by the bakers for the blend. The bakers are constantly experimenting, but usually stick pretty closely to a few flours. They have a reputation for willingness to be shown, but an unwillingness to change.

There are many large bakeries in Havana, some of which consume as much as thirty barrels of flour per day. These bakeries are not modern in any respect and have none of the machinery with which an up-to-date American bakery is equipped. The bread is hand-made, and the method of handling the flour and dough, the working of the ovens, all requires a great deal of labor; but the results will compare favorably with the product of any foreign bakeries. There is an adaptability about the method suitable to Havana—the arrangement of the building and the ovens about interior courts, the dark cooler corners for flour and bread storage, which will permit of only a limited amount of modernizing.

The largest bakery in Havana is that of Colom & Co., which was visited by the writer as the guest of the baker. At the importing house of Colom we learned something of the methods at the bakery, and it was well that he did, for neither the amiable head baker nor any of his men could speak English. By observation and gesticulating he was enabled to get a pretty fair idea of what a Havana bakery is like. The bakery is a large low building of substantial construction. You enter a very clean and spacious retail department from the street, and continuing through, enter a long court. The bakery is arranged around this court. The ovens, furnaces, kneading-rooms and flour store-rooms are all suitably located to avoid unnecessary work. Near the ovens are tall racks of long baking-pans. These are handled by long iron peels. The kneading-room usually presents a busy scene.

The employees are Spaniards or several of the many types of Cubans. They knead the bread well and keep half a dozen or more small boys constantly on the run as carriers of flour or pans. The bakery is quite dark, and, as far as possible, the employees suspended work to enable the securing of photographs. It is surprising to see the load of bread the boys employed as bread-carriers can "tote" about on their head. With all the employees, there is a lack of clothing. Some of the lads wear only a small cloth around their waists, which hangs to the knees. The cotton flour sack is used as a principal part of the baker's dress. Holes for the head and arms are cut in the sacks and they hang with a Philippine effect.

The bakeries of the larger class all make small cakes and use lard and sugar. These cakes are well liked by the Cubans, but do not sell in quantity. They are molded into several plain shapes.

There are quite a number of the larger bakeries in Havana that are worth visiting. One of the newly-established concerns is called the "Uncle Sam" bakery. It is one of the largest in the city.—*Northwestern Miller.*

BAKING IN NEW ZEALAND.

We are a small people, scattered over a straggling country, with four centers of population, each of from 25,000 to 50,000, writes a correspondent to the *Bakers' Helper.* Other towns are small in comparison and the bulk of our population is rural. We all eat bakers' bread and we all suck "lollies."

We grow good wheat: Pearl, Velvet, Red Clay and Tuscan. We have good rains in the spring and early summer and dry harvest time, so that both crops and condition are a certainty. We have fine roller mills. Our flour is uniformly sound, but never rises to a very high grade. At the time I write best brands are worth from $2.55 to $2.70 per hundred pounds at the principal ports. Bread is sold as low as eleven cents, generally twelve cents, the four-pound loaf. It rises to fourteen and sixteen cents in districts where little competition exists.

Bread baking is almost entirely in the hands of Scotchmen, and Scotch methods of a few years back, prevail. Our circumstances are not favorable to the development of great businesses, well organized and well equipped. Science and style are not much in evidence, and for years back we have seen nothing like novelty, push or advertisement in this line. There is very little bread doughing machinery in the colony. Twelve or fifteen Bailey-Baker continuous baking ovens and one or two steam ovens are in use; the bulk of the work is done in the old style. This is in contrast to the enterprise one sees recorded in your pages.

The French loaf comes to us with the dust of the oven and the cart in its creases, and with the curse of Adam visibly imprinted on it; accounts are differently kept; we pay for it when it suits us.

DAMPER—AN AUSTRALIAN BREAD.

"Damper" is purely an Australian product. It was never heard of anywhere else, and it will probably hold its own in that land, for years yet to come, and more than once I have thought, blessed be the man who invented it, writes Mr. H. Virstow, to a baker's journal. I say man, because no woman would have thought of it, since it is not refined enough in its makeup to emanate from the feminine brain. This is the way it is made, in its most primitive form: Selecting for a molding board a sheet of bark, perhaps eighteen inches wide (Australian trees are in many cases noted for the immense slabs of bark you can peel from them) and three feet long, the self-taught cook takes from his "swag" made up of his possum rug or blanket, and his little stock of provisions, the precious little flour sack, purchased perhaps at a station twenty miles behind. On to his molding board he empties a sufficient quantity of it, adding to his taste salt for which he has paid perhaps twelve cents a pound.

He thinks himself especially fortunate, if he happens to have enough saleratus "to make it light." Then kneeling amid the emphatic silence of nature, disturbed if at night only by the hideous howl of the dingo, or by day, the screech of the parrot or cockatoo, or the measured hopping of the kangaroo, he mixes these ingredients. How careful he is, that he lose not a grain of the precious flour. After he has worked the mass to the consistency of dough ready for the oven, he fashions the loaf, say two inches thick, and of the shape of a large waffle.

Then he turns to the glowing coals of the fire made from the fragrant myall or eucalyptus, and carefully rakes out any of the wood which may still be smoking. Here he makes the "damper bed," and places the damper therein; carefully covering it with coals, meanwhile using the utmost care that none of the ashes touch it.

The batch is in the oven, and there it stays until it is done. Experience has taught him, that it will take about ten minutes for every pound of the loaf, then he rakes off the coals, and looks with pride on this pale brown circular result. He must be in a hurry if he eats it before it is thoroughly cold, but when he gets ready to do so, his knife severs the inch and a half slices, between two of which he spreads—butter? Oh no, that is too much of a luxury, and besides he couldn't carry it, but a slice of corn beef or fresh mutton, which he has bought for perhaps three cents a pound at the last station.

THE BAKING TRADE IN SOUTH AFRICA.

Bread baking is an established industry in the Cape Colony and the quality of the article is said to be good. The industry is well advanced also in the Colony of Natal, but in the other South African countries the methods of bread baking are very old-fashioned and afford ample room for improvement.

From what the Philadelphia *Commercial Museum* learns from its correspondents there appears to be an opening there for modern bread making appliances, especially in the Transvaal and the interior States. And as regards machinery for confectioner's, cake maker's, and candy maker's uses the field is there for any manufacturer energetic enough to introduce his goods, for the reason that the bulk of the confectionery, etc., is imported. The country is an improving one, and modern devices for improving the quality of an article and cheapening its labor cost will come more and more into demand.

There are nineteen bakeries in Cape Town; twelve in Port Elizabeth and nine in East London, the principal towns in Cape Colony. All of these establishments are more or less modern, but this does not argue that their proprietors are unwilling to adopt improved methods. For a peculiarity of South African bread trade is that while there is no competition in price there is keen rivalry as to quality and in a country where "baker's bread" only is used the character of the machinery and the methods employed counts for a good deal. Wherever people have settled there has been established a bakery. The people do not make bread in their homes.

Loaf bread, rolls, scones, muffins, etc., are all made by the bakers. The loaf weighs from one to five pounds and sells for about six cents per pound. A good bread baker receives from $16 to $20 per week, but many are paid much less. Malays are largely employed and at much lower figures. But little loaf cake is produced by the bakers, the bulk coming from England. Many varieties of small cakes, fancy shapes, are made, but no crackers, biscuits, fancy wafers, etc., are made, all coming from England, which suggests that there is an American market here for these goods.

The flour used is nearly wholly American; of 50,261,081 pounds imported into South Africa in 1897, 42,253,547 coming from the United

States. This was consumed by the white population, the aborigines using mainly corn, cornmeal and samp.

In Johannesburg, the chief city of the South African Republic, or Transvaal, as it is known, bread is still being made by the old hand method, not more than one or two bakers using machinery. Nearly the whole of the confectionery and candy is imported, principally through Natal ports. The importations of confectionery, candy, etc., during 1897 amounted to 380,000 pounds valued at $52.500. Very little of it was American.

There is a market in South Africa for the goods themselves as well as for the machinery for making confections, cakes, candy, etc.

THE BREAD OF THE BOERS.

There is one peculiarity about the Boer bread which would, for a time at least, recommend it to many in England. This is, that it goes a long way. The Boer does not believe in being prodigal either with his labor or his cash, and the womenkind, in this respect, hold the same opinions as the men. The more substantial the bread is made the farther it will go, and so the mealie meal is lightened as little as possible, and the bread in consequence is more than solid. Every Boer family bake their own bread, this being, of course, necessary in a population so widely scattered, and every farm has its oven, made of baked earth, which stands out in the back yard in convenient proximity to the kitchen door. The vrow generally makes sufficient bread at one baking to last for about ten days, because wood is scarce in the Transvaal, and the oven takes a large fire. The way the Boer woman makes her bread is very simple. She takes a sufficient quantity of mealie meal, adds a little salt, and a little Kaffir beer (a drink made of maize, and which is largely used all over South Africa in bread making). These are her ingredients. The bread is made in huge loaves, which, without any exaggeration, may be described as the size of cart wheels. The baking usually occupies a day, and during this period it is advisable to give the vrow as wide a berth as possible, for her temper at this time is usually none of the best. The poorer class of Boers bake their bread in three-legged pots. They make a fire under the pot, and then heap ashes on the top of it. The bread baked in this way is generally over-done. When a Boer family is "trekking," and it is necessary to replenish the supply of bread, a halt is made for a day. The men of the party will obtain a good supply of firewood, and will select a large ant-bear hill. A large opening will be scooped out in this hill, and a fire will be made inside it. This fire will be kept up until the inside is sufficiently warm, when the bread will be placed in, and the opening blocked up with side of earth. An adept at this kind of baking will turn out really good bread from a "veldt oven." The one article every Boer woman is clever at making is the rusk. These rusks are of the same consistency as a bone, and are intended to be dipped into the coffee, and eaten in this way they are really excellent. Besides the rusks, a kind of cake is made which is called a "lekker." This cake is made from mealie meal, sugar and eggs, and is much appreciated by the people, though visitors to the country who have been induced to take it do not share this opinion. The great difficulty which confronts the Englishman who settles down in the Transvaal is how to keep himself supplied with bread. Every Hottentot woman knows how to make bread, at least, she fondly imagines so; but their ways are not our ways, and any one who ever saw a "Tottie" making bread will assuredly eschew their help for the future. The Boer women will bake for newcomers for a consideration, but he will as a rule find that eight pounds of flour only make about three pounds of bread under their skilful handling, and by the time he has solved this apparently abstruse problem he will have become indignant and will take the matter into his own hands and bake for himself. Some of the bread, cookies, damper, call it what you will, turned out by a solitary Englishman, baffles description. Some of the trading stores sell bread, when they have it. Unfortunately it is very seldom that they do have it, and as the bread is generally baked by natives, people fight shy of it. In some of the smaller Kaffir wars it has been the custom to supply every man with a pound of flour and a certain quantity of baking powder every day, and he had to bake his bread for himself. This, of course, refers to the Colonial irregular troops. The average Colonial can turn his hand to most things, but when it comes to making his own bread in his pannikin, for no other convenience was at hand, he bore it for a time, but eventually struck, and biscuits—universally called dog biscuits—were substituted.—*Bakers' Times*, London.

A ZANZIBAR BAKERY.

Zanzibar streets are full of the strangest sights and scenes. A month could be spent there without ennui. The bazaars alone never cease to be interesting. The women clustering round the pumps filling five-gallon paraffin tins with beautiful water is a scene I could watch for hours. They are so clean, so eager and merry! The baker of flat cakes is worth going miles to see. In his shop, which has a frontage of six feet, is an earthen oven, shaped exactly like the washing copper of the English kitchen. At the bottom of the oven is a lot of burning wood. The smoke is carried away by a flue lower down. Round the top, and inside, is a smooth concave surface. The baker takes the dough, manipulates it deftly until it is a perfectly round disc, about eight inches across and one-sixteenth part of an inch thick. Then he throws it upon the smooth concave surface and starts another biscuit. Directly the dough strikes the wall of the oven it blisters and bubbles, and in a minute it is done. The baker has to be very quick to keep the oven going, but he is quick, and his monotonous song, as he works, haunts me still. His shop, his oven, and himself are all on the street, and if, in bending, any part of his person trespasses into the street, the arms and shoulders of the hustling throng instantly remind him that space is space in Zanzibar.

BREAD MAKING BY ZUNI INDIANS.

The Pueblo Indians of New Mexico and Arizona have a history which dates back for many centuries before Columbus discovered America or Coronado made his famous trip from Mexico to the cities of Cibola. There remain only a few pueblos, among the more prominent being that occupied by the Zunie. A model in the National Museum at Washington, D. C., represents a Zuni family engaged in making paper bread. The process of bread making is described by the *Scientific American* as follows:

"Corn is to-day, as it has always been, the distinctive Indian grain, and they have many ways of preparing it for food, but the bulk of the crop is dried and, as occasion demands, is made up into bread. In one room in each house there is a bin-like trough along one side, placed directly on the floor and framed in with low slabs of stone set on edge. This bin is divided by transverse pieces of stone into three or four compartments, and in each of these there is mounted on a slight incline a flat piece of rough stone, usually black lava which is abundant in that country. This is the meta of the Aztec, the mitata of the Mokis, and in connection with a small piece of flat stone, which is rubbed back and forth over the lava slab, is the grinding mill of these people.

"The corn, having been previously soaked in water to loosen the hard outer skin, is thrown into the first compartment, where it is rubbed between the stones into a coarse meal. This is passed over into the next compartment, where it is ground finer, and then into the next, where it emerges in a fine meal, as fine as our wheaten flour. Castaneda, in his account of Cibola, says that a special room is set apart for the grinding of the corn, and that this room contains a furnace and three stones made fast in masonry. Three women sit down before these stones; the first

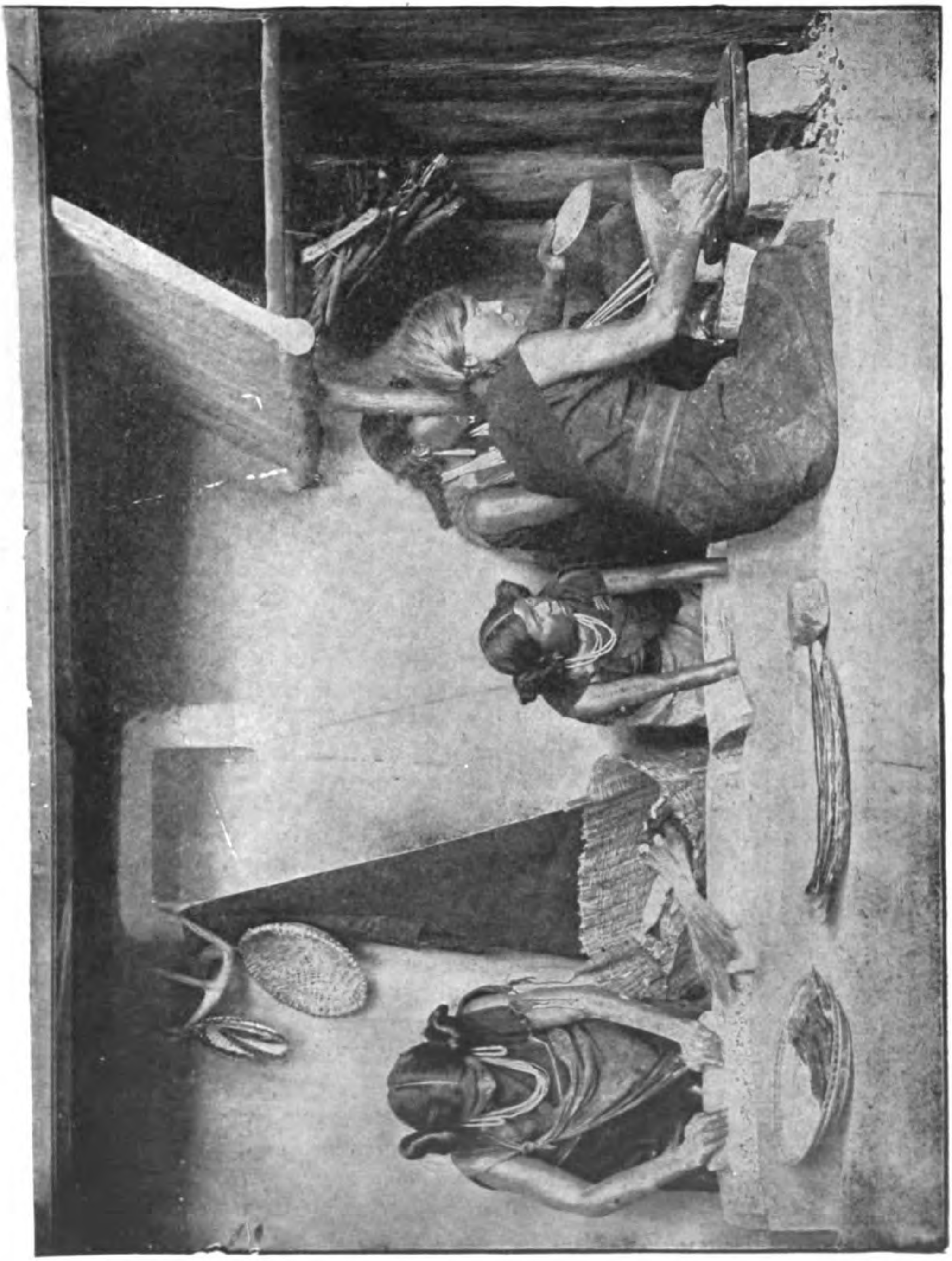


Fig. 181—Zuni Indians Making Bread.

crushes the grain, the second brays it, and the third reduces it entirely to powder. The accuracy of this description is apparent.

"The fine powder which comes from the third grinding is mixed with water to a thin batter, which another woman spreads with her hands on a heated stone, and immediately after peels off a thin layer about the thickness of heavy manila paper. A number of sheets of this peculiar bread are shown piled up in the center of the picture in front of the mealing bin. Ordinarily it is of a dark-blue color, as it is made from blue corn, but for ceremonial feasting it is made of pink, or yellow, or white, or variegated corn, and in each case partakes of the color of the grain. When fresh this bread is quite palatable, but when a day old it becomes very brittle, and, as it is usually made without salt, it tastes much like sawdust.

"The flat stones on which the paper bread is baked, one of which is shown on the extreme right of the picture, are considered very valuable, and often descended from mother to daughter through many generations. Their manufacture is a secret process, carried on only by certain old women of the tribe at a distance from the villages and accompanied by numerous rites and ceremonies. A certain kind of stone must be selected in the first place, and it must be of even grain and free from cracks or flaws. Then, after being rubbed smooth, it is treated with pitch and perhaps other ingredients, with frequent exposures to fire and smoke, and at intervals certain incantations and formulas must be repeated. At one stage in the preparation the strictest silence must be observed, as, it is said, a single word spoken then will crack the tablet. If all goes well, the final product is a stone of jet-black color, instead of the light-yellowish gray of the original sand-stone slab, with a highly polished surface, from which the flakes of paper bread peel off readily. If, however, there was any flaw in the stone, or, if some of the formulas or incantations were omitted, or wrongly pronounced, or spoken in the wrong order, the stone will crack when exposed to the fire and will be worthless. It will be noticed that the stone is mounted some six inches above the floor on low pillars, built up of bits of stone and adobe mud. Commonly it rests on two slabs of stone on edge, forming a box-like flue or stove, in which a hot fire is maintained by constantly feeding in small sticks."

A MODERN BAKERY IN BERMUDA.

We have just received particulars of a large new bakery at Bermuda erected for E. J. Thompson, writes an English journal, who has been making exhaustive inquiries for many months in this country with the view of having an up-to-date model bakery. He ultimately placed his order with Messrs. Melvin & Sons, Glasgow, who, in addition to supplying the ovens and machinery, prepared plans and specifications for the new bakery buildings, which had to be erected in an incredibly short time owing to the fact that large numbers of Boer prisoners are being landed from time to time. As Mr. Thompson had secured the Government contract to supply the necessary bread, his old bakehouse was totally inadequate to cope with the requirements. It had been Mr. Thompson's intention to erect a new bakery independent of the unexpected Government requirements, as his bread trade had grown to considerable proportions. We append plans of the new bakery, from which it will be seen that it is capable of a large output. The bakehouse is 80 feet in length, having a width of 33 feet in front of the ovens, giving ample space for machinery, tables, troughs, etc. The ceilings are lofty, and good light is provided. The front walls of ovens are being built in white and colored enameled bricks. Five ovens are being built—three

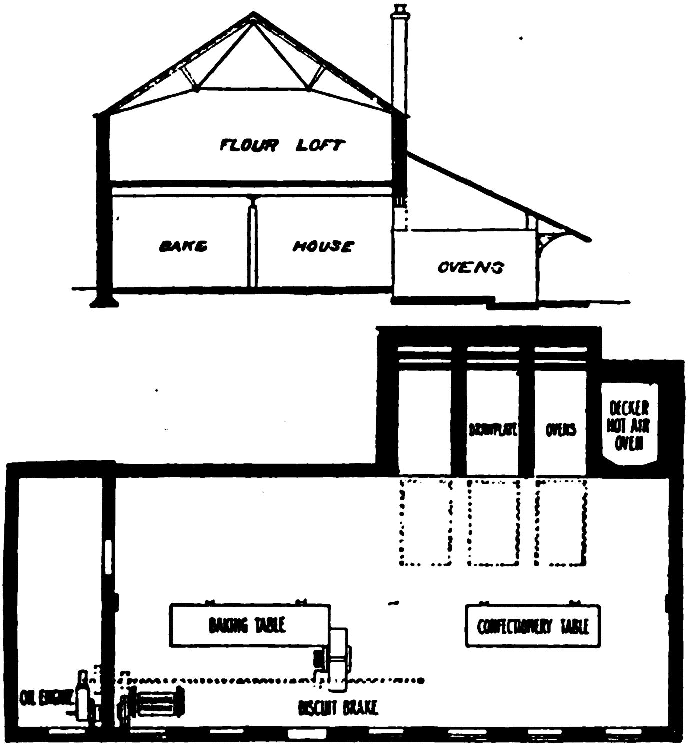
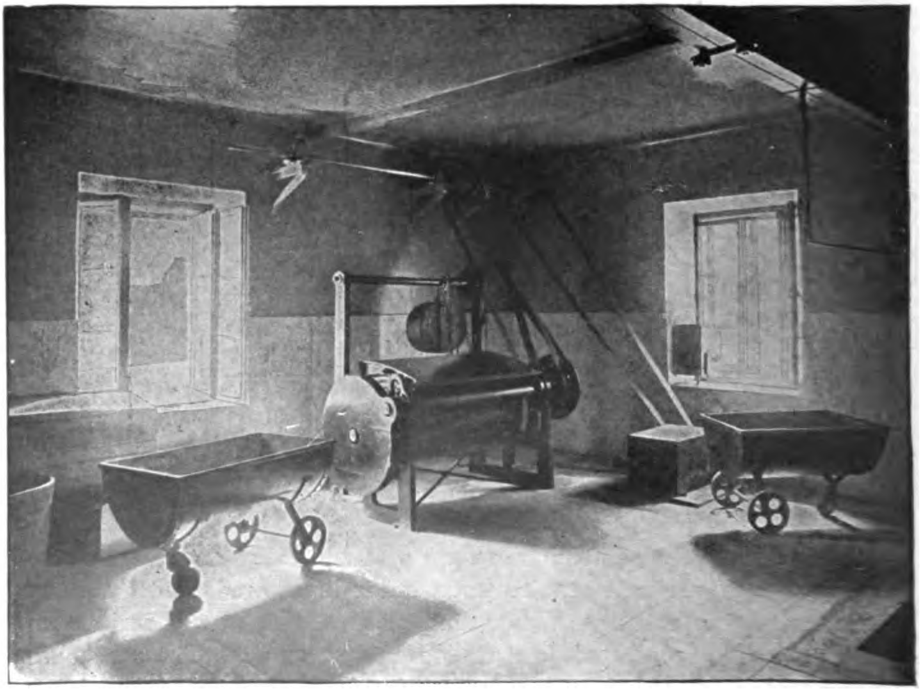


Fig. 182.—Bermuda Bakery.

of Melvin's steam drawplate ovens, and a pair of their decker hot-air ovens; also large fuel hotplate. Messrs. Melvin sent out one of their experienced oven-builders, who employed local builders to assist, and as bricks are not obtainable in Bermuda, the greater proportion of the building material had to be shipped from Glasgow. The machinery consists of a 3-sack Melvin kneader, dough divider, hoist, power whisk, shafting, pulleys, etc.: also 16 horse power oil engine. Mr. Thompson spared no expense in the erection and equipment of his new bakery, so that it is in every respect a model of what the modern bakery should be. We have no doubt that his commendable enterprise will prove satisfactory and profitable.



Corner in Modern Bakery.

Bread Statistics.

Reports recently gathered give some interesting data in regard to the bread consumers of the world. They show that while a Portuguese worries through a year with an average bread supply of 176 pounds—about half a pound a day—a Spaniard, just across the border, requires 413 pounds per annum, and Spain cannot be regarded as a wheat-growing country either. In Hungary, where waving fields of grain are common in the wheat-growing season, 361 pounds a year on an average supply a native, while an Austrian, who also raises more or less wheat, gets along with 187 pounds a year. Only 143 pounds of flour are required by a German in a year, 165 by a Dane, while the Russians, the greatest wheat-growers in Europe, eat but 99 pounds per annum per head. A native of Belgium consumes 278 pounds, and of America 357 pounds, while the Switzer eats 418 pounds per annum, an Italian 310, a Dutchman 283, an Englishman 352 pounds. The greatest flour eater in the world is the Frenchman. He consumes nearly 2 pounds a day, or 705 pounds in the year. This enormous quantity consumed by a Frenchman, when compared with the 56 pounds per annum which a Scandinavian requires, revives the old theory that climatic influences have more to do with the demands of nature than education. In the extreme northern climates, where cold is severe, flour does not seem to be the favorite food. There is not much combustion in it, as in oils and animal food. The Laplander, who eats no flour at all, is sometimes known to consume 7 pounds of whale or seal blubber at one meal. A Russian who only eats 90 pounds in a year of the flour he raises, is popularly supposed to make up the deficiency in swallowing tallow candles, and any kind of rich, fatty substance, no matter what the flavor.

It will be remembered that Sir Wm. Crookes, the president of the British Association, has prophesied that in 1931 there will be a cry for more bread than the world's farmers produce. Already, Mr. R. S. Baker states in the *Royal Magazine*, there are 517,000,000 bread-eaters. An increase equal to two Londons is yearly swelling the enormous figures, the additions coming partly from births in the more advanced countries, and partly from the training of the consumers of rice, rye, and the like into a preference for wheat foods. The deductions of years have shown that each bread-eater—man, woman, and child—will consume a barrel of flour (four and one-half bushels of wheat) every year. The French, the English, and the Americans eat more than the average; the Russians and the Germans eat less. On the basis of this average, the bread-eating world requires more than 2,300,000,000 bushels of wheat every twelve months to supply its table with bread. If the wheat fields of the world produce as much as this, then there is plenty and prosperity the world over; if the production is less, there are suffering and starvation. Few people realize how closely the crop is consumed each year. According to the statistician of the United States Department of Agriculture, the world's total production of wheat in 1897 was 2,226,745,000 bushels—not enough by millions of bushels to supply the world's food demand and furnish seed for the crops of another year. Consequently, countries of the earth where the crop was light were visited by want and high prices, in India the need even touching the point of famine. During the following year, 1898, the crop was enormous, reaching a total production reported as 2,879,924,000 bushels, but this is probably an overestimate; and, as a consequence, there was plenty of food in nearly every part of the world.

CONSUMPTION OF WHEAT BREAD INCREASES.

The consumption of wheat bread has always been a pretty good barometer to indicate the condition of the masses of a country. When and where it is small, at that time and place the mass of the people will be found living in straits; where it is large, comfort is the rule and extreme want the exception. The peasants and workers always crave white bread, no matter what faddists may say, and they gratify the craving when their means are such as to permit it.

Figures recently published showing the increase in the consumption of wheat bread, as compared with rye bread, make a very definite commentary on the increase of general comfort among the peoples of Europe, says the *Am. Miller.* In Sweden the consumption of wheat has doubled of recent years, while the consumption of rye has increased but slightly. In Belgium the laborer eats 117 pounds more bread per year than he did thirty-five years ago, and more significant still is the fact, while then only 31 per cent. of the bread was wheat bread, rye bread has now been almost entirely abandoned in favor of wheat bread. In Hungary the latest statistics show an increase in the consumption of wheat of 20 per cent., as compared with the five years preceding 1900.

France is, of course, the wheat bread country. The increase of wheat consumption in that country, as compared with the middle of last century, is over 50 per cent. A similar change is taking place in Germany, which, next to Russia, has been the country of rye bread. In 1880 the proportion of rye to wheat consumed in Germany was as 70 to 30; in 1894 the proportion had changed to 64 of rye to 36 of wheat. In fifteen years the consumption of wheat increased over 26 pounds per capita, while that of rye decreased 18 pounds.

Year by year wheat is becoming the world's bread grain. Other grains will not be entirely supplanted; on the contrary, we believe corn will form an increasingly large share of the diet of the people, but people will eat it because they like it. Rye bread will always be eaten for the same reason. But wheat, as the world gets richer and the people of it closer together, will be more and more the world's bread grain. People want it and they get it, just as soon as they can afford it.

HOW MUCH BREAD A MAN EATS.

The important position bread takes in the list of food of men has been demonstrated by Dr. L. Caye in a series of calculations. He shows how much bread a normal, healthy man with a good appetite consumes during a natural life of seventy years. Allowing one pound loaf a day would make 25.500 pounds, which would fill a room of over 400 cubic yards. The comparison illustrated in Figure 183, shows the size of loaf this would make, compared with a man of five feet eight inches tall.

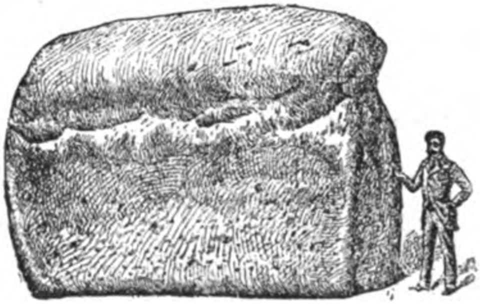
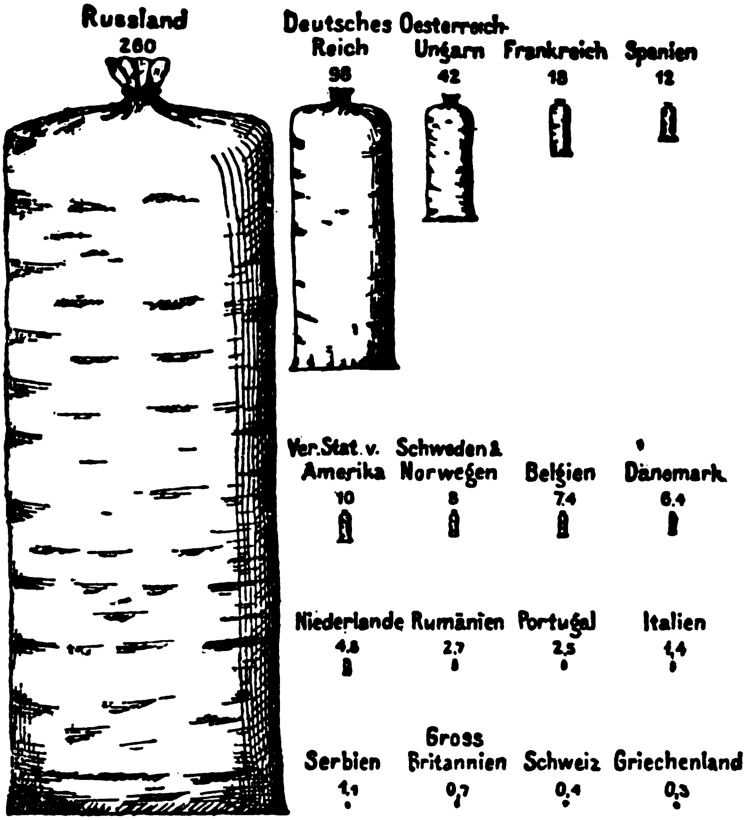


Fig. 183—The bread a man consumes.



Russia.	Germany.	Austria-Hungary.	France.	Spain.	United States of America.
260	98	42	18	12	10

Sweden and Norway.	Belgium.	Denmark.	Netherlands.	Roumania.	Portugal	Italy.
8	7.4	6.4	4.8	2.7	2.5	1.4

Servia.	Great Britain.	Switzerland.	Greece.
1.1	0.7	0.4	0.3

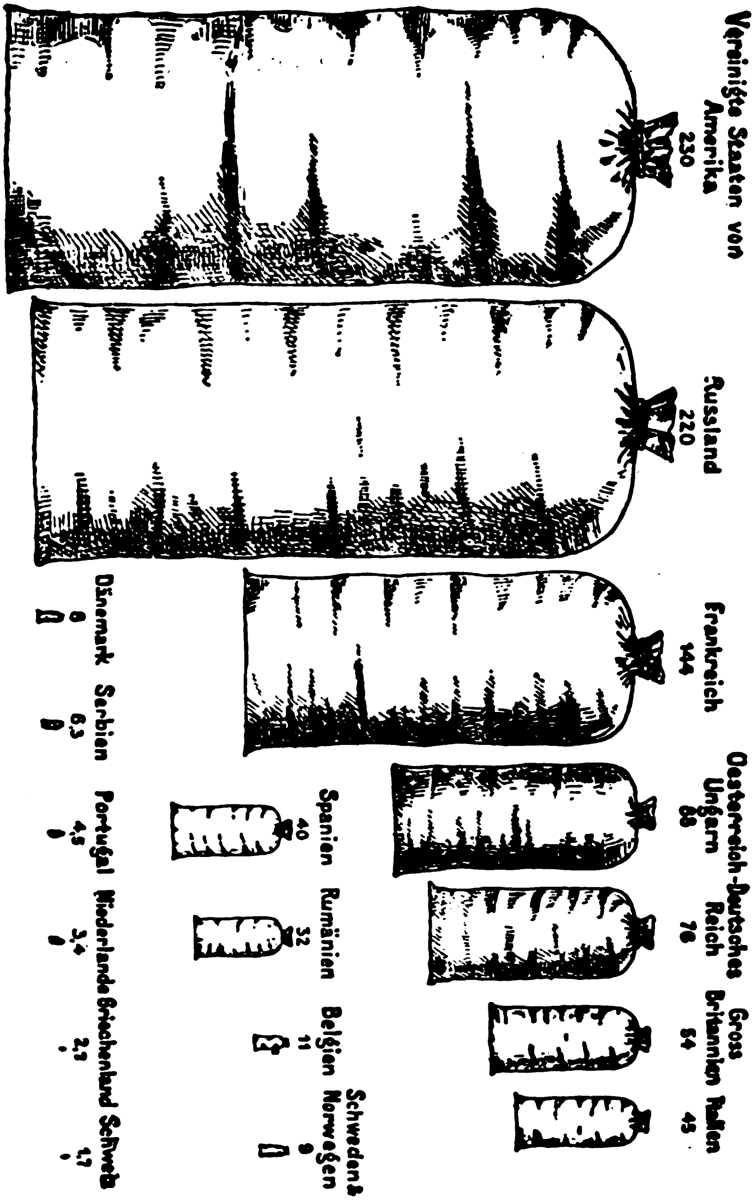
Fig. 184 —The production of Rye in million hectoliters by the nations of the earth.

SS

	ST TE		s, managers,		WAGE-EARNERS.		
			Women.				
		s.	Number.	Salaries.	Greatest number employed at any one time during the year.	Least number employed at any one time during the year.	
1		0	2,896	$876,713	68,200	56,466	1
2	Alab	65	5	1,083	312	261	2
3	Ariz	0	......	....	39	32	3
4	Arka	0	1	120	192	61	4
5	Calif	67	84	26,864	1,728	1,560	5
6	Color	2	21	8,004	477	386	6
7	Conn	4	77	24,002	1,838	1,564	7
8	Dela	0	8	2,348	196	176	8
9	Distr	0	25	5,612	637	570	9
10	Flori	0	4	1,050	167	141	10
11	Georg	0	5	984	260	256	11
12	Illin	4	226	$71,084	6,406	5,104	12
13	India	7	65	18,846	1,468	1,204	13
14	India		......	....	4	4	14
15	Iowa	6	55	17,298	975	785	15
16	Kans	0	20	5,140	429	382	16
17	Kent	1	28	8,566	709	575	17
18	Louis	7	10	3,411	1,062	861	18
19	Main	7	32	7,813	566	481	19
20	Mary	0	30	9,886	1,814	1,640	20
21	Mass	6	501	167,961	6,160	4,745	21
22	Mich	8	66	17,863	1,542	1,296	22
23	Minn	4	57	14,910	1,092	918	23
24	Missi	0	......	....	75	71	24
25	Misso	6	92	25,563	2,764	1,978	25
26	Mont	0	9	2,640	107	86	26
27	Nebr	4	12	3,306	375	313	27
28	Neva		......	....	4	2	28
29	New	6	18	5,050	382	322	29
30	New	4	80	23,630	2,946	2,644	30
31	New	0	2	540	48	42	31
32	New	4	684	223,667	16,042	13,369	32
33	North	4	5	334	52	46	33
34	North		......	....	45	33	34
35	Ohio	2	139	43,439	3,969	3,337	35
36	Okla		......	....	35	31	36
37	Oreg		13	3,518	349	207	37
38	Penn		297	76,317	8,284	7,046	38
39	Rhod		70	20,674	773	689	39
40	South		7	1,620	263	227	40
41	South		6	1,719	30	25	41
42	Tenn		14	3,706	412	331	42
43	Texa		1	240	507	456	43
44	Utah		12	2,212	143	117	44
45	Verm		11	4,032	169	136	45
46	Virg		25	4,696	476	410	46
47	Wash		12	3,660	223	196	47
48	West		10	2,194	123	116	48
49	Wisc		49	11,333	1,532	1,314	49
50	Wyo		......	....	14	3	50

CTS.—CONTINUED.

