THE

PRESERVATION OF FOOD.

FROM THE

"AUS DER NATUR" OF ABEL.

WITH ADDITIONAL NOTES,

BY

E. GOODRICH SMITH.

HARTFORD:
PRESS OF CASE, LOCKWOOD AND COMPANY.
1857.

NOTICE.

THE following Treatise is one of those excellent monographs which have appeared in an annual that has been published by Amb. Abel, of Leipzig, in Germany, under the title of "AUS DER NATUR," for some years past. These volumes have secured high commendation in leading reviews of that country, and the various papers they contain are full of instructive knowledge. The design of every one of them is to bring down to the time of its being written, in a popular form, the information relating to the subject, mingling historical, theoretical and more especially practical views, so as to give a brief and yet complete view of the topic chosen. In general this has been accomplished most successfully, and many of these monographs would be of interest if presented in English to the reading public of this country. The present small work is offered as an experiment to this effect. It is contained in the last volume of the "Aus der Natur," and relates to a subject which it is hoped will be found sufficiently attractive to secure for it a favorable reception. Within the compass of less than one hundred pages are condensed many facts in respect to the preservation of food, both animal and vegetable, a considerable portion of which will, it is presumed, be new to most readers.

I have put in a few notes on the margin, and at the close, for the purpose of explanation or additional information.

E. GOODRICH SMITH.

WASHINGTON, 1857.

To the

Hon. JAMES S. WADSWORTH,

Of Geneseo, N. Y.

A grateful recognition of your kind patronage of this little work, and of your well-known interest in the spread of knowledge and information among the people.

By Yours, Respectfully,

The Translator and Editor.

PRESERVATION OF FOOD.

From the moment that man was thrust forth from the gates of Paradise, and the declaration was made to him, "In the sweat of thy brow thou shalt eat thy bread all the days of thy life,"—that is, from the moment when man came forth upon the earth, the warning voice of his stomach,—for some the greatest tyrant, for others the greatest divinity,—has taught him that man can not live from hand to mouth, but must exercise anxiety and care for coming days. So it is with the course of things in nature. The earth, which dispenses her gifts with the liberal hand of a mother, needs, from time to time, repose in order to gather again into her bosom new strength. Then comes an apparent stand-still in vegetation, to which man was certainly first pointed to enjoy life, and during a long period it offers nothing by which he can quell his hunger, the daily spirit of uneasiness to him.

Thus, it was nature herself, which at first caught in her arms, the needy creature, so man calls himself, and laid her pointing finger, not unnoticed, before his eyes. Ever since the memory of man, we find a complete succession of methods in use for the

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preservation of food. Indeed, he who takes pleasure in drawing them forth from the dust of libraries and rummaging the old works by which the actions and industry of man since the remotest periods, are transmitted to us, may say of the latest inventions, that though they have been indeed written out, claimed and patented as such, "they have been already in use."

From the time of the childhood of mankind, only scanty notices, it is true, have been delivered to us, but they justify broader conclusions. For many centuries before the Christian Era, careful attention was given to chemistry in Egypt; so that this science here attained a proportionably high development. Here, also, we derive the first knowledge that they understood how to preserve, if not food itself, yet organic substance generally from destruction. The proofs exist at this day, in the various museums of Europe. There are the mummies, dead bodies preserved for many centuries. The oldest credible documents in relation to this subject, we owe to Moses, and to Herodotus, who lived more than a thousand years afterwards. The former, was certainly in a situation to give us accurate information respecting the process which the priests, in whose hands was the science, employed. But he limits himself to giving us the fact, that Joseph caused the body of his father to be embalmed, and this operation lasted forty days, the usual time. Herodotus has, indeed, left us particular details at length; but they are somewhat inexact, and hence, have often been disputed. But we must remember that the antiquarians, who have expressed the opinion, that the old Egyptians could never have used the process given by Herodotus, had little scientific knowledge. It seems to us, on the contrary, that Herodotus is not so wholly wrong; he names to us the substances which are used, even at the present day, for similar objects; spices, ethereal oils, and probably, common salt, or the soda (carbonate of soda) which is now a national product in Egypt.

Even at the present day, the mummies are an object of the greatest wonder. But we go too far, when we suppose that the ancients possessed secrets which have been lost in the course of time. We can always allow that they, by various experience, brought this operation to a certain perfection; but the embalming was not only the custom of that country, but a precept of religion. It was not restricted simply to men, but they also sought to preserve certain animals after their death. This usage gives us occasion to acknowledge, with how careful an eye the ancients observed the processes in nature. They certainly were acquainted with the unfavorable influence which corrupting substances exert on the human health, especially in the warm regions; and to keep this scourge afar from the country, the priests who only were the learned at that time, might have declared, that the embalming of the bodies was a precept of religion, from no other motive than to make sure of its being carried out.*

The wisdom of this regulation appeared, subsequently, in respect to the plague, which has repeatedly desolated Egypt. In ancient times, they knew nothing of it. Soon after the introduction of Christian burial, the plague made its appearance. Resting on the words of the Bible, " Dust thou art and unto dust shalt thou return," the first enthusiastic propagators of Christianity, inquired little whether this custom was healthful, and demanded by the nature of the country; it was of heathen origin, and for this reason, must yield to the zeal of their faith. How greatly the general state of health of the country was thus injured, is evident to the traveler at every step. In the low grounds on the Nile, we can not dig even a few feet, without coming upon water; the corpses, therefore, are buried close beneath the surface of the ground, so that the stench of corruption forcing its way therefrom, and tainting the air, serves as a scent to the wild dogs and other ravenous beasts that are prowling about, and that are enticed from a distance thither. To possess themselves of their prey, is not then difficult for them.

But we always over-value the merit of antiquity.

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* It is a well known fact, however, that the old Egyptians believed in the doctrine of the separate existence of the soul for some thousands of years after death, and hence, regarded it as of the utmost importance, that the body should be preserved with care for its reunion with the spirit.—Tr.

In this particular case, the nature of the country has been wholly disregarded; attention has not been paid to the great heat and extraordinary dryness of the air. And precisely herein have they sought out the mysteries of the old Egyptian art. To these two causes, we owe the excellent preservation of the ancient architectural monuments. Even at the present day, in the great African deserts, which, as well as the sea, requires its numerous sacrifices, we find mummies of men and animals that have been dried up solely by the glow of the sun, and the burning hot sand, and so have been long preserved in this state for centuries. If, on the other hand, the ancients had practised their art on the banks of the Seine, or Thames, the Danube, or the Spree, we should have counted at the present day very few mummies in our museums.

After Thales, in the period of from 640 years before the birth of Christ, to the third century of the Christian Era, we find definite notices. Pliny, for example, mentions salts that dry up organic substances, and so are fitted to preserve them for centuries. For a long time previous, had the valuable property of salt been known, and they knew how to derive advantage from its use. Among the Greeks, too, we find a word that signifies to salt and to embalm. The old authors indeed relate to us little as to the salting of flesh for preservation; but they speak of a Latin proverb already in use, "*Nil sole et sale utilius.*" "Nothing is more useful than the sun and salt." The details that have been communicated to us, relate mostly to the corpses of kings and of animals which were preserved on account of their rareness. Thus, for example, Pharnaces sent to Pompey the body of Mithridates; but as to this, Plutarch says, that the face could not be recognized, because they had forgotten to remove the brains. The Indians sent to Constantine a large ape salted, and of the sow, which, as a happy omen to Eneas, brought forth thirty young, it is related, that in Varro's time, it was shown in Lavinium. But it is not the less certain, that they used the salt, the praise of which Homer sung, the various modes of the preparation of which were well known to the ancients, at that time, for salting flesh and fish for purposes of domestic economy.

And hence, we are not of the opinion that they first preserved princes and martyrs, "and afterwards legs of mutton and hams," as has been supposed, in a journal report of the Paris Exhibition. It is indeed more natural that man should first care for his own preservation, for the necessity and sustenance of his body; for he existed a long time before there were princes and martyrs.

Pliny speaks expressly of other methods, that were used for the preservation of food. They coated various fruits with wax or rosin, or they put them in honey, as our housewives do in sugar, which was in use at that time only as a medicine. Grapes and similar fruits, they sought to preserve by inclosing them in earthern vases, which they closed tight and buried some feet deep in the sand. Still further, they caused the substances which they wished to protect from corrupting, to be boiled in water, before they were shut up tight in the vases. Hence, we see that already, in ancient times, they were well acquainted with, and knew how to value the advantages of Appert's method, which has first been brought into use in our day.

