Notes and Recipes for Hard Bread

Reverse Engineering hardtack for Home Baking

M. A. Schaffner, August 2019

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'Tis the dying wail of the starving:
"O, hardtack, hardtack, come again once more!"
You were old and very wormy, but we pass your failings o'er
O, hardtack, come again once more!

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Introduction -- What Is "Hard Bread" (and Who Cares)?

"Bread and soup are the great items of a soldier's diet" wrote Winfield Scott in his 1821 General Regulations, and this reflected centuries of a practice among European armies that would continue well into the 20th century. In general the food issued to soldiers consisted of bread, meat, and a smattering of vegetables, washed down with a variety of beverages, often spirituous. In camp or garrison the meat ration would be simmered with vegetables to make soup, which would be served as the main mid-day meal, eaten with bread.

According to Augustus Meyers (Ten Years In The Ranks, U.S. Army), in the pre-war army the meat itself might be taken from the soup and served with bread for breakfast the next day, and bread by itself with perhaps stewed dried apples or molasses would make up supper. The two constants for every meal were bread and black coffee served sweet and strong.

But bread presents several challenges to an army on the march. It takes time to make, as well as special facilities in the way of hastily constructed ovens or additional wagon transportation. It crowds a soldier's haversack and won't keep well for any length of time.

The response to these challenges had, from time immemorial and especially at sea, taken the form of some kind of dried biscuit. "Sea biscuit" or "ship's biscuit" sustained sailors on long voyages for centuries, and essentially the same article, called "hard bread" or more popularly "hardtack" (and occasionally "hard crackers") had by the time of the Civil War taken on the job with armies on the march.

What was "hardtack"? It was, as John Billings described [reference e)], "a plain flour and water biscuit." It came in more or less standardized wagon-transportable boxes from the commercial bakeries contracted to make it and was issued to soldiers to carry on the march. Two or three days' worth could fit in the soldier's haversack and, according to an 1863 army study of knapsack weight (Official Records, Series I, Volume 25, Part II, pp. 486-489), up to ten days in the knapsack, drastically cutting down on the weight of subsistence stores in the supply trains. The biscuits, or crackers, generally weighed about ten to the pound, each sized about three by three inches, around a half inch thick. Hartack was essentially a carbohydrate delivery system, each piece providing some 120-150 calories.

Who cares, and why this should matter to anyone now, entirely depends on who you are and how much you care about the minutia of the Civil War. The attached descriptions by Billings and Hinman were written by veterans decades after the war to satisfy the nostalgia of soldiers and their loved ones of the next generation or two who wanted to know about their father's and grandfather's experiences in the great rebellion. A similar interest continues to this day among Civil War "buffs" and even, I suppose, military logisticians looking for lessons in the past. As an example of the latter, the knapsack study mentioned above determined an ideal soldier's load to be about 45 pounds -- the same weight S. L. A. Marshall rediscovered after World War II, and one that might prove of some interest to those today concerned with musculoskeletal injuries among contemporary American soldiers.

Those most intimately concerned with hardtack of course would be living historians interpreting the war to visitors at historic sites and the diminishing number of "authentic" or "hard core" reenactors who

spend weekends trying, for various reasons sane and otherwise, to get as close as they can to the actual experience of soldiering in the 1860s. When "events" (reenactments, living histories, preservation marches, picket posts, etc.) call for attendees to show up with a "flat haversack" and live off 1860s army rations, it matters a great deal whether the rations can be eaten or not.

True confessions -- I've attended enough events advertised as "flat haversack" to know that, more often than not, the issued rations will consist of meat that must be cooked in the dark if there's time at all, and hard-tack that will prove impossible to eat, unless you have the python-like ability to dislocate your jaws and swallow a 3 inch square of half-inch thick lasagna whole.

No, that's not "authentic." Real hardtack was meant to be eaten and despite the difficulties often described in period references, official or personal, it was indeed eaten, sometimes even as a sandwich of two pieces around a slice of salt pork.

For quite personal reasons then, I became interested in recreating hardtack as it probably existed in actual field service during the Civil War. Over the course of several months I experimented at home in an attempt to "reverse engineer" the original product based on army specifications and soldiers' descriptions.

How well I succeeded I leave up to those trying to duplicate my efforts based on the recipes included in this paper. I should note however that every oven varies, as does the skill of every baker, and I caution anyone attempting to make or eat hardtack not to overtax their dental work. It took me a couple of dozen tries to get a satisfactory product without incurring expensive repairs but I still take nothing for granted. So be careful with your teeth -- it's far cheaper to throw out a batch than run to the dentist with a disaster in your dentition.

With all that in mind, I encourage the reader not to jump straight to the recipes but take some time with the following descriptions of what hardtack was meant to be, how it was received at the time, and the manufacturing environment in which it was made. After that, *bon appetit!*

Specifications and Contemporary Descriptions

Commissary Kilburn's wartime Notes specified that hardtack, *Should be made of best quality of superfine, or what is usually known as extra superfine flour, or better of extra and extra superfine, (half and half.) Hard bread should be white, crisp, light, and exhibit a flaky appearance when broken. If tough, solid and compact, it is evident the fault is either in the stock, manufacture, or baking; it should not present the appearance of dried paste. If tough and pasty, it is probably manufactured from grown wheat, or spring wheat of an inferior kind. In all cases, it should be thoroughly cooled and dried before packing. Kiln drying, where practicable, for long voyages, is particularly desirable; but if really and thoroughly dried in the oven, it will keep just as well, and its flavor is not destroyed. To make good hard bread, it is essential to employ steam.* [Reference a)]

Note the defects mentioned by Kilburn. Hardtack exhibiting any of these would not have met the army's standards, but the fact he mentions them at all suggests they nonetheless occurred.

The 1896 Subsistence Manual provides a few additional details on manufacture: *The selected flour is mixed with sufficient water to make a dry dough; the dough is then put into the kneading machine and*

thoroughly worked; it is then run through the "break," and then through the cutter, which cuts the sheets of dough into cakes ready for baking. The cakes are then transferred to the ovens, where they bake very quickly. The thickness of the cakes is very important; they should not be so thick as to prevent them from drying properly, nor so thin as not to have the proper strength to prevent them from crumbling in transportation. [Reference b)]

The fuller attached texts from both the above references give ups a few more tips. In addition to avoiding "dried paste" by using the right flour, Kilburn stresses that "the dough should be mixed as dry as possible" and the bread baked and dried thoroughly. He adds that it should keep a year but in practice in the midst of war only lasted about three months. The 1896 Handbook warns of mold, admits soldiers don't thrive on it over time, describes it as hard to chew, and suggests that it be steeped in water, coffee, or soup if possible. It adds "It should be issued only in cases where it can not be avoided." Hardly a recommendation, and not much encouragement to anyone trying to make it at home.