ENSES.	COST OF MATERIALS USED.				VALUE OF PRODUCTS.	
	Aggregate	Principal materials.				
		Total.	Purchased in raw state.	Purchased in partially manufactured form (including "all other materials").		
427,891	$96,221,915	$91,771,202	$5,472,171	$86,299,031	$175,667,348	1
30,114	386,909	367,958	6,920	361,038	681,736	2
5,729	49,734	48,272	632	47,640	108,549	3
6,811	64,710	59,719	250	59,469	129,911	4
216,379	2,624,261	2,501,177	174,967	2,329,210	4,876,688	5
94,409	865,100	817,174	27,881	789,293	1,606,979	6
326,397	2,914,802	2,811,437	243,692	2,567,745	5,208,694	7
10,970	264,176	255,937	7,666	248,271	485,240	8
8,302	1,144,363	1,098,796	130,619	968,177	2,038,176	9
1,893	149,470	141,210	4,205	137,005	308,600	10
504	290,557	279,451	3,089	276,362	597,549	11
799	$8,193,002	$7,892,138	$511,647	$7,380,491	$15,878,861	12
7,108	2,338,967	2,256,296	39,381	2,216,915	4,165,511	13
498	3,849	3,562		3,562	8,925	14
837	1,427,765	1,378,270	11,292	1,336,978	2,673,788	15
735	518,064	487,558	9,633	477,925	979,315	16
652	837,811	809,483	27,304	782,179	1,644,415	17
867	1,393,789	1,348,153	8,309	1,339,844	2,295,753	18
182	643,856	614,950	15,645	599,305	1,204,531	19
768	2,369,846	2,282,623	84,979	2,197,644	4,140,692	20
081	8,346,701	8,023,027	824,532	7,198,495	15,420,529	21
135	2,253,154	2,163,092	47,027	2,116,065	4,098,128	22
188	1,532,116	1,466,712	44,770	1,421,942	2,760,489	23
093	88,593	84,684	2,412	82,272	168,877	24
991	3,884,605	3,767,082	333,169	3,433,913	7,284,268	25
798	202,467	189,947	5,384	184,563	416,411	26
588	505,056	481,999	12,413	469,586	1,061,567	27
481	8,629	7,399	146	7,253	16,180	28
042	469,529	447,829	8,189	439,640	859,638	29
787	4,561,905	4,403,505	280,010	4,123,495	8,183,144	30
454	54,866	49,696	241	49,455	122,644	31
857	23,557,866	22,835,303	1,511,069	21,324,234	43,051,251	32
496	57,996	54,415	1,249	53,166	106,605	33
362	37,203	34,169	500	33,669	81,100	34
399	5,427,110	5,238,669	179,668	5,059,001	9,857,288	35
218	39,891	37,252		37,252	86,860	36
27,087	465,261	453,157	13,841	439,316	778,946	37
09,193	11,055,386	10,630,173	617,952	10,012,221	20,784,041	38
1,017	1,235,881	1,196,350	155,940	1,039,410	2,156,292	39
17,110	323,390	313,239	2,042	311,197	524,908	40
4,232	29,001	26,624	1,214	25,410	78,933	41
57,923	682,752	666,344	8,352	657,992	1,166,219	42
54,582	685,314	646,470	9,521	636,949	1,302,615	43
21,184	142,149	135,713	8,229	127,484	291,313	44
27,389	206,419	195,494	5,262	190,232	417,269	45
33,540	472,584	454,829	16,907	437,922	922,361	46
31,414	320,494	308,784	20,874	287,910	654,316	47
53,140	212,556	204,865	8,047	196,818	393,920	48
02,079	1,870,611	1,787,506	15,100	1,772,406	3,619,288	49
1,617	11,399	10,710		10,710	128,035	50



United States of America.	Russia.	France.	Austria-Hungary.	Germany.	
230	220	144	88	76	
Great Britain.	Italy.	Spain.	Roumania.	Belgium.	Sweden and Norway.
54	45	40	32	11	9
Denmark.	Servia.	Portugal.	Netherlands.	Greece.	Switzerland.
8	6.3	4.5	3.4	2.7	1.7

Fig. 185—The production of Wheat and Barley in million hectoliters by the nations of the earth.

Heat for Baking.

PREPARED BY EMIL BRAUN.

THERMOMETER AND PYROMETER.

The introduction of machinery and patent bakeovens necessarily demand of the up to date baker a more or less technical and theoretical education. The one demands the other. The regulation of temperature of water, sponge and dough, as well as the regulation of heat in bakeshops and the ovens must be studied and the same properly applied.

"Is the use of the thermometer or some sort of heat-registering apparatus imperative? If a man has been in a bakehouse or dwelling long enough to know its construction," writes Mr. J. Blandy, "by feeling, fumbling, groping, and using most of his senses, he can find his way over it in the dark, with perhaps a stumble now and again over bottom and top steps, etc. But if he takes a light with him, no other effort of his senses is needed than the sense of sight, and he will also be able to travel more safely and quickly."

Heat expands nearly all substances, while in the cold they shrink, particularly metals and liquids. Upon this law of Nature the construction and work of the thermometer, or heat measure, is based. The quicksilver in the glass tube of the thermometer rises or falls according to the influence of heat. The fundamental principle of all heat measures is the same, only the construction varies, and we recognize three standard scales, i.e., three separate systems of degrees: The Réaumur, the Celsius and the Fahrenheit. The Réaumur thermometer, which is the standard in Germany, Austria, etc., has its "*Scala*" divided into eighty parts or degrees; the Celsius or Centigrade has 100 degrees and is used almost exclusively in France and Southern countries of Europe; the Fahrenheit system is used in America and frequently in England, has 180 degrees.

To indicate the system referred to, when mentioning temperature, the roman letters R. C. or F. are used; for instance, 10° R. means 10 degrees Réaumur. These "Scala's" are named after the inventors (Réaumur, born 1683, at La Rochelle, France; Celsius, born 1701, at Upsala, Sweden; Fahrenheit, born 1685, at Danzig, Germany). The point at which water freezes is marked on the Réaumur and Celsius Scala with 0°; on the Fahrenheit with 32°; the boiling point of water (by 760 mm. barometer) is on the Réaumur 80°; on the Celsius 100, and on the Fahrenheit 212. The difference or the space between the

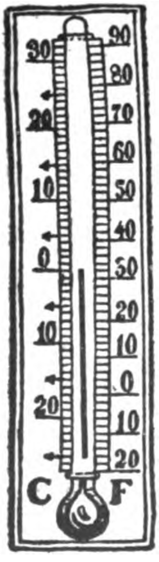


Fig. 186-Thermometer.

freezing point and the boiling point of the three systems is divided respectively in 80, 100, 180 equal parts or degrees.

By Réaumur and Celsius the degrees below the freezing point (0°) are marked *"minus,"* or *"Cold"* degrees (—0) in contrast to the degrees above the freezing point, or *"Heat"* degrees marked + (plus). On the Fahrenheit thermometer, however, the 0° degree is 32 below the freezing point. It is, therefore, very important always to mention the letters R. C. or F. to indicate which system or "Scala" is used. For instance, you would write to Europe: "We had very hot weather yesterday; it was 100° in the shade." Not mentioning that you mean 100° Fahrenheit, they may call you a fakir, an impostor, for the reason that, according to their system, the water in the rivers would be boiling at 80 degrees Réaumur or 100 degrees Celsius. It may be appropriate here to give a table transforming the degrees from one Scala to the other:

1. To transform degrees of Fahrenheit into Réaumur, you deduct 32 from the number F., multiply remaining number by 4 and then divide by 9. For instance, 77° F. are equal to 20 R. Deduct 32 from 77 = 45; multiply with 4 = 180; divide by 9 = 20.

To transform Fahrenheit degrees into Celsius, deduct 32, multiply by 5 and divide by 9.

2. To transform Celsius into Réaumur, multiply by 4 and divide by 5. To transform Celsius into Fahrenheit, take the number of C. degrees 1 4-5 times and add 32.

3. To transform R.° into C., take the number of R. 1¼ times. R.° are transformed into F. by taking the number of R.° 2¼ times and add 32.

R.	C.	F.	R.	C.	F.
80°	100°	212°	14	17.5	63.5
76	95	203	12	15	59
72	90	194	10	12.5	54.5
68	85	185	8	10	50
64	80	176	5¾	7¼	45
60	75	167	4	5	41
56	70	158	2	2.5	36.5
52	65	149	0	0	32
48	60	140	— 4	— 5	23
44	55	131	— 6	— 7.5	18.5
40	50	122	— 8	—10	14
36	45	113	—10	—12.5	9.5
34	42.5	108.5	—12	—15	5
32	40	104	—14	—18	0.5

30	37.5	99.5	—16	—20	— 4
28	35	95	—20	—25	—13
26	32.5	90.5	—24	—30	—22
24	30	86	—28	—35	—31
22	27.5	81.5	—32	—40	—40
20	25	77	—36	—45	—49
18	22.5	72.5	—40	—50	—58
16	20	68			

THERMOMETERS.

The column of mercury in the tube of a thermometer seems to be round, and about one-sixteenth of an inch in diameter. As a matter of fact it is flat, and a good deal finer than one of the hairs of your head, says the Pittsburg *Dispatch.*

When a maker of the instrument was heard to say this he was asked for an explanation, and he thereupon told some things abou the work that are not generally known.

As mercury does not expand to any great extent, it is absolutely necessary that the opening in the thermometer should be very fine, and it is made flat because, if it were round, its fineness would make it too hard to be seen. Its apparent size, about ten times its real size, is due to the magnifiying effect of the glass.

Mercury is used in thermometers because it is so regular in its expansion and contraction. Spirits of wine is sometimes used, with coloring matter added, but it is not perfectly accurate. The degree marks on a mercury thermometer are the same distance apart the whole length of the scale, but in a spirit thermometer the marks are further apart above, say forty degrees, than they are below that, because expansion of the spirit increases in a greater ratio above that point.

It is generally supposed that the tube of a thermometer is made to conform to the scale, but it is just the other way—the mercury is put into the bulb and then the scale is graduated to the requirements of the tube.

The mercury is injected into the tube by evaporation. Its divisibility is remarkable; it may be forced through a piece of wood, and yet every particle will be a perfect globule.—N. Y. *World.*

BAKE OVEN ANGLE STEM THERMOMETERS.

Mercury thermometers for bake ovens have not been extensively used heretofore on account of their liability to breakage, as well as constant separation of mercury column. Both of these defects have been successfully overcome in the form of instruments illustrated here. They have been adapted for all kinds of ovens and are extensively used in many of

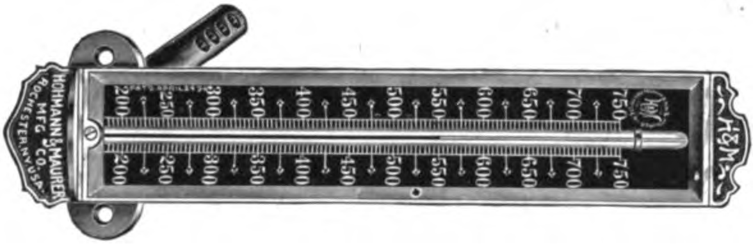


Fig. 187.—Angle Stem Thermometer for Bake Ovens. (Hohmann & Maurer System.)

the largest bakeries. The simplest form bake oven thermometer has an oval flange fixed to scale case (see illustration) and can be attached to any oven by simply inserting a piece of iron pipe as a sleeve.

PYROMETERS.

These latest improved "Bake Oven Pyrometers" have the following advantages above other Pyrometers, which are in the market and are adapted for any style of oven. The movements are made non-corrosive, also the inner expansion stems of same, thus insures better wear. The inner and outer expansion stems of the Pyrometers are made very sensitive and the hand on the dial-plate will show instantly the least variations if the oven becomes too hot or too cold. Also by its use green hands may be broken in at the oven, there need to be no uncertainty or guess work as to the temperature of the oven and consquently no chance of burnt bread or crackers and it is a positive fact with the oven at the proper temperature more work can be done in a given time.

Fig. 188.—Zaubitz' Improved Pyrometer.

These "Bake Oven Pyrometers" have also an adjusting screw on the back of the case, to adjust the pointer on the dial-plate to the temperature of the atmosphere generally 60 degrees, which the Pyrometer should always show when cold. By this adjusting screw every baker can set the

Pyrometers if they should become out of order or when they need re-adjusting.

The Pyrometer needs neither attention nor lubrication, it is always ready for use.

Length of stem from end to end as shown in the cut is 36 inches.

There is also a vast difference in the permanency of the temperatures of internally and externally heated ovens. In the ovens heated from the outside, where the fire place is underneath the oven chamber, the fire can be kept burning during the time the batch of bread is baking, and these ovens are called *"Continuous"* bakers. The fire can be kept up indefinitely and the heat refreshed at any time. The heat absorbed by the loaves, when put into this style of oven, is replenished during the actual time of baking, by a continuous heat drawn from the fire beneath the hearth. In the old style oven, with the fire inside the oven, the fire necessarily has either been dumped or is nearly out or covered over with ashes or an iron shield. It is plain that there must be sufficient heat stored in the baking chamber to last for one or more bakings, as the fire can not be replenished during baking. Consequently in the ovens with the fire inside of the oven chamber, a higher degree of heat will be necessary at the start of baking than in the ovens heated externally.

Not every flour produces loaves of the same rich colored crust, if baked in the same heat, and under all the same identical conditions. Some brands of flour will require as much as 20 degrees more heat than others, to produce the same rich golden colored crust. The regulation of the proper oven temperature must therefore be left to the *"man at the oven."*

TEMPERATURE OF DOUGH AND SHOP.

It is hardly possible to give a certain scale for the exact degrees at which to take the water for making dough. The hardness of the water, the strength and vitality of the yeast and the stability of the flour used are all conditions to be considered to say nothing about the fluctuations of the atmosphere. The proper temperature of the dough, when taken from the mixer is considered by experienced bakers to be between 78 and 82 degrees F. The time it will have to stand to ripen or aerate must be judged by the foreman or the man in charge of the doughroom.

Mr. John Blandy, of London, gives the following rules how to ascertain a required temperature of dough. He says:

"The temperature, or degree of heat of a dough can always be within a degree, by adding together the number of degrees of heat in the flour to the degrees in the water, and then dividing by two, which will give the heat of the dough when made. Say that the heat of the dough when made is 80 degrees F., and the heat of the flour is 60 degrees, then the heat of the water must be 100 degrees F. This will make 160 degrees, half of 160 degrees being 80 degrees, the required heat of the dough. When the heat required is 78 degrees, and the flour 58 degrees, the water must be 98 degrees; these added together make 156 degrees, half of which is 78 degrees, and so on to insure any heat in dough."

Although the above rule may be applied as nearly right, we can not agree with Mr. Blandy that the exact degree of heat of the dough can always be obtained by his method. He does not seem to take into consideration the loss of heat while dough is in the mixer; and then, the first dough made after the mixer has stood idle for a number of hours will naturally reduce the heat of the water and flour more than the second dough, especially in winter, unless the shop is kept at a certain temperature all the time. To prove this statement we quote Prof. Wm. Jago from his standard work "Science and Art of Bread Making." On page 6 he gives results of observations on temperatures of doughs as follows:

"A number of observations have been made on the temperatures of mixtures made in the bakehouse on the large scale for manufacturing purposes. The doughs were machine mixed and no allowance is made for the salt and compressed yeast, quantities of which were the same in all cases. The quantities, temperatures, and calculated specific heats are given in the following table:

WATER			FLOUR		DOUGH
Quarts	Lbs.	Temp. F.	Lbs.	Temp. F.	Temp. F.
53	132.5	95°	205	52.5°	79.0°
51	127.5	90°	205	50.0°	77.0°
51	127.5	90°	205	50.0°	77.0°
53	132.5	98°	205	53.0°	79.0°
53	132.5	89°	205	53.0°	76.0°
53	132.5	89°	205	53.0°	76.0°

The whole of these figures, it must be remembered, are those obtained in experiments made under conditions such as hold in the bakehouse, and represent rather the result of actual working, than theoretic specific heats with all disturbing causes eliminated. In the case of the mixtures made at the highest temperatures, there is naturally a greater loss of heat, and this causes an increase in the corresponding apparent specific heats.

A very interesting paper on the above subject was read by Mr. W. S. Corby, of Washington, D. C., at the Convention of the National Association of Master Bakers in Detroit. We reprint the same here in full:

Temperature in Dough Making.

It is well known in bread making, that by careful attention to the temperature of the bakery or dough room, and the temperature and weight of the flour and water, which constitute the major portion of the dough, that a painstaking workman is able to make a dough at a desired temperature; that is, a temperature he knows it is necessary to have in order to allow him to accomplish certain results, such as a fixed time for the fermenting period, age of the dough, different characters of bread, etc.; but after the dough is made, the baker is at the mercy of atmospheric conditions over which he has had no control; for instance, at the time he makes his dough, he may have a dry clear and bracing atmosphere to work in; and after his dough has been made, say two or three hours, the conditions will be entirely changed, the atmosphere becoming close, moist and sultry, which has its immediate effect on the dough, making it soft, and weak, and even though it may be given a good age, the baked bread will have a young appearance and be dark in color.

Then again, the temperature may suddenly drop; the atmosphere becoming quite cold to what was expected when the dough was made. which condition is liable to chill the dough, retarding fermentation and putting the work back in the shop, and when the baked bread finally comes from the oven, it is a small indifferent loaf, and always has a poor texture; but of all the sudden changes that the baker has to contend with, the one that makes him the most serious trouble, is when the temperature of the atmosphere suddenly increases, say from 80 to 95 degrees F. or more, for this (too often) means sour bread, and even though the bread may not be sour, we are sure that bread made in a temperature of 90 degrees F. or more is not as good as bread when made at a temperature of from 80 to 82 degrees F., for as the temperature increases above this point, the gluten in the dough softens and loses its strength and acids develop whereby it is impossible to obtain as wholesome and nutritious bread as when made under more temperate conditions, and this, we believe, is one of the main reasons why the average person does not eat as much bread in hot weather as in cold. The atmospheric conditions here referred to, and many others that it would be almost impossible to mention, are liable to occur at any time.

We commenced to cast about for a means of counteracting these undesirable elements, whereby we could be quite independent of outside influences, and the most practical scheme that suggested itself to us was a refrigerating room for the doughs and ice machinery to be used in connection with the same, similar in character and operation to that used by cold storage plants.

To start with, we have a room 32 feet long, 15 feet wide, and 10 feet high, which gives us ample room for ten troughs holding in all fifteen thousand pounds of dough. The walls, ceiling and floor being constructed as follows: First, one-inch dressed pine boards; then two sheets of heavy, water-proof, building paper; then one-inch dressed boards; then 2 x 6 lumber fastened on to the same every five feet, making a two-inch dead air space between; after this, another thickness of one-inch dressed boards and then two more sheets of heavy water-proof building paper, covered again by one-inch dressed pine boards all carefully fastened together, forming a wall six and one-half inches thick.

There are many ways of building refrigerating rooms, but this construction gives us the very best satisfaction, as we are able to maintain a temperature of 70 degrees F. in the dough room with very little attention, when the temperature outside of the room is often from 90 to 105 degrees F.

To cool the dough room, we use an ice machine, operated on the direct expansion system, where the ammonia is expanded directly into the pipe coils that are suspended about eight inches from the ceiling of the room. Under each coil of pipe is provided a drip pan set at an angle of 45 degrees to the coils, and the cold air will follow the pan down on the upper side, and the warm air will follow the pan up on the underside, causing a complete circulation of air in the room; and as the frost that collects on the pipe coils is formed from what moisture may be in the air, you can see that the atmosphere in the room is always comparatively dry, for the frost on the pipes will attain different thicknesses as the moisture in the air may be present, and very soft doughs feel decidedly dryer to the touch than a very stiff dough will, where it is subject to a moist air and high temperature during the fermenting period.

The advantages we most observe with the refrigerating plant are as follows:

1st. We are able to control the doughs as we see fit.

2d. Each dough follows up the preceding dough to the minute, doing away with delays caused by the doughs coming slowly, or careless work caused by the doughs coming so fast that they cannot be properly handled for fear of their becoming sour before being baked.

3d. The dough is healthier, and even when given good age, tastes and smells as sweet as when first made, because acids that destroy the good flavor in bread cannot so rapidly develop.

4th. We are able to use less flour in the dough than would otherwise be required to make the same kind of bread.

5th. The dough becomes stronger in an atmosphere where the temperature is about 70 degrees F. than it would in the ordinarily hot temperature of the bake-shop of 90 degrees F. or more, which means larger loaf volume and all around better bread.

6th. The entire amount of bread manufactured under these conditions will average decidedly more uniform in size, color and texture, which generally means an increase in business.

7th. It simplifies the conditions with which the baker has to contend. For example, the dough made at a temperature of 82 degrees F. and then placed in the dough room at a temperature of 70 degrees F. will, when ready to be divided up into loaves, be at the same temperature of 82 degrees F.

8th. It should be impossible to make sour bread; and that could only happen through inexcusable carelessness.

The cost to maintain and operate our cold storage plant is ninety cents every twenty-four hours, which not only includes the refrigerating dough room, but also a room with the temperature at 35 degrees F., for keeping milk, yeast, etc., and a cold-water tank that supplies us with two hundred gallons of water per hour at a temperature of 33 degrees F., and after having the same in operation during the hot months of the past summer, we know that the standard of bread that we have been able to make has been above that which it would have been if we had not had the cold storage plant in operation.

The fermenting period, formerly a source of much guess work and anxiety with us, has now reached such a point of assurance and accurate conditions that bread making is now a pleasure.

In shops which have no regular proving rooms, where the dough is kept under even temperature in the troughs and closely watched, some attention must be paid to the temperature near the floor as well as higher up. Here is where some bakers make a mistake. They have a thermometer hung in the shop, about five to six feet from the floor, and calculate the shop temperature from that. If they place another thermometer near the floor, they may find quite a difference between the two, especially in winter. Mr. August P. Junge, of Joplin, Mo., one of the best known younger men in the baking business writes:

"The temperature of our doughs is always taken as they are set. This will act as a guide in case it turns colder the next day, when the temperature can be raised a degree or two. In making the doughs, the temperature is taken before all the water is poured on and the remaining water poured on accordingly. In this way the doughs can be made to a desired temperature. For taking the temperature of the doughs I use an ordinary dairy thermometer."

The air in a bakeshop will also affect the doughs. I have found that on a Sunday the doughs act slower than on other days; the reason for this I have laid to the air, it probably being purer and more free from yeast cells. Our shop is thoroughly aired on Saturday, and this probably causes it.

I have also found that some shops require less yeast than others. This is also caused by the air and perhaps the cleanliness of the shop. Our shop is well ventilated, but also requires more yeast than some others.

The temperature of the bakeshop during the operation of molding is another important feature in producing uniform bread, as a dough ferments more while it lays on the bench than at any other stage.

THE OVEN HEAT.

The heat in a bake-oven can and should be kept under perfect control by the foreman or ovenman, just as an engineer keeps his engine under control. A pyrometer or thermometer can be adjusted to every make of oven, whether brick, iron or sheet-iron. Of course a general scale of degrees to all ovens cannot be adopted. The thickness of the brick walls through which the tube has to run before it reaches the recording dial, or the proximity to the fireplace, will have to be considered. But after the baker has once fixed the scale in his oven, he can always depend on it. There are three different scales or systems of heat measuring—the Réamur, the Celsius and the Fahrenheit. The latter is the most popular and is used exclusively by American bakers. There are three methods employed by bakers in judging the heat for baking:

A sharp or bread heat, 450 to 520 degrees F.

A medium or cake heat, 360 to 450 degrees.

A slow or drying heat, 300 to 360 degrees.

In general the heat mentioned for breadbaking is 500 degrees, Fahrenheit.

After one or more trials a baker will know how high the heat in his oven should be for the various kinds of baking. One baker told me recently that he heats his patent oven only to 360 degrees for bread. Portable ovens are generally heated a little higher than brick, because the heat coming through the thinner walls causes the thermometer to rise quicker than where a thick wall is first to be passed through.

The Hubbard Oven Co. gives the following scale of degrees for the pyrometer on their ovens:

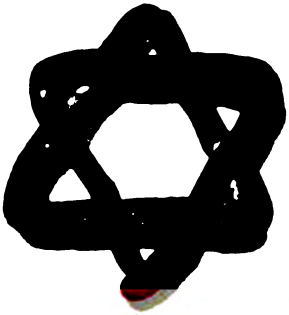
"This should register 450 to 500 degrees for bread, rolls, pies, etc., and say 350 for cookies and light cakes. A few days' trial, however, will be a better instructor to you than anything we can tell you, as bakers differ in their opinion of the amount of heat required for the several bakings."

Special care should be taken not to heat the oven too quickly for bread. A so-called flash heat is not good at beginning of baking. In a flash heat the crust on the bread is formed too quickly, and will get brown before the water from the inside dough can be sufficiently evaporated; the crust burns and the inside remains raw. We also have to consider whether the oven is to be filled or only partly filled at each baking. If the oven is filled to the door and each loaf is close to the other (especially in pan bread), it takes from ten to fifteen minutes longer to bake a batch than when the oven is only half full, and the loaves not so close together.

An old method recommended for novices in baking is to place a piece of paper inside the oven door. If it takes about five minutes to bake the paper a dark brown, the oven is about right for bread. If the paper burns in a minute or so, the heat is too flashy. If the paper doesn't brown at all in five minutes, the oven is too cold for bread.

Some bakers throw a handful of flour into the oven to test the heat. If it burns at once, the oven is too hot. By watching how long it takes to burn, the various stages of heat may be determined.

A practical baker will arrange his baking according to the oven. If it is heated to the proper bread heat, the fire should be stopped and the dampers closed. If the bread-baking is finished (not more than two batches) and the oven has rested a while, or the dampers have been drawn—the heat being about 400 degrees—it should be ready, without any more fire, for pies, cookies, dropcakes, etc. Then, with the heat at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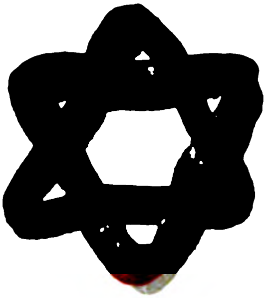
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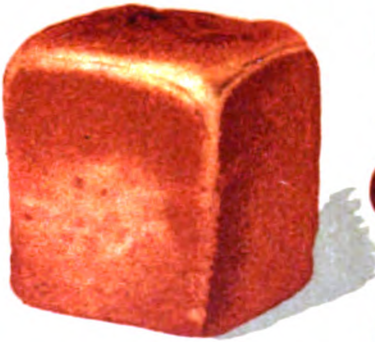
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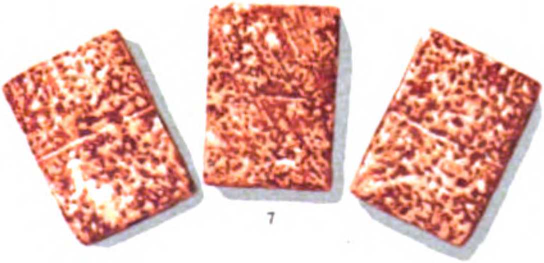
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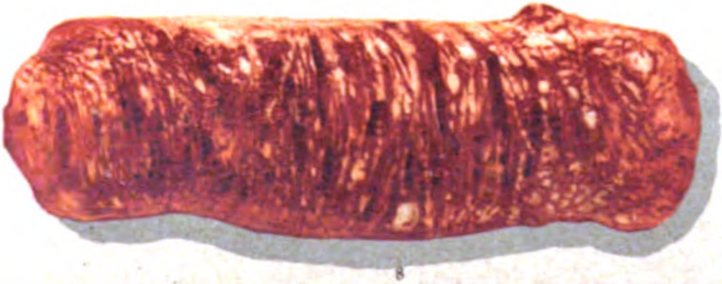
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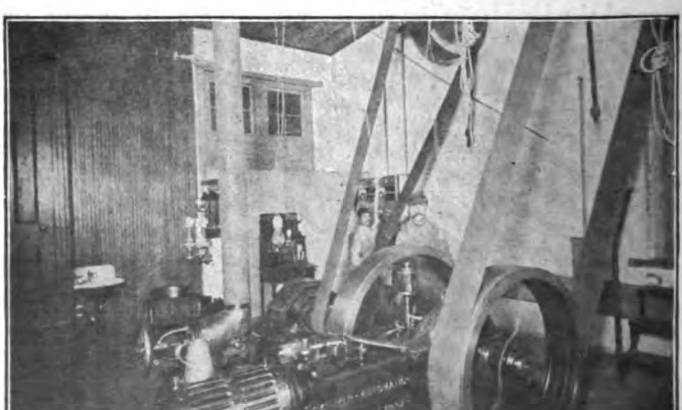
360 degrees, winecakes, cupcakes, macaroons and kisses could be baked. Of course we have now the modern continuous baking ovens, in which bread can be baked continuously. See chapter on Bakeovens.

The *Canadian Baker* in an article on heating ovens says: "A great deal of fuel may be saved and the spoiling of goods avoided by a careful study and mastering of the oven. It is appalling the waste and loss that accrues through mismanagement and carelessness in this respect. A good ovenman is worth a good deal to an establishment."

TEMPERATURE OF BREAD DURING BAKING.

In the baking process of bread the constituents are exposed to a varying temperature according to their location in different parts of the loaf, says the London *Miller*. Very little is on record as to the temperature attained in the oven during baking. Jago says that the temperature should be from 220 to 260 degrees C. Probably the ordinary temperature of the bake oven is over 200 degrees C. The exterior of the loaf is exposed fully to this degree of heat, but the interior, owing to the large amount of moisture present, can scarcely be heated beyond the boiling point of water. Some direct observations made upon the temperature of the interior of the loaf have, by means of maximum recording thermometers embedded in the dough, shown that it does not exceed 100 degrees to 102 degrees C. In different parts of the loaf, therefore, the carbohydrates are exposed in a moist condition to a temperature ranging from 100 degrees to 258 degrees C. Under these conditions, particularly at the higher temperature sucrose would undergo slight inversion, but invert sugar would not be affected. The chief change would be produced in starch. When suspended in water, all varieties of starch are converted into soluble forms at a temperature of 100 degrees or less. This action becomes less marked when the starch is merely moist. Dry starch is said to be converted into soluble forms at 200 degrees. According to these views the starch of bread should be largely rendered soluble by the heat of baking. That this is not the case is pointed out by Jago, and also appears from the experimental data obtained at Purdue University. The small amount of soluble starch, dextrin, etc., found is doubtless produced in the crust of the loaf. The starch of the interior is hardly heated beyond 100 degrees, and this is not sufficient in the absence of an excess of moisture to produce the change to the soluble form. As to the effect of these conditions of heat and moisture upon the pentosans, hemicelluloses, and true celluloses but little is known. There is every reason to believe, however, that these constituents of flour undergo little or no change during the processes of preparing or baking bread.

Some careful investigations have been made by M. Balland on the temperature which is reached in the interior of a loaf of bread during baking, and the results were published in the "Comptes Rendus," Paris. Delicate thermometers were inserted in the dough before placing it in the oven, and on the removal of the loaf the temperature recorded was carefully noted. It seemed that contrary to the opinions expressed by some investigators that the heat generated in the crumb of the bread never exceeds 212 degrees Fahr., that is to say the temperature of boiling water, M. Balland finds that it invariably attains from 212 to 216 degrees Fahr., while that of the outer crust, which cannot form at this temperature, is very much higher. These experiments were made on various kinds of bread baked in different sort of ovens, so that they may be taken as conclusive as regards the normal temperature reached during the manufacture of bread.



Engine Room. (Schmalz' Bakery).

The Manufacture of Compressed Yeast.

A baker's book would not be complete without some reference to the manufacture of compressed yeast, an article which, since its introduction into the United States some thirty odd years ago, has revolutionized the industry of bread baking in all its branches. An opportunity was recently afforded the editor to visit the compressed yeast works of the Fleischmann Manufacturing Company and inspect the process of manufacture (or more correctly speaking, cultivation and preparation) of this now almost universally used article—by wholesale and retail bakers and household cooks alike—and he left marveling at the exactitude which characterizes every step in the several processes through which compressed yeast passes, at this plant, before it is ready to be placed on the market.

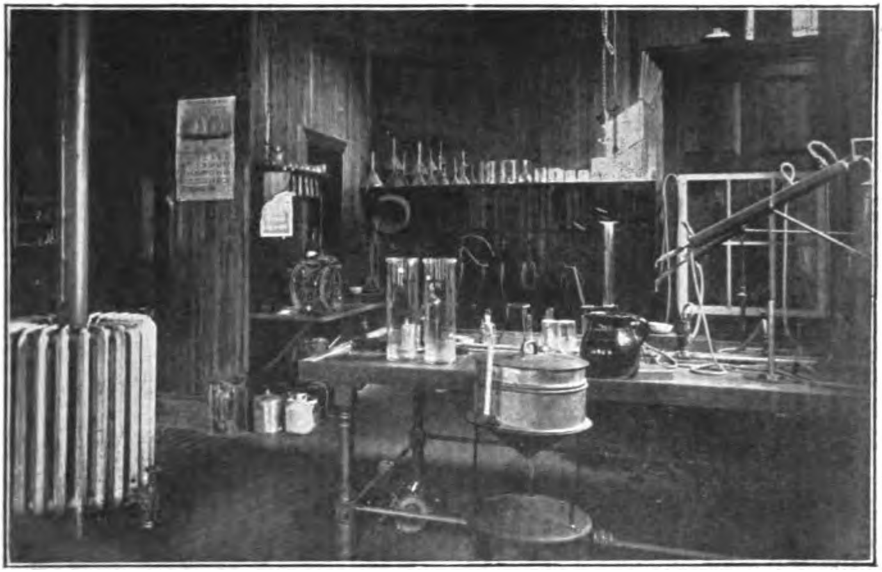


Fig 189—Laboratory.

The Works are located at Charles Point. Peekskill-on-the-Hudson, an ideal spot for the location of a plant handling a food product or anything which enters into man's food, the hygienic conditions being unsurpassed. The plant was completed in the summer of 1900, is the largest of its kind in the world and is equipped throughout with the most modern machinery and appliances, many of the latter being unique and designed by experts in the employ of the Fleischmann Manufacturing Company.

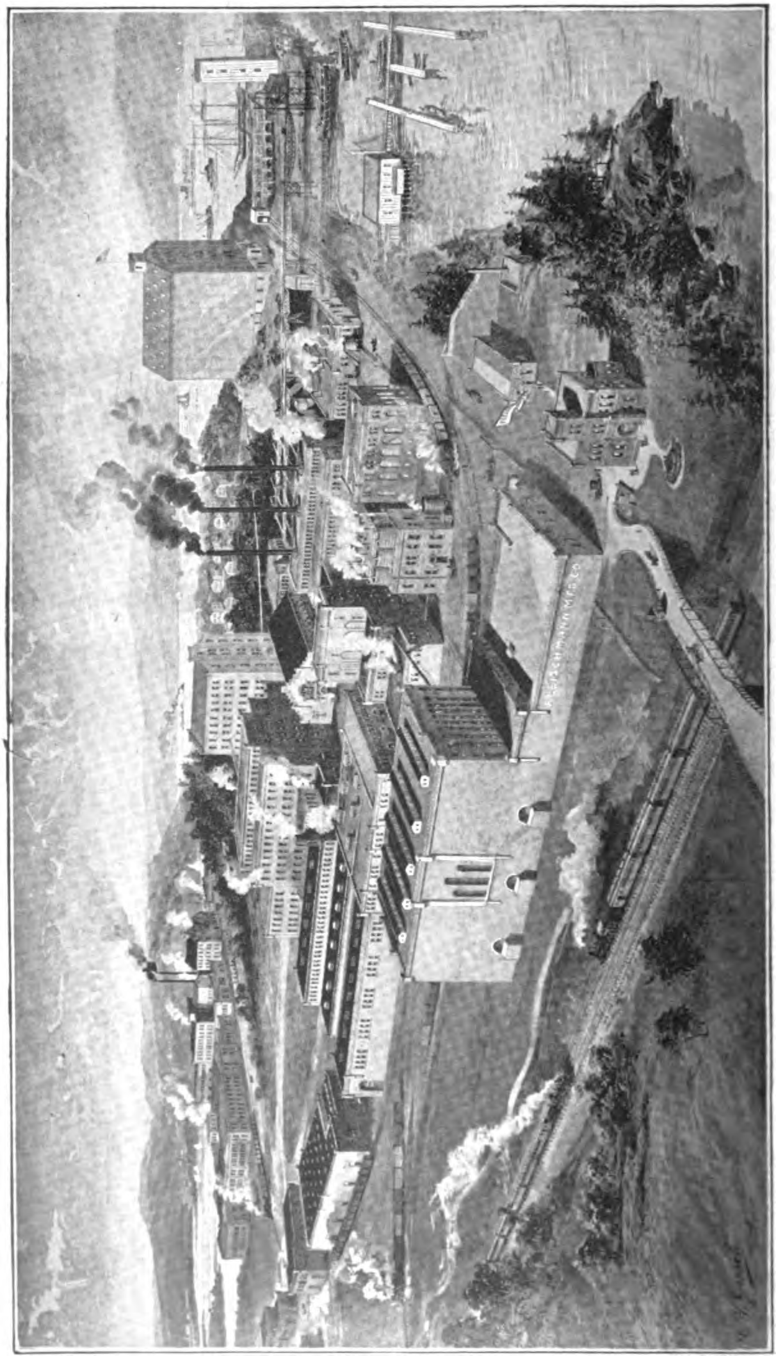


Fig. 190.—Factory at Peekskill on the Hudson.

The accompanying bird's-eye view gives but an inadequate idea of the size of the plant, but its magnitude may be comprehended when it is stated that it covers one hundred acres of ground. In the upper right-hand corner of the picture is the marine tower and granary. In the marine tower the grain, which has been conveyed to it either from boats or cars, is carefully blown (and thus freed from dust), screened and cleaned, after which it is conveyed to the granary which has a capacity of 350,000 bushels of grain. Only the best and finest grades of malt, rye and corn are used, all of which grain is chemically tested by an expert chemist and his staff; a section of his laboratory is shown herewith. (Fig. 189).

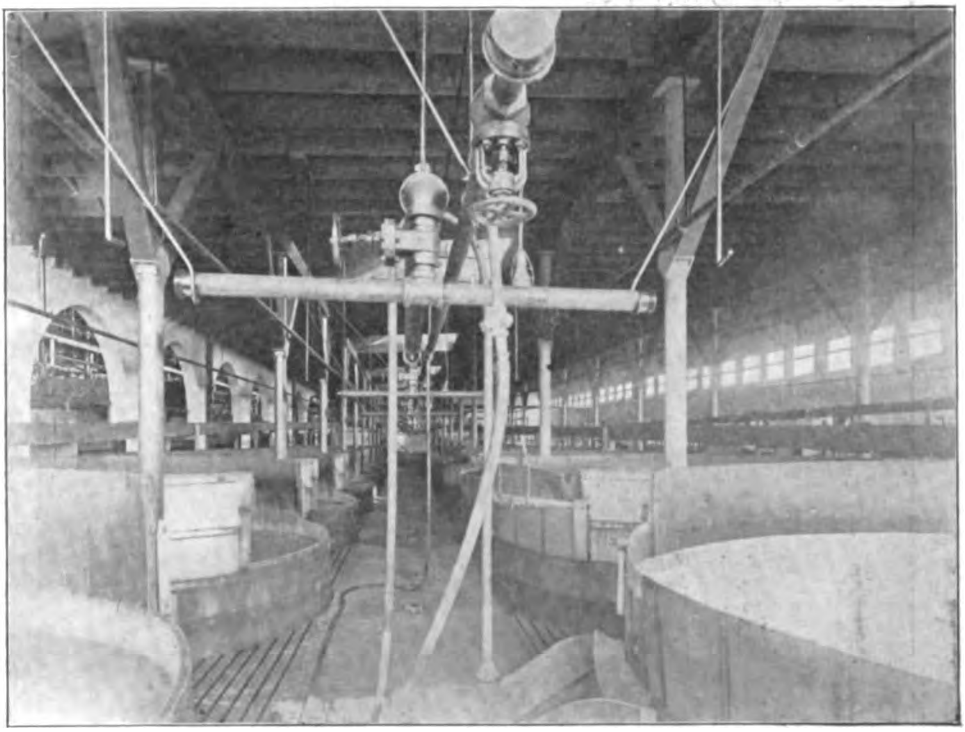


Fig. 191.—Mash Room.