All the methods of preservation, of which they made use in Antiquity, aimed at preventing, as much as possible, the entrance and influence of the atmospheric air. They hence knew, that there was something contained in the air, by which the corruption of food might be hastened. Already, with Vitruvius, we find the important statement which has yet been pronounced heretical in our day, that matter does not perish, but only suffers changes, by which all that proceeds from the air returns thither again. They could not indeed give an accurate account of this thing, for to discover the connexion first belonged to science in modern times. As chemistry furnishes to the soldier his weapons of offence and defence, to the husbandman, his fertilizing manures, to the painter his colors, and, generally, seeks to supply all the wants of men, she has in the recent times, too, created for us simple and appropriate methods for the preservation of food. These are valuable, because many articles of food from the vegetable world, of which we would not willingly be destitute, are to be met with only in certain times of the year. Yet these are required for victualing in war, especially for long journeys by sea and land, particularly in inhospitable regions.

To provide the supply, it was necessary accurately to study out the means of sustenance which the animal and vegetable kingdoms afford. Every substance which we use for the nourishment of the body, contains a by no means insignificant number of the so-called proximate elements in one whole; and among these, precisely those combinations which we regard as the vehicles of nutriment, are very intricately compounded; that is, a great number of atoms (particles) of simple or uncompounded bodies (elements) are here united in groups. The greater the number of particles combined in such a group, the more easily is such a substance exposed to corruption; because the bond which embraces the single particles, is but loosely connected, so that there is a greater power of motion to each part; which not only allows another grouping of the atoms into more simple combinations, but also causes a strong tendency thereto.

The germ of corruption is consequently inseparable from the chemical nature of food; and precisely those elements on which nutrition depends, constituting, as they do, the articles of food what they are, we have to regard as the causes of their little tenacity and easy spoiling. It may be said, that certain particles resist this disorganization, and that they yield to it only by force, and so afterwards endeavor to burst their fetters. But great as on the one side is the resistance and the inclination for it, as little on the other side is the power; the feeble bond that embraces the single atoms, is fully sufficient to restrain them, and keep them in order. Of a voluntary decomposition of the intricately compounded combinations into a simpler one, such as is apparently the cause in putrefaction, there is therefore nothing to be said. There must be an assault from without in order to break asunder the connecting bond, and afford the individual atoms an easy power of motion. And this is given by the operation of the air, or rather of the oxygen contained therein. It is the greatest enemy of all existent bodies. It has indeed no power over life; but as soon as this has flown, the animal and the plant fall away to its all-gnawing teeth. In itself alone, it is powerless. It needs confederates within and without.

To the former belongs water, which is almost ever contained in great quantities in the collective means of nutriment. Raw flesh consists two-thirds of water, and not less is the quantity of water in vegetable substances of nutriment, especially in the roots and juicy fruits. Apples, for example, contain above 80, and pears at least 80 per cent. of water. The characteristic of water is mobility; it is never at rest. Hence, it readily yields its aid to the outward enemy for the work of destruction, by which it is itself set free in order again to take part in the perpetual circulation, to which, like the everlasting Jew, it is by nature destined.

Further, the oxygen of the air in its attacks on the animal and vegetable substances is sustained by a certain not too high temperature; the limits here are pretty closely drawn, from one degree to some thirty or forty degrees (Centigrade) above the freezing point. All the three conditions must co-operate; if one of them is wanting, the other two enemies are powerless. And hence all the methods we make use of for preserving food, aim at this object, to remove one of them from the combination.

In some, and precisely the most important articles of food, of which men can not possess themselves on account of the great bulk, nature has herself undertaken the business; and thus she comes to the help of man. We allude here to grain and the pod-fruits; here too, the substances exist in the richest abundance which may otherwise be regarded as the germs and vehicles of corruptibleness—gluten, albumen, legumin, in a word, the nitrogenous elements, which alone re-supply to the body what labor, bodily and mental, has consumed. Water too, is not here wanting, but the quantity is so small, 9 to 20 per cent.—while in potatoes, it is 67–78 per cent—that it can not cause putrefaction. The husbandman, therefore, has nothing further to do than to protect grain from moisture, keep from it insects, mice and rats, and provide a sufficient change of air.

We see the same in the potato, and notwithstanding its large proportion of water, in fruit. For their preservation, we need no great expenditure of means; a cellar is sufficient to keep them for months, not because the temperature is too low to induce putrefaction; it is only delayed, but not really prevented. We do not protect the potato but it protects itself, for the life,—germinating power—still exists in it; we have a sound potato, and though severed from the plant, yet it is to be regarded as a part of a living plant. If its life dies, then also the protection of the cellar ceases, a death of the potato, whether effected by frost, mechanical injury or by secret causes of the potato-disease, unavoidably draws after it putrefaction. That in the case in question, we have to seek for the true cause of the preservation, flesh also shows us. We can preserve it only a few days from corrupting, in the same cellar in which we preserve potatoes for months without damage, if we neglect other precautions and place our hopes on the low temperaature of the cellar only, on which indeed, the heat of the sun exerts no influence. In flesh, the life is wholly extinct, and for this reason in a short time it becomes a prey to the all-destroying air; and the sooner, the warmer the temperature is, and the more the air is filled with moisture. The nitrogenous elements are changed by the influence of the oxygen, and soon a foul smell indicates the advance of putrefaction. Then various flies lay their eggs or larvæ in the flesh, and in a short time it serves as food for the worms.

The means of protection which we must use, to keep off putrefaction, are also of a very simple description. They consist in our either lowering the temperature to the freezing point, removing the moisture, or preventing the access of the air. But these doctrines we owe first to modern times; and yet a certain instinct in men ever since the primitive ages, has caused them to find out the correct ones, though often indeed by round about ways. We will first, therefore, consider these older methods.

In general, they are restricted to the preservation of the flesh. In the case of vegetables, they are used only in a slight degree, although they are here first in place. They formerly contented themselves for the winter with potatoes, other grown roots and pod-fruits; of the preservation of green, or pot-herbs, they thought little. Only cucumbers and sour crout, as well as some fruits, constituted an exception; but which we have to regard less as articles of food than as luxuries.

The chief means which have been found in use from ancient times to the present day, are confined to *salting* and *smoking*. We must not believe that in the former case, salt directly keeps off putrefaction. The cause is a wholly different one. Salting is nothing else than a species of drying. The water has a greater affinity for common salt than for flesh, therefore it is stronger attracted by the former than it is retained by the latter. From one-third to one-half at least of the water, is drawn out of the flesh; the quantity which remains is too small to aid in inducing putrefaction. That this is the reason of the preservation, will be readily admitted, when it is known that in salting flesh, juicy flesh that is full of water, can be strewed over with dry salt, without adding the least quantity of water, and yet in a short time the flesh may be found covered entirely over with a fluid brine. For this cause also, flesh may very easily spoil, if enough salt is not used, though the water is not only removed from the flesh, by direct attraction, but also because that the muscular fibre of which likewise the flesh consists, is contracted, and therefore the water is in fact, pressed out.

The universal diffusion and the great approval which this method yet enjoys in our households, ought not, necessarily, to lead us to the belief that it is an excellent one. By means of the salt, not only water is drawn out from the flesh, but with it also, everything which is dissolved in it; important elements for human bodies, not only inorganic, as especially potash and phosphoric acid, but also organic, as lactic acid, creatin, creatinin, and especially considerable quantities of albumen, which is important for nutrition. They are all lost, as the brine can not be used again. And this is the more to be regretted, for with much justice, they may be compared to a concentrated broth. Salted flesh, hence possesses a considerably less value for nutrition than flesh that is boiled, for there remains at least, in a great degree, the albumen, in this case, as it coagulates by the heat, and thus becomes insoluble and does not pass off in the strongest broths. Flesh is, therefore, far more exhausted by salting than by boiling. Much more injurious yet is the circumstance, that not only the general nutritious value is lessened, but that by the removal of the above mentioned valuable substances, the equilibrium of the capacity of nutrition is destroyed.

It may be objected to me, that in the use of salted flesh for centuries, good health has been enjoyed; but it is not so. Where, indeed, salted flesh now and then comes upon the table, we may not be aware of injury; the substances necessary for the preservation of the body which are wanting, are unconsciously compensated for by other means of nutriment, as there is an alternation and variety in our articles of food. But it is different, where salted flesh is the principal means of nutriment, as in the case of sailors, and soldiers in the time of war. Here the defectiveness of the nourishment shows itself most decisively. Who has not heard of the scurvy, a painfully hereditary disease of those classes? This disease has its origin in a defective condition of the fluids in the human body, and this again is caused by partialness of nutrition, in consequence of the continued use of salted flesh. Distressing pains in all parts of the frame, blue spots in different portions of the body, stinking gums, and swollen limbs are the characteristics of this fearful disease, which does not easily give up its victim once seized by it, and whose health is shattered for his whole life; while it ever returns in multiplied and changing forms, as hypochondria, rheumatism, dangerous colic, unless a man constantly observes the strictest regimen, great moderation in all things, and carefulness and cleanliness in clothing and food. In a certain degree, nature herself modifies the unadaptedness of salted flesh for nourishment. Salt is hardly ever met with perfectly pure; it always contains lime and magnesia. These, with the phosphoric acid, which the salt has drawn out of the flesh, form with the water, insoluble combinations. Thus, at least, there is preserved to the human body, this most important element for the continued renewing of the bones, even in men already grown up. The white coating which we always perceive on salted meat, is nothing but those combinations, which just because they are insoluble, are deposited again on the flesh. If we had perfectly pure salt at our command, the disadvantages mentioned would be far more evident. But to this lucky circumstance, as it is called, man's good sense can lay no claim.