Other experts at the time largely agreed, adding their own comments. August Kautz, who (in addition to writing and selling instruction manuals for volunteers) commanded both cavalry and infantry divisions on active service, noted: *When old, it is unpalatable, and sometimes indigestible. It can be made more agreeable to the taste by toasting, either in a dry condition, or soaked in water for a few moments. Crumbs of hard bread may be made very palatable by soaking them in water, and then frying them in a pan with a little pork fat. Hard bread soon spoils when it gets wet, and must be used immediately, or it will be worthless.* [Reference c)]

Eben Horsford, a nutritional expert, inventor, and entrepreneur, stated: *If wet, it rapidly becomes unfit for food, and frequently becomes mouldy when kept in moist places. When made from some kinds of flour, in which the starch or gluten, or both, assume a gelatinous character, and show, when baked and kiln-dried, a glassy fracture, it is quite impenetrable to the fluids of the mouth and stomach and exceedingly difficult to masticate. Soldiers whose back teeth are defective have difficulty in reducing the hard bread to proper condition for digestion; and to the soldier benumbed by cold or fatigue, imperfect nutrition is not unfrequently followed by protracted and dangerous diarrhoea.* [Reference d)]

Soldiers who actually had to survive on hardtack had their own perspectives, and diagnoses.

John Billings noted that while some soldiers refused to draw it (perhaps surviving on what they'd bought from the sutler or saved from boxes sent from home), others could wolf down a day's ration of ten in one sitting. When hardtack were moldy they were thrown out and replacements drawn; when infested with weevils they were eaten anyway with no discernible change in taste; but when very hard they had to be soaked although the result might be no more successful than transforming them to the consistency of gutta percha. Still, hardtack could be enjoyed a variety of ways -- crumbled in soup, soaked and fried with salt pork, or, most often, broken up into coffee. On occasion he mentions they could even be eaten as a kind of sandwich, with a slice of salt pork between two pieces of hardtack.

Overall, though, despite his complaints and apparent unwillingness to keep eating hardtack in civil life, Billings writes, *But hardtack was not so bad an article of food, even when traversed by insects, as may be supposed.* [Reference e)]

Interestingly, contrary to hardtack's generally adamantine reputation, other sources mention the salt

pork and hardtack sandwich. In his account of the assault on the Crater Henry G. Thomas wrote, *"This morning our breakfast was much like that on other mornings when we could not make fires: two pieces of hard-tack with a slice of raw, fat salt pork between – not a dainty meal, but solid provender to fight on. By good fortune I had a bottle of cucumber pickles. These I distributed to the officers about me. They were gratefully accepted, for nothing cuts the fat of raw salt pork like a pickle."* ("The Colored Troops at Petersburg," The Century, Vol. 34, Issue 5, Sept. 1887)

Perhaps the only aspect of this meal more remarkable than the "sandwich" is the idea of following up on a dish of raw pork cut with pickle juice with a battle rather than a day in the latrine.

Wilbur Hinman, another veteran, used the title character of his novel Si Klegg and His "Pard" as his vehicle for conveying all aspects of the service of the common federal soldier during the war. In Si's experience, unlike Billings', no such sandwiches appear. Hardtack remains invariably hard, unless soaked to the consistency of leather. Si continues to eat it, but "only because he had to do it -- it was that or nothing." [Reference f)]

With all the criticisms and acknowledged problems of hardtack, one wonders why the army continued to use it. The availability of soft bread whenever the army settled into garrison, winter quarters, or fixed fronts like the works before Petersburg and Richmond in the last six months of the war provide one explanation. Hardtack was a stopgap for the marching ration and never issued exclusively for longer than necessary. And it was a tried and true expedient, with centuries of use behind it.

Nevertheless towards the end of the Civil War the army did commit to an alternative in the form of the "bread" portion of the "Horsford Marching Ration." Reference g) reports the result of this experiment, and an object lesson in what can happen when one strives for "excellence" in place of the "good enough."

Mechanical Bakeries, Steam, and Hardtack

Why does home made hardtack often end up like quarter-inch thick lasagna while the hardtack issued during the war was apparently, on occasion, enough like a cracker to allow soldiers to make salt pork sandwiches?

Commissary Kilburn's Notes provides our chief clues: The ingredients are flour and only enough water to make a dry dough. The only additive is possibly salt, to be mixed with the water first, but the clear inference is that salt is dispensable. Two other points seem essential – very fine flour, and "steam."

"Steam" in the context of 19th century bakeries means steam to run the machines of a "mechanical bakery," as well as steam to provide even heat through pipes in commercial ovens. It also, even today, means enough moisture to keep the crust soft for initial baking and then gradually caramelize, as with a baguette.

What sort of machinery was required to "employ steam" in the manufacture of crackers? The answer for this comes from Knight's New Mechanical Dictionary. Published in various editions between 1876 and 1880, the Dictionary provides a multi-volume resource on industrial processes of the era. See [https://books.google.com/books?id=tilRAAAAYAAJ&dq=crackers%20intitle%3Amechanical

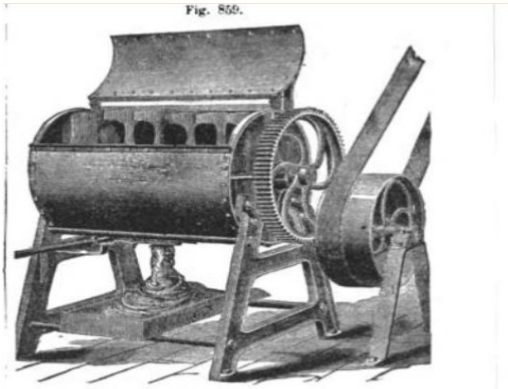
%20intitle%3Adictionary%20inauthor%3Aknight&pg=PA270#v=onepage&q=crackers%20intitle:mechanical%20intitle:dictionary%20inauthor:knight&f=false]

Machinery relevant to the making of hardtack includes the Dough Mixer, the Dough Break or Dough Kneader, and the Cracker Machine.

Dough Mixer

"A bakery machine for compounding the ingredients of bread, cake, crackers, as the case may be. The machine illustrated is for mixing soft cake dough, beating eggs, and preparing the dough for the machine which rolls the paste, and cuts and pans the cakes. See CRACKER MACHINE. The dough mixer is a horizontal cylinder with an axis provided with arms which cut, stir, and intimately incorporate the materials. It is discharged below when the gate is opened.".

Fig. 859.

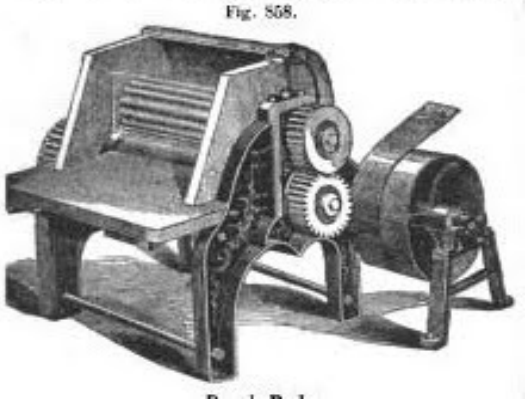


Ruger's Dough Mixer.

Dough Brake

Dough Brake. A bakery machine for kneading dough. It takes the material from the mixing machine, and makes it ready for the cracker machine. Dough brakes are *simple* or *return*. In the former case the dough is laid upon a table, passed between rollers, and discharged on to a lower shelf whence it is picked up and laid on the upper table for the repetition of the process. In the *return* dough brake the labor of lifting the dough is saved.

Fig. 858.