From the granary the grain is conveyed to the mill, the high building to the left of the granary where it is ground preparatory to being subjected to the first process in the cultivation of Yeast therefrom, which operation is conducted in the building immediately in front of the mill. From thence the product in the course of preparation is run into the building facing that last referred to, where it is advanced another stage in

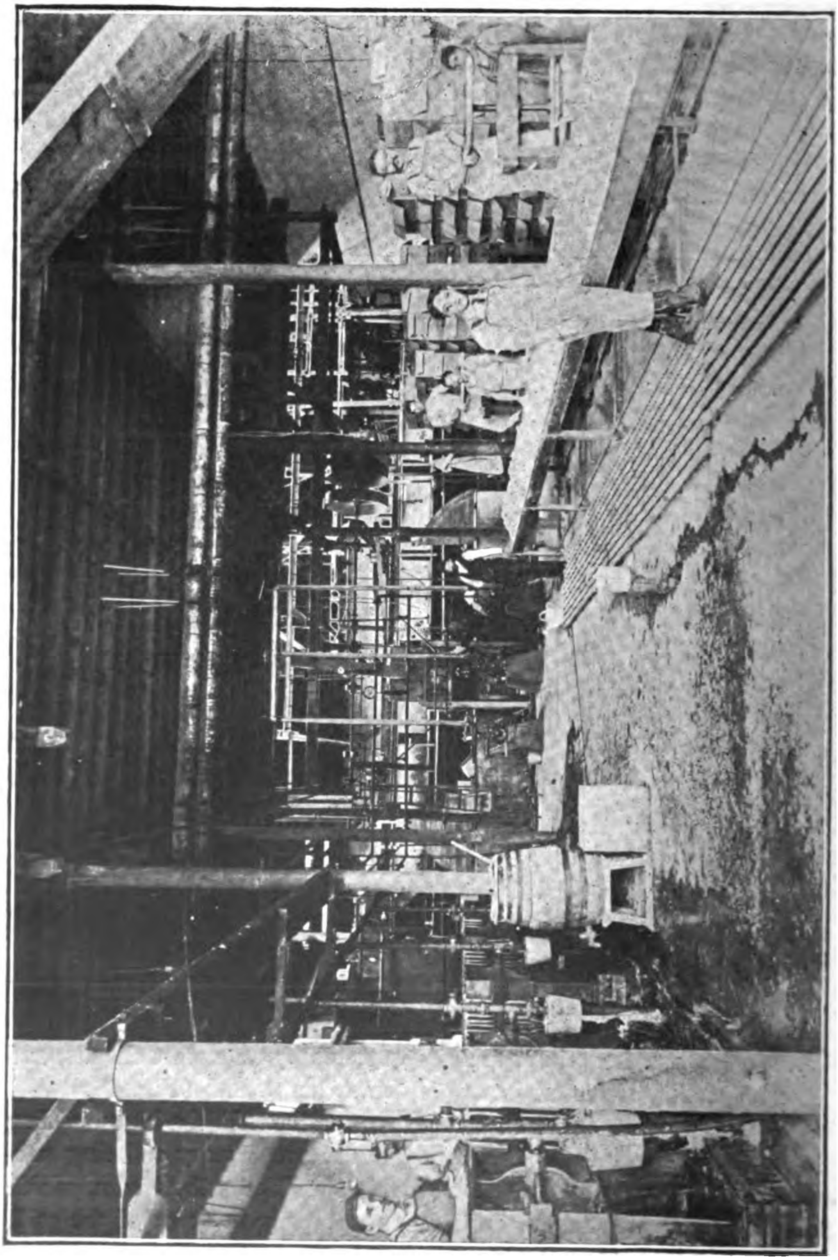


Fig. 194. Packing Room.

the process. The Yeast is then carefully collected, thoroughly freed from the particles of grain or hulls which may adhere, washed with distilled water and conveyed to immense tubs. Fig. 191. With the Yeast a portion of water passes into the tubs, and in order to separate the two (as far as is possible by gravity), the Yeast is allowed to settle to the bottom of the tub. When this has been done, the Yeast is removed from the settling tubs and pressed by means of powerful hydraulic presses for the purpose of extracting this remaining water and leaving the Yeast in a compact mass, and from this process the name "Compressed Yeast" originated.

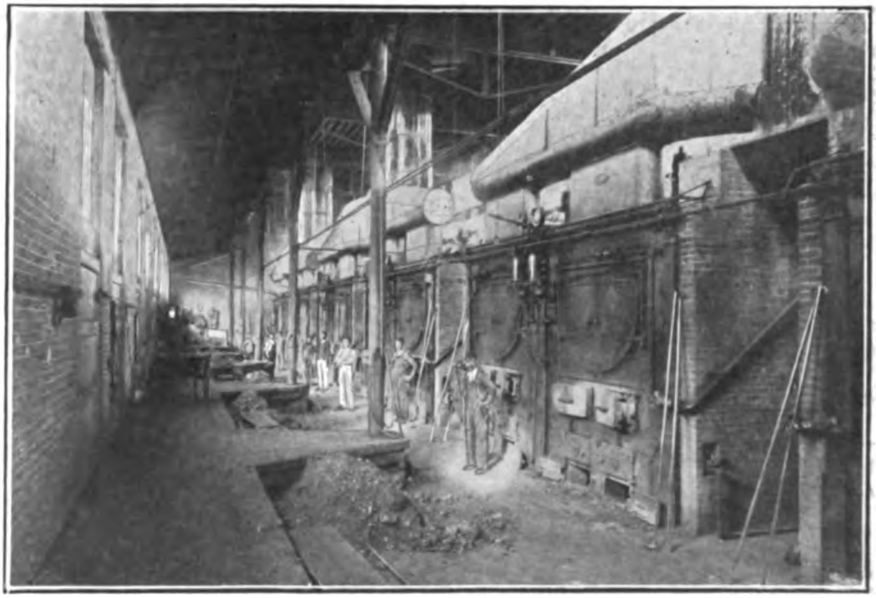


Fig. 193.—Boiler Room.

The Yeast is now ready for packing into the boxes in which it is shipped. A picture of the press and packing room is shown in Fig. 192. The boxes of Yeast which contain about 60 lbs. each, are then placed in a refrigerator, which has a capacity of 2,000 boxes, where it remains until the hour of shipment arrives. Fleischmann & Co., of New York City, handle the entire output of the Fleischmann Manufacturing Co.'s plant, and the Yeast is shipped to them in cars especially constructed to protect it from possible injury by excessive heat or cold during transportation, it being exceedingly susceptible to changes in temperature. The writer was much impressed with the scrupulous cleanliness which prevails throughout the whole of the processes in preparing the Yeast. Most of the work is done by machinery without the intervention of manual labor, and the Yeast is carefully protected from injurious outside influences at every stage of the process of preparation.

To run this enormous plant a battery of twelve boilers is necessary, part of which are shown in Fig. 193; also two Corliss steam engines, one direct electric and one connected electric engine, as shown in Figure 194, and a refrigerator plant of 100 tons capacity.

It takes about one and one-half miles of railroad track on the grounds of these works to accommodate the freight cars necessary for the business, and Figure 195 shows a picture of the locomotive owned by the corporation, which is kept constantly busy shifting cars in and out, and from one point to another.

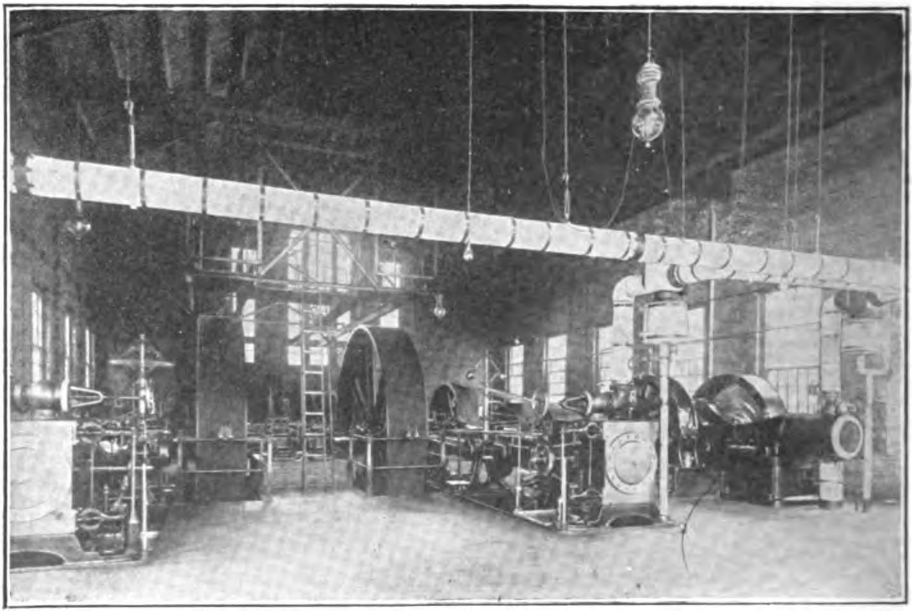


Fig. 194—Power House.

As stated at the outset, the introduction of Compressed Yeast revolutionized the baking industry in this country; in fact, the marked improvement in the quality of bread now produced as compared with thirty years ago dates from the time the use of this article was adopted. Compressed Yeast makes uniformly better bread—produced by the use of Compressed Yeast, but other material advantages are secured by bakers.

By the use of properly prepared Compressed Yeast the danger of having sour bread is reduced to a minimum. There is no need for enlarging upon this advantage; every baker will appreciate it.

The uniformity in quality and strength and the consequent uniformity in results obtained is another point gained by the use of Compressed Yeast, and in these days when the baking business is being done under more systematic methods than was the case a few years ago, this is a most important feature—to the small baker and the large wholesaler alike—as the time required in turning out a batch of bread can be determined to a nicety, which is not the case when the quality or strength of the leaven used varies from day to day.

Another advantage in favor of Compressed Yeast is that it possesses more activity, and consequently works quicker than any other yeast, and as "time is money" this feature will commend itself to every enterprising baker.

Fig. 195.—The Fleishman Locomotive

But after all, the fact that by the use of Compressed Yeast of good quality a white, fine grained, well flavored bread, with a rich colored crust can be produced, is the principal reason why its use is advocated in this article, for the American public of to-day wants the best and the up-to-date baker who caters to this demand and turns out the best loaf of bread is going to do the largest business and the demand for shorter working hours one part of the workmen is another important point to be considered by the bakery proprietor, and he surely welcomes every improvement in the manufacture of a reliable, quick working, uniform compressed yeast.

SPIELMANN'S YEAST AND VINEGAR PLANT, CHICAGO.

We represent here illustrations of another well known firm, engaged in the manufacture of Compressed Yeast, the Spielman Bro.'s Company, of Chicago.

Fig. 196.—Spielman Factory.

Twenty-seven years ago Peter Spielmann, a baker by profession and who at that time was the proprietor of a well-established bakery in Chicago, concluded to go into the manufacture of compressed yeast and he finally succeeded in establishing a steady patronage for his product and had to build a large new plant. The present mashing capacity is 800 bushels a day and it is running to the full capacity.

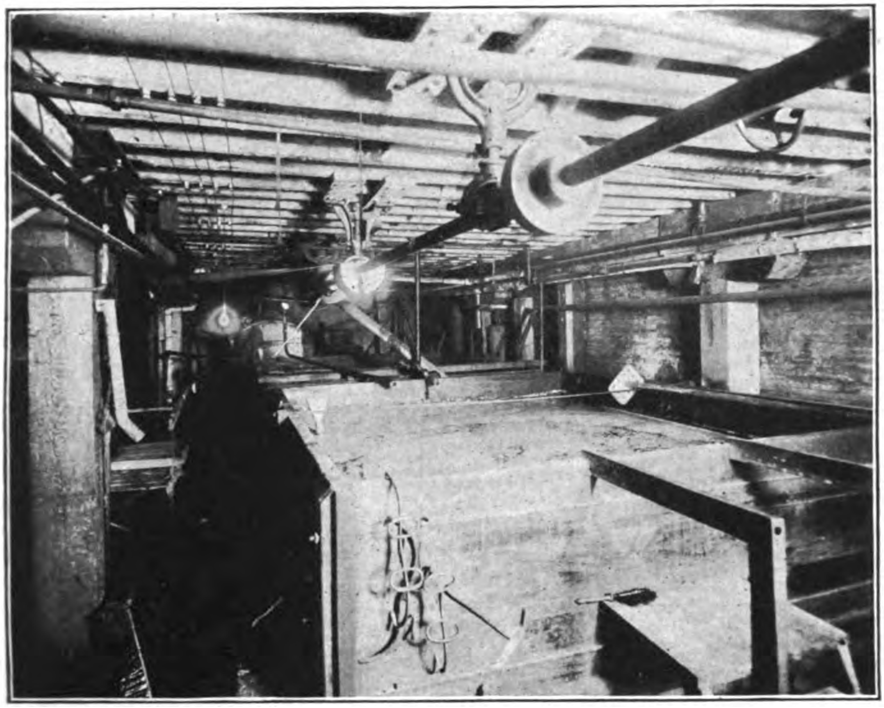


Fig. 197.—Yeast Vats.

Fig. 198.—Filling Room.

Fig. 199.—Stables.

Evolution of Baking Machinery.

Prepared by EMIL BRAUN.

At the dawn of the twentieth century, it would be a sign of madness to deny the advantages of machinery, or to complain of its introduction into the baking business. Machinery has made possible the establishment of the large wholesale bake shops and the extension of the business in ways which a few years ago seemed impossible. But it by no means follows that because machinery is, in a measure, revolutionizing the trade, it will drive the small baker out of the business. On the contrary, it is not unlikely, in the end, that machinery will strengthen the place of the retail baker in the trade. The neighborhood bakery is as essential to modern conditions of life as the corner grocery and the corner drug store. The big department stores, have temporarily and to a limited extent, injured the business of the latter, but they have not driven the grocer and the druggist from the field of competition. These still hold their place and will continue to do so, because they supply an actual need in the community. The wholesale bakeries are, to some extent, cutting into the business of the small retailers, but they have not, and cannot, drive them from the trade. There should be trade enough for them both.

What the retailer must do, and is doing, is to accommodate himself as much as he can to the new conditions of the business. The subject of the introduction of machinery is now occupying the thoughts of bakers as never before. The question as it presents itself to the small baker is one of ways and means. He recognizes the advantages of machinery, but doubts whether the size of his trade warrants its introduction and often finds his room rather limited.

An illustrated description of the evolution in modern improvements in bakery construction, machinery and bakeovens will undoubtedly interest the readers of this work. For this purpose we have gathered some plans of modern bakeries in different countries, various styles of kneading and mixing machines and other utensils and bake ovens. To commence with, we can compare the old way of carrying the heavy bags of flour up two and three flights of stairs or down into the basement with the easy convenience of the modern elevator, run by power, either gas or electricity. In Germany the bakers still use windlasses turned by hand to a great extent. This is a marked improvement over the old style of carrying the bags, but is not popular in America.

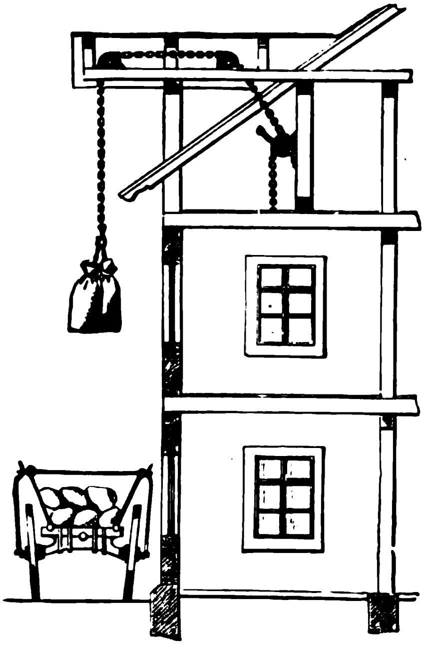


Fig. 200.—Flour Hoist (Germany).

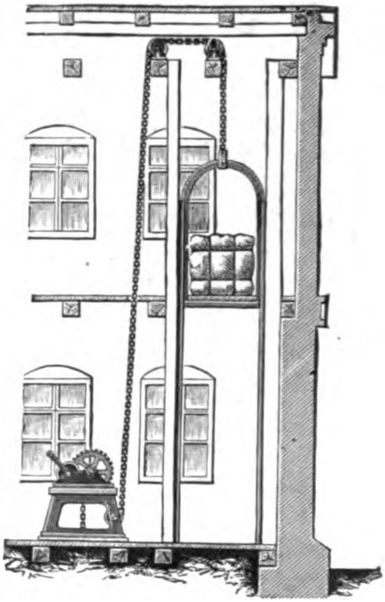


Fig. 201.—Flour Elevator (Germany).

Sifting Apparatus.—A number of devices for this purpose have been invented and patented, and with the growing popularity of blending different brands of flour the so-called "*Blenders*" have become almost a necessity in a modern bakery.

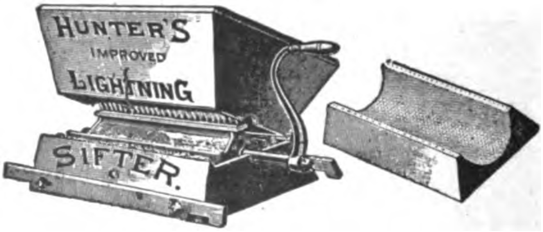


Fig. 202.—The Lightning Sifter (J. H. Day Co., Cincinnati).

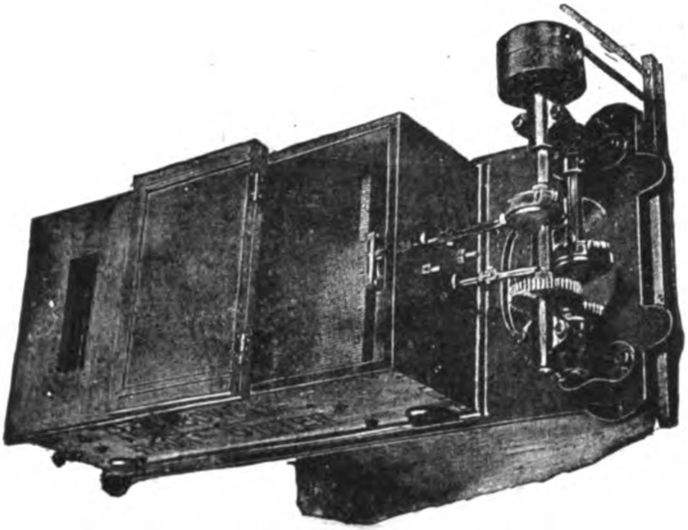


Fig. 203.—English Flour Sifter (System Rainbow).

Fig. 204.—Flour Sifter (German Style). Herbst & Co., Halle, Saxony.

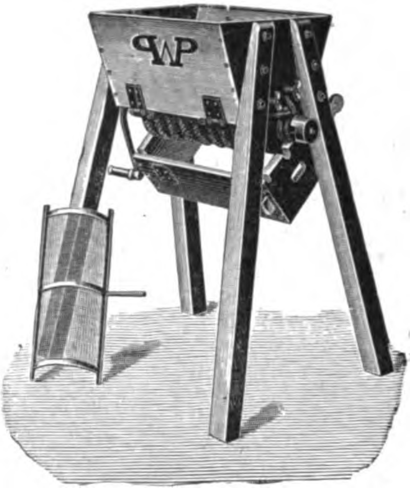


Fig. 205.—Hand Sifter (Werner & Pfleiderer).

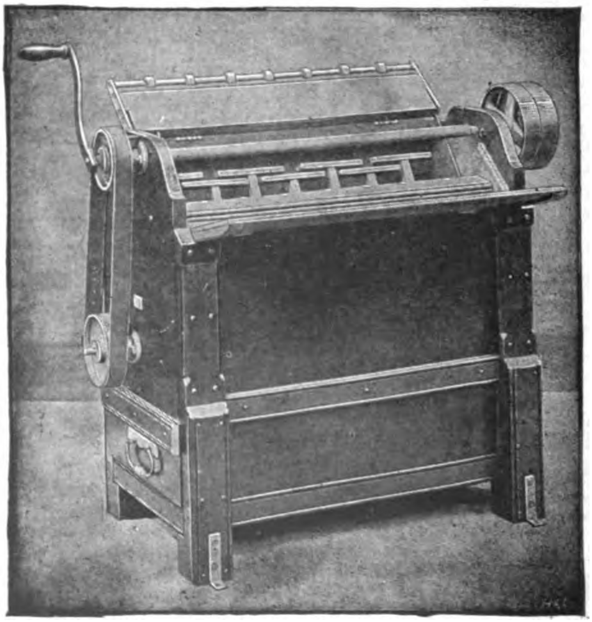


Fig. 206.—Flour Bag Cleaning Machine.

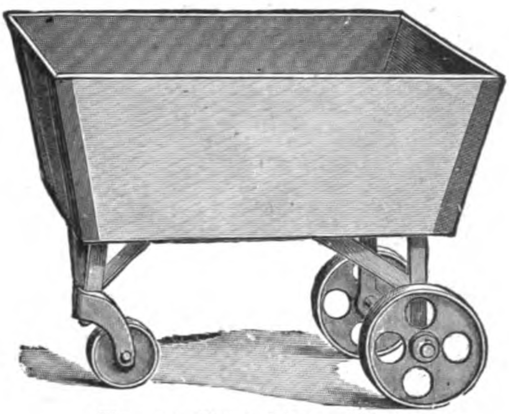


Fig. 207.—Dough Wagon (Wood).

Dough Troughs.—It almost seems as if the wooden dough-troughs are doomed. Sanitary ideas in the baking business have placed the ban upon any and all devices that may become a place of lodging for germs or bacilli—most all bakers of up-to-date tendencies are replacing the wooden troughs with steel troughs. They are now made in various sizes and shapes to meet the requirements of the different bake-shops. Some are heavier, some lighter, some are made of steel, some enameled or galvanized, and some have a wooden frame, lined with sheets of polished steel. All are placed on rollers, so they can be moved from one part of the shop to another. However, iron troughs are more susceptible to changes of temperature in the bake-house than wooden troughs.

Mr. Boettler, of St. Louis, made the following statement regarding iron troughs at the National Convention: "We have been using iron

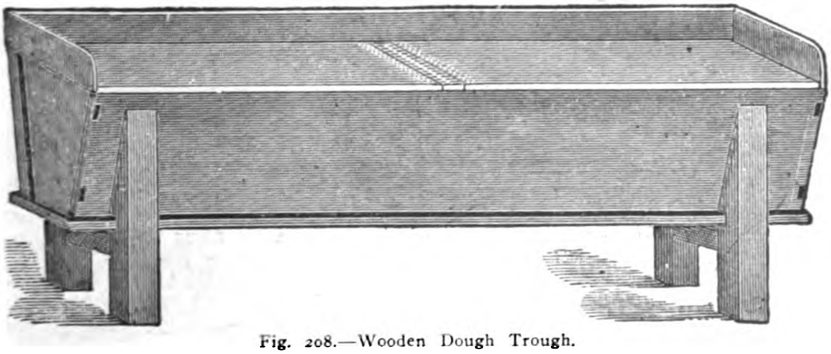


Fig. 208.—Wooden Dough Trough.

troughs for twelve years, we would not have any other, there is absolutely no difference in the temperature of the iron. If the temperature of the room is the same, the idea that a wooden trough is a non-conductor and will keep the temperature of the dough more uniform than the iron is ridiculous, because the temperature in the room regulates the temperature of the dough in the trough. We would not have wooden troughs again, if given to us. The iron troughs are cleaner because they are easily cleaned out. You take a little lard and rub it over the trough and it is always clean. I even believe the disease called "rope" is merely caused by the uncleanliness of the baking troughs. You can never clean a wooden trough as thoroughly."

Fig. 209.—Day's Steel Dough Troughs.

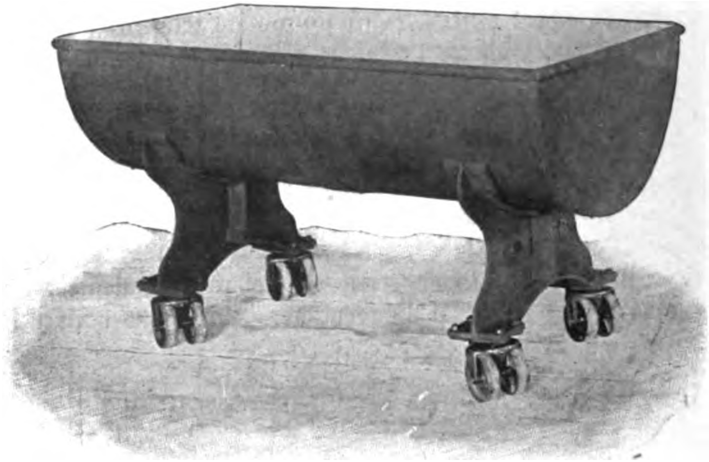


Fig. 210.—Iron Dough Trough (on iron stand with castors).

Mr. Nasmith, of Toronto, recommended iron troughs of shorter size in place of the usual 10 or 12 foot troughs.

The use of iron or steel troughs surrounded with a jacket which may be filled with hot or cold water, as occasion may require, has also been recommended.

With regard to iron troughs which are not jacketed or covered with a non-conducting coating of some sort, it is often argued that metal is colder than wood, but, strictly speaking, this is not so, metal is simply a better conductor of heat; the supposed greater coldness of iron than wood is due, not to its really being so, but to its creating the sensation of greater coldness when touched. A piece of iron and a piece of wood may both be at the same temperature when tested by the thermometer, yet, when they are touched alternately with the hand, the iron, if both are below 100 degrees Fahrenheit, will feel colder than the wood; but if both are above that temperature, then the iron will feel the hotter. The sensation of cold in the first case is due to the great conductivity of iron, which, being colder than the hand, quickly abstracts the heat from it, and thus

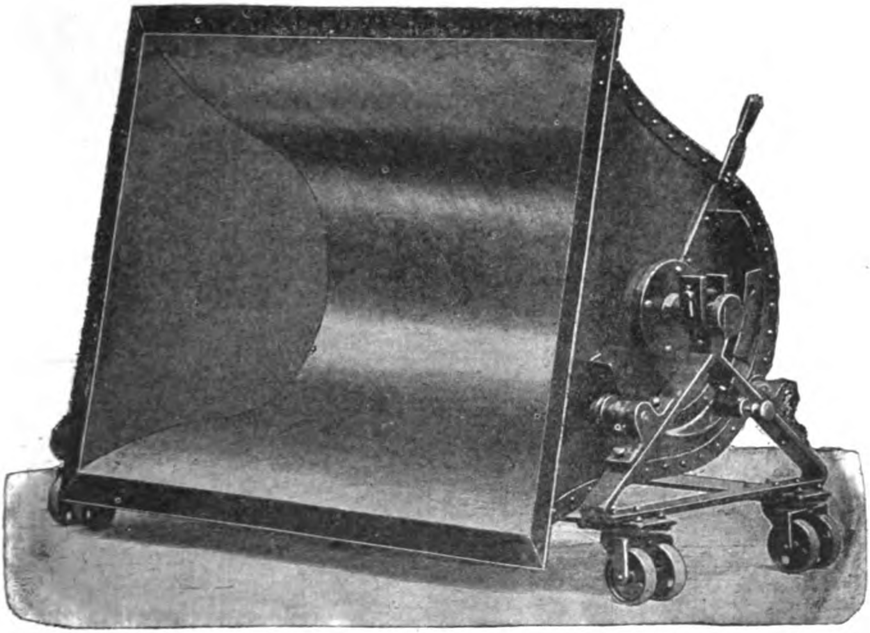


Fig. 211.—Dough Wagon (with tilting arrangement).

reduces its temperature; while wood, having low conductivity, does not carry off the heat from the hand quickly, hence does not produce the same sensation of cold. When the iron and wood, on the other hand, are both at a temperature above that of the hand, the passage of heat is then from the substance to the hand, and the iron parting with its heat at a much quicker rate than the wood, seems to be hotter. What, then, will be the effects on dough when placed respectively in an iron or a wooden trough? In the case of a dough made comparatively warm, as in winter, and placed in an iron trough, the dough, if at a temperature higher than the atmosphere of the bakery, would more quickly lose some of its heat than if it had been placed in a wooden trough; but if the temperature of the bakery were higher than that of the dough, then the iron trough would be the more suitable for allowing the heat of the bakery to pass through

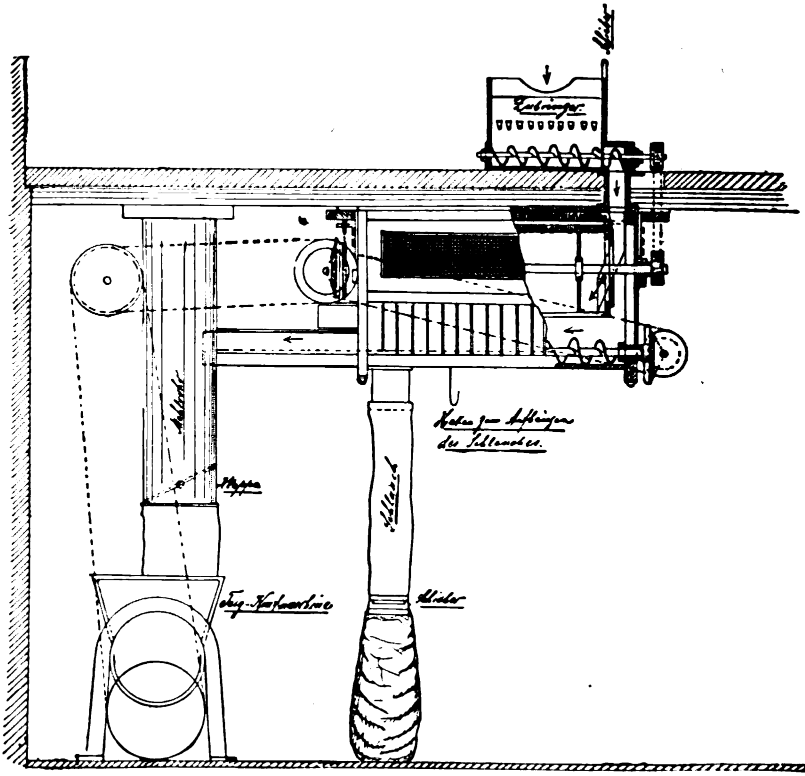


Fig. 212.—Flour Sifter and Blender (Berge-Borbeck System).

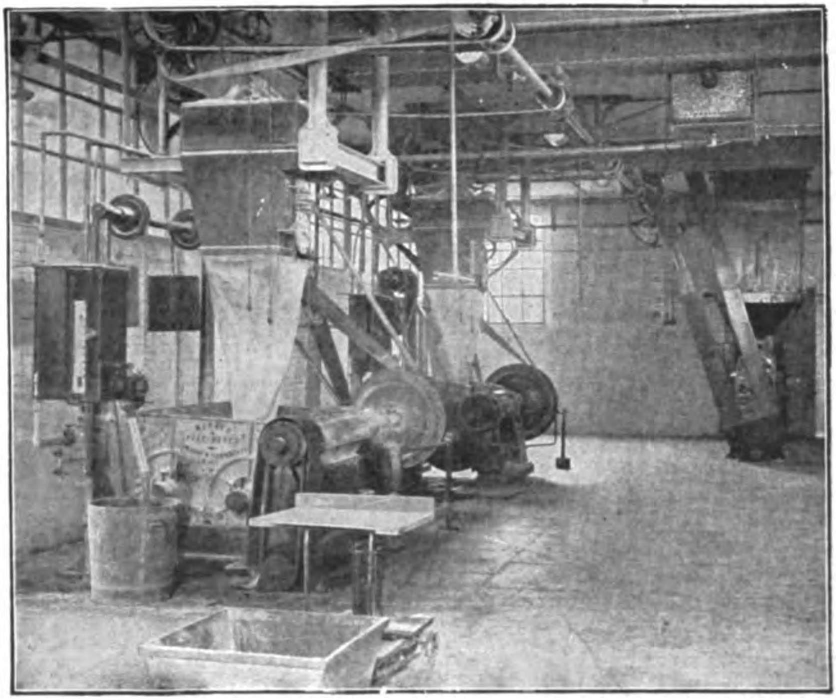


Fig. 213.—Mixer Room (Showing Modern Equipment).

to the dough. In the summer time, when the difficulty is to keep dough cool enough, a wooden trough would be better suited for keeping the dough protected at the bottom from the heat of the bakery, while one of iron would in every case tend to equalize the heat of the dough and the atmosphere, whether the heat is that first given to the dough by the use of hot water, or whether it is due to heat generated by the process of fermentation. It will thus be seen that in bakeries where iron troughs are in use, the regulation of the temperature of the bakery must always be a matter of much more consequence than it is in those bakeries in which wooden troughs are used.

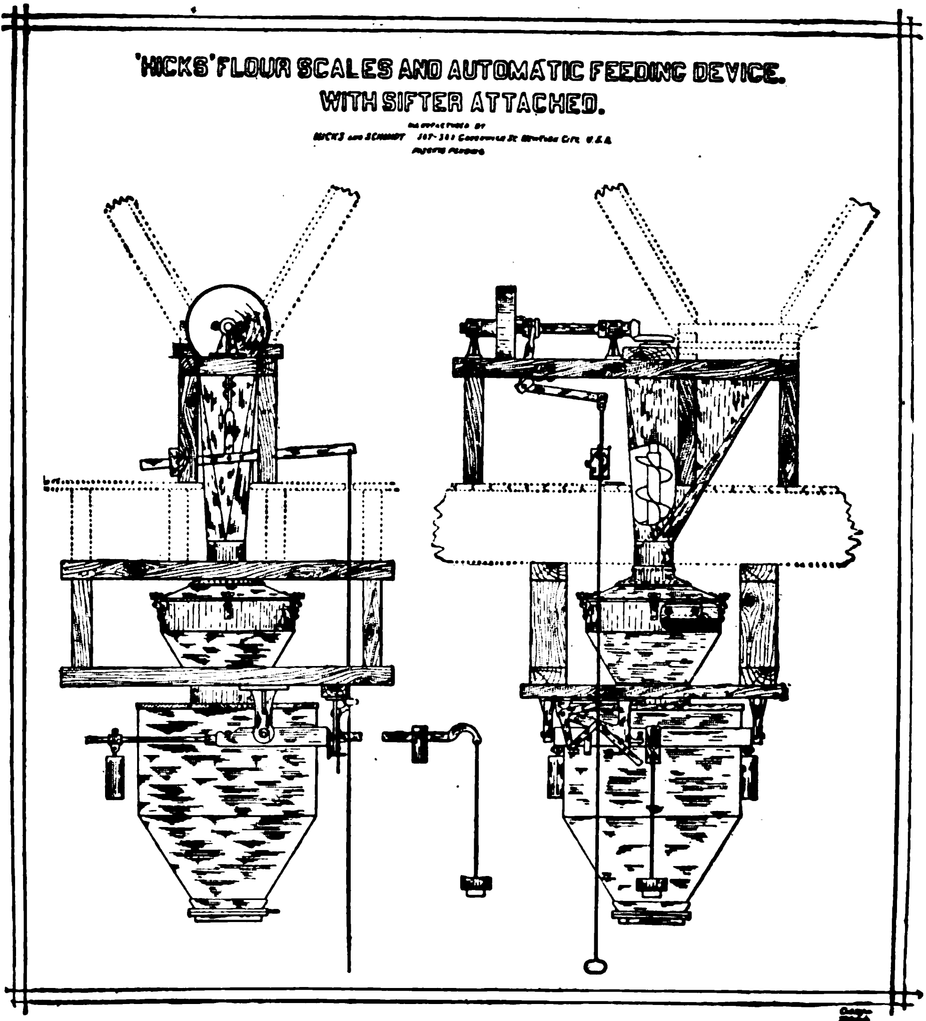


Fig. 214.—Automatic Flour Scale and Sifter (Hicks & Schmidt, New York).

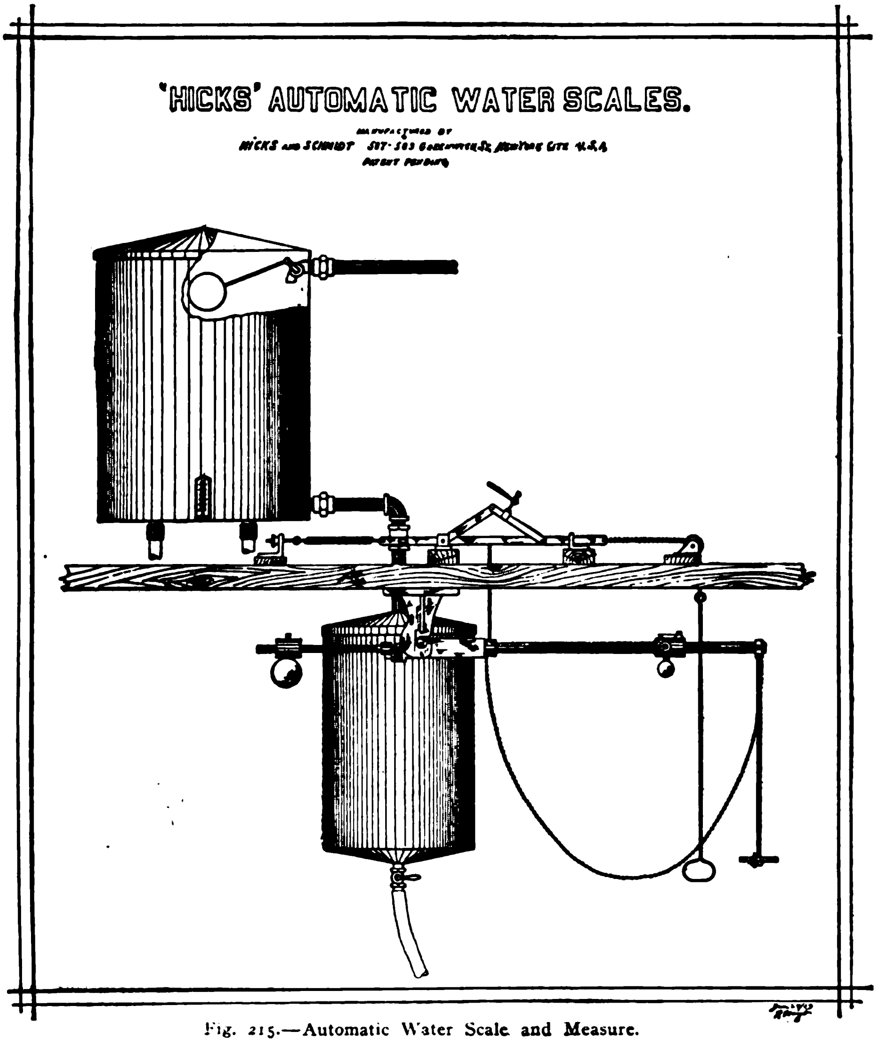


Fig. 215.—Automatic Water Scale and Measure.

WATER TEMPERING AND MEASURING APPARATUS.

Several systems of water tempering and measuring or weighing apparatus or tanks have been introduced during the last few years, and have proved to be a great advantage in the modern bakery.

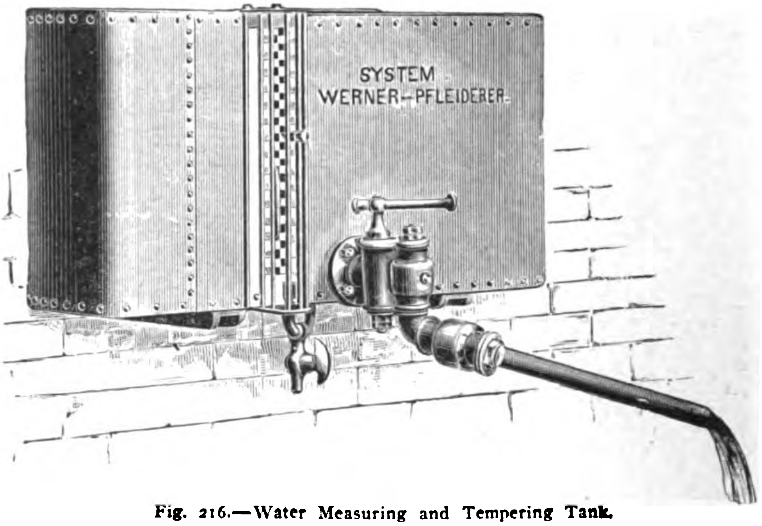


Fig. 216.—Water Measuring and Tempering Tank.