Just as in respect to many an old by-word which men have regarded for centuries as true, modern times has in a certain degree broke to shivers, too the old Roman proverb, "Nothing is more useful than the sun and salt." The common use of salt in the preservation of flesh up to a short time since, if not as the only method, yet by far the most universally diffused, is now in a measure, fallen into discredit. We now know that salted flesh also, even as potatoes, when the only means of nourishment, is attended by a curse. Precisely where it was formerly regarded as indispensable, in the fleet and for the victualing of fortresses, &c., it is wholly set aside in the most recent times, on account of the health of the crew and the army—an indication for housewives to follow this example.

In France, too, where recently considerable importations of salted meat have arrived from America, they have very soon acknowledged the injury which resulted from the too free use of it to the consumer. The people have already, therefore, for this reason, and not at all from prejudice, renounced the American salted meat. It would hence be advantageous if those who are engaged in conducting the trade in this meat, else important for Europe, would turn their thoughts to another method of preservation than salting. This we doubt not will be the case as soon as the salted meat no where finds a market.

Salt has likewise served for preserving for a longer time, a few important vegetable means of nourishment, especially sour-crout and cucumbers. Yet we notice here another appearance; the brine becomes decidedly acid. The nitrogenous combinations contained in the above mentioned vegetable parts, act on other substances which in accordance with their composition are converted into sugar, in consequence of which a similar process takes place as in the souring of milk, a kind of fermentation, that is called lactic-acid fermentation, because there is formed in it a considerable quantity of lactic acid, which is here accompanied also by acid of butter.

The means too, in use by our housewives, particularly for the preserving of fruit, as sugar, ardent spirits and vinegar, operate also, the same as salt. Here likewise, the water is partially removed, or rather held in such a way as to forbid further injury by fermentation or decomposition of the vegetables. There is moreover, need of the greatest precaution, if we wish certainly to keep them from spoiling. We must not be sparing either of sugar or vinegar. Usually, the sugar is dissolved in the juice of the fruit, and the solution of the sugar must have the consistence of a pretty thick syrup, for the sugar by itself is very much inclined, in weaker solutions, to pass over into fermentation, which is then too, communicated to the fruit. If we fill the preserved articles warm into the jars, the few drops of water which condensed on the inside by means of the rising vapor, and by running down, dilute the upper portion of the syrup, are often sufficient to cause them to spoil. The same is the case with vinegar which is commonly to be had in the market only in a diluted state. Housekeepers know only too well, how often cucumbers and fruits preserved in vinegar, turn and wholly spoil. This is less easy if the vinegar first poured in, is after a while removed, and with it at the same time also, a large quantity of water, (some 80 or 90 per cent.,) which is contained in the cucumbers, and then new vinegar poured in, which now will be no longer essentially diluted.

The careful housekeeper in these various matters, seeks to increase the preserving power yet more by means of spices, which by themselves, furnish an effectual protection against putrefaction. This power the spices owe to the proportion of ethereal oils of different composition, which in themselves act against putrefaction, and indeed with such power, that a very small quantity is sufficient to preserve large masses of substances that are easily decomposed. The spices are also fitted to bring to a stand an already-begun fermentation and decomposition. On this account too, with their help, the articles of food which have already suffered a begun decomposition, are eaten with less danger than when this precaution has been neglected. But as to what this almost marvelous power of preservation owes its origin, science has as yet furnished us with no satisfactory reason. We must, therefore, for the present, be contented with the facts.

In *smoking* food, it is not only the drying that is here often carried much too far, by which the flesh resists putrefaction and may be preserved for a long time. In the smoke which rises from the hearth there is contained a greater or less portion of a volatile substance which has a biting burning taste, and a pungent disagreeable smell. It is the creosote, one of the most powerful antiseptic (that which resists putrefaction) substances. It has the property of coagulating albumen, and thus making it insoluble. By this process the flesh is armed against the attacks of the oxygen, and animal substances, rendered insoluble, with great difficulty pass into putrefaction. Smoking, on this account, deserves the preference to salting, because in it no elements important for nutrition are lost; only the nutritious value of the smoked flesh is somewhat diminished, as the coagulated albumen and the very often too much dried up muscular fibre are of less easy digestion than fresh meat.

In the creosote that is manufactured from tar, and in the pyroligneous acid that drips off in the carbonizing, or converting of wood into coal, we have the means of effecting a so-called smoking of flesh in a moist way. The pyroligneous acid contains a small quantity of creosote, but more than a solution of the same in water that takes up only $1\frac{1}{2}$ per cent. of it. By these two means, we can in a much shorter time produce the same change of the flesh than by smoking it for a longer period. It is enough to dip the flesh several times in the two above mentioned liquids, or brush them over with it. The flesh then gradually dries up and takes the appearance and the taste of smoked meat. It thus becomes so well preserved, that it suffers no injurious change even in the greatest heat of summer. According to Stenhouse, we may secure these effects by placing the flesh in a closed box, and placing with it a few drops of creosote in a small bottle. On account of the great volatility of the creosote, the atmosphere is filled with the vapor of creosote, and this then protects the flesh from spoiling.

The quantity of creosote sufficient, in all these cases, for the effect, is a very small one. This circumstance is but rarely adverted to in smoking by the moist method, and for this reason, there is often too much of a good thing. Hence have arisen many complaints, that meat prepared in this way has a most disagreeable taste; that thus one spoils the best hams and sausages. On this account, Jäger, after successful experiments, recommends another process. For sausages, bacon and hams of a swine weighing 120 lbs., he takes 1 lb. of shining lamp-black or soot, of a clear wood fire, such as falls in the lower parts of any chimney, containing no coal fire, because, in the preparation of coal, all the volatile products of decomposition have already escaped. Boil the soot in eight quarts of water down to four quarts, and add to the strained liquid, two or three handfulls of salt. In this solution, place small sausages for one-quarter of an hour, large ones for half an hour, and such as are made of the maw (hoggess) and brain-sausages, three-quarters of an hour to one hour; bacon according to the size, six to eight, and hams, twelve to sixteen hours. But they must first all have been somewhat dried in an airy place, and this must also be done again after taking them out. The taste of meats treated in this way, is far more agreeable than according to the usual smoking by wood.

Science ought not to stop at the proof that the methods of preserving food used in domestic economy, accomplish this object unsatisfactorily, inasmuch as the capacity of nutrition and the ease of digestion is lessened. It is far more serviceable to build up than to tear down. To replace the old and unsatisfactory modes by new and better modes, comprehensive investigations must be made as to the character of the changes which the organic substances undergo as soon as they come in contact with the air. The researches of Gay Lussac, especially, were of the most beneficial results for life. He found, particularly, that by means of boiling heat, the organic substances were preserved from every change; at the temperature of boiling water, the nitrogenous substances lose their capacity of calling forth putrefaction or a change of atoms in vegetable or animal matter; while these substances themselves suffer a change, such as we may best see in the albumen that coagulates by the heat. A similar process takes place in the so-called exciters of fermentation or putrefaction, all of which are compounds corresponding to albumen.

Of the permanent effect of boiling heat, housekeepers have already long before been aware. By boiling, milk is guarded from becoming spoiled,—or coagulating in consequence of the existing lactic acid,—but its souring is thereby only kept off for a short time, as the effect of the oxygen of the air is not excluded. If we continually repeat the boiling at the proper time, the milk may be preserved for any period we wish from spoiling. But the use of this means is too dependent on circumstances, and hence can not be applied to use.

The temperature of boiling water protects food from spoiling only when the operation of the air is permanently removed, as is done in the so-called APPERT'S method. This method, already proposed in the year 1803, by the Frenchman Appert, deserves our admiration for its great simplicity and efficacy; we may justly term it the most rational, simple, cheapest, and surest. An advantage which can never enough be valued is this, that the means of nutrition which are preserved in this way, lose nothing of their nutritiousness and taste. The permanence of preservation is almost unlimited, if defects are not allowed to occur in the operation itself. Thus, for example, Captain (now Sir) John Ross, the well known Arctic voyager, presented to the Society for the Encouragement of Arts, (in Paris,) meat that, treated according to Appert's method, had been perfectly preserved for sixteen years.