An earlier hand-operated version of a "biscuit brake"continues in use on the Eastern Shore of Maryland to make "beaten biscuits." These were originally prepared by repeatedly whacking unleavened biscuit dough with the flat of a hatchet or a hammer to aerate it. The more you beat it, the less dense the final

product. Given the regional popularity of these biscuits it is no surprise to see Billings mention that "most of the hard bread was made in Baltimore." [A description of the process can be seen here: https://www.youtube.com/watch?v=GJshSaX2WOA]

Dough Kneader

A dough kneader would be an improved, more mechanized version of the brake:

"Dough Kneader. A machine for incorporating dough : violent and repeated pressure is necessary. See DOUGH BRAKE. The name of the brake is from the pivoted lever upon which the weight of the man was formerly swung in the old method of preparing cracker dough. The Durand dough kneader is an annular trough driven by steam, and with stirring devices which revolve in the trough while the latter revolves."

Cracker Machine

The last stage of manufacturing crackers, or hard bread, requires feeding the finished dough into the cracker machine, which rolls out the dough, cuts the crackers, collects the scraps for re-use, and drops the crackers onto pans for baking.

The entry in Knight's describes the entire process this way (for hardtack one would omit the leavening and proving):

"The process of cracker-making by machinery is as follows: In the first place, the flour is run through a sifter, then put into troughs, where all the ingredients are mixed in by hand and left to stand until the chemical process is completed. The material is then run through the dough mixer, and from thence several times through the dough brake. It is piled up on a table, covered with cloth, and left to stand until it is properly proved, or gets light, then run again through the brake several times, being doubled over each time, and finally rolled out in a long strip the proper width for the machine. It is then placed on the hopper board of the machine, and goes through the rollers, where it is reduced to the proper thickness, falls on the apron or carrier, passes under a revolving brush, then to the cutter, which it changed to cut different shapes. After the crackers or biscuits are cut, the sheet of cut dough passes to the fingers and scrap apron, where the scrap is run over the upper apron, and the crackers pass below and drop into pans placed on the lower or third apron, and the pans are then placed in the oven and baked, which requires from 7 to 15 minutes, according to the kind of goods being baked. The largest set of machinery and oven will bake from 50 to 70 barrels of flour into crackers in ten hours."

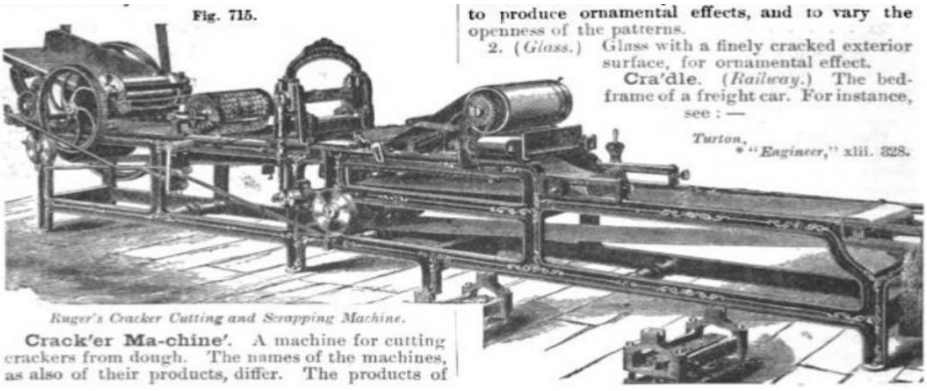


Fig. 715.

Ruger's Cracker Cutting and Scrapping Machine.

Crack'er Ma-chine'. A machine for cutting crackers from dough. The names of the machines, as also of their products, differ. The products of

to produce ornamental effects, and to vary the openness of the patterns.

2. (*Glass.*) Glass with a finely cracked exterior surface, for ornamental effect.

Cra'dle. (*Railway.*) The bed-frame of a freight car. For instance, see : —

Turton, "*Engineer*," xlii. 328.

Tools for Home Use

Obviously none of the above machines exist in the kitchens of casual bakers, much less the interested living historian or reenactor. Nonetheless, I set out to duplicate hardtack manufacture with what I had at hand, running about two dozen experiments over the course of several months, starting with half-batches of five crackers, then a full batch, or day's ration of ten.

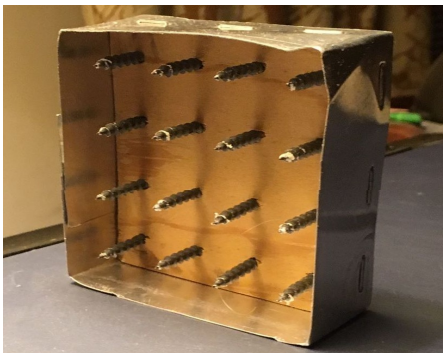
For the finely ground flour indicated by Kilburn I used pastry flour, then a mix of pastry and cake flour, then reverted back to pastry flour alone. After the first couple of recipes I dispensed with any salt.

For "steam" power I used a KitchenAid; for steam heat I relied on the more or less even temperatures of our cheap gas stove at home, negotiating rack heights to find the most consistent.

For steam in the oven itself I boiled a cup of water in the microwave, dumped it in a pan at the bottom of the stove just as I put in the crackers, and quickly shut the oven door. That step requires a bit of agility but seems to help considerably with producing flat crackers whose corners don't curl up.

"Unsteamed" hardtack on left; made with steam, on right

To ensure some uniformity in sizes I used two devices. First, a cracker cutter, sheet metal edges three by three inches, with sixteen screws to perforate the dough. These you can obtain from various sutlers or, in my fortunate case, a skillful friend (thank you, John Teller!). The other tool I use is a quarter-inch roller -- after pressing the mixed dough into shape and reducing it with a normal dough roller.



Teller's Hand-made Cracker Cutter

The Quarter-inch Roller

I should add that the purpose of the quarter-inch roller is not to get crackers a quarter-inch thick. Rather, experience showed that after rolling the dough out to that thickness and placing immediately after in the oven it expanded to about half an inch in thickness while retaining the same three by three inch external dimensions.

All of these ingredients and tools came in handy for producing a "hard bread" that proved over many tries to be increasingly serviceable, if never like the half-inch thick saltless crackers once produced by Bent's, which I now firmly believe used some form of leavening. Instead I got a hardtack that matched contemporary descriptions. When fresh, it could even make a cold bacon sandwich, but after a few weeks would gradually harden, though still remain amenable to carefully deployed bicuspids.

Durability and Edibility

A couple of final observations before moving on to the recipes.

First, just how long does hardtack last? Most "buffs" and reenactors have heard of soldiers who claimed to have received rations of hardtack from the previous war. Some Civil War soldiers claimed to have been served leftovers from the Mexican War; soldiers from the Indian Wars and the Spanish-American War swore theirs had survived the Civil War. But our official references -- Kilburn and the 1896 Manual -- are pretty clear in stating that the standard was never more than a year and in practice was limited to about three months.