DOUGH KNEADERS AND MIXERS.

Perhaps the oldest record of a dough kneader is a tablet discovered on the tombstone of Senatore Eurysace, who was a prominent baker in ancient Rome. Plenius tells us the old Romans employed slaves for kneading their dough. In the better families these slaves were compelled to wear gloves and protect their mouths with a cloth, as a safeguard against any contact of their breath or perspiration with the dough. After the downfall of the Roman Empire we do not find any more traces in historical records of improvements in devices or implements for breadmak-

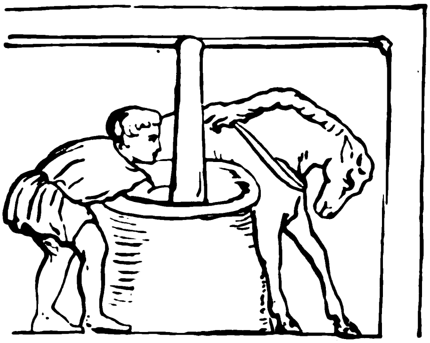


Fig. 217.—Dough Kneader of the Ancient Romans.

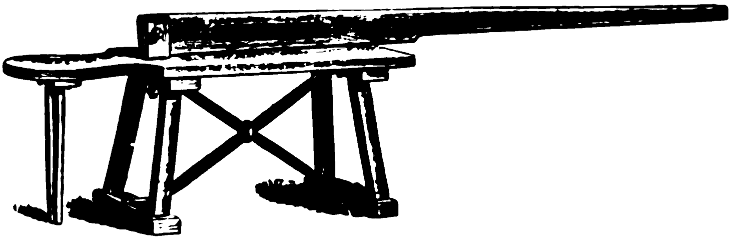


Fig. 218.—German Dough Brake.

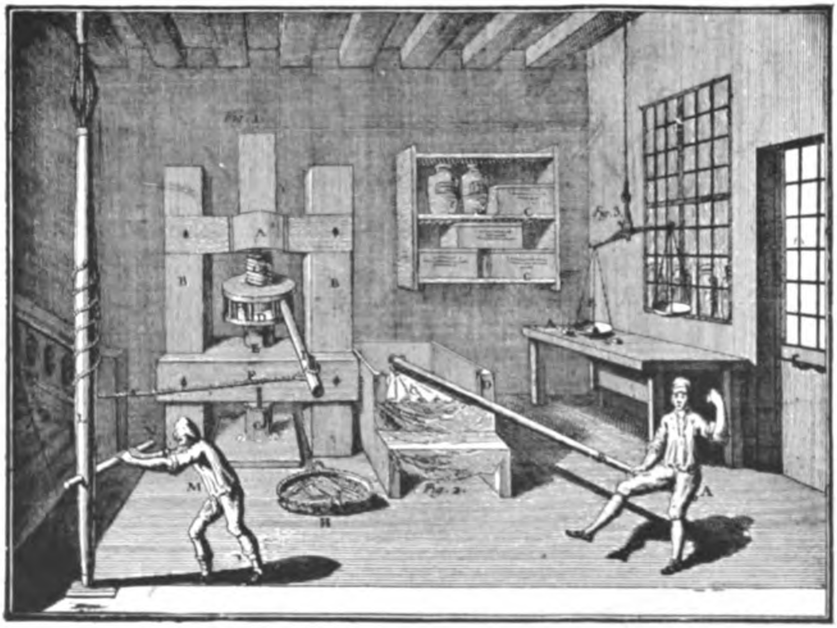


Fig. 219.—Dough Kneading in French Bakery (18th Century).

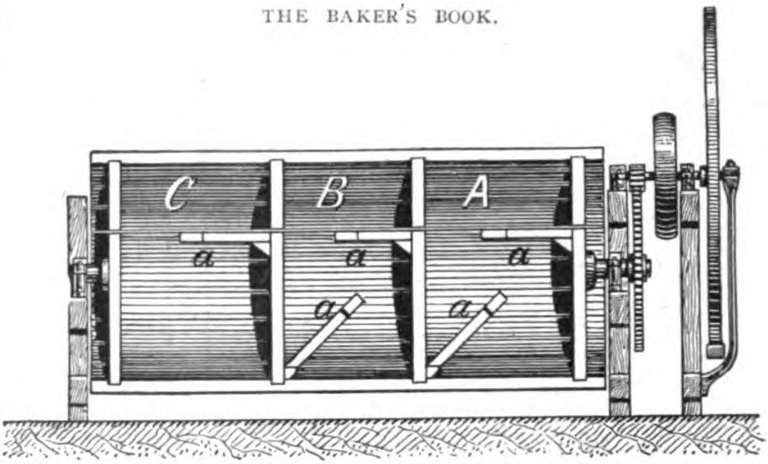


Fig. 220.—"Lambertine" (French Mixer).

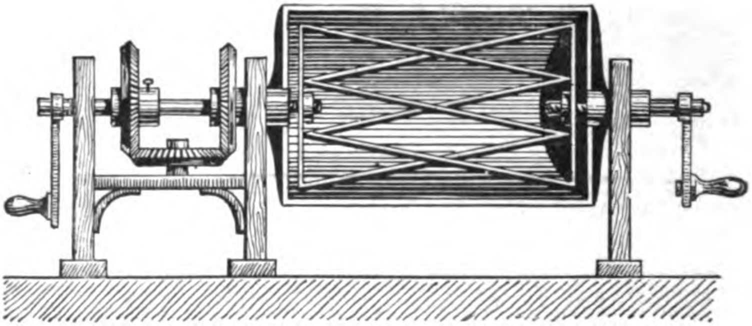


Fig. 221.—Dough Mixer (Clayton System).

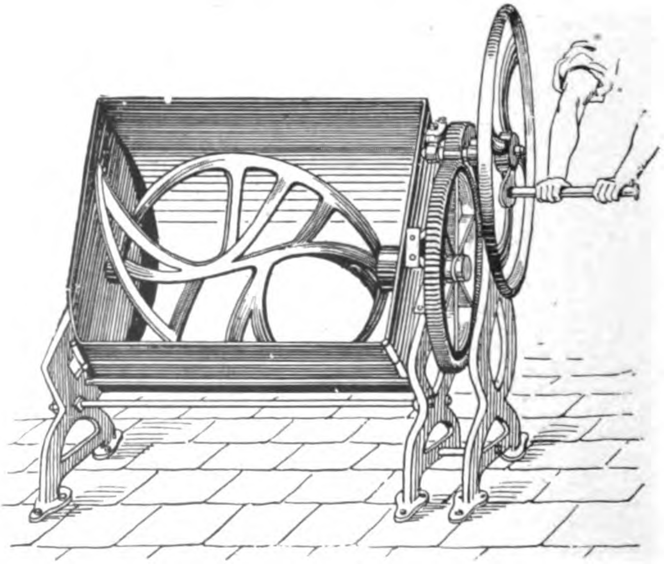


Fig. 222 —Boland Mixer (Improved).

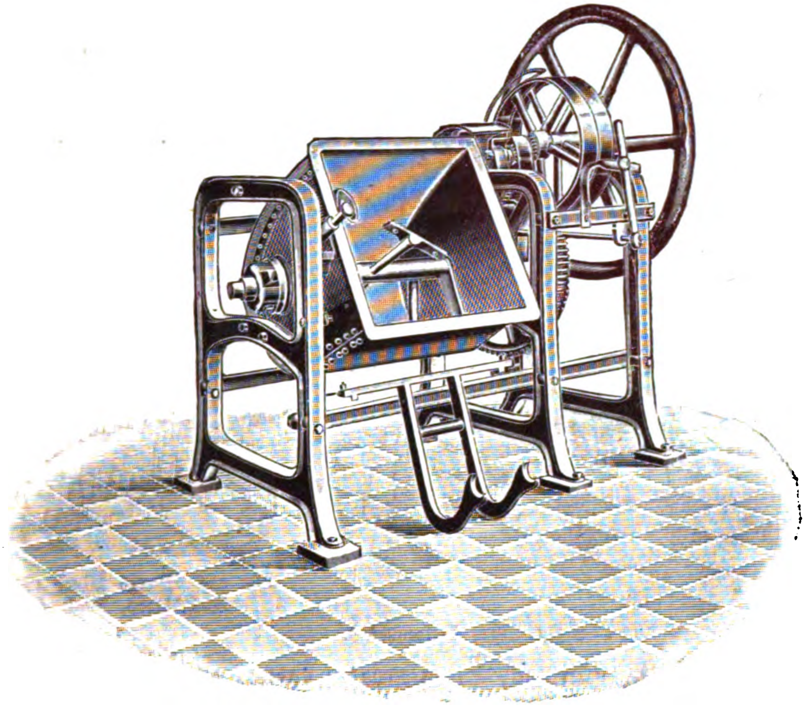


Fig. 223.—Kuepper Mixer (with kneading attachment for stiff dough).

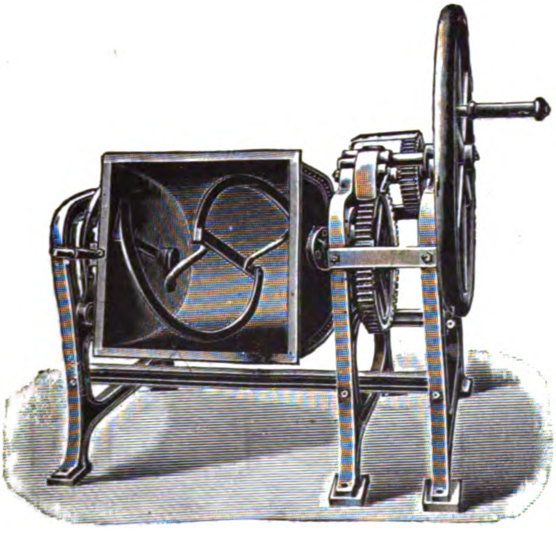


Fig. 224 —Hand Mixer. (System Peter Kuepper).

ing until toward the end of the eighteenth century, when some timid, clumsy efforts were made to introduce labor-saving apparatus in the baker's shop. While other trades, like the tanners, printers, weavers, etc., showed more progress in improving their respective trades, the bakers labored along in their same old-fashioned way. Only during the last forty or fifty years a new spirit dawned in the baking industry, principally in Germany. To-day Germany has a greater variety of patented kneading and mixing machines, dough-cutting and dividing machines and bake ovens than all the other countries combined. We reproduce a number of these machines which illustrate the evolution that took place in the baking industry of different countries. In the beginning of the eighteenth century a trough was used, into which long sticks or paddles were inserted crosswise and the men each taking the other end of one of these paddles, they walked around the trough, thereby stirring the dough.

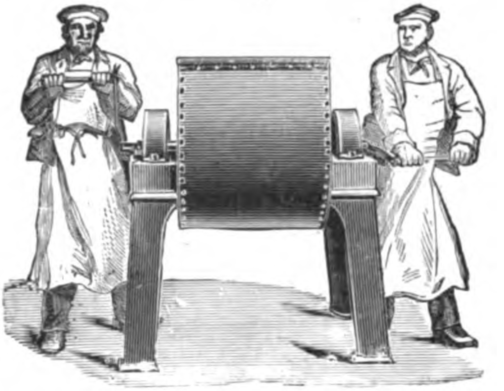


Fig. 225.—Dough Mixer (Frey Bros., Meisenheim).

Fig. 226.—Dough Mixer (System Hodgkinson, England).

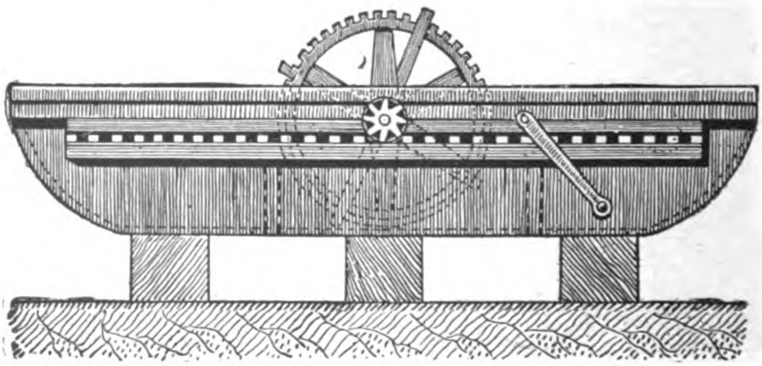


Fig. 227.—Kneading Machine (System Segille).

(This system of mixing dough is still in use in Russia.) There is hardly any time or labor saved by the use of this apparatus, but it has the advantage that the dough is not touched by the hands during mixing.

The brake is also a very old implement of the bakeshop. It is used to this day for honey cakes, pretzels and noodle dough. The first mixers of any account for bread dough were made in France, by Salignac, 1760.

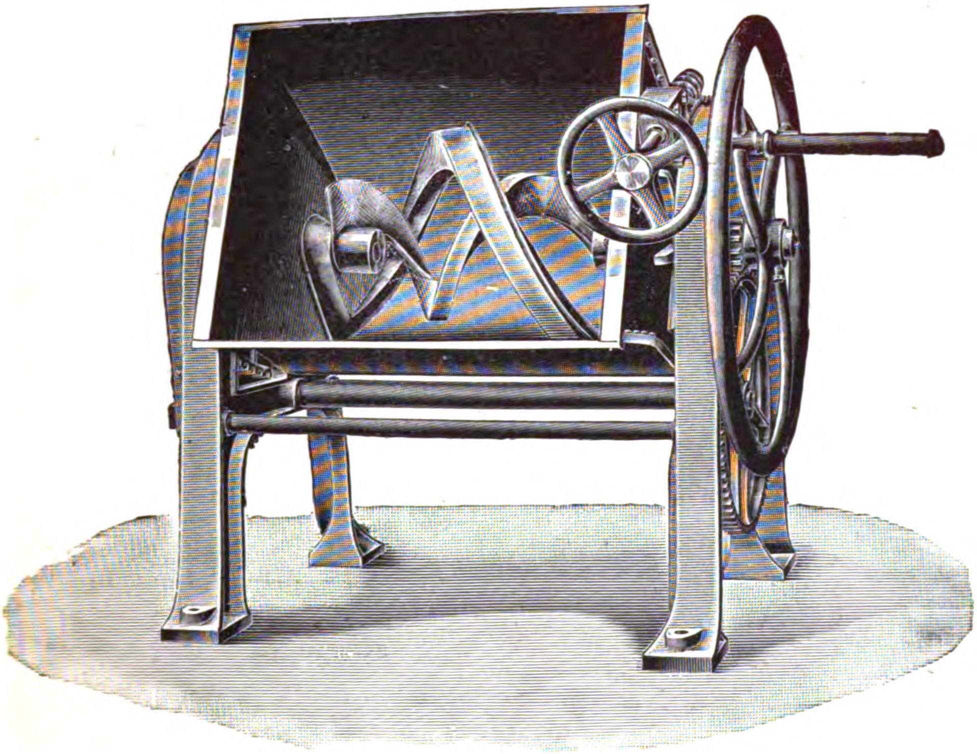


Fig. 228.—Italian Dough Mixer (System Sacco).

A Parisian baker, Lambert, constructed a mixer in 1810, which is called the "Lambertine" and which received first prize in a contest as being the most practical mixer at that time. From that time on the strife for improvements has kept up, and every few years a new mixer or kneader is introduced to the trade until the manufacture of bakers' machinery has become quite an important industry. The illustrated descriptions of large modern bread bakeries gives a good idea of the equipment of an up-to-date bakery. It may also be of interest here to give illustrations of bakeshops in retail bakeries. We reprint a paper prepared by one of New

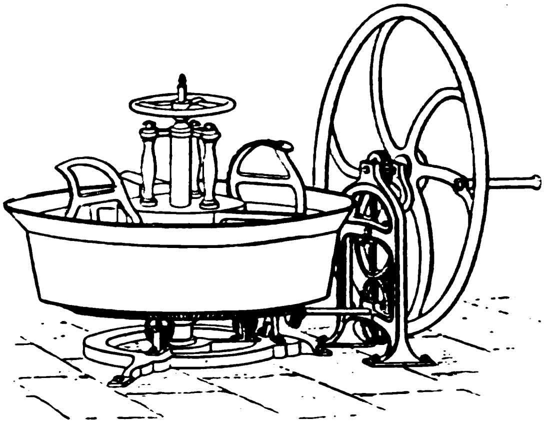


Fig. 229.—French Kneader (Déliry).

York's oldest retail bakers, Mr. Ad. Schinkel, read before the convention of the New York State Association of Master Bakers:

"The use of machinery in the baking business is of long standing. but only in the larger establishments, which were generally called machine bakeries to distinguish them from the smaller concerns or retail bakeries. It has been generally understood that only a very large amount of business would warrant the profitable use of such machinery, it being believed that the retail baker had no use whatever for it. But the time has come, however, when he is forced by the sharp competition of these very machine bakeries to hustle around to hold his own, and the question of ma-

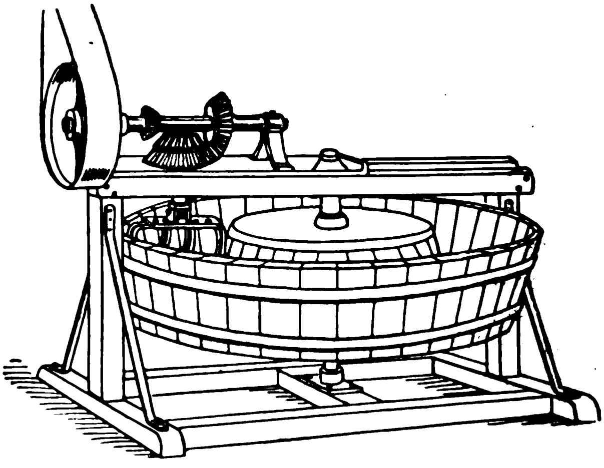


Fig. 230.—French Kneader (Hyquette).

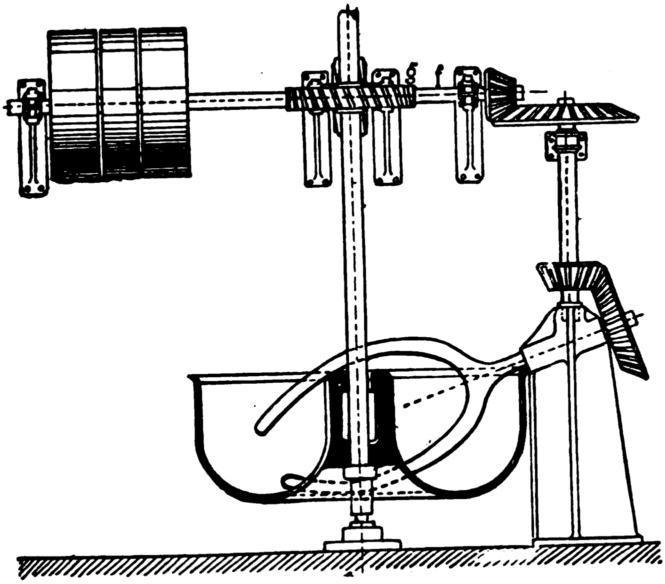


Fig. 231.—Norwegian Mixer (John Rudolphs).

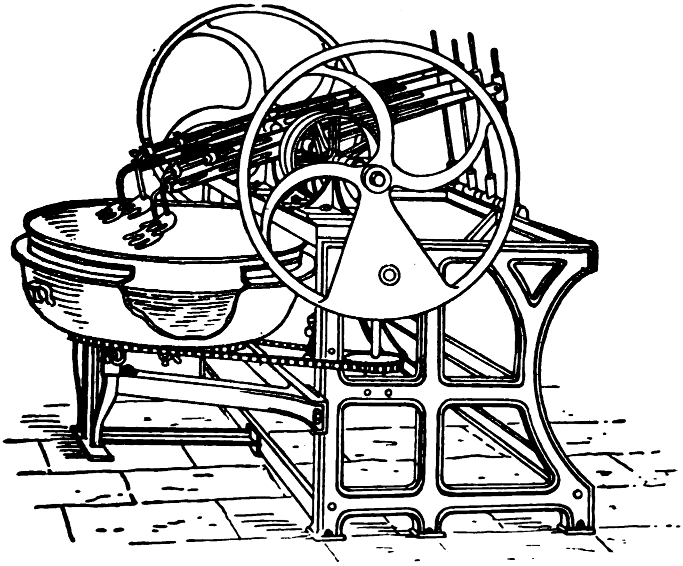


Fig. 232.—Dough Mixer (L. Dathis, Paris).

chinery is brought forward. And so I came to investigate this matter in my own way, and I have come to the conclusion that the retail baker of to-day, who hopes to hold his own and keep up to date, must use machinery. I will try to give you my reasons.

"First: What is the advantage of a dough-mixer and why should a retail baker have one when his doughs are so small, say from one-half to one barrel of flour, that they can be easily mixed by hand?

"Personally, I have great faith in hand-made doughs, provided they are properly worked, but there is the rub. I find at the present time that it is almost impossible to get a baker who will do so, and the result is an imperfect dough, from which it is impossible to make good bread.

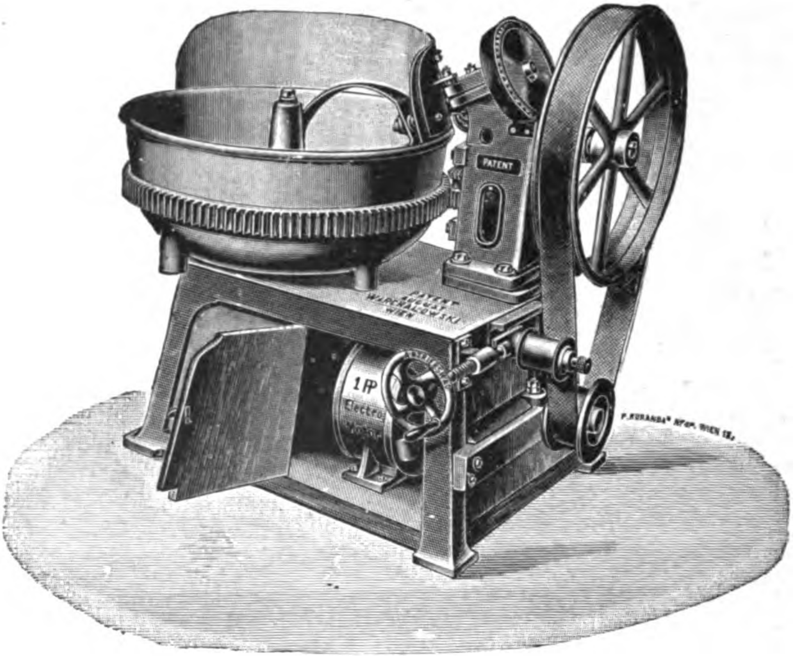


Fig. 233.—Vienna Mixer (A. Warchalowski), with Electric Motor Attached.

"In the second place, machinery takes a good part of the hard labor in a bake shop away from the workingman, and is apt to make him more steady. This is especially true during the hot season, when he very often resolves that he has enough money to lay off for a few weeks and let somebody else have the fun. We all have our little experiences that way.

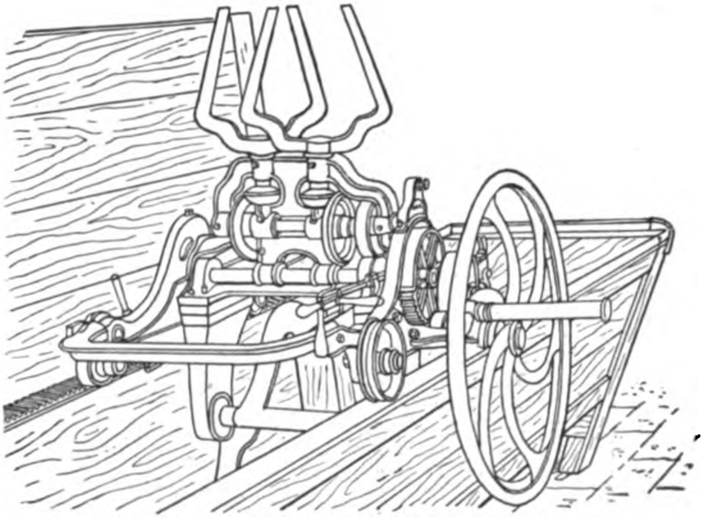


Fig. 234.—Traveling Dough Mixer (System Dagry).

" That, from a sanitary standpoint, a machine dough is absolutely to be preferred for its cleanliness is not to be disputed; furthermore, your machine is a cheap, steady workman. It costs very little to feed, it does not smoke or chew, and, as for the can, it only needs a small one filled with oil. It is always willing and never shirks the work, don't get tired and never goes on a strike; in fact, it is an ideal worker. Now, if you can secure such from comparatively little money, don't you think that it is to your benefit to have it, especially if you are able with its aid to

"Now, what other machinery ought a retail baker to have? Certain-

turn out better goods, which is the only way to increase your business?"

Fig. 235.—Dough Mixer of H. Bertram (Removable Trough).

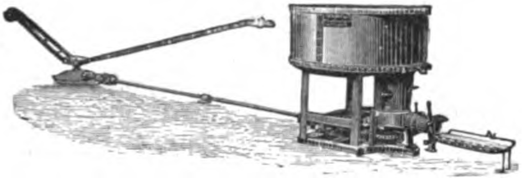


Fig. 236.—Kneading and Pressing Apparatus (Th. Poucelet).

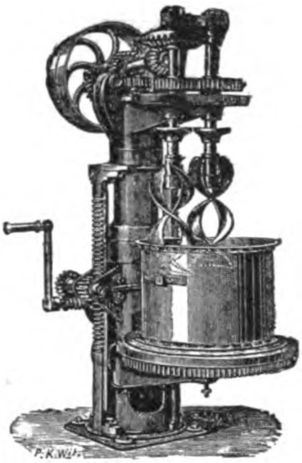


Fig. 237.—Dough Kneader (A. Grzesicki, Graz).

ly a dough-driver, which enables him to get his rolls exactly the size he wants them. There is no guesswork about this machine, as it does its work exact, consequently it is a money-saver. It pays for itself sooner or later, according to the amount of work. It is therefore the entering

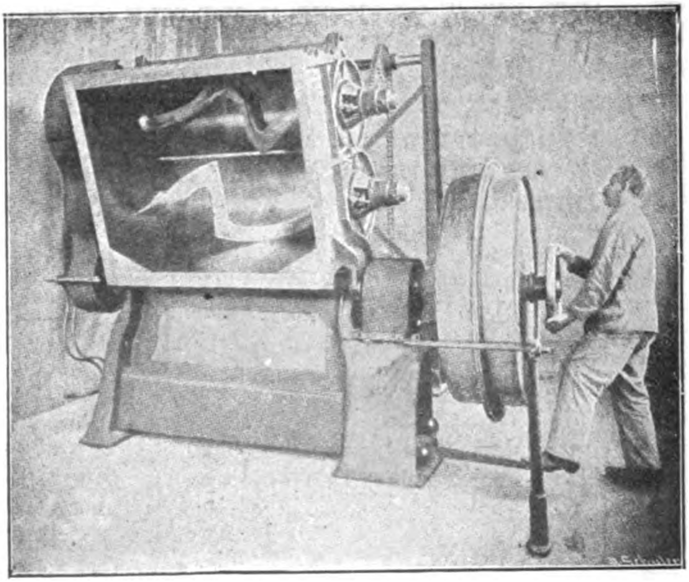


Fig. 238.—Werner & Pfleiderer Mixer (in tilted position with automatic tilting gear).

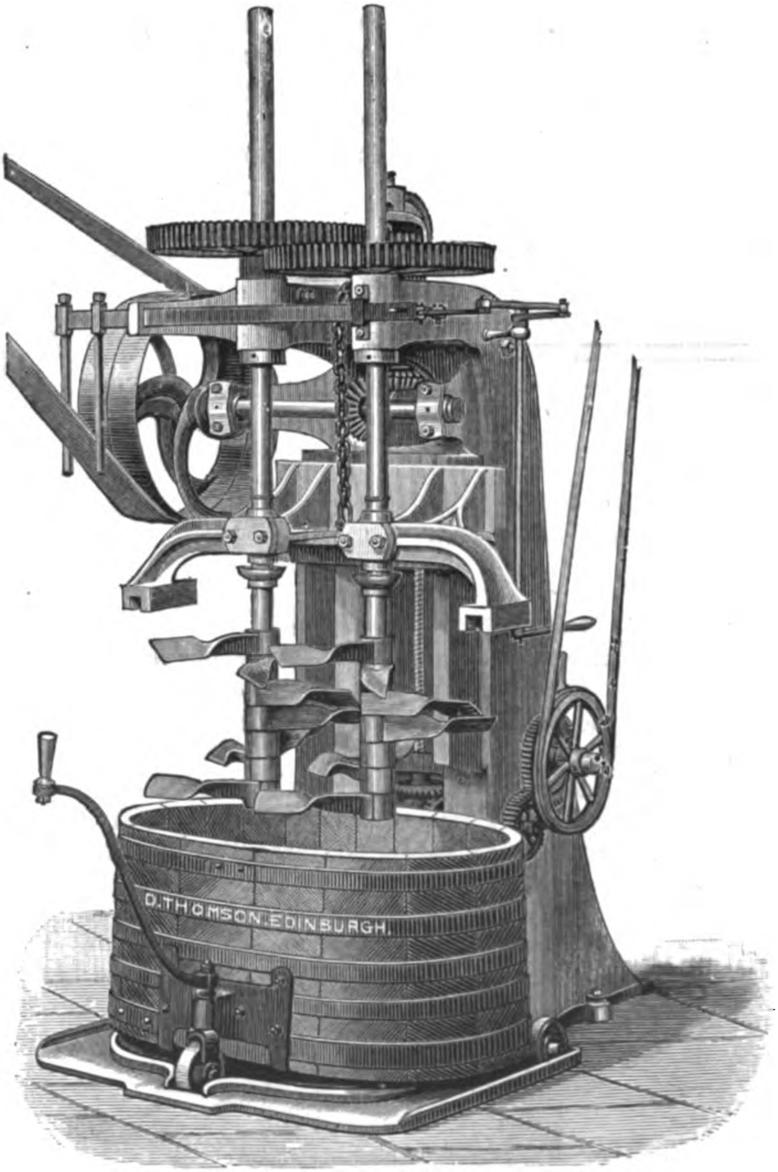


Fig. 239.—Dough Kneader (Thompson, Edinburgh).

wedge for machinery in the retail bakery. It is already used in most bakeries of any consequence and its value is generally recognized.

"The next machine on the list is an egg-beater, which is very useful and ought to be in every well-regulated bakeshop where there are eggs to be beaten in quantities from two dozen up. We all know that beating eggs is the hardest work in our business; consequently a good machine is a labor-saver. It also does the rubbing of butter and sugar for pound and wine cakes, also light doughs for coffee loaves. In fact, it can be used in the cake department throughout. It has all the merits of the dough-mixer in the bread department and is consequently just as important.

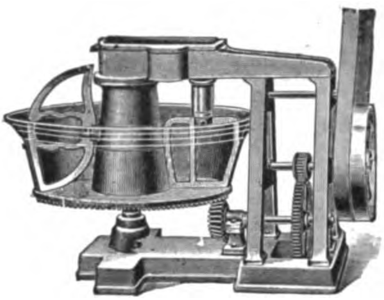


Fig. 240.—Durand Kneader (for power).

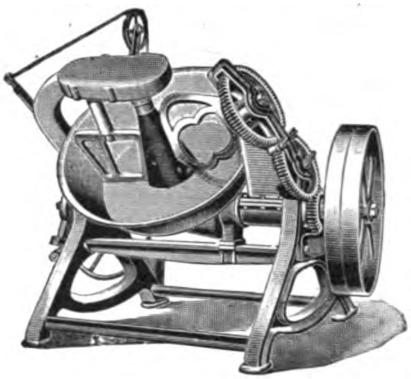


Fig. 241.—Durand Kneader (with Dumping Pan).

"Now, this is about all the machinery which, in my estimation, a retail baker ought to have. I have recently installed a similar plant in my bakery, which is a small one, baking not more than three barrels a day,

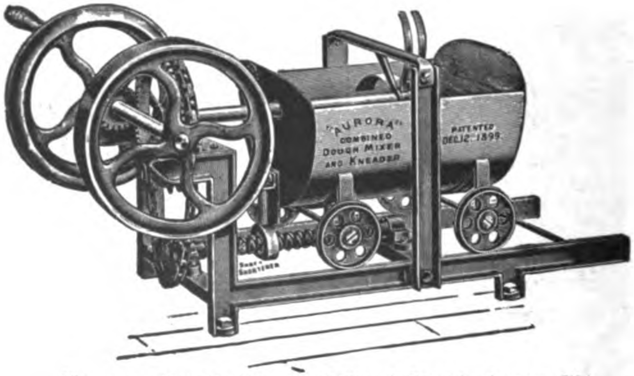


Fig. 242.—Movable Kneader (Nilles & Rausch, Aurora, Ill.).

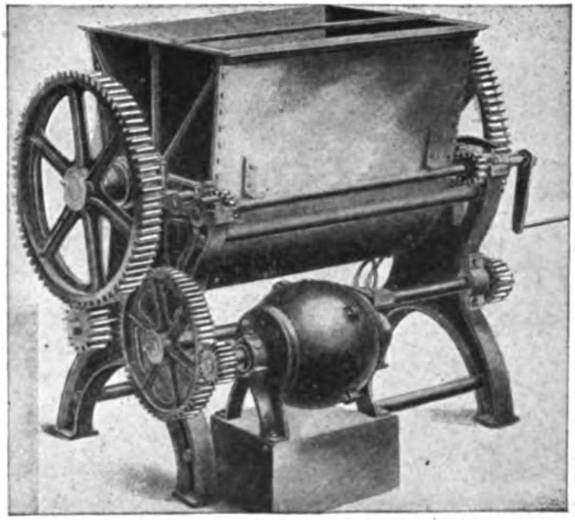


Fig. 243.—Boston Mixer (with Motor Attached). Barbour & Stockwell, Cambridge, Mass.

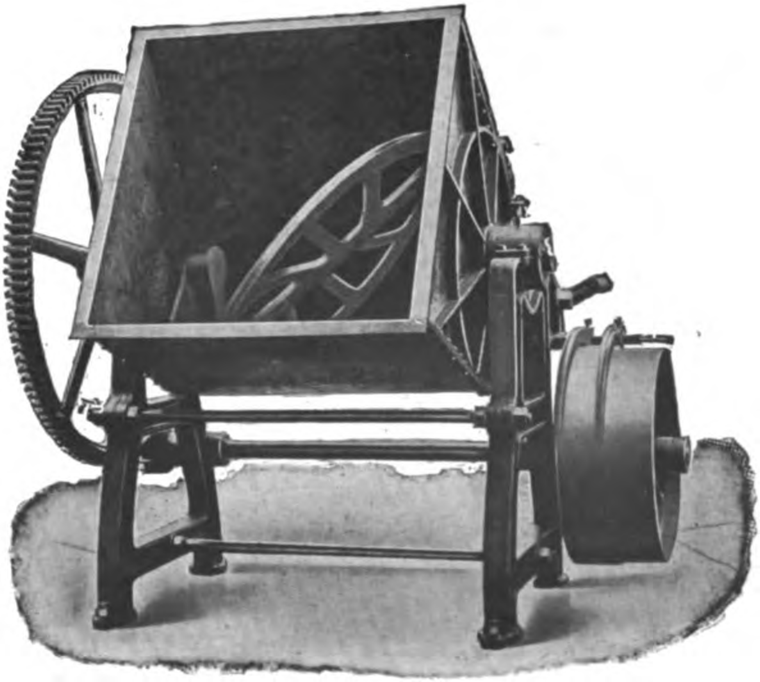


Fig. 244.—Fowler Bros. Kneader & Mixer (Boland System).

and I am highly pleased with the results. My only regret is that I failed to do so years ago.

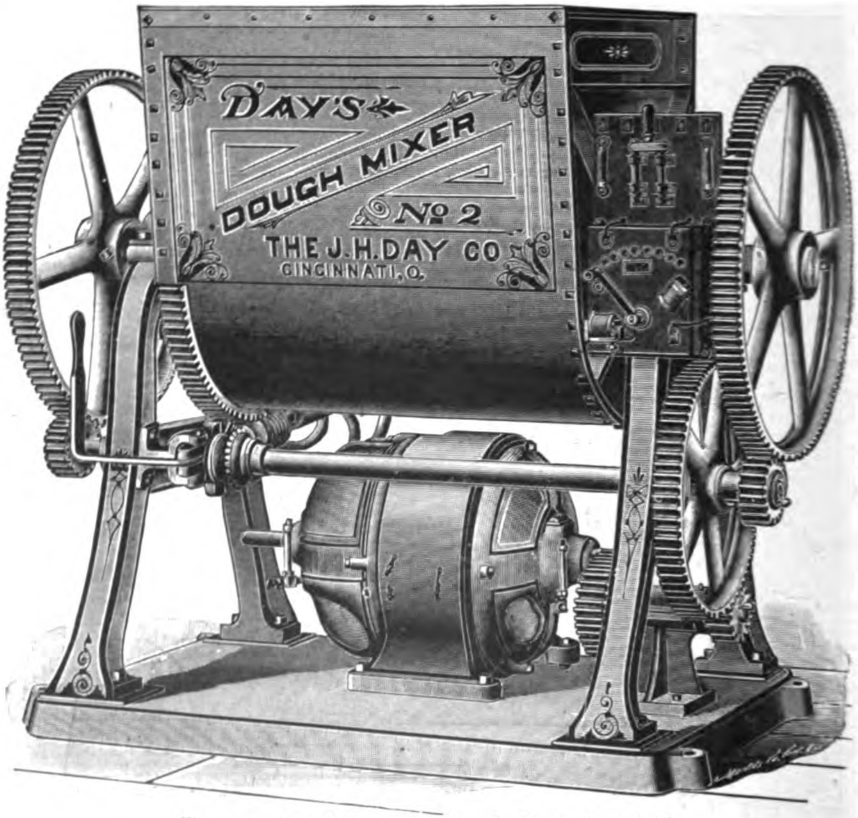


Fig. 245.—Day Mixer (with Electric Motor Attached).

"Now, what is the objection generally prevailing among the retail bakers against the use of machinery? First: The want of space. This can be overcome in most cases, and if there is a will a corner can be cleaned in the shop where waste boxes and other things often accumulate to the detriment of cleanliness and order. The actual floor space required by the two machines is no more than 4 x 10 feet. Secondly, the cost of the machinery has been a main objection against its adoption. I am in position to give you the exact expense in this connection. I have a one-barrel dough-mixer, $125; one egg-beater, $65; electric motor, $75; dough-divider, $90; belting, shafting, wiring and all other expenses con-

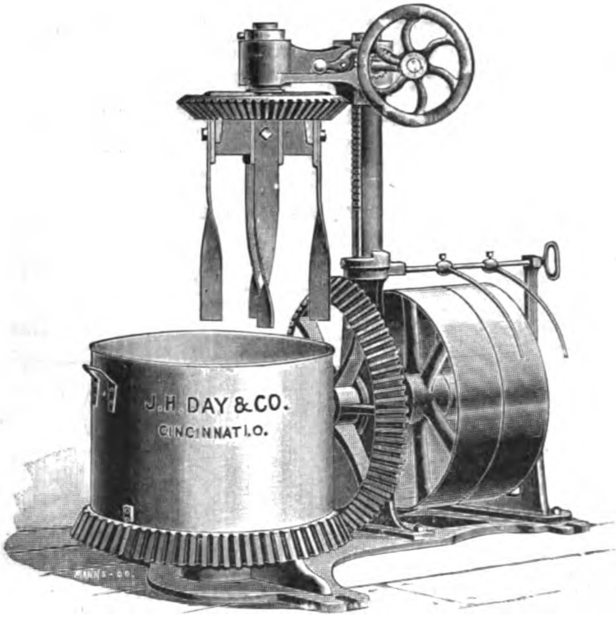


Fig. 246.—The "Pony" Mixer and Creamer.