The North Polar Expeditions especially placed the excellences of this method in the proper light, and after a long struggle, gained for it victory and acknowledgment. These voyages, by which the crews of the ships were wholly cut off for years from the civilized world, would have been nearly impossible without the Appert method of preserving food; for the almost exclusive use of salted meat would have undermined the health of the men, and made them at last incapable of enduring their nameless fatigues and hardships. Though the Arctic and Polar Zone, in general, is stamped with the character of the greatest poverty, yet we must not believe that it is wholly destitute of animal life. In these sorrowful regions the activity of nature has not wholly died out, for even the highest latitude of the Polar climes form no region of eternal snow, and no where, so far as man has penetrated, does the line of eternal snow sink to the level of the sea. Though the mean temperature of the year, descends even far below the freezing point, yet there are also days in which the heat is burdensome. The few weeks in which the sun bursts the firm fetters of the soil, are sufficient to call forth a vegetation which, by its variety of the most beautiful forms and colors, may delight the eye of the bold voyager, long blinded by the masses of snow lying all around him. At this time, it is easy to obtain fresh meat, because then those remote coasts become a place of exercise for numerous animals. But with the very short summer, also, these disappear, and hence, it is useless for the voyager, to be exempted by the winter in those regions from all care for the preservation of food.

Appert's method was reduced to practice by the English, and became a true benefit for mankind. It was not enough for them thus to preserve raw flesh from spoiling; but they prepared it, and also green herbs, in the same manner as when they were to be eaten. In this way, it is possible that in every region and every time of the year, for every one who is only in somewhat easy circumstances, to have at command the most unusual and rarest dishes, prepared according to the best receipts of cookery, the procuring of which would otherwise be impossible, or effected but for large sums of money.

The Appert method for the preservation of food, depends on the fact that the energetic effect of the oxygen of the air is not wholly prevented, but more correctly, as it may be said, merely arrested. A perfect exclusion of the atmospheric air is indeed impossible; and especially, in certain circumstances, a single air-bubble is sufficient to set large masses of food into fermentation. By a sensible plan, Appert has known how to conquer this greatest difficulty. For this purpose, he fills the food into tin boxes, as close up to the edge as possible, with the precaution that, as far as may be, all air shall be removed from the space occupied by the food. He then lays on the box a cover, which is carefully soldered. Instead of tin boxes, we can use glass bottles, which may be hermetically sealed, *i. e.*, made air-tight by means of a cork.

But in spite of all precautions, we can not wholly remove the air from the vessels; and yet it is absolutely necessary, if we would perfectly secure the contents from spoiling. It was therefore an object to render it free from this hazard, and the result was attained by placing a great number of boxes and bottles in a kettle filled with water. The water is then brought gradually up to 100 degrees, Centigrade, *i. e.*, to boiling point, and the boiling is allowed to continue according to the size of the bottles, a half an hour or an hour; and thus there is opportunity to observe, at the same time, whether the closing of the boxes and bottles is thick enough. If there be only a single spot not thick enough, it is seen, that in this the air which is exhausted by the heat, rises in a little bubble through the water. The defective places must then be thickened by a new soldering or the cork replaced by one that closes tight.

The free oxygen which is contained in the small quantity of the inclosed air, is by this operation rendered innoxious forever; while under the effect of the heat it combines with the organic matter and becomes wholly converted into carbonic acid. This process is likewise, as it were, an oxydation, just as putrefaction; but precisely by this change all power is taken away from the oxygen of acting further on the organic matter.

This mode of the preservation of food, has for years been an object of manufacturing industry in England, France and Holland, as well as among other nations which possess a navy of some importance. But the use of these articles of food is in all of them nearly limited to the victualing of ships, and notwithstanding all its advantages and agreeable features, it has found but little entrance into households. The reason of it is, that in their management the tin boxes have great inconveniences. Particularly the soldering and unsoldering of the cover is very troublesome. For households, the cost of the tin boxes is of importance only at the outset, a continued use, which the solidity of the material allows for a long time, thus renders the expense of little consequence.*

In the preparation by manufacture, they fill in the food boiling, the pieces of flesh first, which are separated from the liquid. Then the cover is soldered on, and in the middle is a hole into which the liquid portion is poured by means of a tunnel. Then a little plate of tin is also soldered over the hole. In this way it is easy to fill the vessel almost entirely, and thus to reduce the inclosed air to a minimum.

By a small oversight in this operation, it may happen, that the effect of the oxygen will not be arrested, and thus the door be left open for spoiling. This is the more vexatious, as the preservation in tin boxes prevents any further observation, and therefore any further advance till the time when the food is to be used, and then, generally, the help comes too late. For this reason, an improvement, which Fastier introduced, is of great importance. He added to the water in which the boxes are exposed to a temperature of 100 degrees Centigrade, a sufficient quantity of common salt, by which means the advantage is secured of bringing the food in the box itself to boil, as the solution of salt boils at 110 degrees Centigrade. To the vapor thus extricated, is left a narrow passage out, and thus, at

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* This defect as to soldering, is remedied by different kinds of screw and other tight covers, which have been adopted in this country for boxes used for keeping fruit, &c., though I am not aware that they have been applied to the preservation of meat.—Tr.

the same time, the air is almost entirely driven out. Then, in order that the vessel may be as full as possible, some of the liquid is filled in, and now the opening is closed by soldering. In this way, they make sure that the slight traces of the free oxygen may be more certainly held bound by the organic matter, and so rendered harmless.

The preservation of eggs and butter depends likewise, on endeavoring to effect the entire exclusion of the operation of the air. But the ways in which this is reached are various. In eggs which are destined for preservation, it is a matter of prime importance, that they should be fresh, and as perfect as possible. Some say, that eggs which are not impregnated, may be preserved better than those that are so. To prevent the entrance of the air through the shell, various means have been applied. The shell is coated with grease, gummy glue, or varnish, and thus it is made impervious. A solution of lime, of the proper consistency, no doubt affords the same service.

The following means which is of more frequent use is cheaper. The egg is merged as fresh as possible into water that is saturated with lime, and preserved under it in a cool place. For different reasons there can not here be any spoiling. The water at once enters through the shell, so that the egg is entirely filled, and then the lime has a power of preserving it from putrefaction. To this means another is perfectly analogous. The eggs are laid in water in which ten per cent. of salt has been dissolved. After some hours the eggs may be taken out and dried in the air.

Generally, attempts are made to preserve butter just as flesh, by means of salt. But thus, the agreeable sweet flavor is destroyed, by which fresh made butter is distinguished. In Scotland, therefore, with the salt there is mixed one-third or a fourth of its weight of sugar, in order better to retain the agreeable taste of fresh butter. We can thus keep fresh butter for the period of from eight to twelve days, if it be solidly packed into little tubs and the surface covered with water an inch above, which has been first boiled and then cooled down again. But the water must be renewed every day. According to Bréon, considerably more favorable results are obtained if the water is first slightly acidified. For a quart of water, take 56.4 grains of sulphate of potash or acetic acid. If the butter is to be sent away, place it in a tin cylinder, the opening of which is soldered up. For common purposes, make use of vessels of glass or earthen, the openings of which are well closed. In this way butter may be kept for two months entirely fresh at a temperature of from fifteen to twenty degrees, Centigrade, (about 30 to 40 degrees Fahrenheit.)

Notwithstanding all its excellence, yet Appert's method does not generally well allow of an application to green herbs or vegetable food. The hindrances in the way are two-fold—space and weight. At every dinner we consume only a small portion of meat to larger quantities of this green food, whence we must draw the conclusion, that the latter are less nutritious than the former. From this circumstance, the transportation of such greens preserved after Appert's method, is difficult, since a very great quantity of water contained in all vegetable means of nutrition, must be dragged about with us almost without any use. Water is, indeed, indispensable for all human bodies, but nature lavishes it in such fulness that we can add it to our food almost at any place and time. For this reason, in the preservation of vegetable means of nutriment, the Appert's method is now rarely used, since which another principle, but only for a few years past, has broken out for itself a pathway. This is the removal of the water—the drying of the greens.

This principle too, is so simple we may justly wonder why it has not long ago been brought into use. A cause for it, indeed, was not wanting, as for centuries already, many plants have been preserved in a dried state, without their being spoiled, a single precaution only being used. We may mention here tobacco, grass, (hay,) medicinal plants, Chinese tea, the shriveled leaves of which by means of hot water, perfectly recover their original form. This principle too, has long been in use in our households, in the case of vegetable means of nutriment; in a limited degree it is true, but almost entirely with the so-called "Russian peas," which are early shelled and then simply dried. It was therefore very natural to go a step further and raise the particular application into a general one.

Our housekeepers possess yet a multiplicity of receipts for preserving plants and fruits of all kinds, for future use, but they are too modest to speak much of their art.