For the enemies of hardtack, though few, are lethal. Moisture left from baking will turn hardtack blue in a matter of days, and even more thoroughly dried hardtack won't survive long if wetted by rain or exposed to exactly the kind of humidity one would expect campaigning through the summer months in the south. And what survives moisture will inevitably fall prey to the weevils described in loving detail by Billings. These appear so suddenly, numerously, and apparently from nowhere that they would seem to fully justify our ancestors belief in the spontaneous generation of animalculae.

I once opened an old cookie tin in which lay a batch of hardtack -- old school half-inch thick pasta noodle reenactor hardtack -- that must have been two or three years old at least. The form and external appearance of the crackers were essentially intact. But they sat deep in a sawdust like mix of crumbs and little insect corpses and when picked up were as light and fragile as if crafted of cotton candy. I don't plan to leave any around for long in the future.

One more consideration comes into play. For army logisticians hardtack presented a huge shipping burden, not just by weight but by bulk. A day's requirement for 100,000 men would come to 2,000 boxes weighing 60 tons forming a mass about ten feet high, twenty feet wide, and thirty feet long. A few days' worth would fill a warehouse, a few weeks' a camp. But at the end of the war the army had to find storage for a whole range of property -- more than a million long arms after sales to the troops, pistols, swords, artillery pieces, wagons, unissued clothing and camp and garrison equipage, etc., all of which had to be moved to the comparatively few depots and forts the army planned to keep in operation. Why on earth would they fill any of their precious storage space with a perishable item no one particularly wanted? If any hardtack survived any war it must have quickly been disposed of or simply left for mold and weevil to at last have their way unhindered by official concern.

A second question also perplexed me for some while. Why did soldiers like Billings and Thomas report sandwiches of hardtack that to others like Hinman might have seemed a culinary impossibility? After my own experiences making and eating hardtack it finally occurred to me that the answer to the question lay in Billings' comment that " the most of the hard bread was made in Baltimore..."

Baltimore! Billings served in the Army of the Potomac and Thomas wrote of service before Petersburg and Richmond in the Army of the James. Neither one of them ever likely served more than a few days from a rail head or wharf that itself lay within a day or two shipping distance of Charm City. And with the regional armies' requirements for hard bread amounting to many dozens of tons a day the bakeries of that city must have been hard pressed to keep up with demand, especially given spoilage en route and in the depots. Contrary to Kilburn's judgment, a baker needed no "cupidity" to send out fresh and not thoroughly dried hardtack -- they might simply have been trying to meet the colossal need. And fresh, especially under-cooked hard bread is easy to chew and at times was probably not uncommon.

Poor Hinman on the other hand served out west in the 65th Ohio, fighting in most of the battles and campaigns from Shiloh to Atlanta. He ended the war a Veteran Volunteer and served on with the Army of Observation in Texas. Any hardtack that reached him at all was likely hard stuff indeed.

Mystery solved, I think. That leaves only the remaining mystery of how to make this stuff at home.

Oh, but how does it taste? That of course is not the point, but I rather like it. It reminds me of a hard pretzel without salt. Maybe with a little mustard...

Recipes

Remember that the goal is to reproduce the "hard bread" issued during the Civil War by using the original specifications, primary source descriptions, and the lessons learned from reverse engineering the manufacturing process on the scale of the modern kitchen.

In addition to the basic tools mentioned above, experimentation taught me this about the process:

1) Despite my initial theory about beaten biscuits, it doesn't pay to knead or "beat" the dough any longer than about five minutes. You just overwork the machine without making any apparent difference to the end product.

2) From a modern biscuit recipe: don't try to get a cohesive dough in the KitchenAid from machine power alone. To do that you have to add more water than in these recipes and when you do so you'll end up with a product with the classic solid "glassy" center. Settle for well mixed dough that looks like rough gravel. That in turn can be pressed together gently, folded a couple of times, then rolled out with a few strokes.

3) From Putnam's Home Encyclopedia's 1858 description of the mechanized production of sea biscuit for the Royal Navy: dough can be mixed by machine in four minutes and kneaded in five or six. That's a pretty good guide though, as always, your mileage may differ.

4) Resting the dough "relaxes" it but I saw no difference between 30 minutes or three hours.

5) All bread made according to the following recipes will prove fairly chewable for a few days. The first recipe produces quite chewable hard bread that will quickly go bad. The second hasn't the same tractability, but will keep longer.

6) All bread that survives the first week or two will be difficult to break in the hand but should crumble under the bicuspids or molars -- depending on which of your teeth are most sound. If not, try toasting. As Billings explained somewhat incredulously, this restores it largely to its initial chewiness.

In any case, all the other expedients should work, even if you must employ the musket butt and skillet.

Chewable Weekend Hardtack

Recipe for 10-11 pieces of approximately 1/2 inch thick 3" square hard bread:

Ingredients: Four cups pastry flour, one cup cold, filtered water.

Mix the flour in the KitchenAid on its second lowest setting using the dough hook. Gradually add the water, using a rubber spatula to push the flour from the sides into the congealing dough. Reduce the speed to the lowest level after a couple of minutes. After about five minutes you should have your "rough gravel," though there may still be some unblended flour.

Knead: Stop the machine and knead this together by hand, incorporating all the remaining flour, then continue by machine using the spatula to push the pieces towards the middle. In six or seven minutes all the flour should be absorbed into pieces of dry but slightly glossy dough.

Let the dough *rest* for about half an hour. This wasn't mentioned in the sources but still seems like a good idea. "Relaxing" the dough is supposed to make it easier to roll out.

Pre-heat the oven to 475 degrees. (This is substantially hotter than my earlier experiments at 420-425).

Boil a cup of water. Place a pan in the bottom of the oven ready to receive the water.

Press and fold the rested dough twice; don't press it too hard or overwork it.

Use a heavy roller to *roll the dough out* to under an inch thick. Use a quarter-inch roller to give it its final thickness, making the rolled out dough of a dimension large enough to allow you to cut out at least six, ideally eight or nine pieces of hardtack before re-rolling the scraps. Remember than we don't want to overwork the dough. You might want to make a mark in the re-rolled pieces just so you can discover the difference it makes later.

Cut out the pieces of hard bread with your hardtack cutter. Flip the pieces over to pierce the other side. Place finished pieces on a cookie sheet.

Wet down the tops of the pieces. Get your fingers wet to dampen, but not soak, the upper sides.

Place the cookie sheet(s) with hardtack in the oven.

Quickly pour the boiling water into the pan on the bottom of the oven and shut the door.

Bake fifteen minutes.

Remove and let cool.

Total mixing and kneading time is just over ten minutes, resting 30, and baking 15, making about an hour depending on your deftness in rolling and cutting.

Now, here's why this is not the final recipe. The hard bread produced will be chewy and cooked through, but clearly could be baked longer and dried out more. Still, I would warrant this good for a weekend: authentic in ingredients, largely authentic in production, and easy enough on the teeth to be "sandwichable." After three or four days though, you may find it turning blue.

To keep it longer (say you have leftovers from your weekend) try baking it again at 350 degrees for 20 minutes

Authentic Hard Bread That Keeps

Follow the above process and recipe but with the following changes:

Bake for 20 minutes, then turn off the heat and prop the oven door open with a rolled up towel. Leave it for another 20. This will let any remaining steam out and help with drying.

Finally, shut the door and leave the hardtack to dry further. Take out when the oven cools.