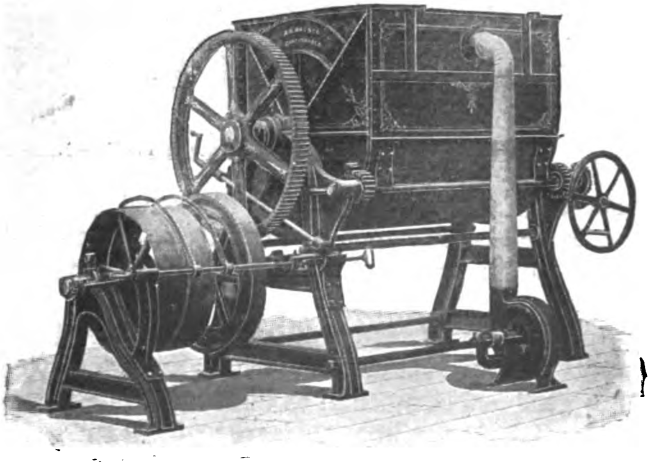


Fig. 247.—The Corby New Process Mixer.

nected with it, $75—making a total of $430. As to the cost of power, am not able to give you the exact figures. As near as I can calculate, however, it is about $1 per week, and with a gas engine it is even less. Now, take the interest on $430, which, at the rate of five per cent., will make a total of about $21 per year, the cost of power is $50. Add to this for possible repairs about $9, to make an even figure, and you have a total cost of $80 a year, or $6.75 per month. Can you hire any kind of a boy for this amount? Certainly not, and if you could get him, what could he do? A careful consideration of these facts, therefore, will, I think, demonstrate that you could not make a better investment in your business."

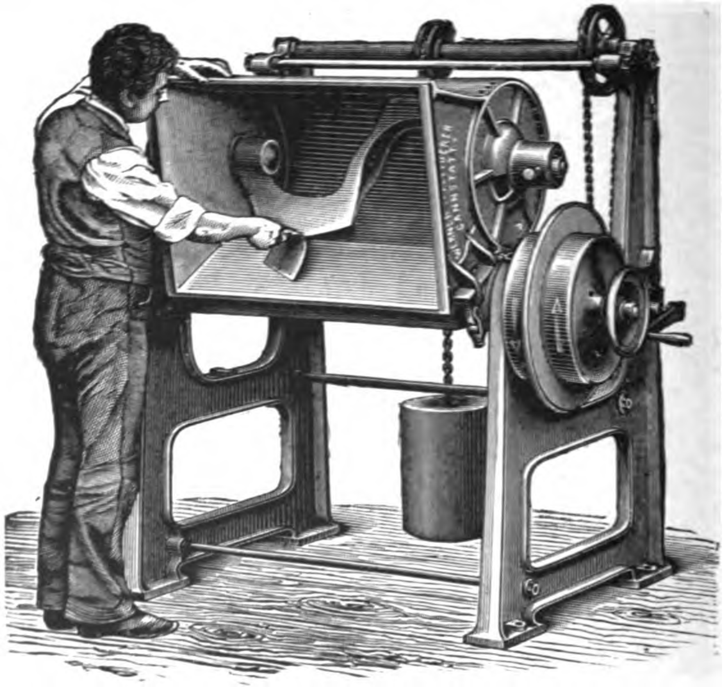


Fig. 248.—Universal Kneader (Werner & Pfleiderer).

The American manufacturers of bakers' machinery have made many improvements on dough-kneaders and mixers and not only claim to make machines as good and as practical as those made in European countries, but it is claimed that our mixers are more practical and not so heavy and clumsy in construction and not so expensive. The demand for modern

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machinery is growing continually and nearly all the manufacturers are kept busy to their full capacity.

Dough Dividers and Cutters for rolls and buns have been on the market for some years. A Vienna master baker, by name of Hailfinger, is credited with having invented the first machine of this kind. In Germany the firms of Herman Bertram, J. Herbst & Co., and Bruning were first to offer dough-dividing machines. In this country among the most popular dividers are the "Van Houten," manufactured by the Dutchess Tool Co. (Fishkill) and the "Bertram," manufactured by Wm. Zoeller (Chicago). The usual size has a capacity of nine pounds of dough which is cut into thirty or thirty-six parts. Although we have a number of such machines for small breadstuff, the trade has been waiting anxiously for an accurate, practical weighing or dividing apparatus, for larger pieces of dough from one pound up. There is only one such machine on

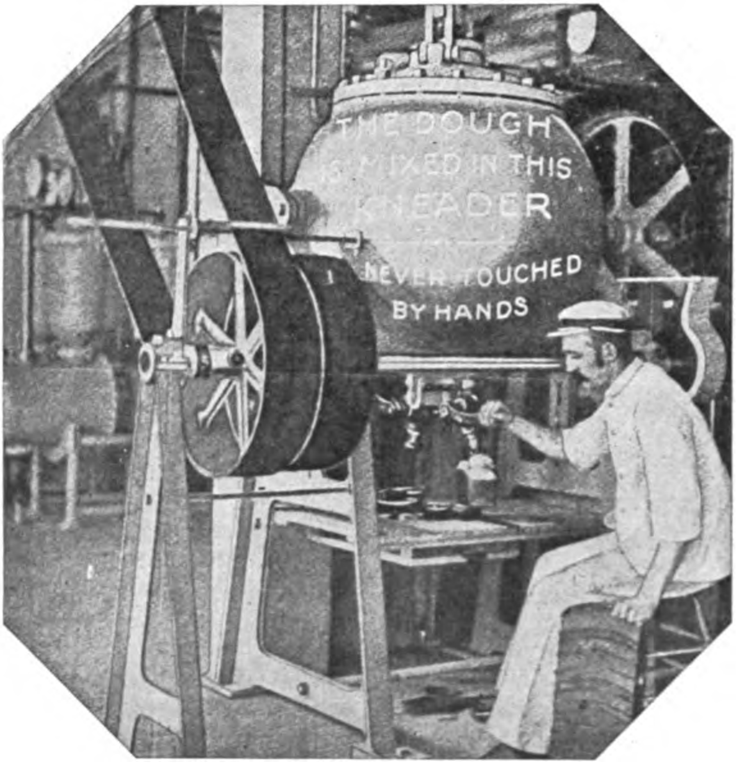

Fig. 249.—Aerated Bread Mixer.

the market at present, patented by Lewis & Pointon, sold by Werner & Pfleiderer. and which has been in use in a number of large bakeries in Europe for some time and is now being introduced in America. The writer has seen several other models of new inventions in this line by American inventors. One of them, an automatic dough weighing or scaling machine, is near complete and will be placed on the market in the near future by the inventor, Mr. Geo. J. Hicks. New York. This machine is designated on the principle of weighing or scaling the dough, not only dividing it, by the aid of a pair of scales in front of the machine, which receives the dough coming out of the mouthpiece. It is claimed to weigh pieces of dough accurately from four ounces to two and a half pounds. Mr. Fowler, of Fowler Bros., Brooklyn, has also been at work on a similar machine for some time and

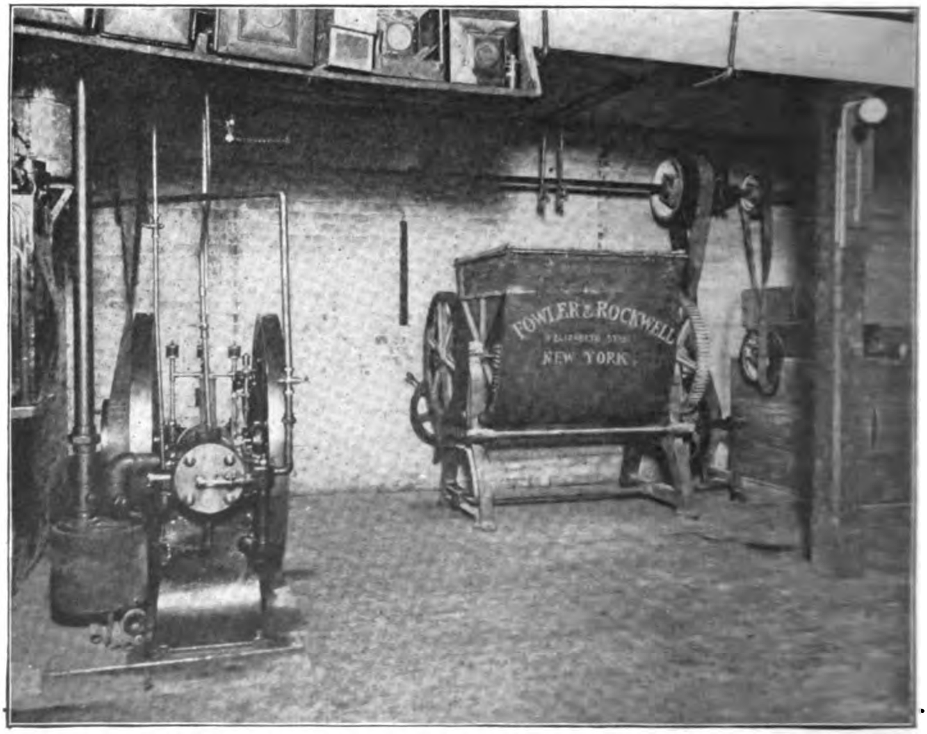

Fig. 250.—Mixer and Gas Engine (showing gearing and shafting).

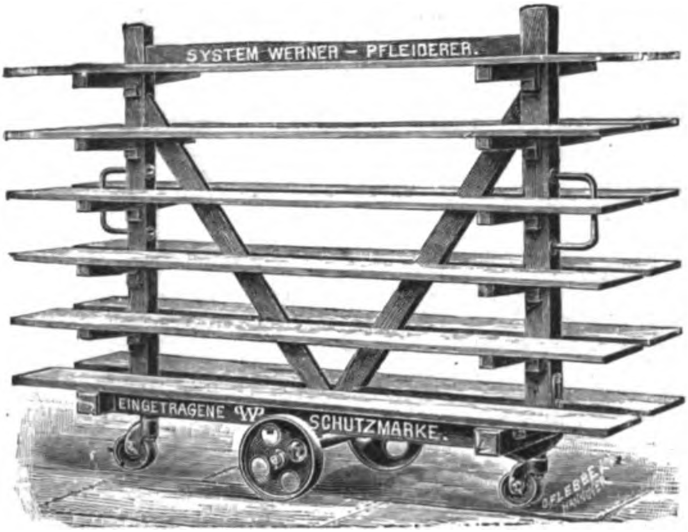

Fig. 251.—Bread Truck (with Removable Boards).

the model, shown the writer some time ago, worked admiringly well, and after the changing of a few minor details, the machine appears to do the work satisfactorily for which it is intended.

There is still another bread scaling machine lately introduced in England which is heralded as doing great work and not being so expensive. Negotiations for its introduction to the American trade are now being carried on.

Fig. 252.—Bread Boxes on Truck.

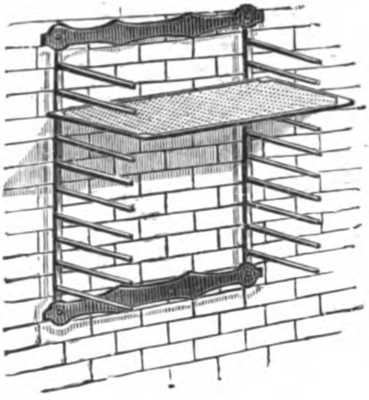

Fig. 253.—Wall Rack (Jas. Y. Watkins & Son, New York).

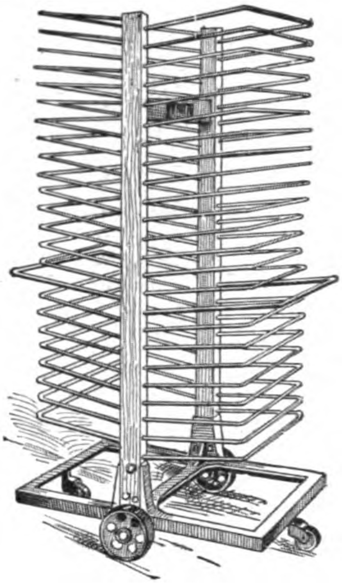

Fig. 254.—Pan Rack on Rollers.

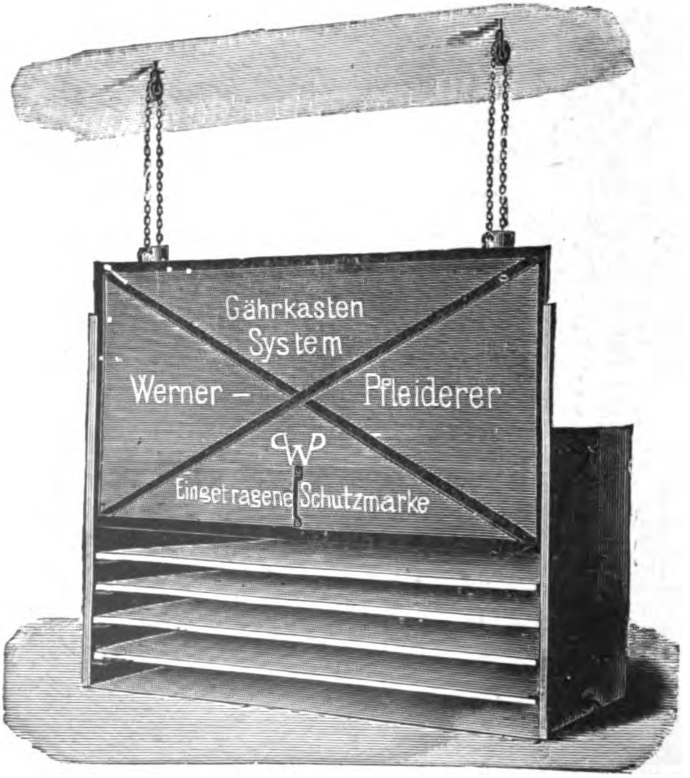

Fig. 255.—Proving Box.

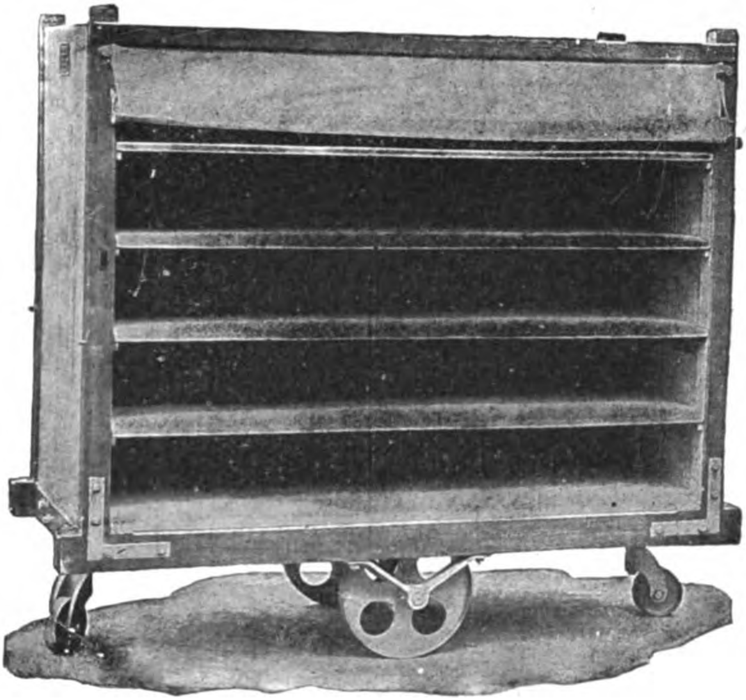

Fig. 256.—Movable Proving Truck.

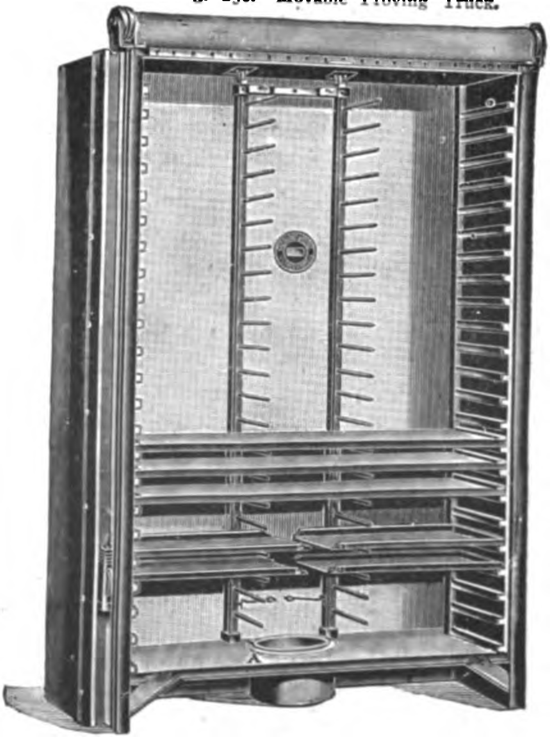

Fig. 257.—Proving Closet.

Fig. 258.—Baker's Shop Basket (Burlington Basket Co.).

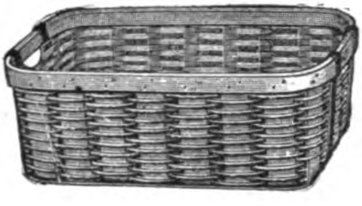

Fig. 259.—Baker's Basket (Burlington Basket Co.).

Baskets and Shipping Cases.—The shipping of bread has made wonderful progress during the last ten years and some of our larger bakeries have built up an enormous bread trade in surrounding towns and the shipping of bread by express has become a distinct feature in a number of bread factories. Of course, the selection of the most suitable package, box or basket is quite important and besides the original cost, the durability and weight of such must be considered.

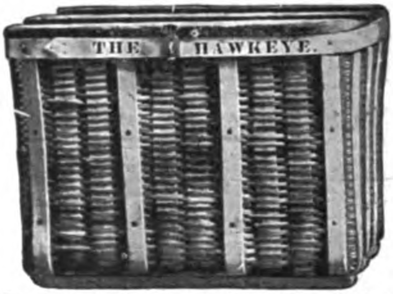

Fig. 260.—"The Hawkeye" Shipping Basket.

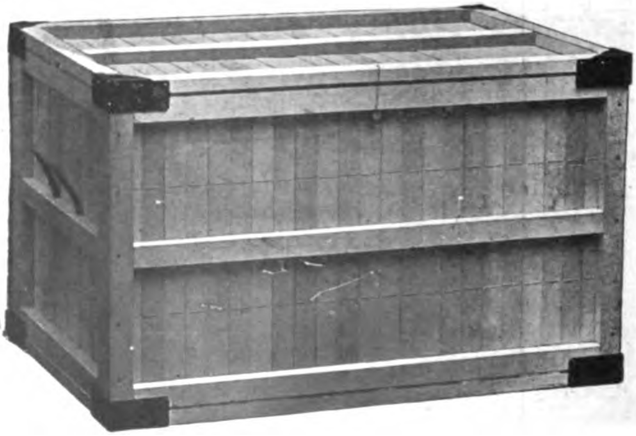

Fig. 261.—Patent Woven Wood and Wire Box (G. B. Lewis Co., Watertown, N. Y.).

Fig. 262.—German Bread Case for Shipping.

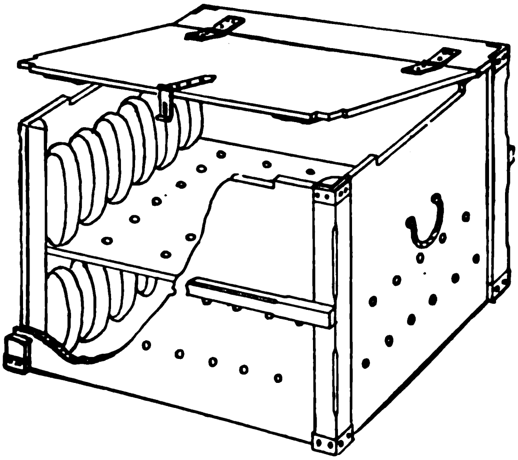

Fig. 263.—Bread Box (Norwegian Patent).

DOUGH MOULDING MACHINES.

Several bread moulding machines have been brought before the trade by American manufacturers. The "Bryce" Moulding Machine, The

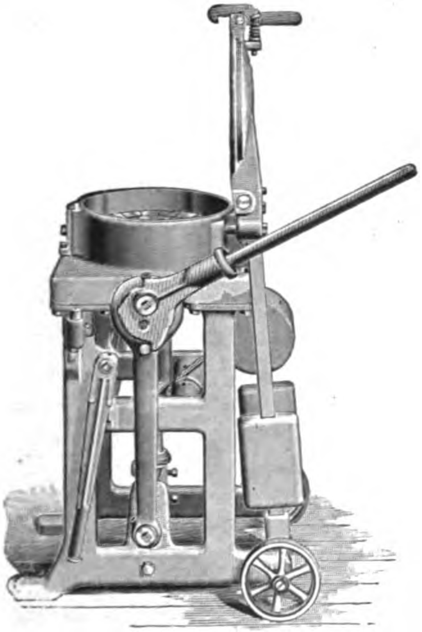

Fig. 264.—The "Van Houten" Dough Divider.

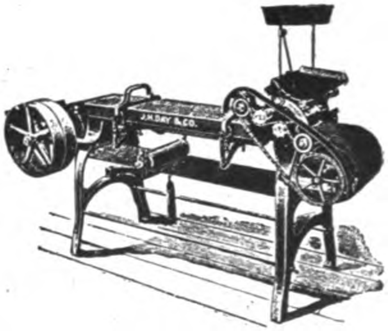

Fig. 265.—Co by Bread Moulding Machine.

"Corby" Moulder have been more or less advertised; Westerman, of Chicago, also manufactures a moulder, but the "Thomson" Bread Moulding Machine has become the most popular machine of its kind during the last two years. It has a capacity of moulding 2,000 loaves per hour and

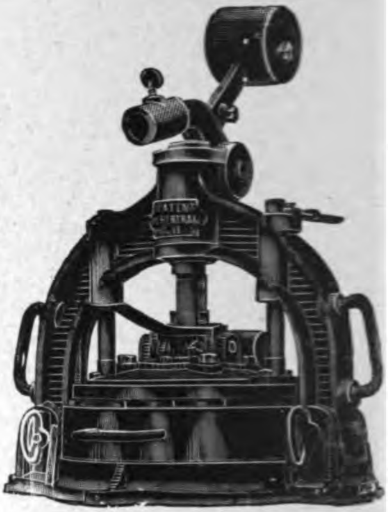

Fig. 266.—Dough Cutter (System Bertram). (Manufactured by W. Zöller, Chicago).

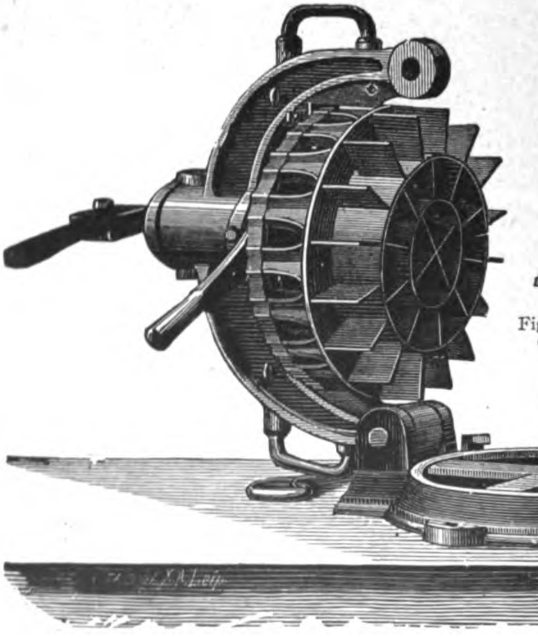

Fig. 267.— Dough Divider (Showing Knives).

moulds the loaves uniform. This machine is made in different sizes to mould loaves of any desired size.

Bread Racks.—Many time and labor-saving devices have been introduced to convey the bread before and after baking to and from proving room and oven until it is finally placed in the basket, shipping cases or wagons or on the shelves in the retail department.

RELATIVE COST OF GAS AND STEAM ENGINES AND MOTORS.

The relative cost and advantages of gas and steam engines has become an important question with bakers, and of late electric motors have also become very popular and their original cost and maintenance have to be considered, when deciding on the selection of the most economical and most suitable power for a modern bakery. There are advantages and disadvantages in each type of machine—and as each has its legitimate field, neither will encroach on the work of the other. It is a matter of general consent, however, that considered solely as a machine for converting the total energy of the fuel into mechanical work, the gas engine is the more efficient; while in the steam engine all the exhaust steam can

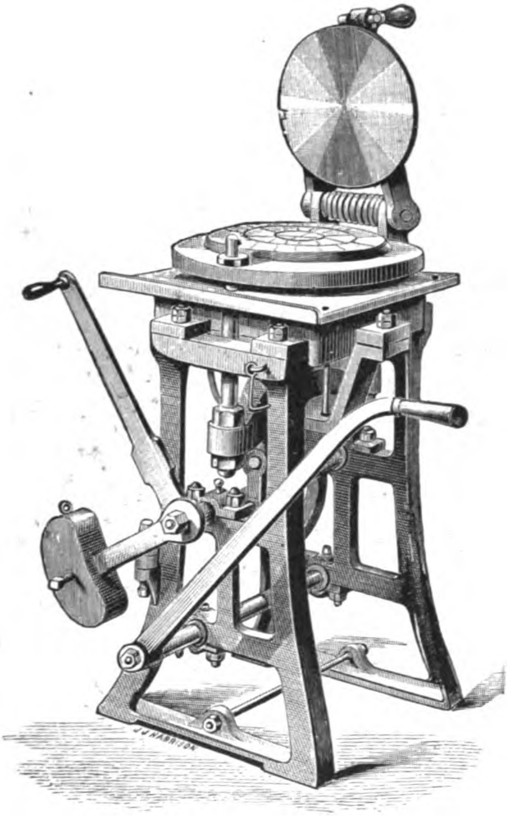

Fig. 268.—Dough Divider for Rolls (Herbst & Co.).

be turned to good account for heating bakeshops, proving rooms, and heating water for all purposes, also furnishing steam for Vienna ovens. We here quote from an article in the *Engineers*

"There are gas engines in operation which transform over twenty-five per cent. of the heat in the fuel into useful work, while in the very best recorded performance of the steam engine barely fourteen per cent. of the energy in the coal burned has been thus accounted for, and in the average steam engine plant, not to exceed five per cent. There are many small plants consisting of common slide-valve engines, with uneconomical types of boilers, in which less than two per cent. of the energy in the coal burned is converted into mechanical work. At the same time it must be remembered that a given number of heat units in the form of fuel suitable for use in a gas engine costs more than an equal number in the shape of coal or other ordinary fuel suitable for burning in a common boiler furnace.

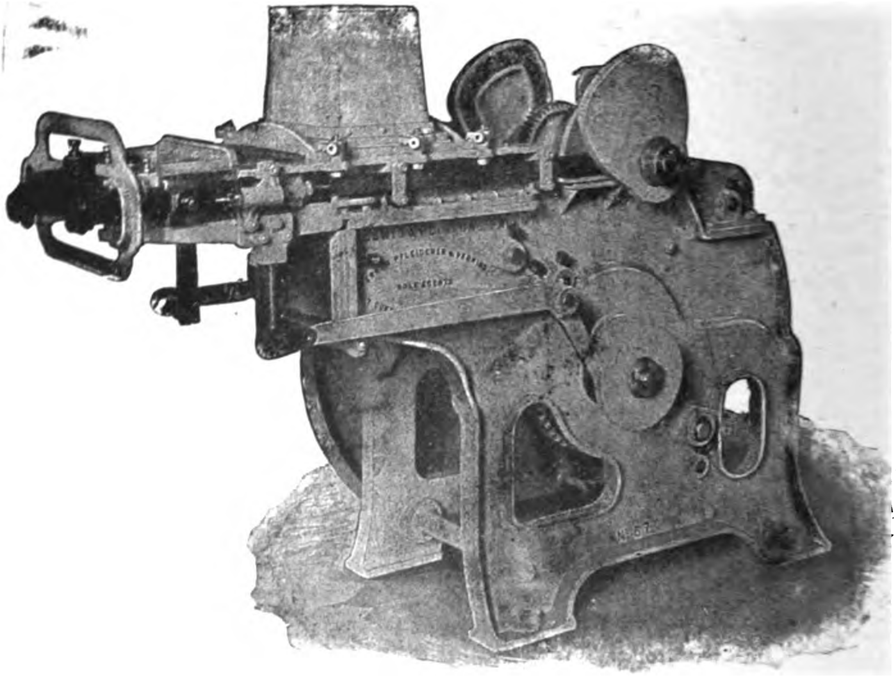

Fig. 269.—Bread Dough Divider (Lewis & Pointon).

"In a general way it may be assumed, that in a plant operating continuously, the item of fuel will be somewhat greater for the gas engine than for an improved pattern of modern steam engine, except possibly in the case of an engine running on producer gas. Where the service is of an intermittent nature, or the power is required only for a comparatively short time each day, this difference in favor of the steam engine becomes less, and may even become a balance in favor of the gas engine, for the reason that in the gas engine plant there are no "stand-by losses," that is, radiation and leakage when standing idle under full steam pressure, and coal burned in banking fires and raising steam.

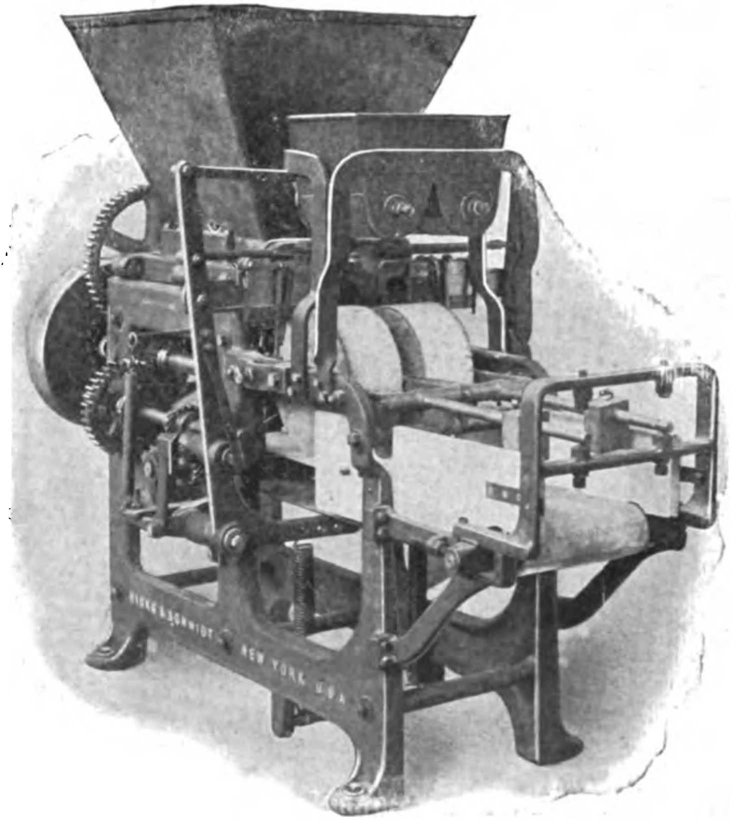

Fig. 270.—Bread Scaling or Weighing Machine (Hicks & Schmidt, New York).

"With the gas engine the fuel expenses starts and stops with the engine. But the fuel cost is only one item in the cost of producing power. One must consider the value of the additional space, and buildings required for a boiler plant; the cost of a stack; labor of handling coal and ashes; cost of attendance, oil and water; depreciation, repairs and insurance of a boiler plant. The gas engine has a field of its own which cannot be occupied by the steam engine, and there is no immediate prospect of the gas engine seriously encroaching on the legitimate field of the steam engine.

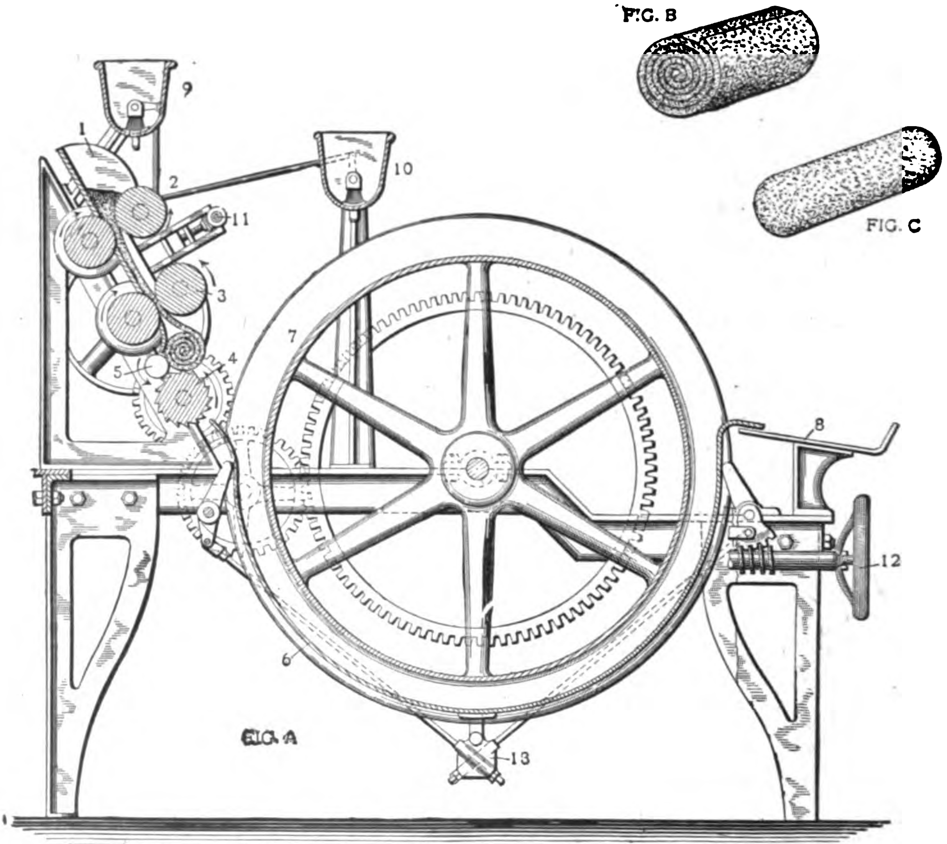

Fig. 271.—The Thomson Bread Moulder.

"In this connection reference may properly be made to the increase of the size of gas engines. A recent contract is for twelve gas engines, aggregating 3,000 horse power. Nine of the engines will be 300 horse power each, one of 125, one of 50, and one of 10. Gas engines of 650 horse power are being built. One of this size will be placed in a steel plant and one in the power house of an electric company. Ten years ago 650 horse power was considered large for a steam engine."

Of course the choice of power depends upon local conditions. After that point is settled care must be taken to see that the power is properly mission depends upon the distance of the machines to be driven from the engine room, the length of time they are to run, and upon the cost of developing the power in the engine room. Of these, perhaps the most important is the distance of the machines to be driven from the engine applied and that it is not needlessly wasted by being sent over long line shafting and a number of belts and pulleys before arriving at the machine it is intended to drive.

We quote here from a paper read before the last National Convention by Mr. Chas. A. Ward, of Pittsburg, on "The best use of power."

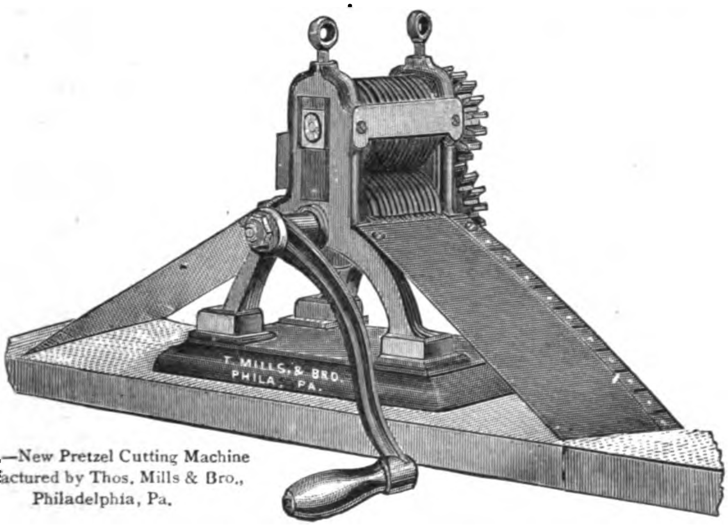

Fig. 272.—New Pretzel Cutting Machine Manufactured by Thos. Mills & Bro., Philadelphia, Pa.

"Power may be transmitted from the engine to the various machines throughout the bakery in two ways: First, by a system of belts and shafting, and second, by electricity. The choice of either system of trans- room. In large buildings where line shafting is used to transmit power to machines which are at a distance from the engine room, much of the power may be lost in transmission. There have been cases in which 50 per cent. of the power developed by the engine has been lost in the line shafting and belting. If such a plant is in a locality where fuel is very cheap, such a loss might not be a serious one, but in the cities where fuel is sometimes high, we will do well to look into the matter to see if a cheaper method cannot be found. The only solution for a case like the one above is the use of electricity for transmitting power. In this case, there is in the engine room an electric generator connected up to the engine. This generates an electric current which is sent over copper wires to the electric motors installed in the various departments throughout the factory. It is not generally necessary to have an electric motor for each machine in any one department, as one motor can be made to serve several machines in each department. The determination of this point should be left to a consulting engineer.

"Let us take, for example, a shop which has a system of shafting and belts, and in one part of the shop there is a dough mixer which requires 20 horse-power to drive it. Suppose that our power costs us $30 per horse-power per year. Now if we lose 30 per cent. of the power in the line shafting, for every horse-power we send to the mixer over the line shafting, only 70 per cent of it reaches its destination, consequently we must send 1.43 horse-power from the engine room so that we can have one horse-power at the mixer. Since our mixer requires 20 horse-power, we must send out from the engine room 20 times 1.43 horse-power, or 28.6 horse-power. Thus we are paying for 8.6 horse-power, which is wasted in the line shafting. This at $30 per horse-power per year would cost us $258 per year. If now we buy an electric motor and a generator, the cost of both might be, say, $650. With this system we might lose about 15 per cent. in the generator, motor and line. At this rate we would lose about 3.5 horse-power, costing us $105 per year. If we count 12 per cent. for interest on investment, depreciation and repairs, the cost per year on the motor and generator would be 12 per cent. of $650, or $78. This, added to the $105 which we pay for the lost power when transmitting electrically, brings the cost per year up to $183. This against $258 per year for lost power when line shafting is used, shows a saving of $75 per year. In nine years the saving would be enough to pay for the machinery installed. After that time the $75 would be clear profit, as the 12 per cent., taken above, includes the price of replacing both machines when worn out. This is only one case in a hundred that might be taken to show what things must be considered when the choice of a system of power transmission is sought. The problems we have considered have of necessity been simple so that you might be able to follow the reader. I would have you remember that in an actual case which might come up for consideration, more elements would enter the problems than those we have considered; but the principle remains the same, and if you become thoroughly grounded in the principle, you are already well on the way to understand the more complex problems which you may have to solve if you truly seek to reduce the price you pay for power."