Ever since the fifteenth century, the preservation of the vegetable means of nutrition in this way, has been alluded to by men of reflection. In the last century, repeated trials were made to introduce the drying of greens in England, Italy and Sweden; but the success was by no means favorable. They did not use the requisite care, so that the greens suffered a change in their taste. Besides, their smell was much like that of hay; the nutritious properties suffered a diminution, because the vegetable albumen coagulated in the too great heat. In addition to this, the volume of dried plants, was always a very large one. This prevented the preservation and transportation; but another circumstance of still greater weight was, that these greens in consequence of the too large surface they offered to the effect of the air and light, were exposed to many changes, causing them to spoil very easily.

All these difficulties a French gardener has happily overcome. In France, they understand admirably how to give to apparently trivial things, great importance. Thus, then, in the short space of a few years, the drying of greens has already grown up to a respectable branch of industry. After the greens have been carefully selected and trimmed, they put them on a hurdle of coarse linen cloth which is set up in a chamber. This latter is warmed by means of hot air which circulates in pipes according to the condition of the greens at 35 deg. or 45 deg. Centigrade. In this slight heat the water evaporates from the plants only very gradually; this is absolutely necessary, for otherwise the greens lose their taste and color. But for the now following operation, pressing, a gradual drying out is very essential, in order that parts of the plants may not lose their capacity of again recovering their original form when afterwards soaked in water.

By a powerfully working hydraulic press, the volume of dried greens is lessened four-fifths, and thus the problem of the preservation of vegetable means of nutriment is most completely solved. For the reception of the greens, there are at the end of the mounting beam of the press, strong iron boxes in which after the greens have been laid therein, they are pressed by a strong and closely fitting pounder. By the drying out, one hundred weight of the greens is reduced to from nine to fifteen. Thus, for instance, a cabbage head of very great size, may be brought singly into a letter envelope; but when it is again moistened and prepared, it becomes of such extent as to fill a large bushel. The present greens have the form and thickness of a cake of chocolate, and like these cakes, they are wrapped singly in a paper or in tin foil, and then several of them packed up in boxes of zinc or sheet iron. The only precaution which must be used in packing, is to keep off the moisture; then they may be preserved for any length of time, without their losing the least portion of their relish. Such a cake of greens of $7\frac{1}{2}$ inches square and $6\frac{1}{3}$ to $7\frac{1}{4}$ lines thick, weigh about 1 lb., and contains in it 20 portions. A box of 32 cubic feet, the sides and height of which are 3.18 feet, contains 25,000 portions, yet any one of them does not weigh $1\frac{3}{4}$ loth, ($\frac{5}{8}$ of an oz.,) while it corresponds to eight times that weight of fresh greens.

Potatoes may be preserved in this way and rendered easy of transportation. They are carefully washed and pealed, then cut into thin slices, and then dipped for a single moment in boiling water. After drying, they are put under the press, but when they have been first exposed for a short time to the moist air, in order that they may become somewhat moistened. Peas and beans are likewise dipped for a minute in boiling water before drying, and after drying, preserved unpressed in air-tight boxes. But the hot water must not operate for too long a time; as otherwise the grains of amylum contained in these fruits and bulbs, swell up and pass over into paste, and the vegetable albumen likewise becomes coagulated. Both processes would impart to these parts of plants after drying and pressing, such a firm consistency, that the water would not penetrate in boiling. How long so ever a time might be used in boiling, the dish would not be made.

If we desire to use the dried greens in domestic economy, they must be allowed to take up again the water which they have lost in drying. Cold water is therefore poured over them, and they are left to stand in it six or ten hours; if we should take warm water, it would lessen the time to four or six hours. By the reception of water, the greens expand, take their original form and color, and the smell peculiar to them is very perceptibly developed. In short, the greens are in all respects like fresh greens. But this operation is of great importance, and the utmost care is to be taken that the watering be continued long enough, if we wish to be certain to secure a good tasting dish. In this preparation there is nothing further, in particular, to observe; the process is conducted as commonly.

The Paris Academy of Science took a deep interest in the subject. They appointed a committee over which Morin presided, to institute decisive experiments on two kinds of greens, Wirsing cabbage and spinage. A second committee too, examined the pressed greens in every respect in the most careful manner. White cabbage, red cabbage, curled cabbage, celery, spinage, rocket, carrots and potatoes, were examined by them. According to the judgment of the two committees, the greens moistened again could not positively be distinguished from fresh. After the greens to be examined had been eaten in a cheerful dinner, both officers of the committees gave their judgment that all the dishes, without exception, were well tasting; and especially, they paid the highest praise to the spinage and cabbage. These were of a fine relish, and tasted so much like greens just freshly plucked from the stalk, that any one might be deceived by them. At the London exhibition, Masson obtained the great medal; and the French Academy of Sciences likewise felt it proper to bestow upon him a premium of 2,000 francs from the Monthyon fund for useful inventions.

The success which Masson had obtained in a short time, stimulated others also, to strike into this new path and follow it out further. Among those who occupied themselves further in the solution of the problem, we may especially mention Gannal. He had already acquired a name by a method of embalming corpses. Afterwards, he employed himself in preserving meat, and soon he succeeded in so perfectly preserving plants that are the most difficult to dry, and which had already almost led others to despair of being effected, that the French Academy, after they had taken different specimens under examination, could not help fully recommending this method, especially to the Minister of Marine; as there was much probability that the greens dried after Gannal's method, would afford the greatest service in the victualing of the fleet and army.

In the experiments which have been made at Brest at the instance of the Marine Board, and in the United States, by direction of the Secretary of the Navy, with the greens, which were dried according to Masson's and Gannal's methods, it appears that in certain greens, one method is to be preferred to the other. In the use of one or the other method, we must take into consideration the nature of the plants. It is acknowledged that the greens, by Gannal's method, in general, have truly preserved all the essential characteristics—form, color and taste—and that from this reason, they would unquestionably secure the greatest favor with sailors, as in cooking they require less time, less water, and consequently also, less fuel. Nevertheless it was felt to be necessary to assign the first rank to some of Masson's greens, especially the cabbage. Every thing has two sides, and so it is here. Each of the two methods has its advantages and its disadvantages, so that they may both exist very well together. The most essential difference of the greens of Gannal's method, consists in preserving all their characteristics faithfully, while those of Masson, by being pressed together into cakes, are all rendered more or less undistinguishable to the eye when they again have received the requisite quantity of water. And this is indeed, the excellence of Gannal's mode; the outward appearance is firmer, and the flavor is better preserved, while the advantage of the other method consists in the greens occupying less space, and in consequence, they are more easily transported. For use in the masses, in the victualing of fleets and the armies, this is of great importance.

Gannal's method has already become an object of manufacturing industry in France. Though it has nothing at all in common with his earlier business—the embalming of corpes—yet he feared that he might thereby be out of favor in the eyes of the people, and prejudice would be turned against his enterprise. He caused, therefore, his ideas to be carried by others; the manufactory bears the name of the firm, Morel, Fatio & Co. The latter, after Gannal's death, remain sole proprietors of this method.

The great importance of the dried greens is so evident, and the approbation which they have attained in so short a time, is of such a description, that it is scarcely necessary to spend a word about it. But the subject is new, and novelty always has a great number of opposers, who from principle, close their eyes in order that they may not see what is good.

The advantages are, for the most part, evident in the provision of the crews of fleets and armies, and in relation to this, we can justly call the dried greens a benefit to the human race. The importance of greens for nutriment is sufficiently confessed. From pure instinct, as it were, man ever since his first existence the world over, has in his food combined green vegetables with meats, long before chemistry taught that each are supplements one of the other, and absolutely requisite to an appropriate nutriment; not only because that by the greens there is a beneficial alternation in our food, but the digestion of meat is thus rendered easier, and it becomes generally more adapted for nutriment, while by the greens a correct proportion is first restored of what we need for our nutrition. Not by eating flesh only, or by the exclusive consumption of green vegetables shall we be in health, but only when both stand in a just proportion to each other. By themselves, only the greens offer to the body but a small substitute for what it constantly uses in its daily change; often the whole solid mass of the plants scarcely consist of a tenth part of its weight, the rest is water. But yet they are very important for nutrition, because they cause the blood to flow more freely in our veins.

The useful effect of dried greens has been exhibited, especially on ship-board; they have here exerted a very favorable influence on the health of the crew. Ever since they have found entrance in the English, American, French and Russian navies, the scurvy has ceased to decimate the crews. This use of the dried greens will ever continue to be the most important, for in this respect they suffice to meet all demands. But also for the usual household economy, they offer many advantages, so far as they are introduced only with moderate claims, and in case we always keep in view what can be attained. They should in no wise be made wholly to replace fresh greens; this they are not adapted to do. Excellent as are the dried greens, yet in many cases we always give fresh ones the preference, and have in a variety of ways to set aside the former. They are only substitutes for fresh ones that, at certain times and places, we can not procure at all, or at the greatest cost. For dried greens nothing further is claimed; they will remove from us only the restricted bounds which our purse or the unfavorable local relations in which we live impose, and in this respect, they prove themselves of value and deserving approbation. This only is the destination which the inventor and manufacturers have given to the dried greens.