My experience with this recipe is that it will keep at least six weeks on my pantry in a plastic container, without AC in a Virginia summer. But if you wish to keep hard tack for any length of time I encourage you to check it regularly and at the first sign of mold or weevils re-bake it as described above.

An "Authentic Cheat": "Army Bread"

Eben Horsford, whose diagnosis of hardtack problems was infinitely better than his suggested cure, made his fortune refining a process for baking powder and incorporating it in "self-rising" flour. As Billings mentions elsewhere in Hardtack and Coffee, this proved a popular sutler item in the later period of the war, used for both flapjacks and, as Kautz describes, a kind of loaf bread:

678. The simplest and best method is to make self-rising flour, by incorporating with the flour, in a dry state, bicarbonate of soda and acid phosphate of lime. These articles must be finely pulverized and minutely incorporated with the flour. A comparatively small quantity is required. A dollar's worth is sufficient for a barrel of flour. The self-rising flour, so well known and highly prized in the mining-districts of California, is made in this way. It requires only the addition of salt and sufficient water to make a dough, and can be baked in the ashes between the halves of an old canteen, or even rolled up in wet paper or covered with leaves. It is equally good for pancakes or fritters. These last may be made much more digestible by the addition of boiled rice. A. V. Kautz, Customs of Service for Non-

commissioned Officers and Soldiers, p. 258

A recipe for this kind of bread comes to us from Camp Cookery, Horace Kephart, 1910 [https://books.google.com/books?id=CFwEAAAAYAAJ&dq=intitle:camp intitle:cookery inauthor:kephart&pg=PA107#v=onepage&q&f=false]

Army Bread.—This is easier to make than biscuit dough, since there is no grease to rub in, but it takes longer to bake. It keeps fresh longer than yeast bread, does not dry up in a week, nor mould, and is more wholesome than biscuit. It is the only baking-powder bread I know of that is good to eat cold—in fact, it is best that way.

1 quart flour,

1 teaspoonful salt,

1 tablespoonful sugar,

2 heaped teaspoonfuls baking powder.

Mix the dry ingredients thoroughly. Then stir in enough cold water (about 1 1/2 pints) to make a thick batter that will pour out level. Mix rapidly with spoon until smooth, and pour at once into bake-pan. Bake about forty-five minutes, or until no dough adheres to a sliver. Above quantity makes a 1 1/2 pound loaf (say 9x5x3 inches).

I've baked mine for ten minutes at 450 degrees and thirty at 325.

I've yet to try it in an "oven" of two canteen halves, but it might be worth pointing out that Horsford himself recommended and later patented a mess kit "of two concave metallic pans, which are slightly irregular segments of hollow oblate spheroids" strapped to either side of a canteen with an attached spoon and fork.

In other words, he doubled down on the old and sometimes derided "campaigner" trick of strapping an old canteen half on a canteen for later use as a plate or frying pan. He almost certainly saw this while studying the army ration in the field and in fact it makes almost too much sense for some soldiers not to have done it before the old scientist thought it up.

***

So that's how you can make hardtack at home or, if that fails, a reasonably authentic alternative. And if you never try it, I hope at least that the discussion, and the attached references, will give you a greater appreciation of the culinary aspect of a soldier's life on campaign during the Civil War.

Reference a):

From C. L. Kilburn's "Notes on Preparing Stores for the United States Army," 1863
[https://books.google.com/books?id=c5syAQAAMAAJ&dq=intitle:notes inauthor:kilburn&pg=PA1#v=onepage&q&f=false]

HARD BREAD

Should be made of best quality of superfine, or what is usually known as extra superfine flour, or better of extra and extra superfine, (half and half.) Hard bread should be white, crisp, light, and exhibit a flaky appearance when broken. If tough, solid and compact, it is evident the fault is either in the stock, manufacture, or baking; it should not present the appearance of dried paste. If tough and pasty, it is probably manufactured from grown wheat, or spring wheat of an inferior kind. In all cases, it should be thoroughly cooled and dried before packing. Kiln drying, where practicable, for long voyages, is particularly desirable; but if really and thoroughly dried in the oven, it will keep just as well, and its flavor is not destroyed. To make good hard bread, it is essential to employ steam.

The dough should be mixed as dry as possible; this is in fact very essential, and too much stress cannot be placed on it. Good stock, dry mixed, and thoroughly baked, (not “dried” or “ scalded,”) will necessarily give good hard bread. If salt is to be used, it should be mixed with the water used to mix the dough. Both salt and water should be clean. Bread put up with the preceding requirements should keep a year; but, as a usual thing, our best bread as now made for army use, will keep but about three months. Good bread, packed closely and compactly, should not nett per barrel more than 70 or 80 pounds; should it be heavier than 80 it indicates too much moisture. The thickness of the biscuit is important; it should not be so thick as to prevent proper drying, or so thin as to crumble in transportation. The quality of stock used for hard bread can be partially told by rules mentioned in the article “Flour," as far as they apply. The cupidity of the contracting baker induces him to pack his bread as soon as it comes from the oven, and before the moisture has been completely expelled by drying. Bread of this kind hangs on breaking; it will also be soft to the pressure of the finger nail when broken, when it should be crisp and brittle.

The packages should be thoroughly seasoned, (of wood imparting no taste or odor to the bread,) and reasonably tight. The usual method now adopted is to pack in 50 pounds nett, basswood boxes, (sides, top and bottom 1/2 inch, ends 5/8 of an inch,) and of dimensions corresponding with the cutters used, and strapped at each end with light iron or wood. The bread should be packed on its edge compactly, so as not to shake.

Reference b):

Excerpted from Handbook of Subsistence Stores, U. S. Subsistence Department, 1896 [https://books.google.com/books?id=QkwMAQAAMAAJ&lpg=PA86&ots=EnMi_LStA1&dq="handbook of subsistence stores" "hard bread&pg=PA90#v=onepage&q="handbook of subsistence stores" "hard bread&f=false]

HARD BREAD.

Hard bread, sometimes called pilot bread, is a variety of water cracker. It is generally made of flour and water only. Salt is sometimes added, at the rate of 1 1/4 pounds to each 100 pounds of flour. While salt improves the taste of hard bread it increases its liability to absorb water and impairs its keeping qualities.

The flour should contain little or no bran, as, on account of the hygroscopic qualities of bran, hard bread containing it is very liable to rapid deterioration from mold. When flour containing bran must be used, no salt should then, under any circumstances, be used.

No artificial agency being used to lighten hard bread, the flour must possess of itself sufficient strength to give the bread the necessary porosity or "spring."

To MAKE HARD BREAD.—The selected flour is mixed with sufficient water to make a dry dough; the dough is then put into the kneading machine and thoroughly worked; it is then run through the "break," and then through the cutter, which cuts the sheets of dough into cakes ready for baking. The cakes are then transferred to the ovens, where they bake very quickly. The thickness of the cakes is very important; they should not be so thick as to prevent them from drying properly, nor so thin as not to have the proper strength to prevent them from crumbling in transportation.

The quantity of water required for use in making the dough varies with the nature of the different flours. If the hard bread is intended for immediate use, from 1 to 2 pounds of salt may be added to each barrel of flour, but the quantity should be diminished as the length of time for keeping the hard bread on hand increases.