Bake Ovens.

ANCIENT PORTABLE OVEN.

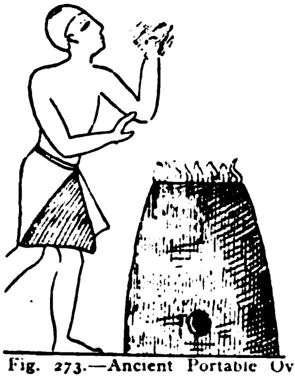

Fig. 273.—Ancient Portable Oven.

The accompanying engraving represents a style of portable oven said to have been in use among both Jews and Egyptians at an early day. It is from an old Egyptian drawing. Professional bakers did their work in fixed, specially constructed ovens. Portable ovens were usually found in private houses. These were in the shape of stone or metal jars about three feet in height, and were heated from the interior with wood, dried grass or flour stalks. When the first had burned down, the cakes were placed on the ashes or the exterior sides of the oven. Or a hole dug in the ground formed the oven; the sides being covered with clay and the bottom with pebbles. Sometimes the cakes were cooked on heated stones or by the more primitive method of laying them directly on burning logs. The dough was also placed between two layers of dried fuel which were then lighted. Others baked it in a pan with oil and ate it whilst hot with honey. Or cooked it in such thin layers that it crumbled in the fingers.

It can be further taken for granted from scriptural sketches, that the old Hebrews had regular bakers' ovens of very large dimensions. In Pompeii several whole bakeshops have been unearthed and arrangements for baking appear to have also formed a part of every large family establishment. (See Vol. I.) One historian tells us of a very large bake oven in the cloister of St. Galle (tenth century) which would hold 1,000 loaves at a time.

OLD TIME VILLAGE OVEN.

In the following article we picture an old time public oven erected in the village of Seriere, in Bugey, France, in the fourteenth century. It is claimed in the sketch, translated originally for the *British Baker and Confectioner*, that this old village oven is still used by the humble French village folk:

"This public oven has the appearance of one of those old chapels so common in Provence, and which have been inhabited by solitary monks. It is built of rough stone, very equal in size, as is still the custom in this district. There is no chimney, the smoke escaping by a break in the wall of the oven. The north side is covered with ivy, which rises to the roof, and gives a picturesque appearance to the whole building. The door, the spout, the irregular openings are all original.

"The interior is also singular. One finds in the way of movables a shovel for the oven and a wooden board with round holes, on which people can write down when their turn of the oven is due. The door of the oven is of sheet iron, but this is of modern date, as it was formerly of stone. To the right of that door there is a sort of niche, which formerly would contain the figure of a saint. A tablet of stone before the oven serves to place the bread on; two side tablets built into the wall serve a similar purpose. This is all the furniture of a public oven which has seen nearly 600 years of existence. In this and similar villages bakers' wares are not of the most brilliant description. It is principally the peasants, however, who use the

Fig. 274.—Old French Village Oven.

public oven. The middle classes prefer bakers' bread in place of these rude round loaves, weighing from thirteen to fourteen pounds, but which are nevertheless very healthful and nourishing. Formerly the baker joined to his trade that of flour merchant, which gave him also the custom of those who preferred to bake their own bread.

"Bugey was formerly a lordship of the ancient Burgoyne. At the time of the Roman conquest it was inhabited by the Segusiens. Numerous traces of that epoch remain, notably the lake of Seriere, which was formerly the bed of the Rhone. As in Provence, many ancient customs are preserved, among them the public oven, which we owe to the feudal times. One knows that at that epoch the nobility had the right to seize on the public road and confiscate to themselves any bread not baked at the public oven and all flour not ground at the common mill. In all the lordships of the Gallo-French Empire, as in Bugey, the courts had the right of banality, viz., to publish in the lordship decrees concerning the public ovens and mills. The nobles and ecclesiastics were exempt from this rule for the bread for their own tables, *because of the risk that the bread might become sour in carrying it from the public oven!* On the night of 4th of August, 1789, the right of a lord of the manor to oblige his vassals to use his oven disappeared. Since then the public oven of Seriere has become a communal oven in the condition that we have described."

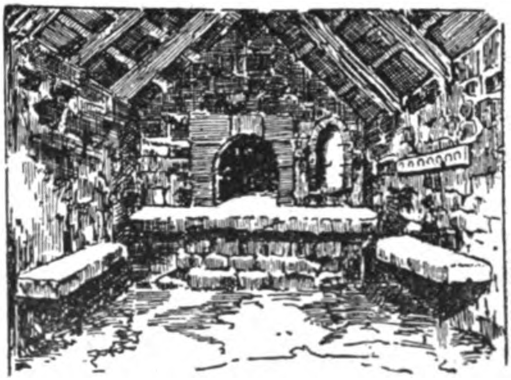

Fig. 275.—Interior of Village Oven.

All the old-time ovens were fired with wood, and they were built nearly on the same principle as the ovens found in many smaller bakeries of to-day, especially in country districts. The ovens are well filled with dry wood and then fired. When all burned out, the ashes are removed and the oven swapped out. This process is practically the same as used by the French bakers to this day, even in some of the largest bakeries.

* Ovens with direct fire, the grate being placed in one corner in the baking chamber, were next introduced. Then followed the patent "Continuous Bakers" with the fireplace underneath the ovens. Drawplate, reel and rotary ovens are the latest achievements in modern oven construction. In Europe another style, called the traveling oven, the plates traveling on chains, is used in cracker bakeries. The fundamental principles of a good bake oven are an airtight baking chamber which can be heated evenly in every part, and an arrangement of flues as dampers, by which the heat can be controlled and regulated.

In the older style ovens with "direct heat," where the furnace is placed inside of the oven chamber near the door, and the flue further back on the opposite side, the heated gases from the furnace first strike backward through the baking chamber and then return to the flue on the opposite side. Before baking is commenced, the dampers and doors are closed to give the heat a chance to equalize and reach every part of the baking chamber. After one or two batches are baked, the fire must be refreshed and the dampers pulled, to replace the heat lost in previous bakings.

PORTABLE OVENS.

The name "portable" oven is generally applied to any oven, which can be removed from one place to another. The simplest as well as the cheapest "portable" ovens are sheet iron boxes, fitted with a small furnace and shelves above. But in this direction also great improvements have been made. We have now so-called "Sectional" Ovens, or "Sectional Portable" Ovens, which are practically removable brick ovens, such as the McDowell, the Middleby, the "Clad" Oven, the "German-American," etc. These are built in the style of a brick oven with one baking surface, where room is very limited, an upright oven with more than one baking chamber, one on top of the other; and in the best of them the baking chambers are laid with tile, same as used in a brick oven. The Roberts and the Hubbard Portable Ovens built on this style are very popular, and are made in different sizes and styles. Some of the portable ovens have a boiler attached so as to get steam into the oven, if wanted.

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*See page 574.

A PORTABLE BAKERY.

Fig. 276.—Portable Bakery.

An exceedingly compact and efficient portable baking establishment has been recently patented in this country by E. M. Sjoholm, of Stockholm, Sweden. It is designed particularly to meet the demands of an army on the march. A small box under the wagon contains the fire, but the special feature of this device is the arrangement of flue tubes throughout the oven so that every unit of heat is made to do the greatest possible amount of work. The tubes run horizontally the length of the oven, forming several floors or chamber divisions and the heat of the fire is made to pass back and forth through this great length of tubing before it is allowed to escape. Therefore every part of this oven is heated to the same intensity, and great economy of space is secured.

CONTINUOUS BAKERS.

The greatest advantage of the so-called "continuous bakers" is, that a steady heat can be kept up continually, the furnace being underneath

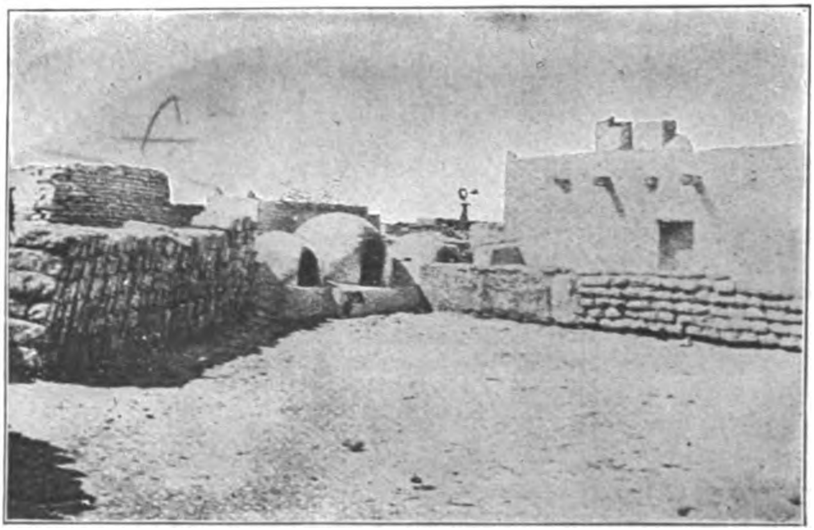

Fig. 277.—Mexican Ovens.

the baking chamber. Batch after batch can be baked in quick succession. By a proper manipulation of the dampers and checking the draught, loss of energy or waste of heat and fuel is prevented, and a great deal of fuel can be saved.

There are a number of "continuous" patent bake ovens on the market, such as the "Duhrkop," "Bailey," "Petersen," "Schubert," etc. They are designed primarily for bread baking, and for "hearth bread" they have sloping soles and steam attachment, which is turned into the oven chamber for "Vienna," rye bread, etc.

Steam ovens are provided commonly with radiant heat from iron pipes containing steam, heated under pressure to a high degree. The pipes, each of which is complete in itself, are hermetically sealed, but before being sealed a small quantity of water is enclosed in each. Each pipe is tested to withstand a very high pressure. The sealed pipes are arranged in parallel rows along the top and bottom of the oven, under the bottom tiles in the latter part, and *under* the roof and actually in the interior of the oven in the former part. The pipes are arranged so as to be in contact at the back ends with the furnace which is placed at the back. As the pipes become heated, the water in the interior is resolved into steam, which being confined, and therefore under great pressure, can be raised easily to a temperature sufficient for baking purposes. Ovens of this class are sometimes made with a drawplate sole.

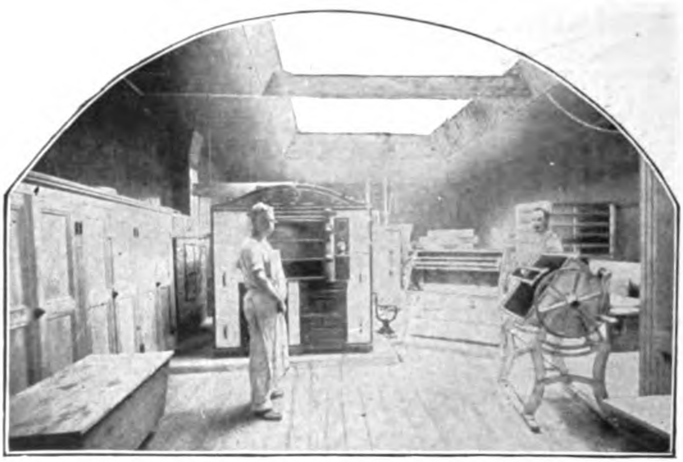

Fig. 278.—A Bakeshop in Rear of Store (showing "Hubbard" Portable Oven).

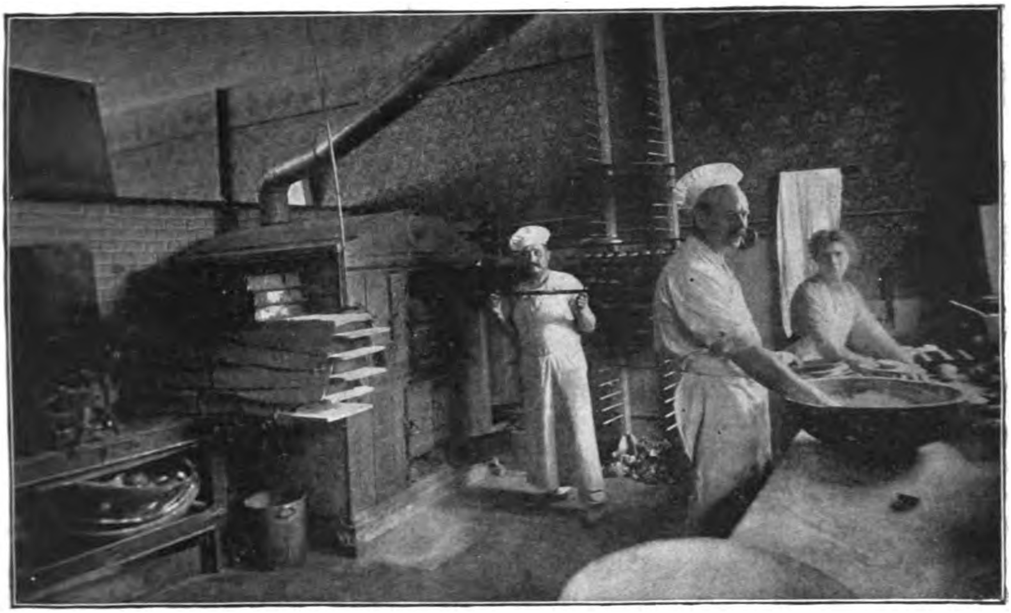

Fig. 279.—Bakeshop Adjoining Store (showing Portable Oven).

DRAWPLATE OVENS.

The principle of the drawplate, which also accounts for the name, lies in the arrangement of the baking plates being removable. The slow process of loading the ovens with the peel has led to the idea of building an oven with sliding plate which can be withdrawn from the oven chamber, loaded quickly, and, running mechanically on wheels, be pushed back into the oven.

Fig. 280.—"New Homestead" Portable Oven.

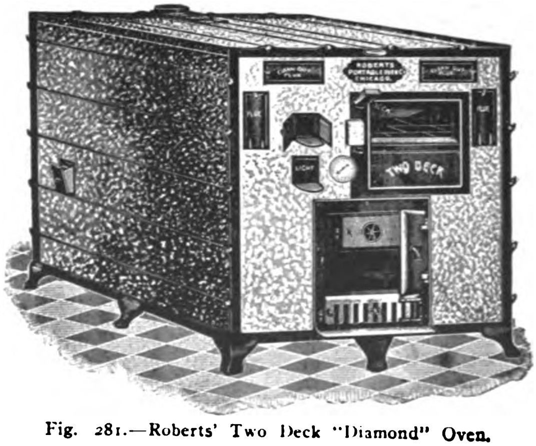

Fig. 281.—Roberts' Two Deck "Diamond" Oven.

Fig. 282.—Roberts' "Black Diamond" Oven.
Roberts' Oven Co., Chicago.

One of the objections to drawplate ovens, the extra space required when plates are withdrawn from the oven, has been overcome with the construction of the double deckers. The two plates, practically take only the space of a single decker, and the additional cost is comparatively very small.

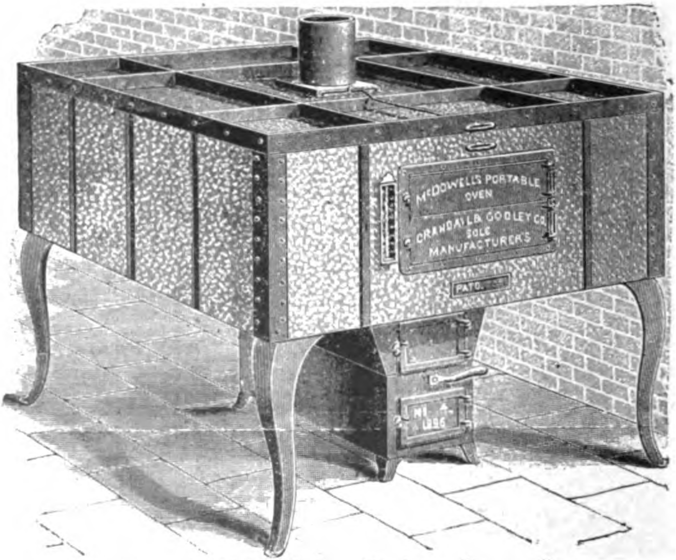

Fig. 283.—McDowell Portable Oven (Improved).
Crandall & Godley Co., New York.

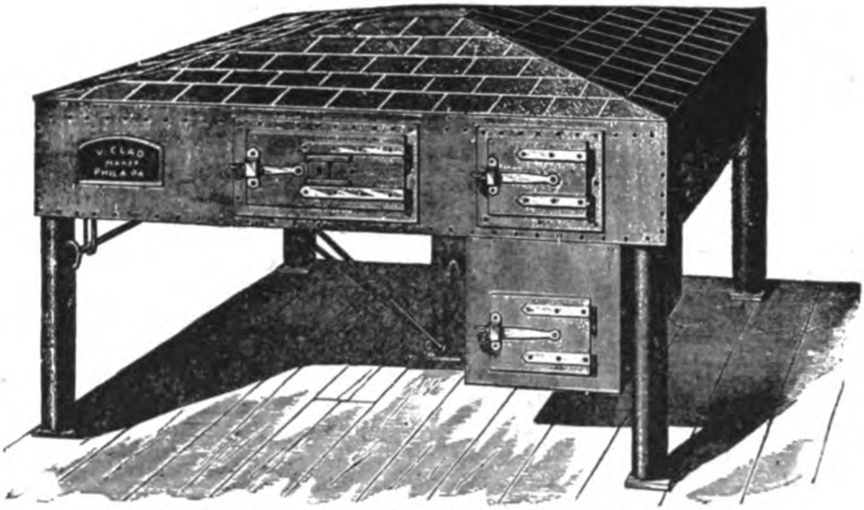

Fig. 284.—Portable Oven with Brick Top (V. Clad & Son, Philadelphia).

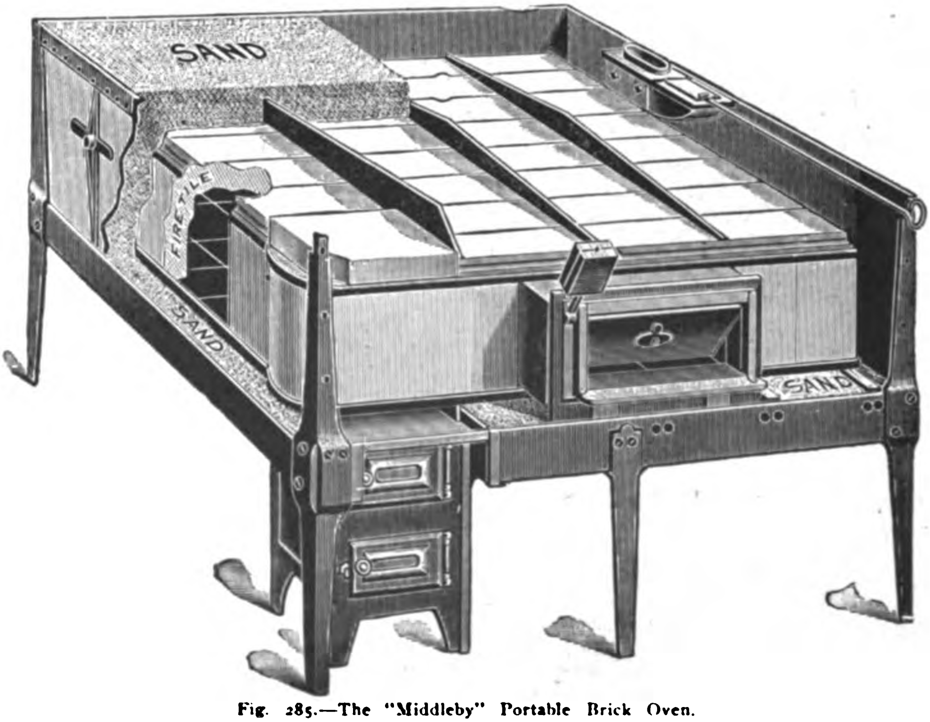

**Fig. 285.—The "Middleby" Portable Brick Oven.
Middleby Oven Co., Boston, New York & Chicago.**

COMBINATION OVEN.

The "Combination" oven consists of a drawplate, about 1 ft. 6 in. above the bakeshop floor and a peel oven over the drawplate about 3ft. 4 in. above the floor.

The "Combination" oven is of special advantage where the space in a bakeshop is limited; its capacity is just about twice as much as that of one ordinary oven, and it occupies no more space than one oven would. It is an ideal oven for bakeries where space is limited.

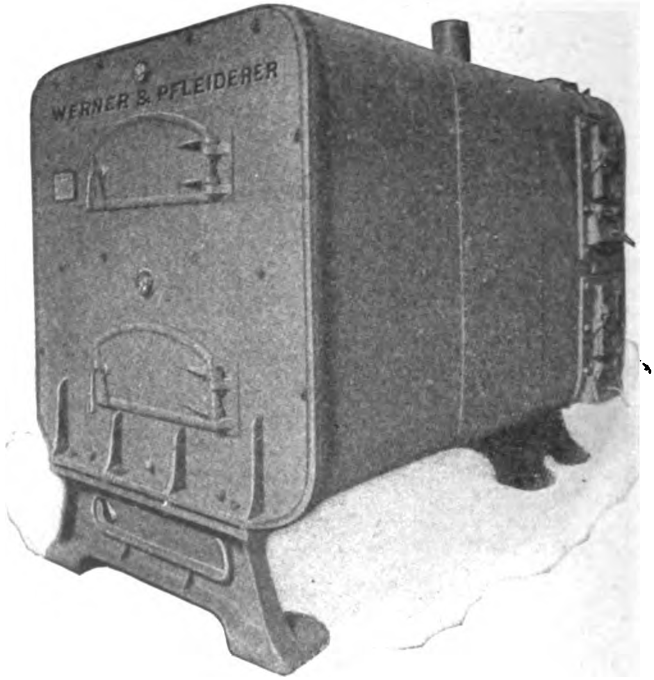

Fig. 286.—Steamship Bake Oven.

By means of the dampers it is possible to work either of the two oven chambers quite independent of each other, and to maintain different degrees of temperature.

The drawplate may be used for "pan" bread, cakes, pastry or pies, and the peel for Vienna, French bread or rolls, according to requirements. The peel oven is built either with a "sloping" or "flat" sole.

Drawplate ovens can be found in nearly every large bakery in Europe. There are several distinct systems and they have become very popular lately in America as well. The Werner & Pfleiderer drawplate oven is heated by steam pipes. In the Jos. Baker & Sons drawplate oven the heating system consists of hot air chambers with dampers and flues for admitting heat direct into the oven chamber whenever required. Coke is used principally as fuel and the economy on this point is remarkable.

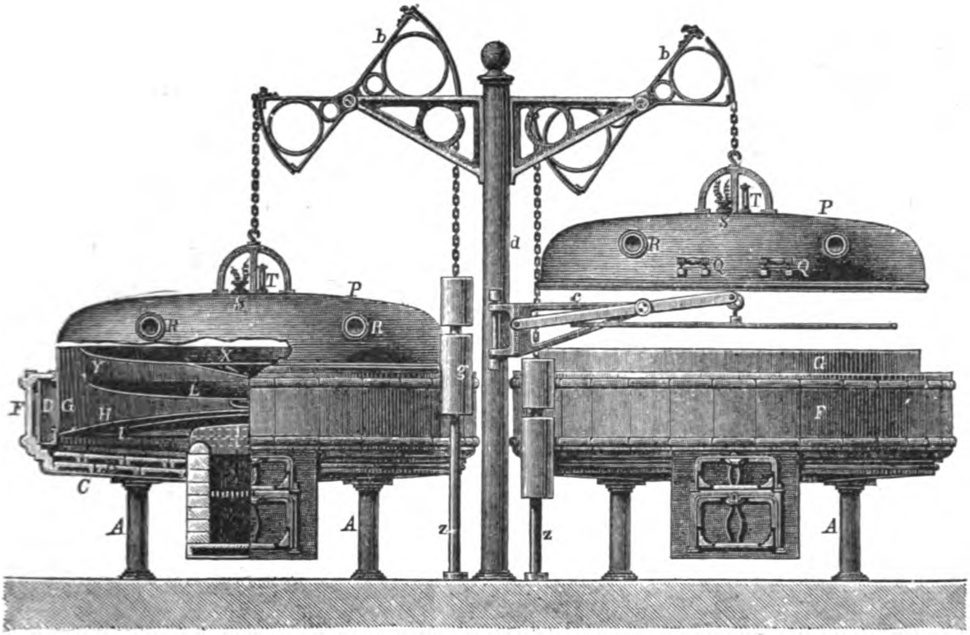

Fig. 287.—French Bake Oven (M. L. Dattris, Paris).

FUEL FOR BAKE OVENS.

Opinions about the most economical fuel for bakers' ovens differ and local prices of material have to be considered in the selection of the fuel. This point was discussed at one of the National Bakers' Conventions and it will be of interest to reprint the opinions of some of the leading bakers.

The President—The point we want to get at is, "What ovens are wanted by the baker?" We all have ovens; and there are a great many different ovens and a great many different notions about what is needed. We want to get what is desired, that will give the people that build ovens

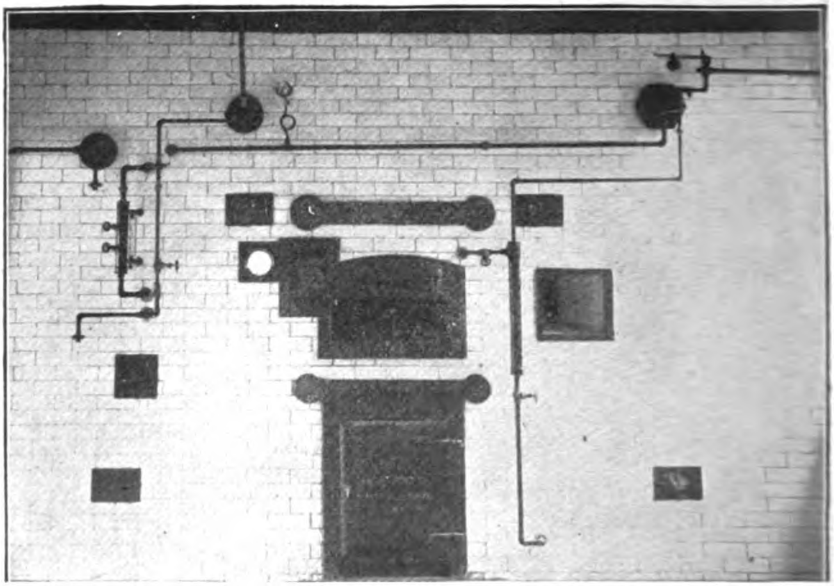

Fig. 288.—Continuous Baker, Showing Steam Attachment (Bailey Oven Co., Philadelphia).

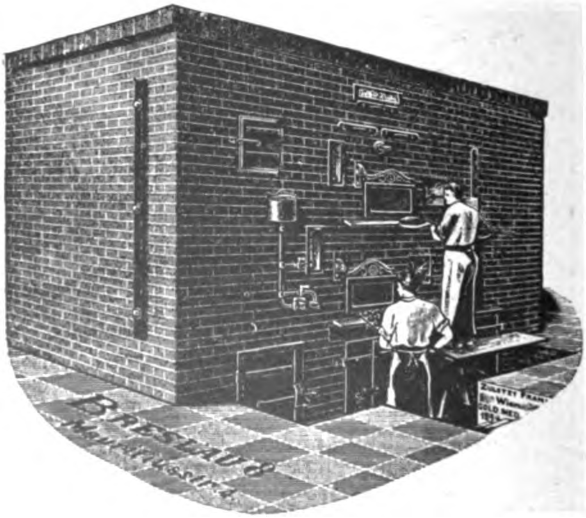

Fig. 289.—German Double Decker Brick Oven (Continuous Baker).

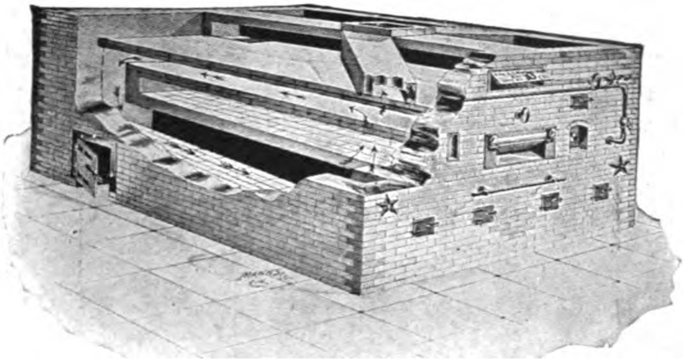

Fig. 290.—Patent Brick Oven (Clauss Oven Co., Cincinnati).

something to improve on. In connection with steam, in a great many cases you hear of the steam running into the oven at high pressure. That drives the heat out, cools off your ovens, and the steam you put in to moisten your heat is blown out of the door. It you put on a gauge to reduce the steam down and only allow a small pressure in there, you get better results.

Mr. Collins—My experience is that about fifteen pounds pressuse is sufficient.

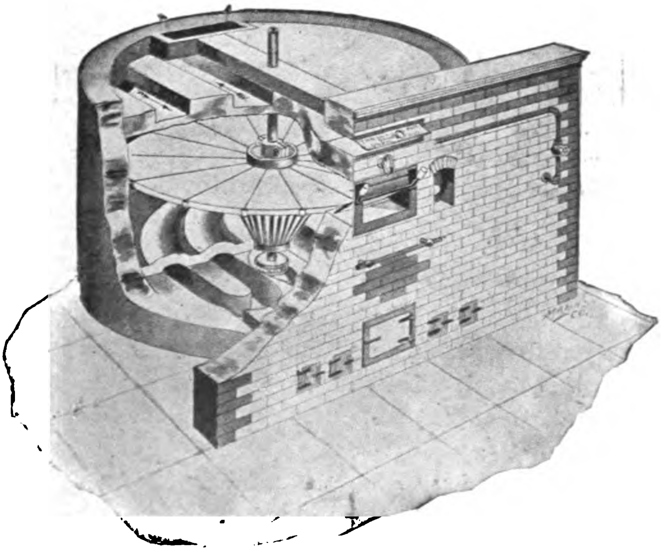

Fig. 291.—"Patent Rotary" Oven (Clauss, Cincinnati).

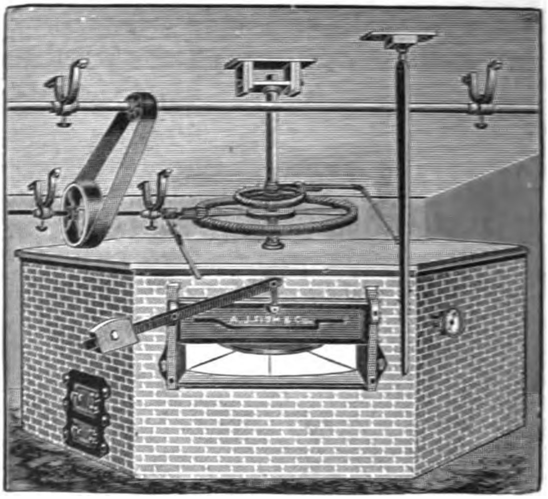

Fig. 292.—Rotary Oven (A. J. Fish & Co., Chicago).

Mr. Wagner—The first oven we built was about eighteen years ago, and it gave very good satisfaction; but I found that the oven baked more at the back and on the sides than it did in the front; and then the flues were too close together and gave too much trouble in cleaning them, and I found that a large expansion of arch was a nuisance. Two

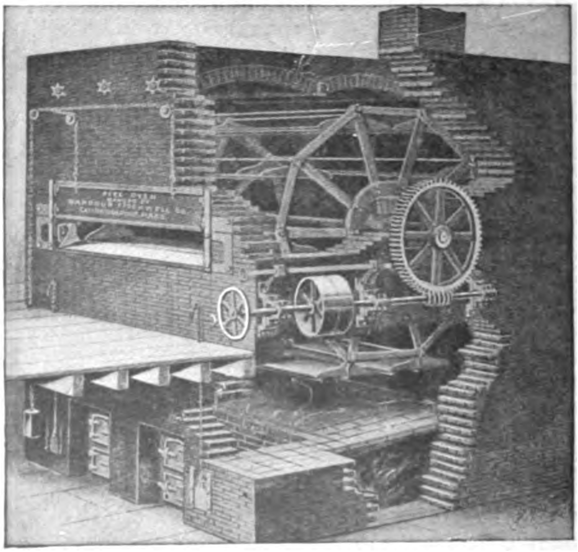

Fig. 293.—Revolving Open Furnace Reel Oven (Barbour & Stockwell, Cambridgeport).

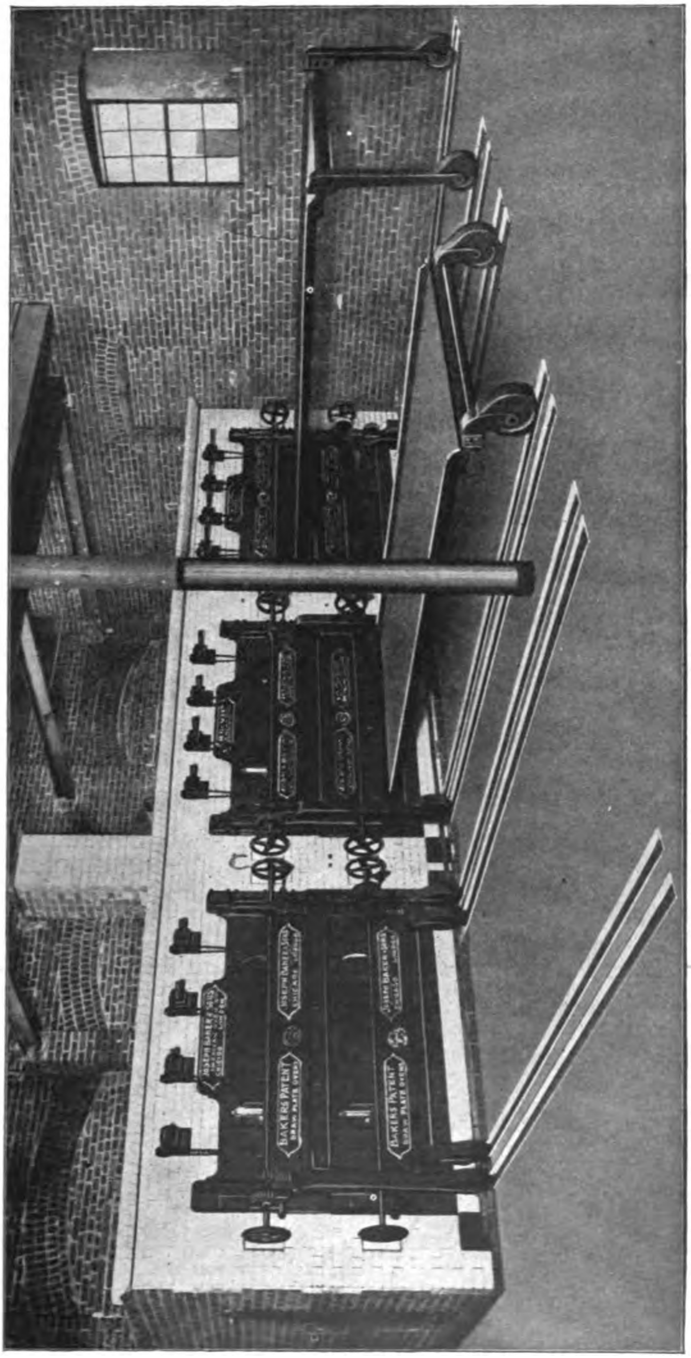

Fig. 294.—Three Double Decker Hot Air Draw Plate Ovens at Morton Baking Co., Detroit. Built by Jos. Baker & Sons, American Oven Co.

years ago we made over our plant and we have thrown down five ovens and put in four more, divided our arches into three parts by the use of steel beams, and our second arches were made 8 inches instead of four. We found that in repairing the furnaces we had very great difficulty at the top, and I went and got the Jersey arch tile made to order. I find that they work more easily; so now, instead of having to work the bread around, they do not need to change at all; the men just keep on shoving in and shoving out, and they can bake without stopping. I find it is not necessary that you should have a low oven for Vienna bread. I put up one fourteen inches and another oven sixteen inches, and I found the sixteen inch oven works just as well on Vienna bread as the twelve inch. I think the more steam you get into your oven for Vienna bread the better it is.

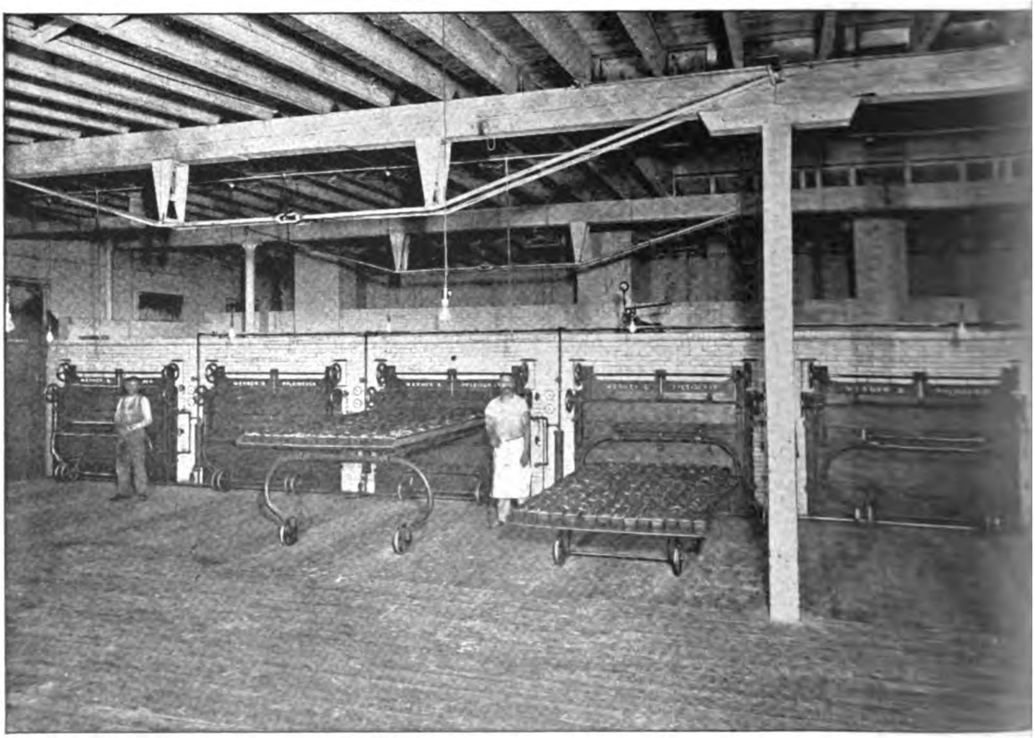

Fig. 295—Werner & Pfleiderer Draw Plate Ovens at the Freihofer Vienna Baking Co., in Philadelph

Mr. Boettler—We have a shaking grate, and we have never replaced it with a new grate bar. The grate bars will last from three to five years without replacing, while the stationary grate will wear out in six months. It is a very simple thing, and there is no patent on it. At first there was a patent and we asked permission to use it and the patentee wrote back saying he was not making any more, and we could use the patent. We are using gas house coke; we were formerly using anthracite coal. Shaking grates prevent the formation of cinders. We have water running in our furnaces; that saves the fuel and saves the grate bars and the evaporation of the water will assist you greatly. We have one man who does all the firing.