More than nine government approvals, and the seven gold medals, which this invention has already received, bear testimony as regards their usefulness to the universal approbation and diffusion which they have found in the short space of six years in France. Every grocer here has a large quantity of the dried greens, of which, especially the rocket, (julienne,) a very fine-tasting soup vegetable,—a mixture of all sorts of greens and herbs, a true "hodge podge,"—enjoys a high approval. In England, too, the dried greens have found great circulation on the occasion of the London Exhibition. Of Germany, we can not say the same, though already in Frankfort-on-the-Maine, the region around which is "world-renowned" for its garden culture,—a manufactory of the kind exists, which likewise does a good business. Its products, however, appear yet to be quite unknown to the German housekeepers. From our own experience, we can highly recommend the occasional use of dried greens; and we are convinced, that by doing so we deserve the thanks of housekeepers, for there are times when they are in great perplexity as to what they can cook.

But we will not omit to call attention to the fact, that in dried greens it is particularly important to attend to their preparation. On this it essentially depends whether our recommendation find favor or disfavor in the eyes of the women. The dried and pressed greens may be more rapidly spoiled in cooking than the fresh; and their value very easily be wholly destroyed. All depends on the care that is given to developing anew the greens by soaking; then the dried demand a longer and not too rapid boiling. Not every attempt will be equally successful, therefore we only ask that the women will withhold their judgment for a little while, and at the same time not lose their courage. Repeated experiments will certainly make them acknowledge the correctness of our views; of this we feel assured.

The dried and preserved greens will, without fail, exercise a great influence upon the welfare of the nations, not only because they will effect a great extension of gardening, which always forms the most gainful culture of the soil; but they will introduce to commerce also new and profitable objects of trade. By means of this commerce, hereafter, a multiplicity of tropical productions will be rendered accessible to the north, less favored by nature,—productions of which we now know anything, only by the descriptions of travelers. Not only in dainties and delicacies will the colonies in future cater for us, but even in times of need, they will powerfully come to the help of the old world, and the imports from them will exert a beneficial influence on the nourishment of the masses. The tropics are rich in the most important nutritious plants, which, so far as inquiry after them exists, may be of special importance for exportation,as immeasurable tracts of land there await cultivation. The earth has capacities enough to feed richly all the men that live upon it, and far more, if man will not lay his hands idly in his lap.

Among the nutritious tropical plants which are of importance, for the whole world, is the cassava, (*jatropha manihot*,) with its bulbous roots, often 30 lbs. weight. An acre gives towards 480 cwt. of bulbs, which, cut in slices and dried, would be a welcome substitute in the markets of Europe, for the potato, worn out by age and diseased. The crop there is surer than that of grain with us. Besides the leaves of the cassava, the stalk is a good-tasting green plant. The banana, too, is found in the tropics in such rich excess, and to be had at so low a price, that it would certainly form a profitable article of export, as soon as only a method easily appreciable and less costly for its preservation, has been discovered. A single cluster, which often consists of 160 to 180 of the fruit, weighs more than 60 lbs. The fruit is gathered four times in a year. The stout herb-like stock requires, indeed, for its full development from the seed, five to six years; but from the perennial base put forth young sprouts which often hang rich with their fruit in three months. At a moderate valuation, the banana yields, according to Alexander Von Humboldt, a product, which exceeds in weight that of grain, about one hundred and forty times, and that of potatoes, on the same space, forty times. We can not, indeed, compare the nutritious value of the banana with that of the potato, much less with that of grain; but still, Humboldt is of the opinion, that the banana could, on the same extent of ground, feed twenty-five times more men than the grain. For the European palates, the fresh fruit are without relish, at least, they need a sort of wontedness in order to find the taste pleasant. And yet there are not wanting authors who are of the opinion, that, by this fruit, sin came into the world. The banana must have been fine, which, in the garden of Eden, excited the appetite of Eve.

On the other hand, the bread-fruit tree, (*artocarpus incisa*,) one of the most important nutritious plants for the people of the torrid zone, furnishes so agreeable and nutritious a food, that men near it hardly ever need any other for their sustenance. Eight to ten months through, the tree is covered with its fruit as large as a child's head, and weighing three to four pounds, and so abundant, that it can be gathered also in sufficient quantities for the three non-bearing months of the year. Three trees are enough for the nourishment of one man. The present are different times from those in which Forster lived, and it may be well that Europe had to wait for an immediate advantage from the bread-tree with which he made us acquainted. He says, himself, on this occasion, that the all-devouring trade of Europe attracts to itself the gifts of nature in the other parts of the world, and gives them a value which they had not in their own country.

Similarly to the dried greens, flesh, by drying or pressing out of the water, may be preserved for a long time. In the warm regions, this method is already in use, and even in the high ones of the north, they make use of it to preserve for a long time the fishes which the ocean so lavishly yields. In South America, they understand how, by means of a very sharp knife, to cut the quarters of oxen into long, narrow and thin slips. They strew them over with the meal of Indian corn, in order that they may not lose their fleshy juices, and hang them up on frames that, through the operation of the sun upon them, the water may be evaporated from the flesh. Towards evening, they carefully observe the heavens; if a rain is threatened, then they bring the flesh under cover, and hang it out again in the morning. One hundred parts of fresh flesh yield about twenty-six parts of dried; the water, therefore, with the exception of a small quantity that remains, passes off. The dried flesh, (jerked, or hung beef,) here called *tasajo*, has a dark brown color, not a disagreeable taste, and sufficient flexibility to allow it to be rolled up. It now presents only a slight surface to the action of the air, and on this account it may be kept for a long time, if the precaution is only taken to preserve it from moisture.

In the mines of South America, the use of tasajo is wide spread; it is here the universal substitute for raw ox flesh. In camps and on board of vessels, the tasajo also performs important service. If it is desired to prepare the dried flesh for the table, the same process is pursued as with the greens. First, it is soaked in water, in order that by the reception of the water, it may again become like fresh meats. Made into a soup, or, as boiled meat, it can hardly be distinguished from that which is prepared of fresh.

The Indian tribes roving about over North America, who drag their supplies of flesh around with them, follow a method which nearly approaches that of pressed greens. They pound the thin dried slices of flesh tight together, so that it may take up the least possible space, and can be easily transported. The dried flesh here, bears the name of *pemmican*. It offers the greatest quality of nutritious substance in the least compass. For another reason, the dried flesh is to be preferred to the so-called flesh extract, (evaporated soup,) as first proposed by Proust, and which Leibig has again, more recently, occasionally recommended. First, it perfectly preserves the flavorous smell which is developed in cooking; but the flesh extract loses very much of it in preparation, as the flavor escapes in the evaporation.

For this reason, it has been often times proposed, in the preservation of flesh, to bring drying into use. But until now, the experiments have almost all failed, while, in our temperate climate, they have wished to effect the evaporation of water by the natural heat of the sun. This, however, is not sufficient, at least the drying out goes on so gradually, that we have always reason to fear its spoiling. A further objection, was the cutting in pieces of the flesh, by which it becomes unfit for many useful preparations. But the rendering it smaller, is urgently necessary, as large pieces may not be dried in this way without loss. On this account, a Frenchman, named Digé, proposed first to boil the flesh half an hour, and to dry it by artificial heat, of from 50 to 70 degrees Centigrade. By the boiling, the fresh meat loses 25 per cent. of water; but, at the same time, not a trifling part of its essential elements important for nutrition; and on this account, this proposal is little to be recommended.

But since the dried and pressed greens have been so much preserved, it is high time to bring dried flesh again into remembrance; less to introduce this method into our household economy, than to preserve for the benefit of hungry mankind, the vast masses of flesh that are uselessly wasted in North and South America, Australia, and even Southern Russia. In the countries mentioned, are found so numerous herds of cattle and sheep, that they are slaughtered simply for the sake of their tallow and skins, while the flesh has no value on the spot and place, so that it serves as food for the ravenous birds and beasts of prey. According to the processes of dried and pressed greens, it is very probable that a person could prepare out of this flesh a valuable article of trade. How far this idea has already been carried into execution, we shall hereafter see.

The preservation of milk was for a long period an unsolved problem. For a short time, the development of fermentation, has been prevented by the lowering of the temperature; the vessels filled with milk were set in cold water, which was frequently renewed. In a further transportation, ice also was brought into use, or to keep it from souring, or, more correctly, to check the existing acid, there was added to the milk bi-carbonate of soda, in the proportion of five grains to one quart of milk. The wants of housekeeping were provided for, indeed, in this way, but it was an object to render the use of this important means of nutrition, accessible also to the seaman on his long and difficult voyages.