Good hard bread is of light-yellow color. When struck, it should give a clear, almost ringing sound, and it should readily and thoroughly soften in the mouth.

The quality of hard bread varies with the grades of flour used. The baker should, therefore, make a careful selection of the flour to be used.

Hard bread should not contain more than 12 per cent of water. The nutritive value of 1 pound of hard bread is equal to 1 1/3 pounds of soft bread made from the same flour.

Hard bread is made in square or round cakes, and is put up in packages to suit purchasers. If either the hard bread or the boxes are not thoroughly dried, the hard bread is liable to mold; both should, therefore, be kiln-dried. If liable to be taken on a sea voyage, or to be kept for a long time, it should be put up in 48-pound hermetically sealed tins, packed in crates, two tins to a crate.

When packed in the ordinary way, *i. e.,* in wooden boxes, it should be stored in a dry place, and issued before it is one year old.

If weevils make their appearance in hard bread, they can be exterminated, without much injury to it, by putting it into a bake oven and subjecting it to a temperature of 325° F. for thirty minutes; or by spreading it out on sheets or tarpaulins and exposing it to the sun for three or four hours.

Hard bread possesses many advantages, as being easily transportable, and being, bulk for bulk, more nutritious than soft bread, is the most practicable food now obtainable. On the other hand, its use is not free from grave objections. It is deficient in fat, after a time it seems difficult of digestion, and certain it is that men do not thrive well upon it for long periods. It should be issued only in cases where it can not be avoided.

It is difficult to masticate the tough morsels, and the only remedy is to steep them in water, coffee, or soup, which is not always practicable. If eaten in the dry state and insufficiently triturated, the hard, angular fragments act as a mechanical irritant and cause diarrhea.

The French have for the past few years endeavored to replace hard bread by a *"pain de guerre."* At first an attempt was made to desiccate the ammunition bread, but the plan had to be abandoned. It was found, after exhaustive experiments in the military bake-houses, that in order to reduce the water in a loaf weighing 750 grammes (26 ounces) to 12 or 14 per cent, a period of between 30 and 40 days was required; and moveover, that when the residuuim was remoistened for use, its edible qualities were far from satisfactory. Private enterprise was enlisted, the result being a long series of failures, all more or less complete. At last, in December, 1892, the Administration resolved on making an extended trial of the compressed bread of Perrier, and a large quantity was issued to the Army. After a two-years' trial, in both France and Algeria, the reports called for were fairly favorable, but before coming to a definite conclusion in the matter the Minister of War issued a circular, dated April 10, 1894, calling on all persons engaged in the baking trade to enter into competition for the production of a war bread, that is to say, " a substance occupying very small space, but including, nevertheless, the whole of the qualities, nutritive and digestive, of ordinary bread." According to the terms of the circular, the required product was to keep good for a year, without manifesting the slightest sign of deterioration. Its dimensions should admit of its being packed in the soldier's valise, and its substance should be sufficiently resistant to withstand the shocks and compression of ordinary transportation. The materials used were to consist exclusively of soft wheaten flour, leaven, water, and salt. In shape each piece was to be square or rectangular, with a due proportion of crust; the crumb was to be white and porous; and both the taste and smell agreeable to the senses. Finally, the dryness must be perfect, there must be no crumbling, and every loaf must swell out completely to the standard size within ten minutes' immersion in water at 50° C. (122° F.). The competition seems to have failed to produce a specimen superior to Perrier's compressed bread, and the latter has been now definitely adopted in the French service. The issue of biscuit to the troops ceased on the 1st of January, 1895.

For the Subsistence Department of the United States kilndried hard bread in square cakes, put up in thoroughly seasoned wooden boxes holding 50 pounds net, has been usually purchased. Experience in the German Army has shown that the large-sized pieces of hard bread were unsatisfactory to the troops.

The military attache at Berlin has reported as follows:

"Relative to hard bread, Mr. Englehardt, Chief of Division of the Commissary Department, informed me that during the war with France the soldiers threw away many hundreds of boxes of it because, in his opinion, the biscuits were too large and they had difficulty in biting them."

Recent experiments have been made among the troops in the various military departments of the United States with the result that hard bread made from the best quality of soft winter-wheat flour in cakes 1 1/2 inches square, and packed in cartons of 1 pound each, has been found to give satisfaction.

The board that was convened to consider an emergency ration for the United States Army has reported, in its conclusions, that—

"It examined certain samples of hard bread submitted to it, and concluded that the best sample was that which became soonest permeated when soaked in hot water. The sample which gave the best response to this test was one which was slightly aerated, its substance being evenly pervaded with minute or pin-point vacuolations. Its density was somewhat lessened by this porosity, so that, pound for pound, it would occupy somewhat more space than ordinary hard bread; but the board considered that this could be offset in great part by exposing the aerated hard bread to a higher degree of heat than is used in the baking of the ordinary bread; by this treatment weight would be lessened by getting rid of a small percentage of water, the percentage of the nutritive elements being thereby increased, while some of the starch would be converted into dextrine. The ready permeability of this biscuit would reduce to a minimum the number of cases of diarrhea that in field service so frequently originate in imperfectly softened and masticated hard bread. It was the unanimous opinion of the board that bread thus permeable and browned on the surface would be improved in its keeping and nutritious qualities, and be more acceptable to the men than the present issue."

Reference c):

Excerpt from Customs of Service for Noncommissioned Officers and Soldiers, August Kautz, 1865, p. 257 https://archive.org/details/customsservicef00kautgoog/page/n8

676. *Hard bread,* although not so bulky as soft bread, is still inconvenient when required to be transported in quantity. Three days' rations fill a soldier's haversack. When old, it is unpalatable, and sometimes indigestible. It can be made more agreeable to the taste by toasting, either in a dry condition, or soaked in water for a few moments. Crumbs of hard bread may be made very palatable by soaking them in water, and then frying them in a pan with a little pork fat. Hard bread soon spoils when it gets wet, and must be used immediately, or it will be worthless.

Reference d):

Excerpt from The Army Ration, Eben Horsford, 1864
https://books.google.com/books?id=il1RBHv577YC&dq=intitle%3Aarmy%20intitle%3Aration%20inauthor%3Ahorsford&pg=PA6#v=onepage&q&f=false

Hard bread, or "hardtack," has the advantage, when kept dry, of not being liable to decay, and may therefore be trusted to stay hunger where more perishable food would fail. But it is exceedingly bulky. A barrel that will contain 196 pounds of flour will hold but 75 pounds of hard bread. The daily ration is a formidable pile of more than 60 cubic inches. If wet, it rapidly becomes unfit for food, and frequently becomes mouldy when kept in moist places. When made from some kinds of flour, in which the starch or gluten, or both, assume a gelatinous character, and show, when baked and kiln-dried, a glassy fracture, it is quite impenetrable to the fluids of the mouth and stomach and exceedingly difficult to masticate. Soldiers whose back teeth are defective have difficulty in reducing the hard bread to proper condition for digestion; and to the soldier benumbed by cold or fatigue, imperfect nutrition is not unfrequently followed by protracted and dangerous diarrhoea.