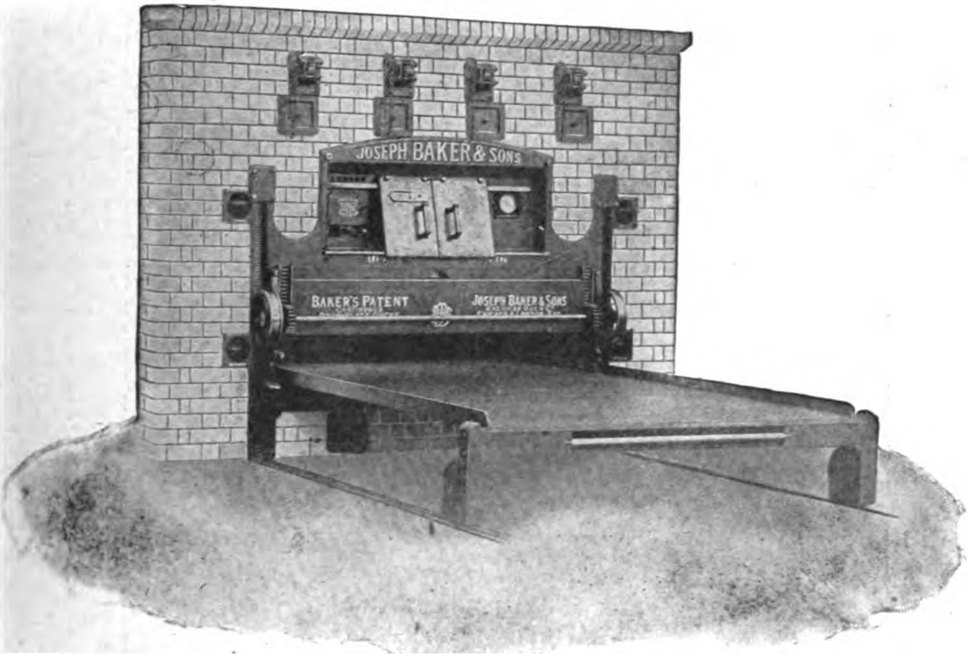

Fig. 296.—Combination Draw Plate and Peel Oven.
Built by Jos. Baker & Sons, Am. Oven Co., for the Weyl Bakery and Café Co., St. Louis, Mo.

Mr. R. B. Ward—We people in Pittsburgh are a little more fortunate than most of you; we have natural gas that costs about ten cents per thousand feet. We have four ovens, and we use about five hundred thousand feet of gas per month. That figures out about $10 or $12 per month per oven, or about ten to twelve cents per day, and if you carry

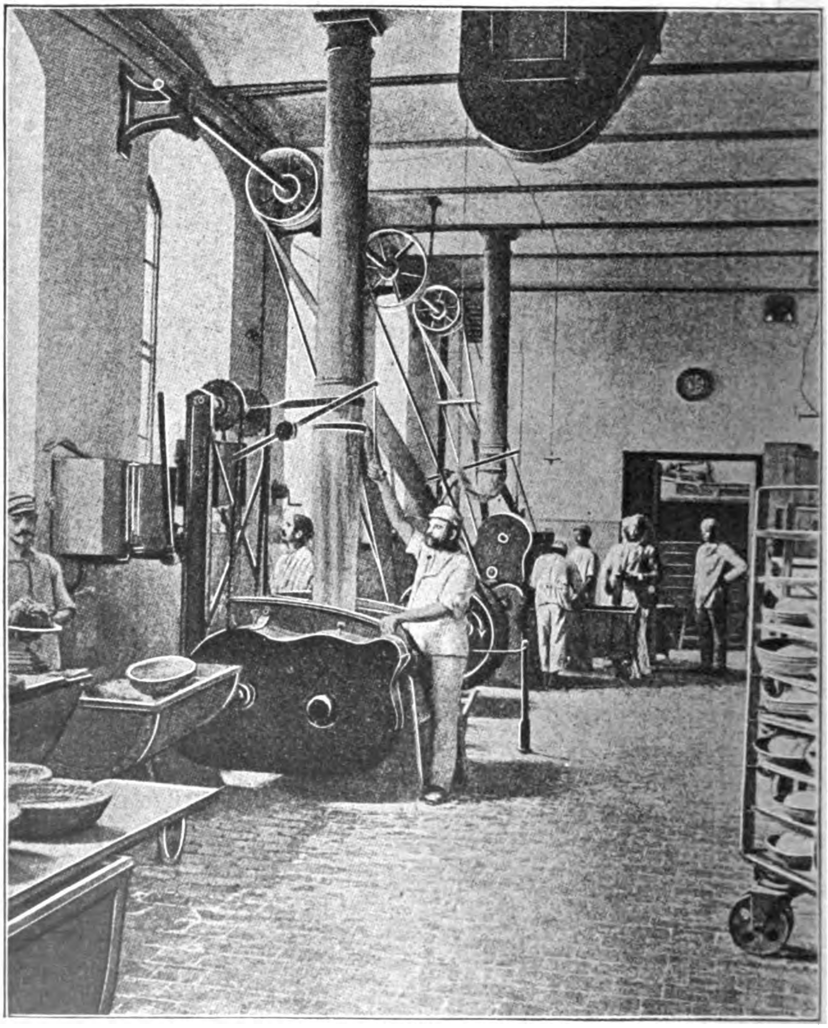

Fig. 297.—Mixing Room (Bakery of the Workingmen's "Consum" Society, Vienna).

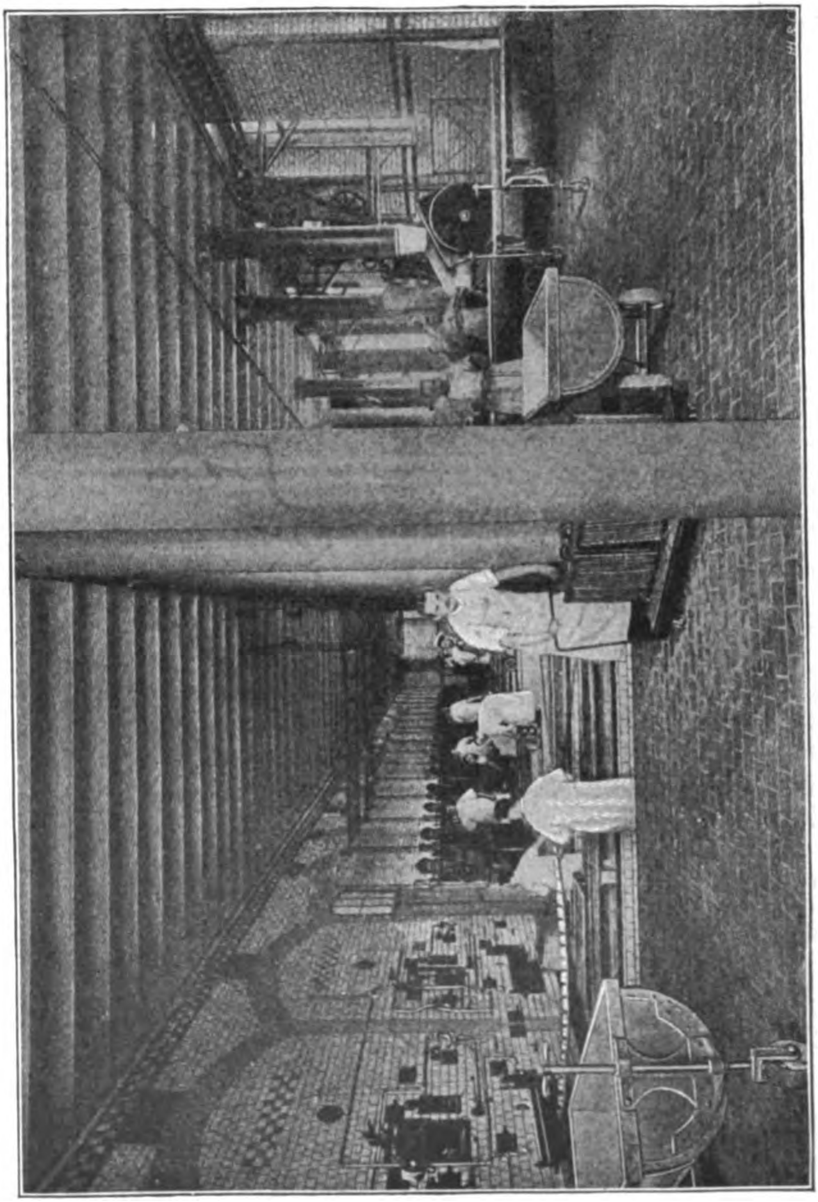

Fig. 298.—Bakehouse ("Consum" Society, Leipzig, Germany).

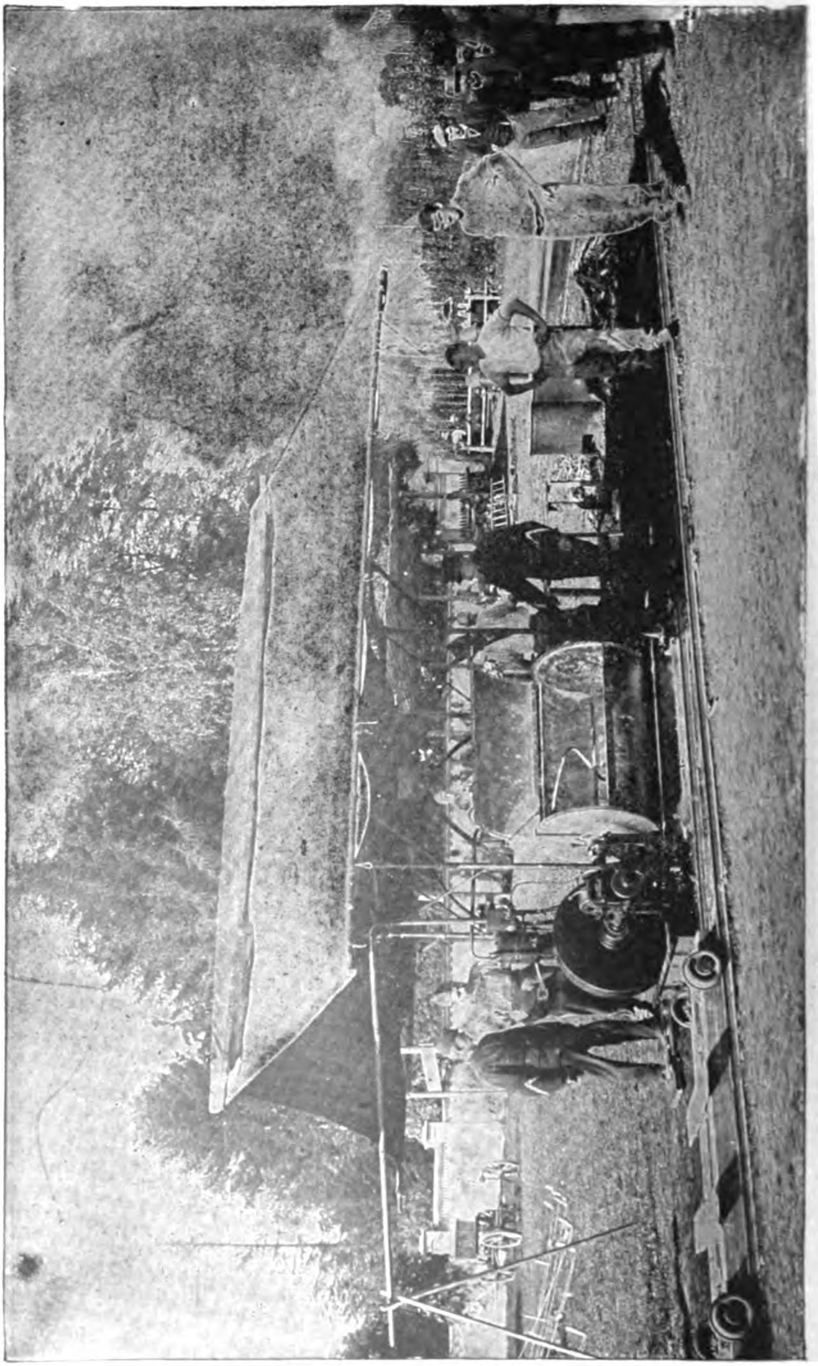

Fig. 300.—Field Bakery (Swiss Army).

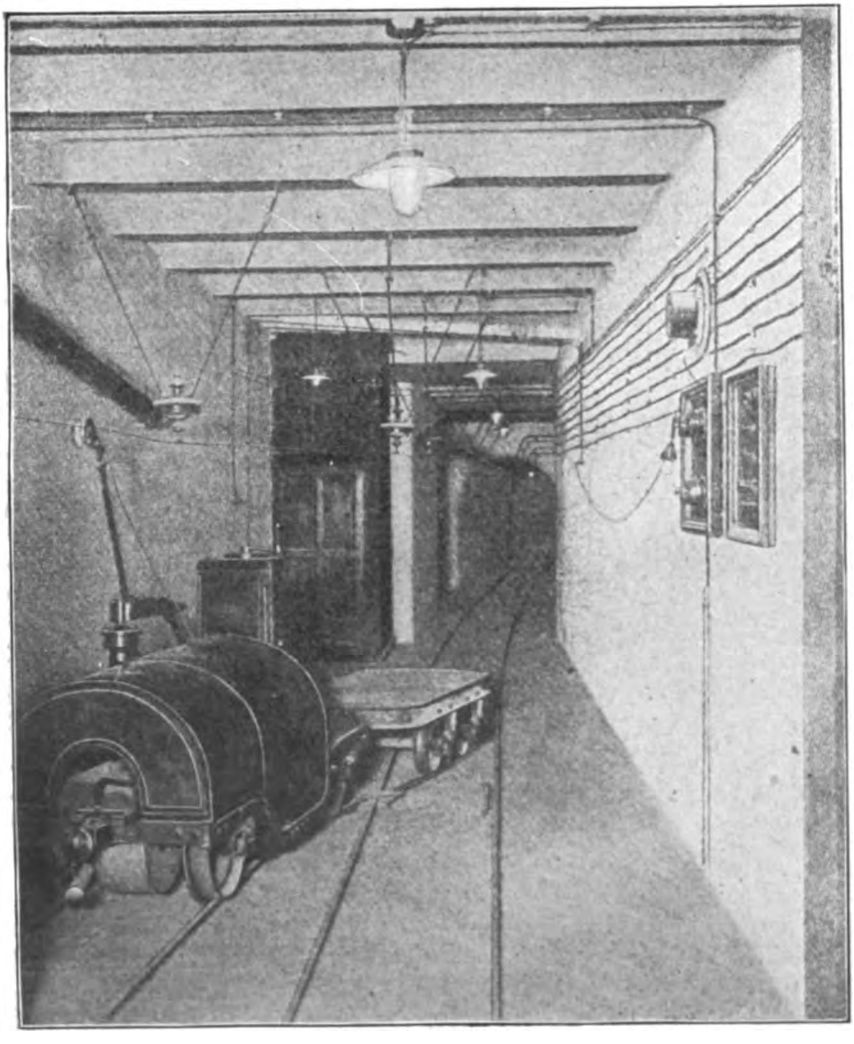

Fig. 300.—Tunnel with Electric Railway connecting the Buildings of the Bread Factory of J. Halseth, Drontheim.

out the calculation it will figure out about two and a half cents per thousand loaves; and if you want to go farther you can find how much it will cost to bake bread per loaf on that basis.

Mr. Morton—For the information of some gentlemen that are in oil bearing districts I may say that we used crude oil for some seven years, up to the past winter, with fine results. We were compelled to give up its use not because we didn't approve of it, but a kind of trust. having got hold of the business, raised the price from thirty cents a barrel to something over one dollar, and they changed from giving us oil until we got refuse, and we had to commence and use coke. In the seven years we used crude oil for our ovens there has never been one cent for repairs in any shape or form, no charge for grate bars or new bricks. We regret that we have had to give up the use of crude oil; one result is that we have had a much hotter shop than we ever had before.

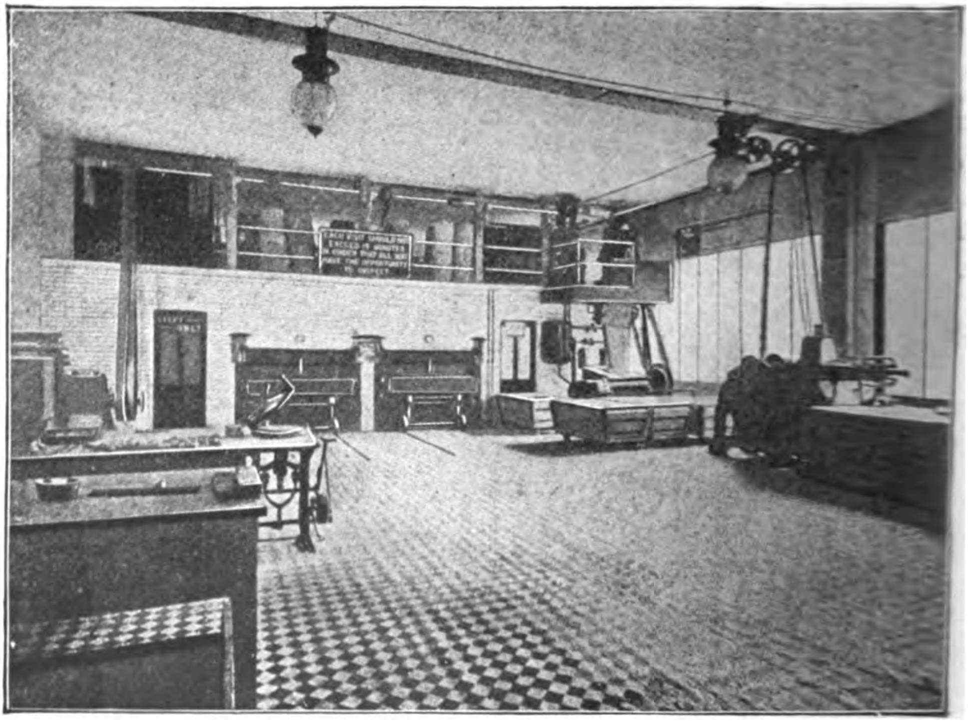

Fig. 301.—Model Bakery in London Exposition.

Mr. Boettler—The reason we use coke is because it is more economical, and the men do not waste it. If you would use coal properly, coal would be the most economical; but from the fact that the men keep firing in and wasting the heat we adopted coke, and we found that we had a more uniform heat.

Mr. Morton—That is our idea in regard to coke. We did make a change one time from oil, thought it was costing us too much, and we attempted the use of hard coal, but our men were not experienced in the use of hard coal and the tendency was to make too heavy a fire; that tendency is not only among bakers but oil tenders. When they get the proper theory of firing with coal, that is a thin fire and fire often, they do all right.

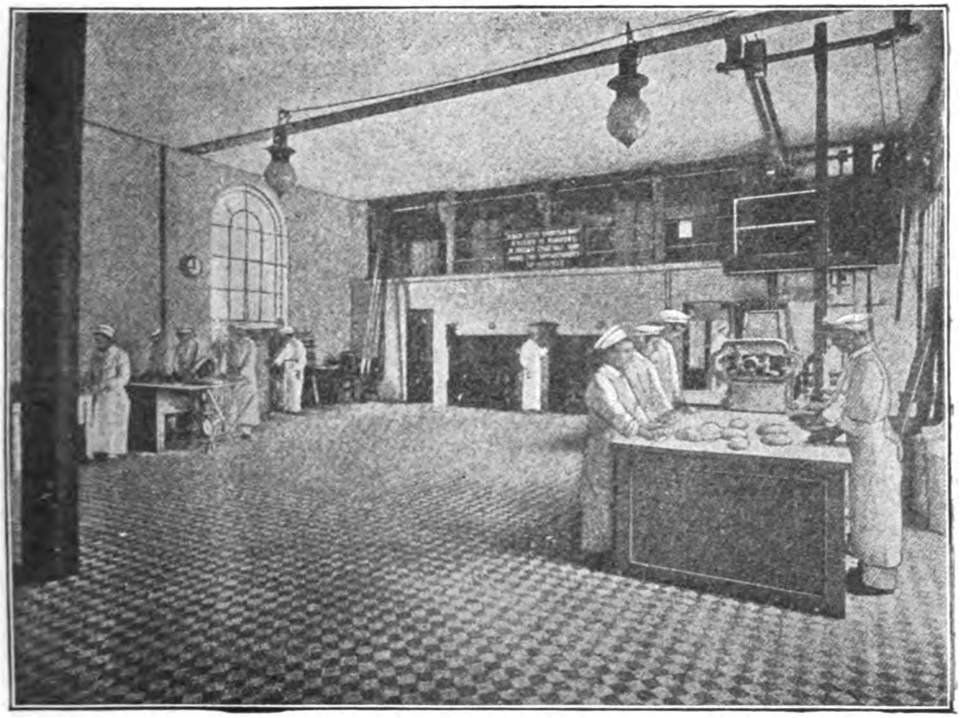

Fig. 302.—Exhibition Bakery, London.

Mr. Collins—I have been going through that experiment the last six months on anthracite coal and gas house coke, and I found that with coal the men would fire too heavy and would smother the fire and burn out the grate bars, and it was costing us for ovens about sixty cents a day. We used our ovens about eighteen hours. Since we have been using gas house coke, the consumption is about fifty bushels a week, and it is cutting our fuel expenses down about one-third.

Mr. Freihofer—We have been using gas house coke even since we have been in business. We have to pay seven cents a bushel for coke. At our branch store I tried an experiment with coal, and I found it most economical, and we are going to put the coke out altogether and use coal.

Mr. McKinney—I have not heard one say what it costs a day to run an oven on coke. We run ovens on soft coal. We buy the highest priced soft coal we can buy. It costs us ten cents a bushel, and our ovens cost us twenty-five cents for full twenty-four hours. We have mostly Duhrkop ovens, and we fire them once every twelve hours; we found coke much more expensive than soft coal.

Mr. Collins—It costs us fifty cents a day for eighteen hours.

Mr. Boettler—We pay $5 a ton for our coke. I think it costs about $20 per month per oven. Our fires are burning all the time; we never let the fires go out. I am satisfied it could be reduced twenty per cent. if it were handled with judgment; but it is impossible to get laborers to use brains, they simply do what they are told. The ideal fuel is gas; by that means you can regulate your flame.

Mr. Whiteside—I think the whole thing resolves itself to the price of the fuel. A ton of coke will produce the same heat as a ton of soft coal. We have five ovens with coke, and it costs me about fifty dollars a month; it costs me five cents a barrel to use coke, and eight cents a barrel to use coal.

Mr. Wagner—I find a good many bakers make a mistake when they first start a fire with coke. They should pull the damper very wide open and after the fire is burning close the damper just enough to let the gas out so that no heat can escape through the chimney. It costs us $70 a month for five ovens, winter and summer, all through; that is about $14 an oven; and that is just by keeping the heat in the oven instead of heating the air.

Mr. Boettler—There is a little thing we got onto; I do not know exactly how it came, but in constructing the ovens in our bakery we thought the steam appliances we had leaked, because we could not get the proper steam in the oven. I do not remember who it was, but some one suggested to put a pipe of live steam in the rear of the oven, with little holes in it, and reduce the pressure from the boiler. We put it in the rear end crossways in the oven, and from it let the steam into the oven, and it was wonderful what a difference it made. It gives a moist heat all through the oven, while if you have it from the side or near the front it comes right out.

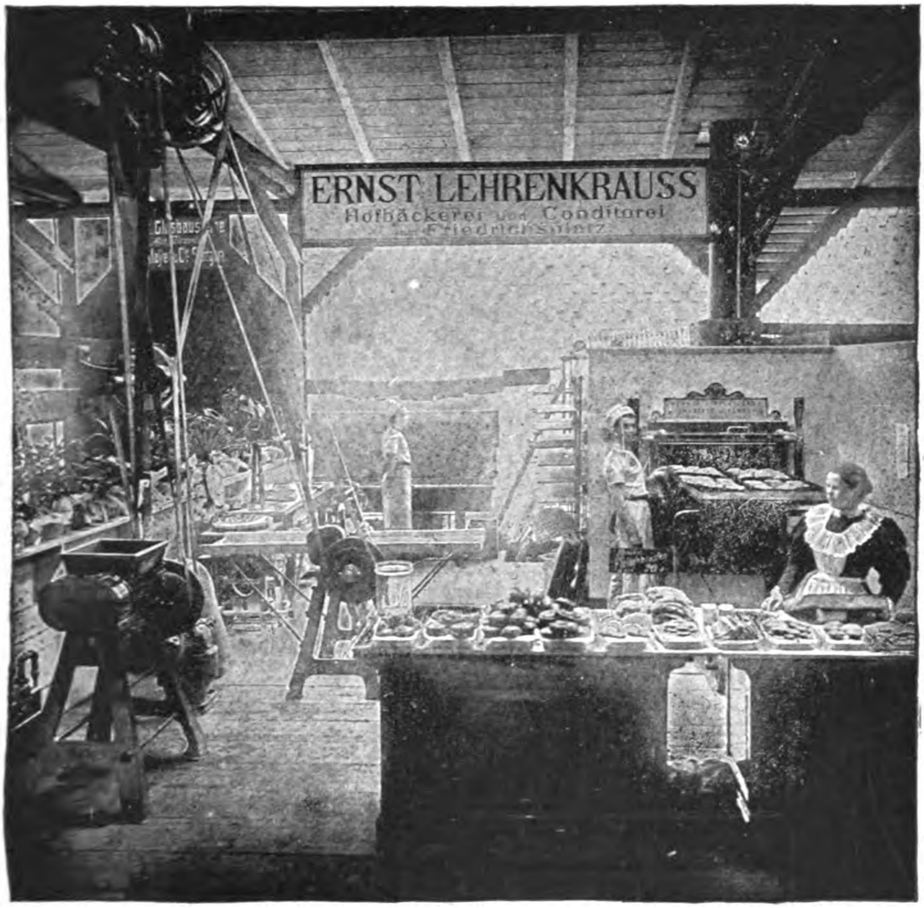

Fig. 303.—Exhibition Bakery (Stuttgart).

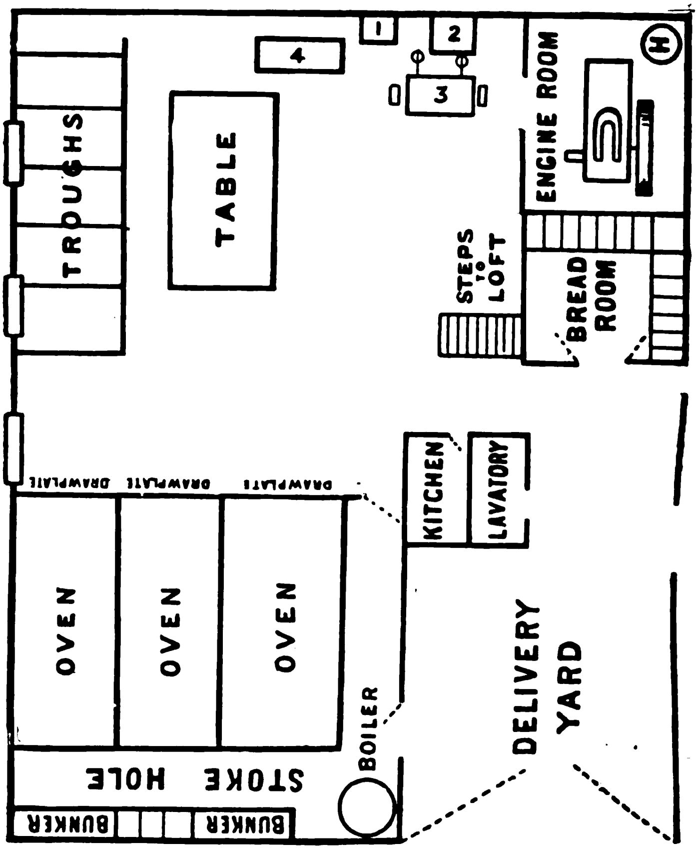

Fig. 304.—Plan of C. H. Paul's Bakery, London, England.

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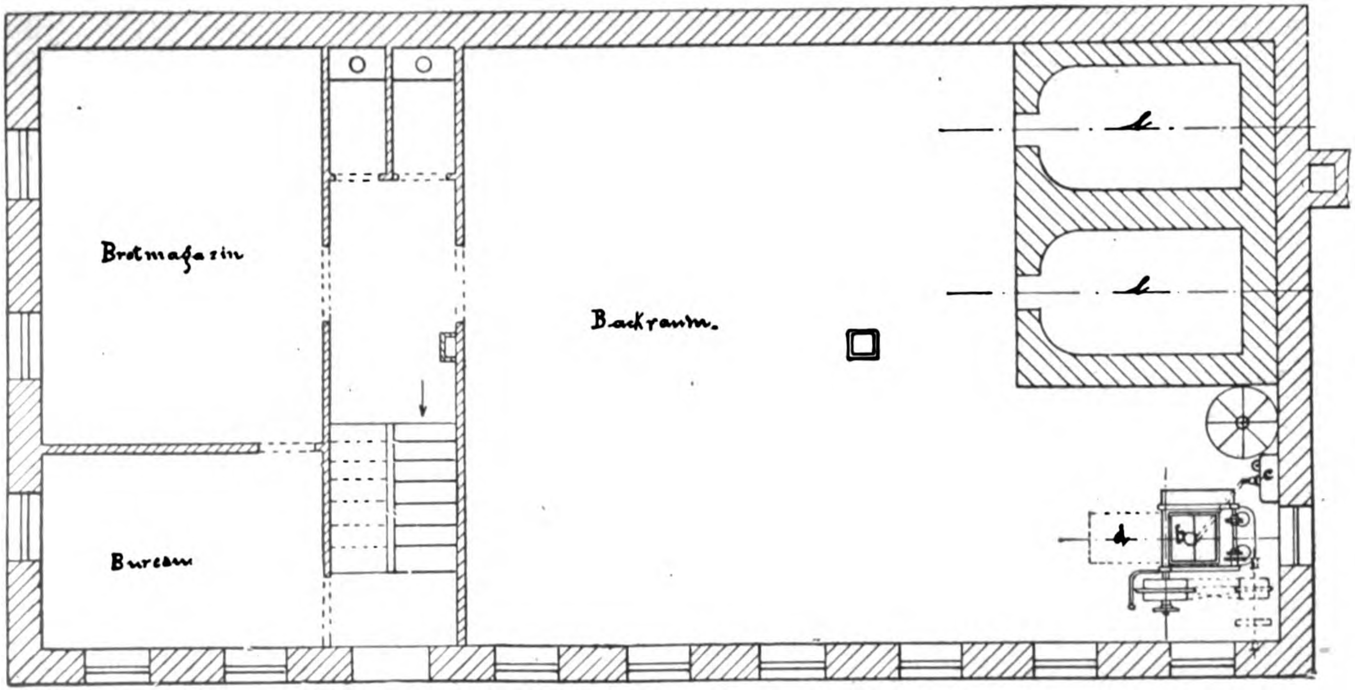


Fig. 305.—Modern Bakery Plan. (Germany.) I. Ground Floor. (a) Bakeshop. (b) Mixer. (c) Water Tank. (d) Trough. (e) Ovens.

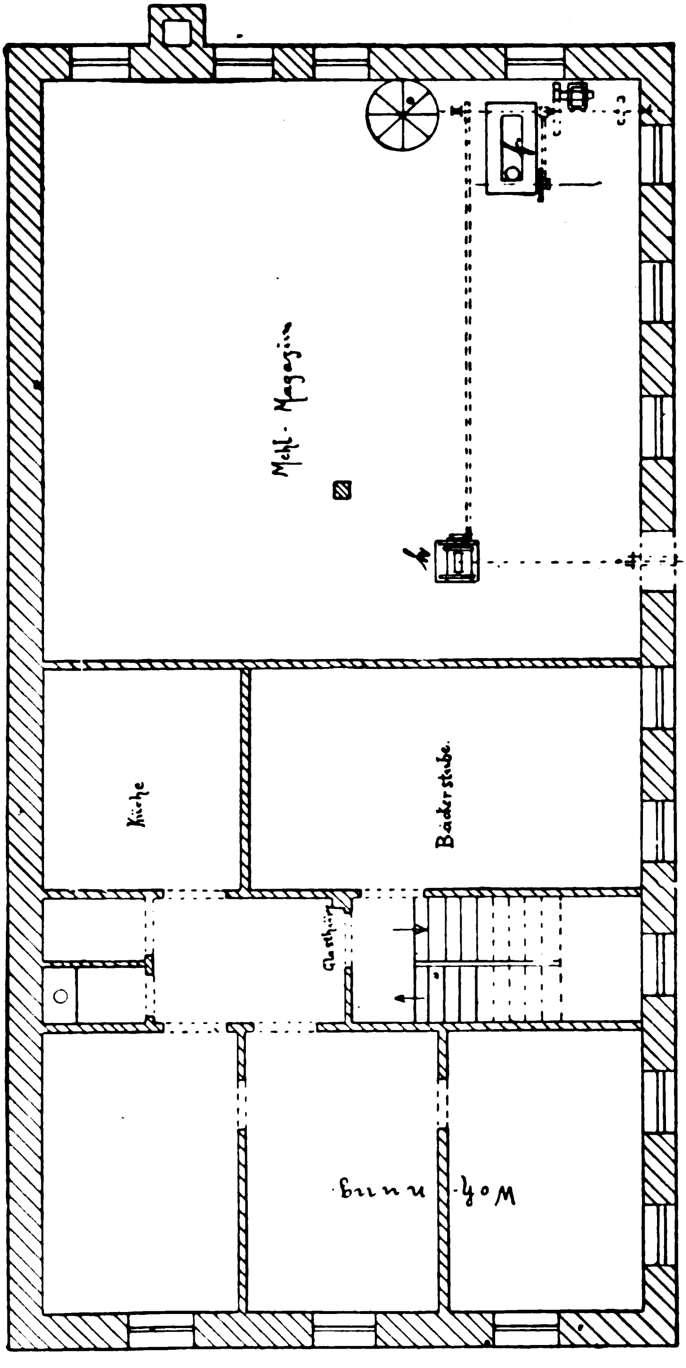
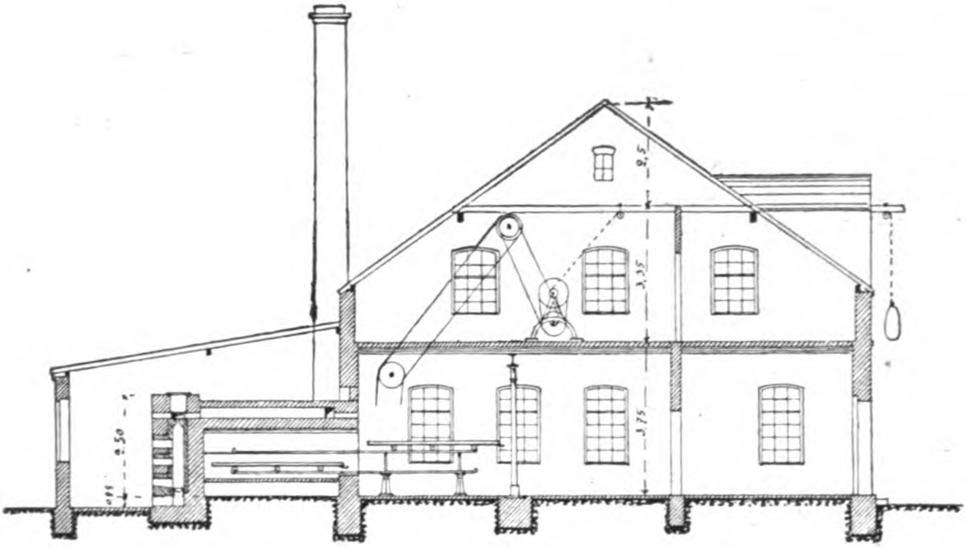


Fig. 306.—Modern Bakery Plan. (Germany) II. Second Floor. (f) Sifter and Blender. (g) Flour Storage. (h) Elevator.



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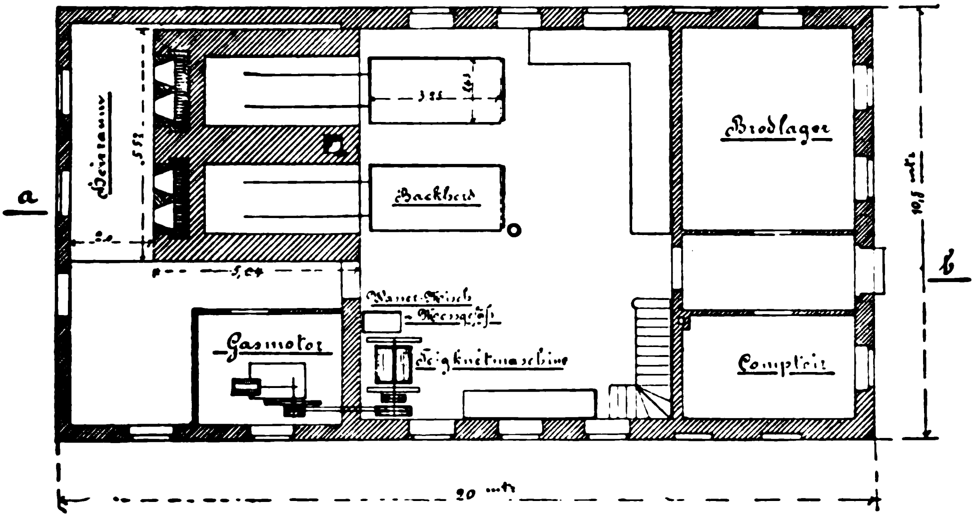

Fig. 307.—Plan of Modern Bakery (Germany).

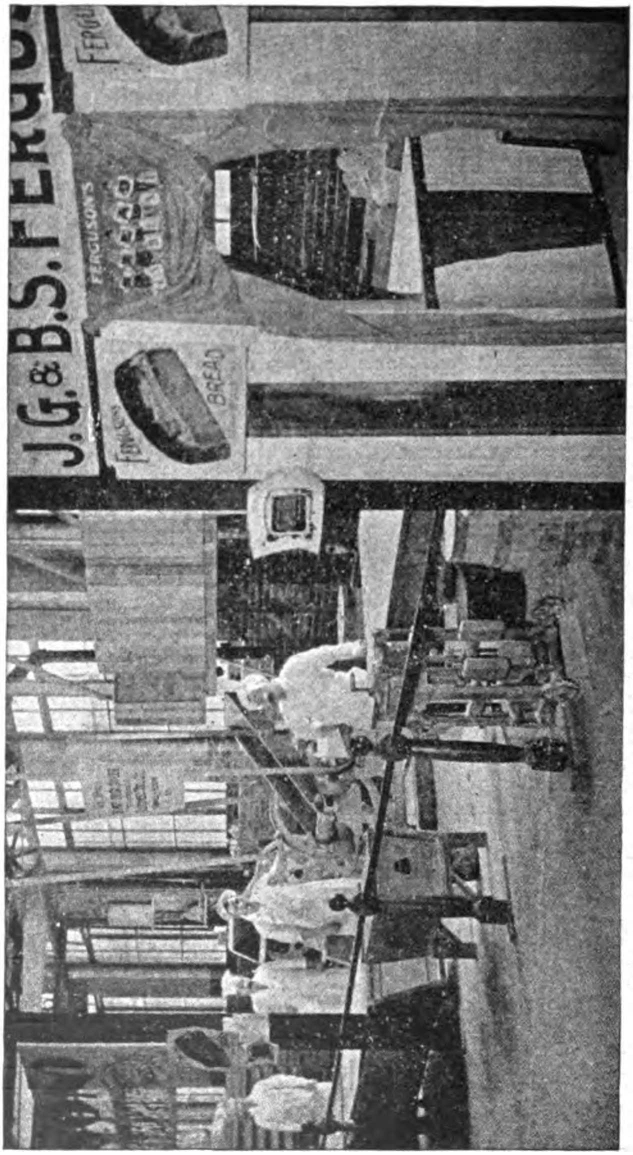

Fig. 30 .—Expósition Bakery, Boston Food Fair, 1897. (Conducted by J. G. & B. S. Ferguson.)