Nothing seemed better than to bring here into use, the Appert method; but it was very soon relinquished. Milk can, indeed, be preserved in this way from spoiling, but it suffers another change. In time, the fatty particles contained in the milk, are perfectly secreted on the surface; we have no longer milk, as a distribution anew of the fatty particles can not be effected. Braconnet, Grimoaud, Calais and Babinet, therefore, proposed to evaporate the milk with sugar into a syrup or a paste. This was tried by various persons on a large scale, but the success was uncertain, till, finally, Lignac removed all the difficulties out of the way. His conserve of milk already, in 1849, at the French Exhibition, drew the attention of the examining judges on many accounts towards it, so that they were moved to decree the silver medal to the exhibitor.

Lignac's method is simple and rational. He adds to a quart of milk, 3¾ oz. of sugar, and then evaporates it to the consistency of a thick syrup. About 60 per cent. of the water passes off in this way. The evaporation is carried on in large flat pans; the depth of the milk must not exceed five lines. The flat pans are warmed, by being set in hot water, and during the evaporation, the milk must be continually stirred with a wooden spatula, to prevent the formation of a scum. After the evaporation, the milk is filled into cylindrical tin boxes, which are soldered, and then exposed to a water bath for thirty minutes, at a temperature of 10 degrees, Centigrade. To secure this temperature, add to the water for every quart, 6¾ ozs. of salt and as much syrup.

When the milk is to be used, it is simply dissolved in the same quantity of water which it has lost by evaporation. A fluid is thus obtained which has all the properties of fresh milk; like this, it secretes the cream when at rest, as with fresh milk, it foams when boiled. Generally, the taste and smell are perfectly identical with those of fresh milk. When this fluid has been once boiled, it keeps a longer time than fresh milk. If the box is once opened, the evaporated milk contained in it will remain unchanged for at least fourteen days, and even a longer time, especially, if the precaution is used, in taking out the quantity necessary for use, always to restore again a new surface.

By command of the Minister of the Marine, experiments were instituted with this milk, at Toulon. The report upon it was on all points very favorable. Other experiments were tried with it in the hospital of the Dey at Algiers. Not only here this milk afforded with vermicelli, rice, and as a milk-porridge, food of a good condition and an agreeable taste, but it showed itself to be better than the fresh milk of Algiers. This last, almost always coagulated in boiling, while the former kept good for a long period. In time, it was evident that Lignac's milk was preferable to every other, and for this reason, the lords of the English admiralty were led to introduce this milk into the English fleet. In 1849, Lignac furnished for it 45,000 boxes.

For agriculture, the preservation of milk is of great interest, especially for those regions which lie far away from large cities. They may here, by it, be in a situation to derive from milk a much higher profit. It would be more profitable to evaporate the milk *in vacúo*, and so, in an apparatus like that in use in the sugar manufactories. The process might thus be finished in a shorter time, and the temperature might be a lower one, by which the advantage would be gained of preserving to the milk its agreeable taste unaltered.

Just as the exclusion of the air, and the evaporation of water, so does a lower temperature allow the preservation of food for a long time, without spoiling or losing its nutritious value. Every one acknowledges the preserving effect of ice. Game, fish, and other delicacies of the sea, are thus protected in the hot days of summer, by covering them with pieces of ice. The temperature is in this way lowered in their nearest vicinity to 2, 3 to 4 degrees Centigrade. In North America, famed for its ice trade, which particularly has its seat in Boston, and here alone, in 1847, 353 vessels were occupied, they use ice, in many ways, for the object mentioned, in their domestic husbandry.*

A temperature below cypher may preserve flesh for any length of time. Siberia affords a proof of this, where, not seldom, a perfectly preserved mammoth,—an antediluvian animal,—with the skin and flesh, has been found in the ice,—the flesh of which was so fresh, that the dogs eat it with an appetite. The ice cellars furnish similar evidenee; in the large cities,—the establishment of which causes no great expense,—they are already used in many ways by the butchers, to preserve the flesh in the heat of summer from spoiling. Generally, they seek an elevated place as a situation for an ice pit, and then lay the entrance higher than the pit itself looking towards the east or the north, also protected from the sun's rays. In order that the heat may penetrate but little into the pit, a long and crooked path leads to the entrance, which is provided with

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* The ice trade has very greatly increased since the date here given, and the details of its preparation for exportation, would be found most interesting, did our limits allow us to quote them at length.—Tr.

several doors. The walls of the pit are abundantly lined with bad conductors of heat, as bark, sedge, or straw, by which the entrance of the heat pressing in from the outside, is rendered more difficult. In order to prevent the effects of the melting ice, they lay drains to carry off the water. New receptacles for ice, called refrigerators, of various kinds, are placed above the ground. They are constructed of wood or of brick; the walls are double, and stand apart from each other. The space between them is likewise filled in with bad conductors of heat, as saw-dust, straw, charcoal, shavings, &c. Tan-bark, which has been moistened with water and then exposed to frost in the winter, likewise affords good service, as it requires a long time to thaw it. In some of these refrigerators, they make use of air-tight chambers between the doubled walls, as bad conductors of heat.

Salt and sugar, ardent spirits and vinegar, those great antiseptics, which only, for a long time, have constituted the material for the art of preserving, are most generally used in domestic economy, but they no longer answer for the greater wants of national intercourse. Luxury, too, which is always more developed, already makes other claims. The ease of reciprocal intercourse of the nations; the ever-extending navigation, and the increasing trade in consequence of it, has removed the contrarieties of summer and winter and north and south; it allows us easily to obtain the productions of another clime and season, since the progress of chemistry, in modern times, has afforded the means of gratifying the growing necessities. How far the just-now mentioned methods of the preservation of food contained in flesh and blood has come into the every-day intercourse, the great exhibitions at London, Munich and Paris, have taught us. Let us cast a glance at the two last, for we can speak of them as an eye-witness.

In Munich, the number of exhibitors was but small. The food preserved after Appert's method, had not received the approbation of our housekeepers; salted meat here still maintains itself in its former favor, and this from choice serves for the victualing of ships, or as articles of export across the ocean. Therefore, these objects were especially sent to the Munich Exhibition from Hamburg and Lubec, where the new branch of industry had already acquired some importance. The meats of Mulsow & Co., in Hamburg, received particular approval; this firm, as well as Brand & Co. and D. A. Carstens, in Lubec, obtained the medals, and K. Hahn & Co., in Lubec, a commendatory notice.

The dried and pressed greens from Frankfort-on-the-Maine, though a considerable selection of them were prepared according to the rules of cookery, by no means corresponded to the expectations of the testing committee. According to their expression, the greens were, in part, hard and woody, and the yellow turnips and the cauliflowers, &c., had a discolored appearance, and, in part, had a hay taste.

The yellow turnips and spinage, of Carstens, from Lubec, were better. But in a note to his report, the referee, Prof. Stein, of Dresden, admits that later occasion was presented to him, of instituting further experiments with the Frankfort pressed greens, which turned out far more favorable than those in Munich. A similar judgment was also reported by another member of the testing committee. The unfavorable opinion, according to the statement of the manufacturer, was caused by the fact, that the small kinds of the former year, had been sent to the exhibition at Munich. We, ourselves, in the previous years, when we were, at repeated times, for a while in Frankfort, took with us a large selection of the pressed greens, which obtained applause in the circle of our acquaintances. But we will remark, that the period of time given for soaking in order to change them, is much too short; if the directions are closely followed, the adverse judgments are easily to be explained.

The Frankfort pressed greens deserve a wide extension, as well as manufacture and imitation in our great and blessed country. We believe we shall render a service to the German housekeepers by transcribing the following items from the price-current of the Frankfort manufactory, and, together with the German prices, set down also the French ones of the large manufactory of Chollet and Company. Every cake of the Frankfort pressed greens furnishes five portions.

Greens.		Frankfort.	Paris.*
Apples,	per portion,	1.8 kr.= 6.18 pfg.	
Cauliflowers,	"	7.2 " =24.69 "	20c.=19.20 pfg.
Succory,	"	5.2 " =17.83 "	15c.=14.40 "
Endives,	"	3.5 " =12.00 "	
Julienne, or Rocket,	"	3.5 " =12.00 "	6c.= 5.76 "
Early Cabbage,	"	3.5 " =12.00 "	
Yellow Turnips,	"	3.0 " =10.22 "	5c.= 4.80 "
Kohl Rabi,	"	3.5 " =12.00 "	
Curled Cabbage,	"	3.5 " =12.00 "	
Plucked Asparagus,	"	6.0 " =20.57 "	37c.=35.52 "
Plucked Peas, I.,	"	14.5 " =49.71 "	
" " II.,	"	9.6 " =32.91 "	30c.=28.80 "
Roman Cabbage,	"	4.8 " 16.46 "	
Rose "	"	6.0 " 20.57 "	15c.=14.40 "
Red "	"	3.5 " 12.00 "	
Red Turnips,	"	3.5 " 12.00 "	5c.= 4.80 "
Celery,	"	3.5 " 12.00 "	
Cut Beans,	"	4.4 " 15.09 "	18c. 17.28 "
Scorzonera,	"	4.8 " 16.46 "	
Spinage,	"	3.5 " 12.00 "	10c. 9.6 "
White Cabbage,	"	3.0 " 10.22 "	5c. 4.8 "
White Turnips,	"	3.0 " 10.22 "	5c. 4.8 "
Wirsing Cabbage,	"	3.2 " 10.97 "	
Sugar Peas,	"	4.4 " 15.09 "	
Damsons,	"	2.0 " 6.86 "	
Feld Kost,†	"	1.71 " 5.88 "	

By taking 250 port. at Frankfort, per port. 1.52 kr.=4.33 pfg.