Reference e):

Description from Hardtack and Coffee, John D. Billings, 1887
https://archive.org/details/hardtackcoffee00bill/page/n6

pp. 113-118... What was hard-tack? It was a plain flour-and-water biscuit. Two which I have in my possession as mementos measure three and one-eighth by two and seven-eighths inches, and are nearly half an inch thick. Although these biscuits were furnished to organizations by weight, they were dealt out to the men by number, nine constituting a ration in some regiments, and ten in others ; but there were usually enough for those who wanted more, as some men would not draw them. While hardtack was nutritious, yet a hungry man could eat his ten in a short time and still be hungry. When they were poor and fit objects for the soldiers' wrath, it was due to one of three conditions : First, they may have been so hard that they could not be bitten ; it then required a very strong blow of the fist to break them. The cause of this hardness it would be difficult for one not an expert to determine.

This variety certainly well deserved their name. They could not be soaked soft, but after a time took on the elasticity of gutta-percha.

The second condition was when they were mouldy or wet, as sometimes happened, and should not have been given to the soldiers. I think this condition was often due to their having been boxed up too soon after baking. It certainly was frequently due to exposure to the weather. It was no uncommon sight to see thousands of boxes of hard bread piled up at some railway station or other place used as a base of supplies, where they were only imperfectly sheltered from the weather, and too often not sheltered at all. The failure of inspectors to do their full duty was one reason that so many of this sort reached the rank and' file of the service.

The third condition was when from storage they had become infested with maggots and weevils. These weevils were, in my experience, more abundant than the maggots. They were a little, slim, brown bug an eighth of an inch in length, and were great bores on a small scale, having the ability to completely riddle the hardtack. I believe they never interfered with the hardest variety.

When the bread was mouldy or moist, it was thrown away and made good at the next drawing, so that the men were not the losers ; but in the case of its being infested with the weevils, they had to stand it as a rule ; for the biscuits had to be pretty thoroughly alive, and well covered with the webs which these creatures left, to insure condemnation. An exception occurs to me. Two cargoes of hard bread came to City Point, and on being examined by an inspector were found to be infested with weevils. This fact was brought to Grant's attention, who would not allow it landed, greatly to the discomfiture of the contractor, who had been attempting to bulldoze the inspector to pass it.

The quartermasters did not always take as active an interest in righting such matters as they should have done ; and when the men growled at them, of course they were virtuously indignant and prompt to shift the responsibility to the next higher power, and so it passed on until the real culprit could not be found.

But hardtack was not so bad an article of food, even when traversed by insects, as may be supposed. Eaten in the dark, no one could tell the difference between it and hardtack that was untenanted. It was no uncommon occurrence for a man to find the surface of his pot of coffee swimming with weevils,

after breaking up hardtack in it, which had come out of the so, he could expel the weevils by heating the bread at the fire. The maggots did not budge in that way. The most of the hard bread was made in Baltimore, and put up in boxes of sixty pounds gross, fifty pounds net ; and it is said that some of the storehouses in which it was kept would swarm with weevils in an incredibly short time after the first box was infested with them, so rapidly did these pests multiply.

Having gone so far, I know the reader will be interested to learn of the styles in which this particular article was served up by the soldiers. I say *styles* because I think there must have been at least a score of ways adopted to make this simple *flour tile* more edible. Of course, many of them were eaten just as they were received — hardtack *plain* ; then I have already spoken of their being crumbed in coffee, giving the " hardtack and coffee." Probably more were eaten in this way than in any other, for they thus frequently furnished the soldier his breakfast and supper. But there were other and more appetizing ways of preparing them. Many of the soldiers, partly through a slight taste for the business but more from force of circumstances, became in their way and opinion experts in the art of cooking the greatest variety of dishes with the smallest amount of capital.

Some of these crumbed them in soups for want of other thickening. For this purpose they served very well. Some crumbed them in cold water, then fried the crumbs in the juice and fat of meat. A dish akin to this one, which was said to "make the hair curl," and certainly was indigestible enough to satisfy the cravings of the most ambitious dyspeptic, was prepared by soaking hardtack in cold water, then frying them brown in pork fat, salting to taste. Another name for this dish was "skillygalee." Some liked them toasted, either to crumb in coffee, or, if a sutler was at hand whom they could patronize, to butter. The toasting generally took place from the end of a split stick, and if perchance they dropped out of it into the camp-fire, and were not recovered quickly enough to prevent them from getting pretty well charred, they were not thrown away on that account, being then thought good for weak bowels.

Then they worked into milk-toast made of condensed milk at seventy-five cents a can ; but only a recruit with a big bounty, or an old vet the child of wealthy parents, or a re-enlisted man did much in that way. A few who succeeded by hook or by crook in saving up a portion of their sugar ration spread *it* upon hardtack. The hodge-podge of lobscouse also contained this edible among its divers other ingredients ; and so in various ways the ingenuity of the men was taxed to make this plainest and commonest yet most serviceable of army food to do duty in every conceivable combination...

p. 135 ...Salt pork was the principal meat ration — the main stay as it were.... On the march it was broiled and eaten with hard bread, while much of it was eaten raw, sandwiched between hardtack....

Reference f):

Description from Corporal Si Klegg and His "Pard", Wilbur Hinman, 1887
https://archive.org/details/corporalsikleggh00hinmrich/page/n8

p. 197... It happened that this lot was one of extra quality as to hardness. The baker's watch had stopped, or he had gone to sleep, and they had been left in the oven or dry-kiln too long. Si took one of them and carried it to his mouth. He first tried to bite it in the same way that he would a quarter section of custard pie, but his incisors made no more impression upon it than if it had been cast-iron...

pp. 200-201...In the morning Si went to look after the crackers he had put to soak the night before. He thought he had never felt so hungry in his life. He fished them out and carefully inspected them, to note the result of the submerging and to figure out the chances on his much-needed breakfast.

It would be unnecessary to describe to any old soldier the condition in which Si found those crackers. For the information of any who never soaked a hardtack it may be said that they were transformed, to all appearances, into sole-leather. They were flexible, but as tough as the hide that was

"Found in the vat when the tanner died."

Si tried to bite off a piece to see what it was like, but he couldn't get his teeth through it. In sheer desperation he laid it on a log, drew his Sunday school bowie-knife, and chopped off a corner. He put it in his mouth, but found it as tasteless as cold codfish.

He thought he would try the frying pan. He cut the hardtack into bits, put in some water and two or three slices of bacon, sifted over the mixture a little salt and pepper, and then gave it a thorough frying. His spirits rose during the gradual development of this scheme, as it seemed to offer a good prospect for his morning meal. When it came to the eating, he found it good, comparatively speaking, though it was very much like a dish compounded of the sweepings from around a shoemaker's bench. A good appetite was indispensable to a real enjoyment of it, but Si had the appetite, and he ate it with a thankful heart.

"I thought I'd get the bulge on them things some way er ruther," said Si, as he drank the last of his coffee and arose from his meal, feeling like a giant refreshed with new wine.