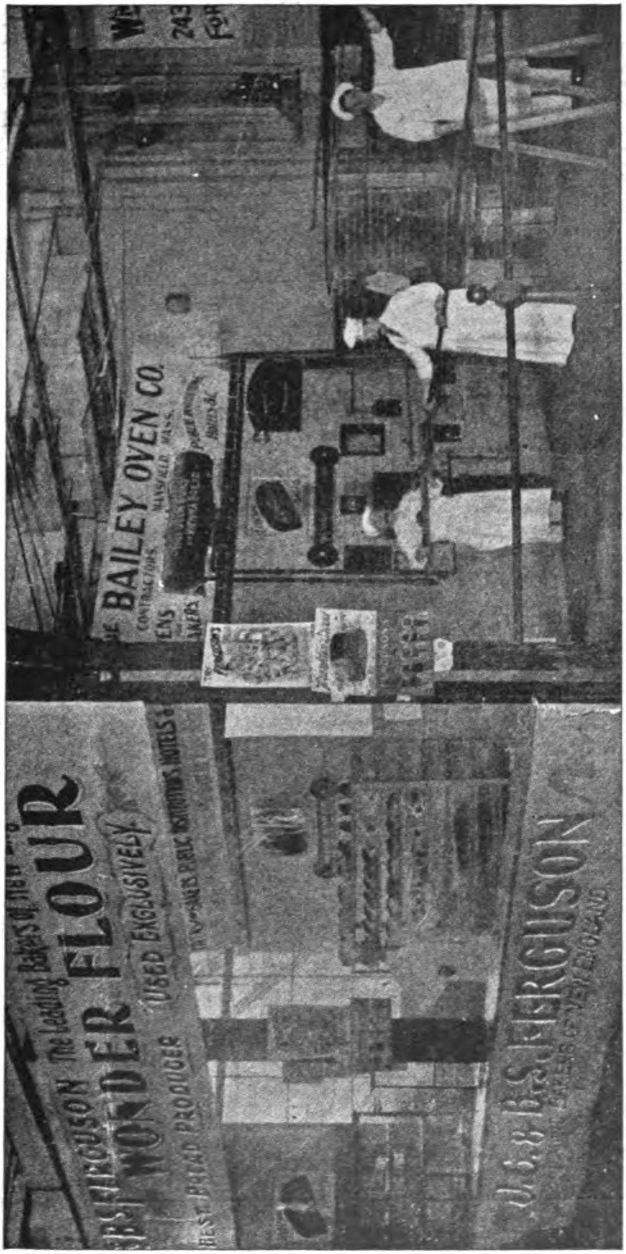

Fig. 309.—Exposition Bakery, Boston Food Fair.

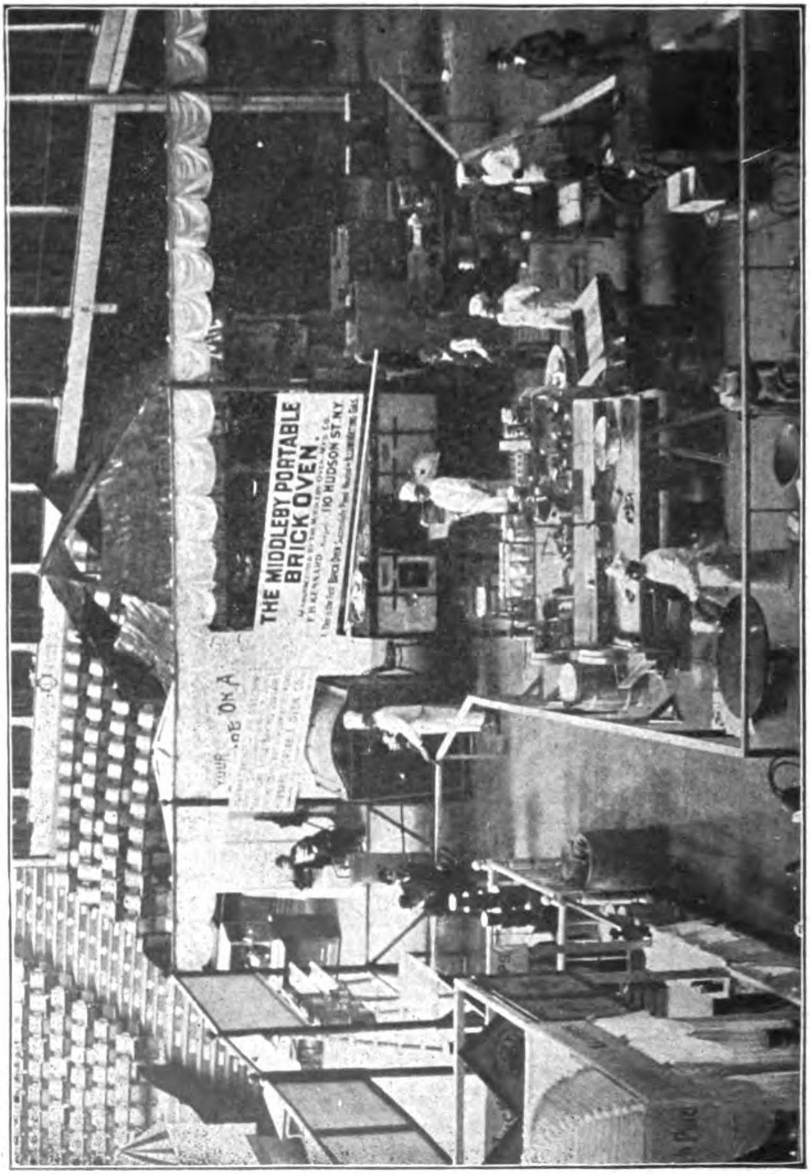

Fig. 310.—Model Bakery (Food Exposition, Madison Square Garden, N. Y., 1898). Arranged and Superintended by Emil Braun.

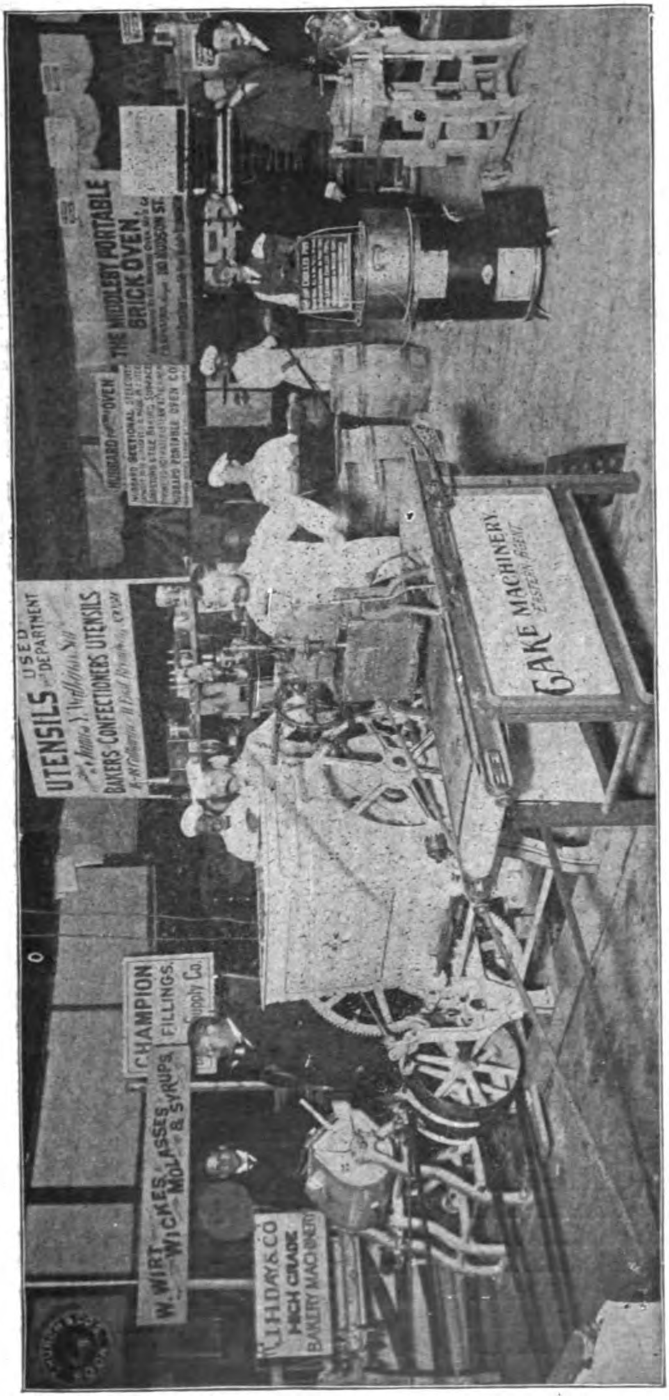

Fig. 311.—Bakeshop (Food Exposition at Madison Square Garden, 1898.)

INDEX

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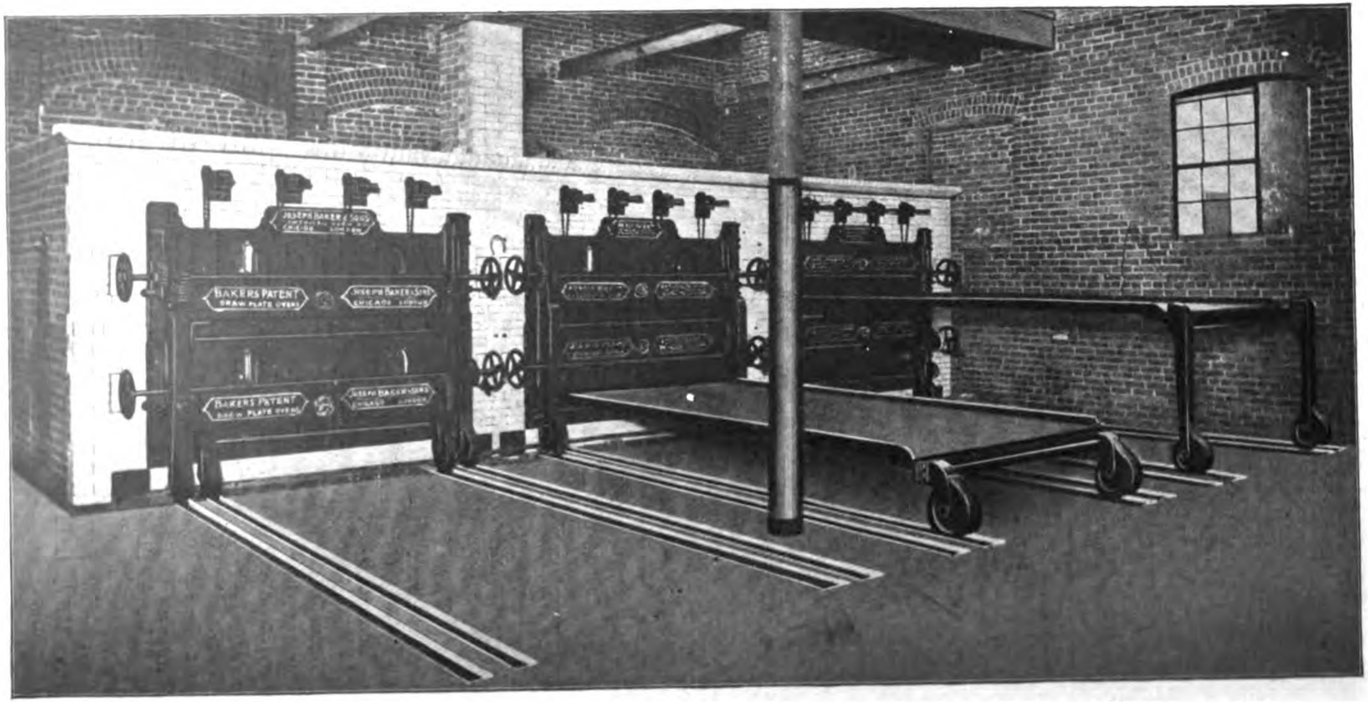
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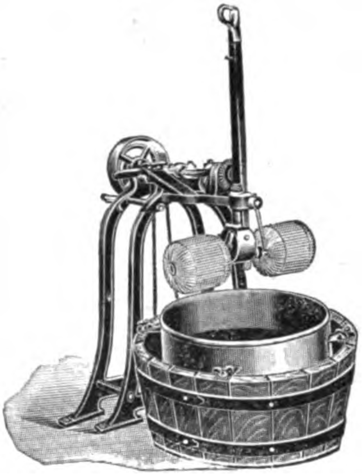


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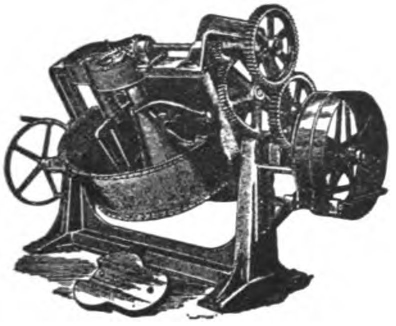

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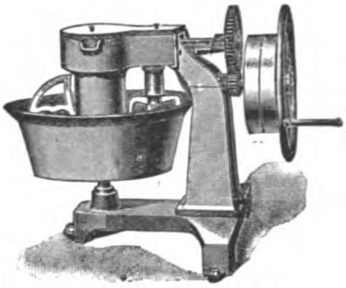

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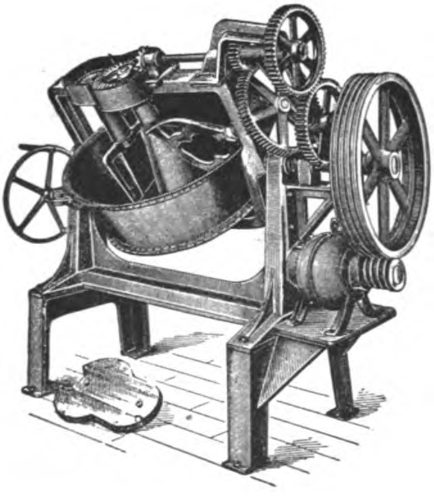

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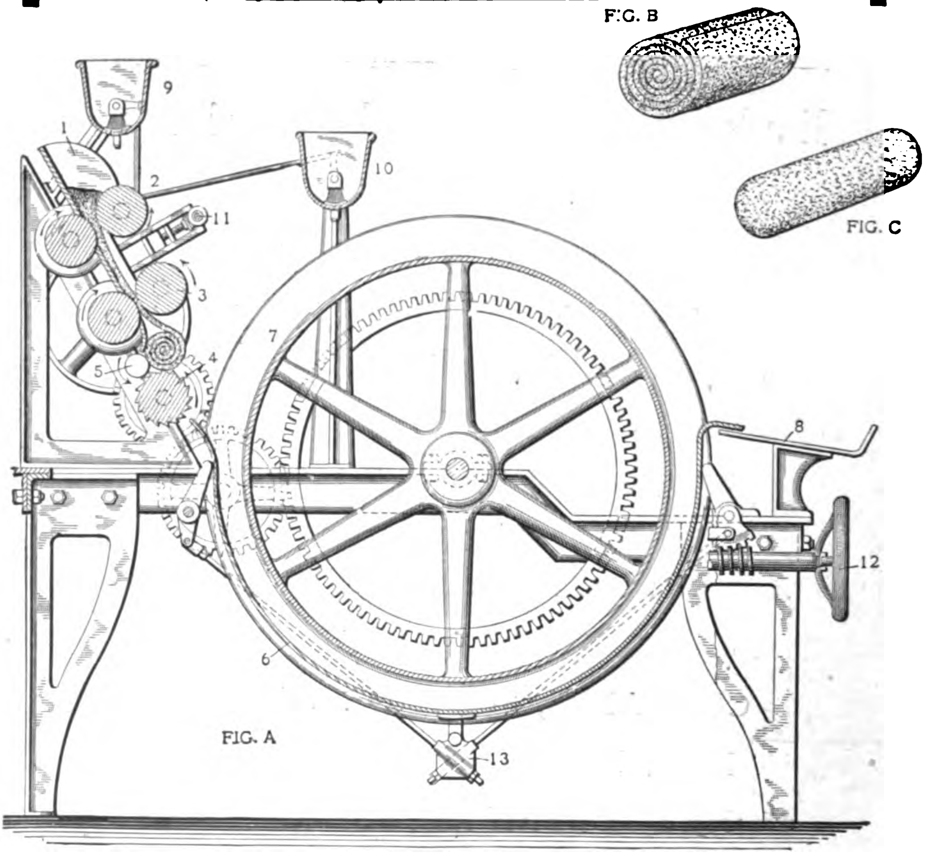

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FIG. B

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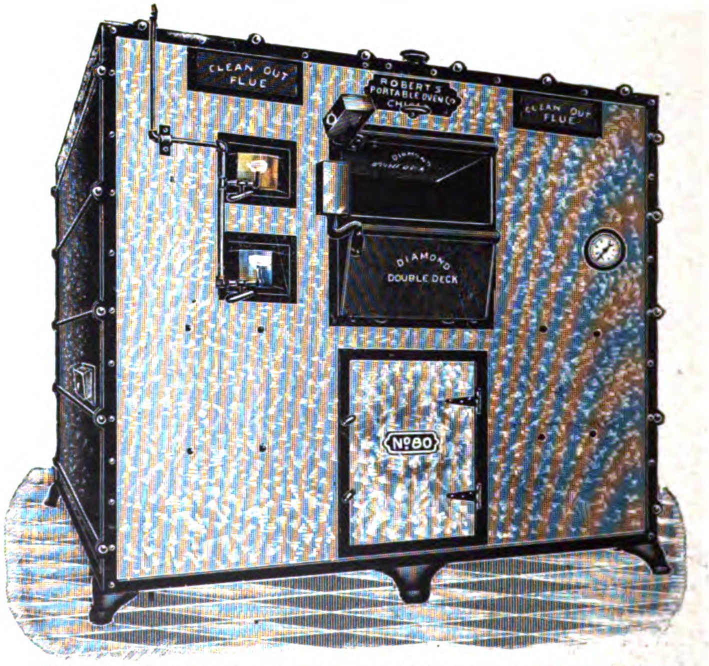

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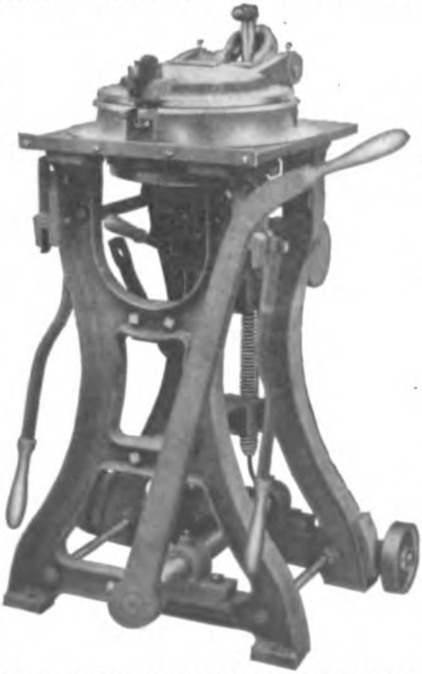

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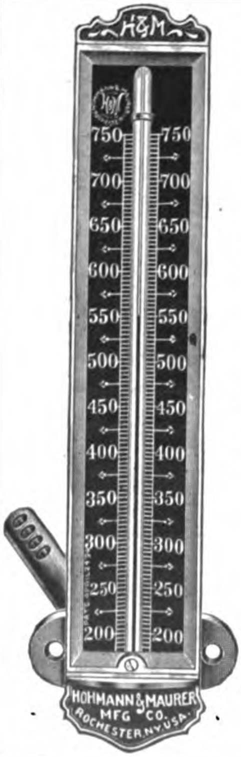
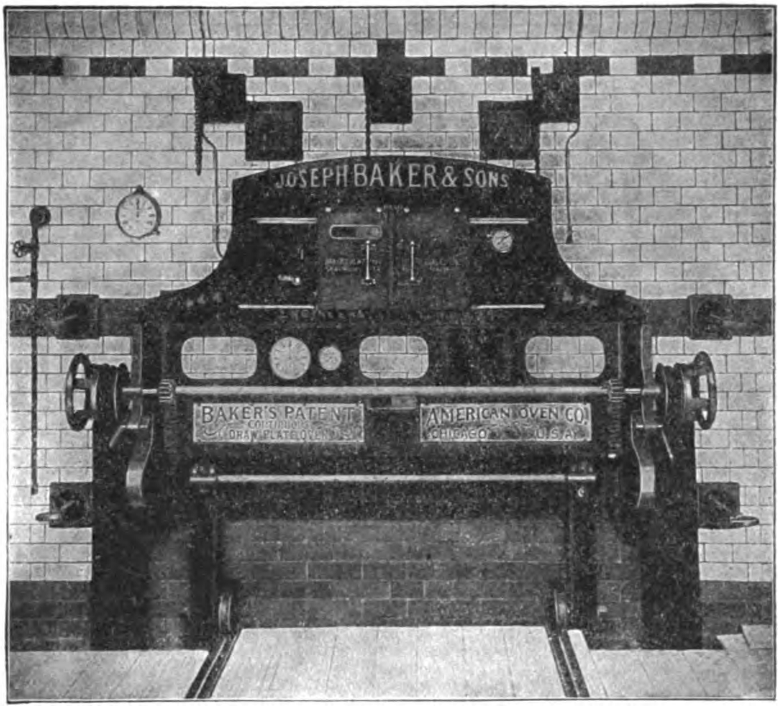
MANUFACTURER
13 So. Canal St., Chicago, Ill.


H&M
750
700
650
600
550
500
450
400
350
300
250
200
HOHMANN & MAURER
MFG CO.
ROCHESTER, N.Y. U.S.A.


JOSEPH BAKER & SONS
BAKER'S PATENT CONTINUOUS DRAW PLATE OVENS
AMERICAN OVEN CO. CHICAGO U.S.A.

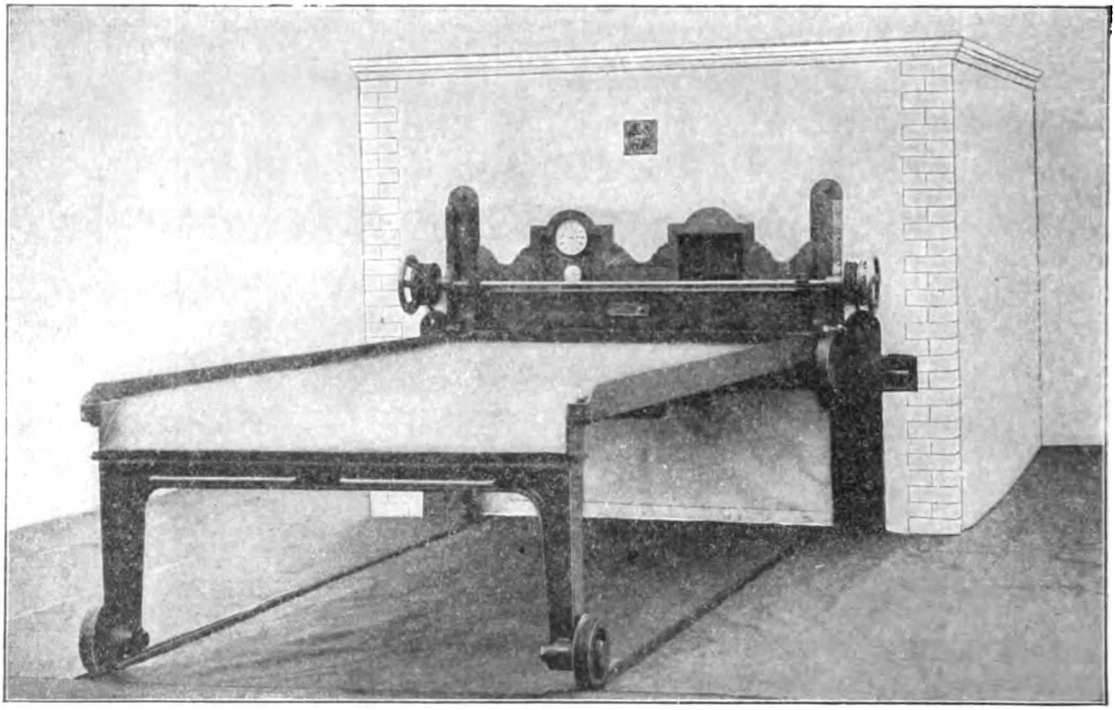
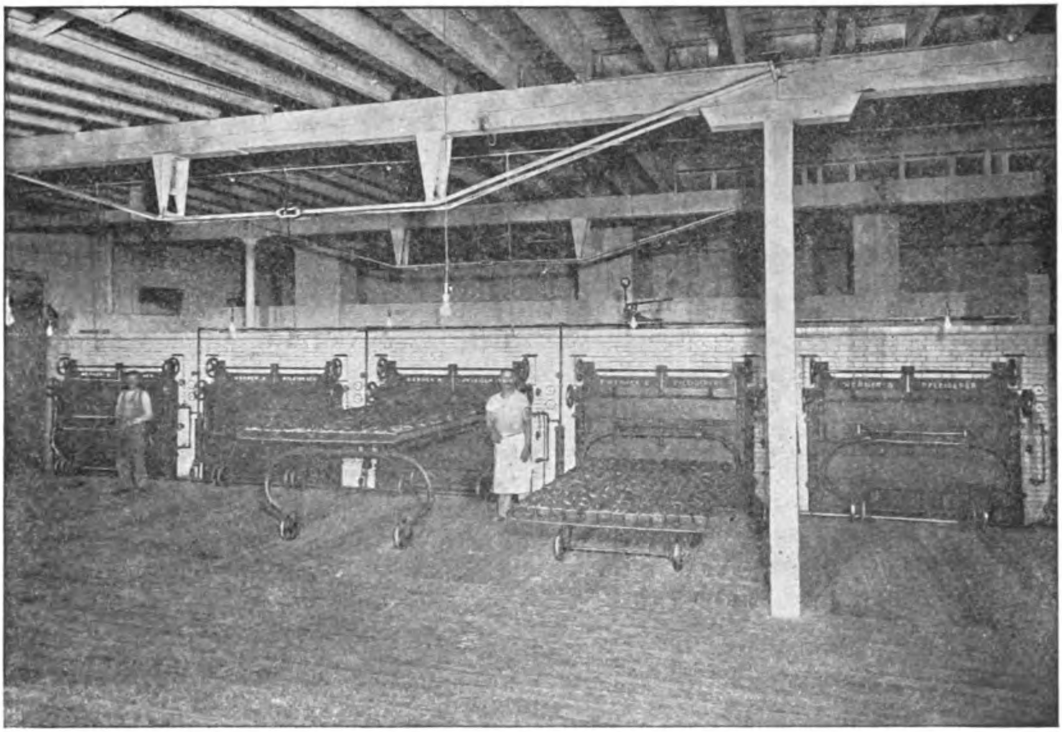
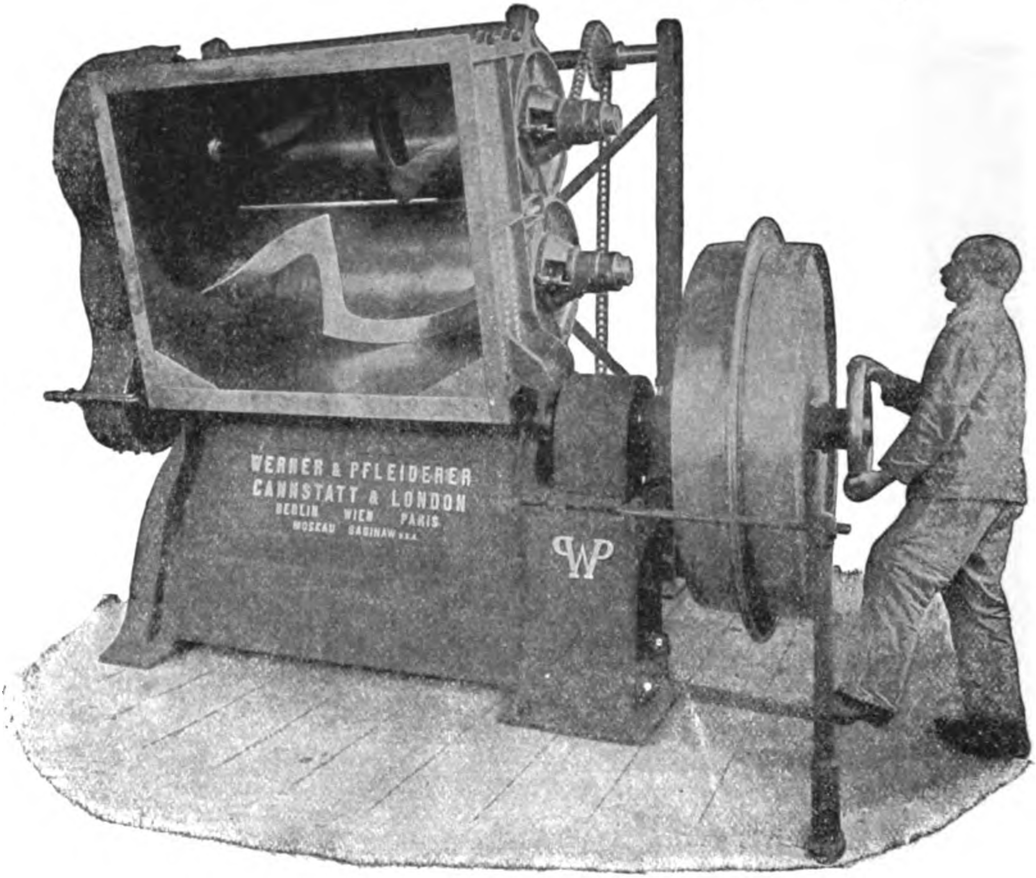
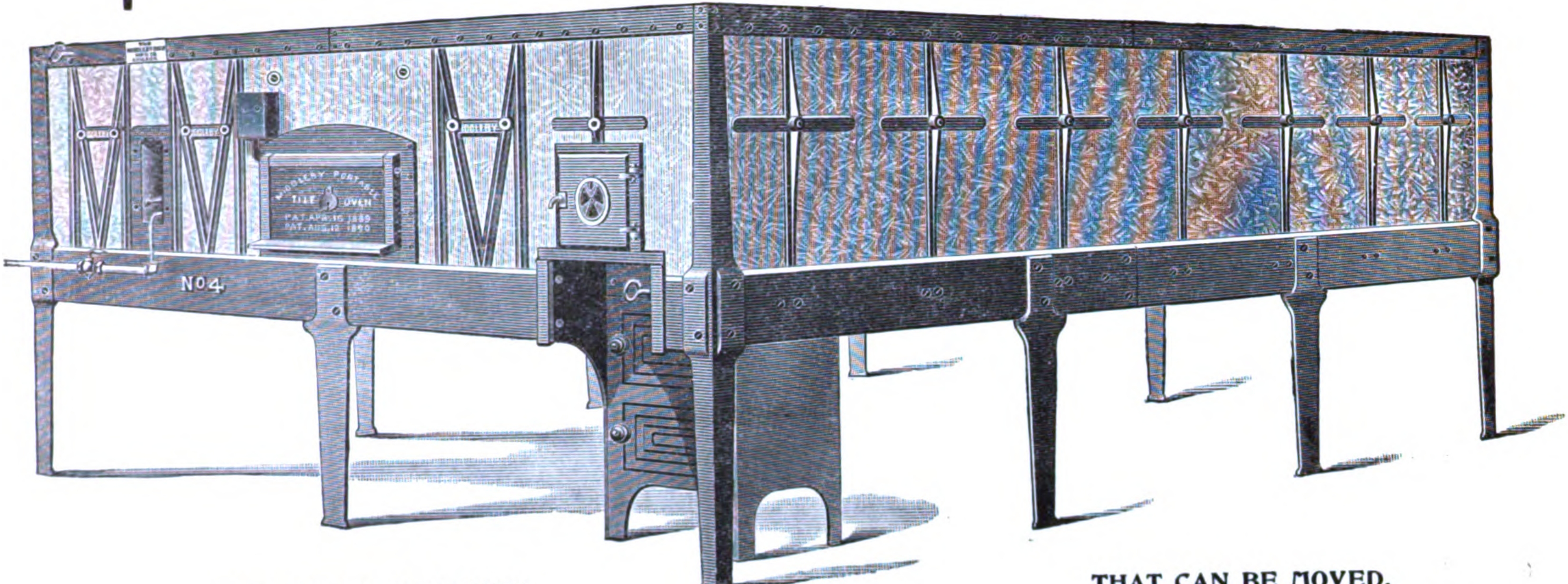


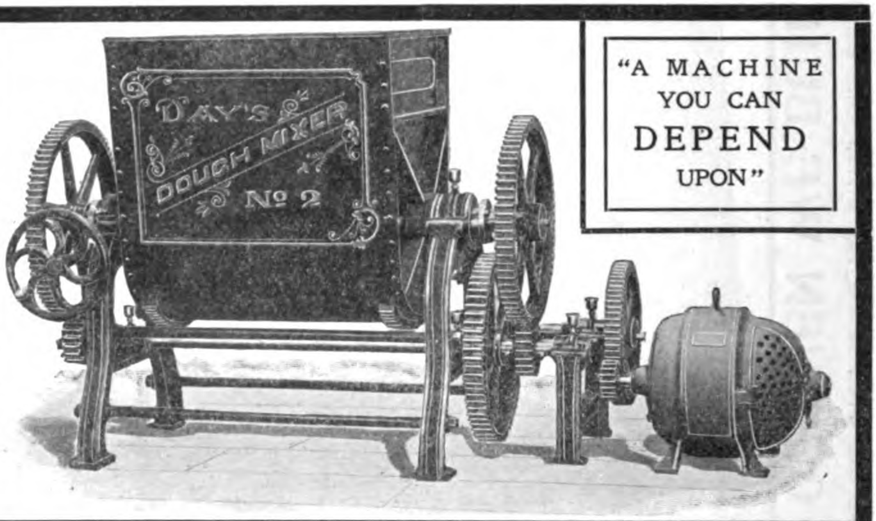
Illustration showing one SINGLE Deck Draw Plate Oven with Baking Plate drawn out



This Photograph shows 5 of the 10 Ovens of the Messrs. Freihofer's Vienna Baking Company, Philadelphia, Pa.

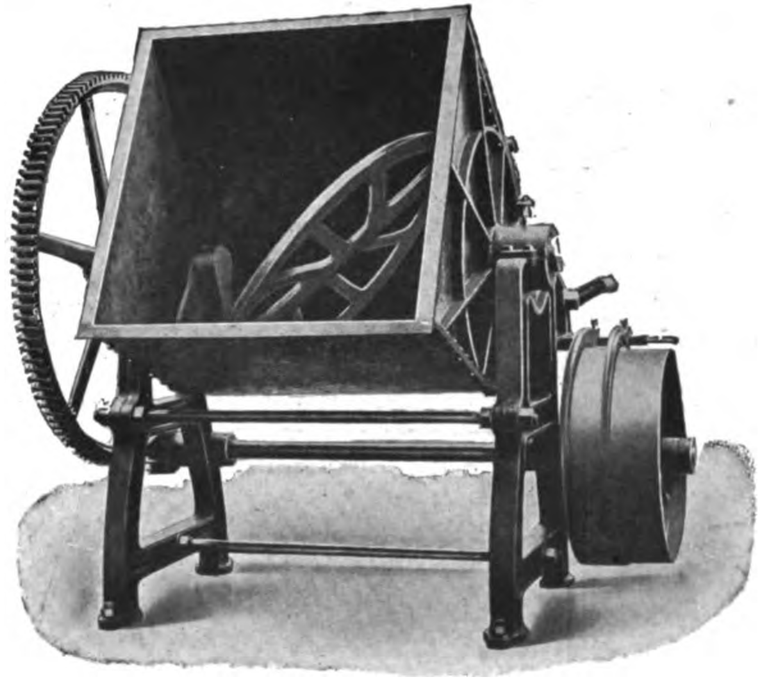

WERNER & PFLEIDERER
CANNSTATT & LONDON
BERLIN WIEN PARIS
MOSKAU SAGINAW U.S.A.
WP

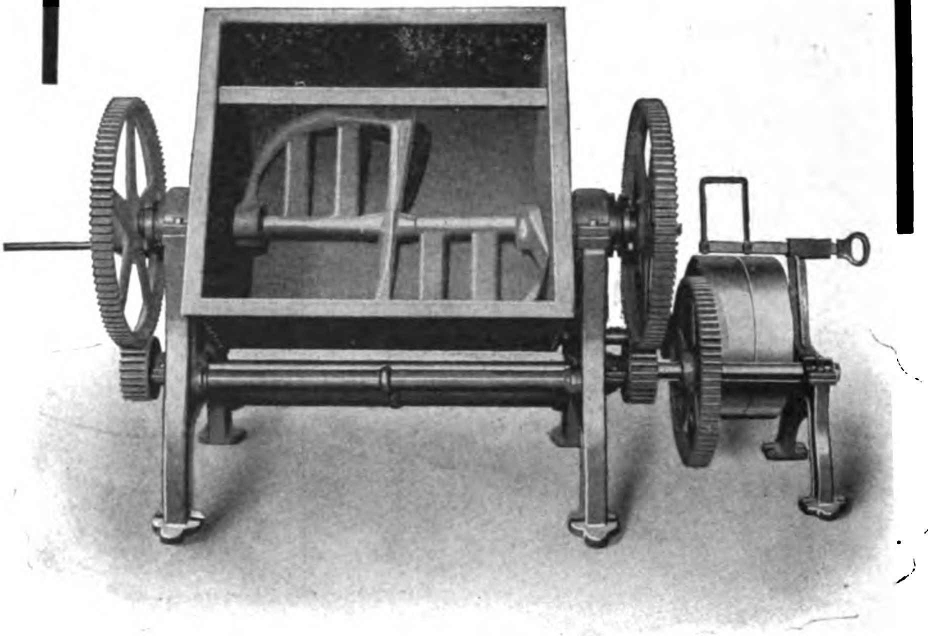

MIDDLEBY PORTABLE
TILE OVEN
PAT. APR. 16 1889
PAT. AUG. 12 1890
No 4

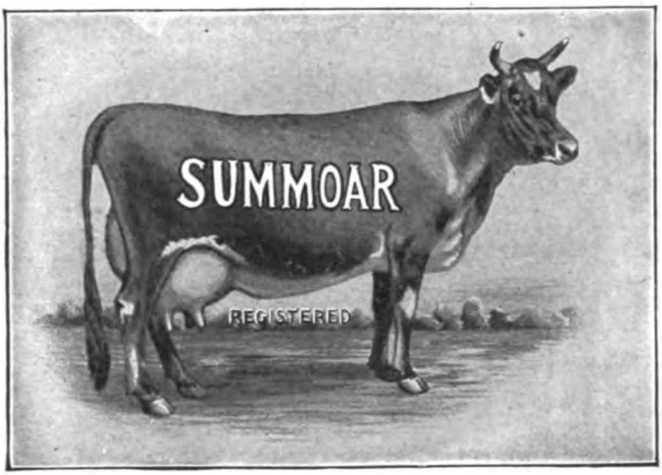

DAY'S
DOUGH MIXER
Nº 2


RISES BEST
WHEN MADE FROM
GOLD MEDAL FLOUR


J. MIDDLEBY, JR.
LEMON PIE FILLING
201 STATE STREET
BOSTON MASS






SUMMOAR
REGISTERED