For the next two or three months Si largely devoted his surplus energies to further experimenting with the hard-tack. He applied every conceivable process of cookery he could think of, that was possible with the outfit at his command in the way of utensils and materials. Nearly all of his patient and persevering efforts resulted only in vexation of spirit. He continued to eat hardtack from day to day, in various forms, but it was only because he had to do it — it was that or nothing....

p. 202... When the crackers were extra hard they were softened -- a curious fact -- by toasting, and in no other way could this be satisfactorily accomplished. The soaking and frying and stewing were but a delusion and a snare.

Reference g):

Excerpt on the "Horsford Marching Ration" from The Medical and Surgical History of the War of the Rebellion, Part II, Vol. 1, Joseph Janvier Woodward, 1879, pp. 627-628
https://books.google.com/books?id=BfL8xB87rzIC&lpg=PA628&ots=58KFtGOSTj&dq="horsford marching ration"&pg=PA628#v=onepage&q="horsford marching ration"&f=false

An illustration of the production of diarrhoea by the use of food in which putrefaction had commenced was afforded during the year following the war by the so-called Horsford marching ration,§ which consisted essentially of parched wheat in lieu of bread, and a special form of compressed beef. A large quantity of this food, purchased in the spring of 1865, was sent to the commissary depot at New Orleans for issue to the troops serving in the department of Texas, where it arrived during the summer of the same year. The parched wheat soon spoiled and became full of vermin; the beef underwent putrefactive changes, and, as a consequence, the marching ration was tried to but a limited extent. When actually used it produced diarrhoea, and this result occurred not only when the whole ration was eaten, but in some instances followed the employment of the spoiled parched wheat only. That greater mischief did not occur appears to have resulted from the refusal of the troops to use this putrid food to any very great extent.

§ Prof. E. N. Horsford, formerly Rumford Professor in Harvard University, Mass, has the credit of having devised this "Marching Ration," and secured its trial by persistent and ingenious representations of its value, in spite of the unfavorable report of a board of officers to whom the question of its adoption was referred. In a communication to the Secretary of War, dated Jan. 23, 1865, be especially claimed for it that it was “more palatable, more healthful, less perishable and less expensive than the existing marching ration." Indeed, he went so far as to assert in another part of the same communication “that it is substantially imperishable." Feb. 18, 1865, the Commissary General was directed by the War Department to purchase 500,000 of these rations for trial. 1n a communication to tho Commissary General, dated March 15, Prof. Horsford explains that his “bread ration consists of ninety parts of roasted wheat coarsely ground, ten parts of finely crystallized, not powdered, white sugar and a trace of salt in each hundred parts. Eight ounces avoirdupois is a day's supply." The price charged for this ration of 8 oz. was 8 1/2 cents per ration. In the same communication Prof. HORSFORD adds: "The meat ration I call 'roasted whole beef.’ It is cooked by coagulating by dry heat the albumen at the surface of the individual mouthfuls into which the total lean meat is cut. It includes in addition to the mass of lean meat ordinarily served, the liver, heart, tongue, and kidneys, together with the meat and nutritive juices detached and extracted from the raw bones of the entire carcass, and the juices of the scrap lean meat adhering to the lump fat. The juices are carried down in vacuo, the lean meat all roasted, and dried down till the pieces are fixed, leaving still about one-fifth of the water of the normal lean meat, the former incorporated with the latter, and with the seasoning resolved into a homogeneous whole of small mouthfuls. These are pressed into forms and varnished with gelatine. * * * Each ration will weigh about three ounces, and occupy about four cubic inches, and be the full nutritive equivalent of ten ounces of first class fresh lean beef." The price charged for the ration of three ounces of this material was 33 cents. These rations, delivered to the Commissary at New York, were ordered by General GRANT to be placed in depot at New Orleans, subject to the orders of General SHERIDAN, for use in the department of Texas. They were actually shipped from New York at various dates between May 25 and July 1, 1865, and having been received by Col. M. P. SMALL, the commissary on duty at New Orleans, portions were sent by him to different parts of Texas during July, August and September, and earnest efforts were made to secure their use by the troops. But the

“substantially imperishable" ration had already begun to undergo putrefactive changes. The soldiers for the most part refused to eat it, and those who were induced to make the attempt not merely found it disagreeable in taste and insufficient in quantity, but suffered from diarrhoea produced by its use. Capt. H. F. HAWKES, post commissary at Ringgold Barracks, Texas, reported to Col. SMALL, Nov. 5, 1865: “Captain LEWIS informed me that on being issued to the troops at Edenburg it produced diarrhoea." * * * Of that sent to Rome, a portion was issued to the troops by Lieut. JOHNSTON until its issue was forbidden by Surgeon EAGLE, Medical Director and Inspector of the 2d Brigade, 2d Div., 25th A. C., as diarrhoea was becoming so prevalent that his hospital was filled with patients." He adds that some of the cases containing those rations were inspected and condemned as “mouldy, rotten, and unfit for issue. To be buried immediately and dropped from the returns." In an endorsement, dated Nov. 28, 1865, Col. SMALL remarks: “Similar reports from different points in this military division have been received regarding the condition and issue of this peculiar ration, all of the same tenor, viz: the meat rotten and mouldy, the bread filled with weevil and worms and unfit for issue. The Horsford meat and bread ration on hand at this depot, in a dry storehouse, and not exposed to the weather either by transportation or otherwise, was found upon examination to be unfit for issue, and the following is the report made: Inspection report: Condition of meat ration ‘mouldy, rotten, and totally unlit for issue to troops; if possible, to be sold, otherwise to be thrown away or buried. Bread ration is full of weevil and other worms, should have been packed in air-tight tin cases; to be sold, as it is only fit to be fed to hogs or cattle.'" The quantity thus condemned at New Orleans, Nov. 13, 1865, was 127,500 of the bread rations, 129,200 of the meat rations. Surgeon D. MACKAY, 29th U. S. colored troops, writes, Nov. 15, 1865, that as post surgeon at Ringgold Barracks he had “the Bread ration tested to its fullest extent. In no case have I known it to produce anything but injurious results. It is perfectly inadmissable in affections of the alimentary canal." Surg. Benj. DURHAM, Jr., U. S. Vols., Chief Medical Officer 3d Div., 25th Army Corps, writes, Nov. 15, 1865, to the commissary at Brazos Santiago, Texas: “ I decidedly protest against any attempt to issue this beef to the troops, for you will find it spoiled, and I recommend that it may be immediately removed from your storehouses lest it should disadvantageously affect other desiccated rations. I also request, if this is condemned, that (as a sanitary measure) it be taken out in a lighter and thrown into the gulf. Unless properly buried it should not be left on the island." Asst. Surgeon O. F. ROGERS, 117th U. S. colored troops, writes from Ringgold Barracks. Dec. 9, 1865, that the Horsford bread ration "produces colic and diarrhoea in a great proportion of the men." Capt. CHAS. H. MORSE, 117th U. S. colored troops, writes, Dec. 9, 1865, of the bread ration: “in my own case, and in the case of the men of my company, it produced diarrhea." Asst. Surgeon B. HOBBS, 116th U. S. colored troops, reports, Dec. 8, 1865, that during the few days that Horsford's marching ration was issued under his observation. “there was a great increase of sickness in the command," especially of “bowel derangements." The unfortunate results of this experiment are well calculated to suggest caution to future aspirants in the same direction.