Pod Fruits.			Frankfort.
Yellow Pea Soup,	at	per portion,	2.0 kr=6.86 pfg.
White Bean	"	"	2.0 " 6.86 "
Lentile,	"	"	2.0 " 6.86 "

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* The portion of dried greens weighs, in Paris, 12.5 grammes=0.85 loth, or ½ oz.; of potatoes, 33 grammes=2.258 loth, or 1¼ oz.

† A dish of Wirsing cabbage, white turnips, peas, beans and potatoes, so fine tasting and nutritious, that is especially to be recommended for sustenance of the masses.

Potatoes.			Frankfort.		Paris.
Potato groats,	at per portion,		1.4 kr.=4.8 pfg		
Potato flour,	"	"	2.0 "	6.8 "	
Potatoes sliced,	"	"	2.4 "	8.23 "	5c.=4.8 pfg.
Potato dumplings,	"	"	2.4 "	8.23 "	

The Industrial Palace, at Paris, presented a complete and magnificent exhibition of all the known kinds of food preserved, and in this, France exceeded all. The French Division numbered not less than fifty-three exhibitors, of whom twenty-one appeared with dry or preserved greens. This rich display of greens instructs us what an important place these hold in France. Whoever is familiar with this country, knows that many words of compliment and of abuse to an extent seen in no other language, are borrowed from the vegetable kingdom. Thus, for instance, there are *cornichon*, pickled gherkin, a favorite jocose, but yet very strongly abusive word, and *mon petit chou*, my little cabbage, a very delicate word of flattery. This usage enters into the designation of him who is named in the German language, "ein grossen thier," a great beast; and for it the Parisian *gamin*, has no other expression, than "*au gross lègume*," a great vegetable.*

Among the French manufacturers of greens, Chollet & Co., who prepare their articles according to Masson's method, and Morel, Fatio & Co., who use Gannal's process, were specially prominent.

* The somewhat similar word of burlesque or sportive abuse, "small potatoes," in use in this country, will, no doubt, occur to the reader.—Tr.

Their greens looked particularly inviting, and possessed a spicy, fragrant flavor. The former house furnish, every year, whole cargoes of greens to the French navy and army, whose provisioning is thus essentially improved. During the corresponding season, in twenty-four hours, towards 100 cwt. of fresh greens were here worked up; in the selection, there were about 24 cwt. rejected, and the remainder contracted, after drying, to less than 11 cwt. The drying out required, daily, $9\frac{3}{4}$ cwt. of hard coal, in order to heat the air; besides there were, daily, almost 3 cwt. of hard coal required for the production of steam, by which the hydraulic presses were set in motion. The refuse was sold as cow-feed. The house of Morel, Fatio & Co., in 1853, prepared above 12,000 cwt. of greens. The next year, the manufactory in Paris, was considerably enlarged, and one as large, besides, erected at Mano. In the Industrial palace, Morel, Fatio & Co. appeared as partners of the firm of Chollot & Co.

The preservation of flesh was here represented in every respect in the French Division. Nigh to whole mountains of boxes *a la Appert*, we found also dried flesh, and besides yet many methods exhibited, of which we have made no mention. Thus, for example, we observed in one compartment, flesh which had as entirely the appearance of fresh, as if it had been hung up in the morning—a mutton chop, a sole, a half of a calf, a snipe, although the hunt was not yet opened. But the flesh was not fresh;

the appearance only deceived us, for a card stated, that the snipe was shot on the 2d of February, and therefore almost a half a year before, and the other pieces in part, bore yet older dates. On more close inspection, it appeared that the flesh was furnished with a coating of wax, by which the access of the air was prevented. But this method is not new; we find it already described in Herodotus. Warrington proposed a similar process formerly, in order to preserve the flesh of buffaloes in the American wilds, which is wasted in the place where they are killed, for transportation to Europe. He would cover the flesh with a coat of gypsum, and this was to be afterwards dipped into grease.

Horse flesh too, was worthy of notice, being exhibited as preserved by powerful means, in the various stages of putrefaction, and ox flesh which was surrounded with a gelatinous coating, drawn from the flesh itself, and that bore the name of *conservatine*. Under the name of "*Societé génerale de conservation des viandes*," an Association has been formed with large means, to make this new method a source of gain. We have received more accurate conclusions respecting the peculiarities of this process by means of the experiments which were carried on in July of last year, under the eye of a committee that made a report on the subject to the Minister of War.

The four quarters of an ox which has been slaughtered in the usual way, are to be cut into pieces of which the smallest weigh four lbs., the largest ten lbs. In dividing them, they remove the bones, and take precaution carefully to loosen the masses of muscle, and without unnecessarily doing them injury. This last circumstance is of the greatest importance; hence, they guard well against cutting needlessly into the flesh, and endeavor, especially, to keep the surface of the pieces as smooth and uniform as possible. Farther, they remove carefully the fat, and the blood vessels which do not penetrate into the flesh, and generally open all the cavities on which they strike. Thus they seek to avoid the gathering of air any where in the flesh, which might help it to spoil. At the same time they lay aside whatever may serve for the preparation of the conservatine, that is, the bones, which are freed from the marrow, and then broken into small pieces, the tail and little cuttings of refuse, especially the sinewy flesh and the neck.

About 60.10 per cent. of the weight of the ox is destined for preservation, and the loss amounts to 0.57 per cent. During the boiling and roasting of those pieces which are destined to be preserved, the conservatine is prepared. All those parts which have been laid aside for this purpose, are placed, with a quart of water to a pound, in a kettle over a lively fire, in order that the water may be made to boil quickly. Then the fire is moderated, the fluid skimmed off and set aside, and after twelve hours, poured through a sieve. The pieces which remain after this, and in the kettle, are put under the press in order to press out the juice as much as possible. The fluids thus strained and pressed out, are mixed together, purified anew by filtering, and then again evaporated under a continual stirring, with a moderate fire, to the consistency of syrup. Then follows an addition of gum Arabic and sugar. After the fluid has cooled off to 35 deg. Cent., a quart of alcohol at 85 deg. to every fifty pounds of the fluid is mixed in. Now, the conservatine—a sort of jelly—is prepared and ready. Every piece of flesh is dipped all over in the conservatine, which has a temperature of 35 deg. Cent., and then till the following day, when the operation is repeated, hung up in the air. The exhibitor said that the flesh which was wholly covered witht he protecting jelly, had kept at least a year. If any one wishes to use the meat so prepared, it is simply dipped a short time in water that is warm enough to dissolve the jelly. If the flesh is raw, it is prepared as fresh meat; if it has been boiled or roasted, it can be eaten at once after it has been sufficiently warmed.

Time will teach us what value we may attribute to this method. By order of the Minister of War, experiments are now going on in France which will inform us what we are to think of this new process. In the mean time, the result of an experiment which was made in April, of last year, has been published. A raw shoulder of an ox ninety-six pounds weight, was cut in slices after six months, before various witnesses. The flesh had preserved its natural color; the muscular fiber was very elastic. Fat, bones and marrow appeared exactly as in a fresh slaughtered beast. A piece of the flesh from it was prepared as a beefsteak; and it was found excellent. A competent judge—a well known epicure—praised the juicy taste of this beefsteak, and likewise the agreeable smell of the raw flesh.

Should the future furnish equally successful results, it is not to be denied that in this new method we see a decided advance in the preservation of food. With the same success, it can be applied to fish, game, fowls, greens, fruits, &c. The burdensome use of boxes is thus wholly dispensed with; the food coated with the jelly, in transportation may be simply packed in chests without fear of its spoiling. The expenses of this method are not very large, because all the parts of the animal are used. Even the flesh that has been pressed out, the refuse in the preparation of the conservatine, can always be sold at a moderate price to the manufacturers of sausages and to meat houses.

To the Paris Industrial Exhibition there were also brought specimens of another method, which on the supposition that it was all it was boasted to be, and should thus be proved hereafter, was looked upon in general as a wonder, and indeed, as the greatest wonder among the wonderful things of industy exhibited. Lamy, a short time before, a manfacturer at Clermont-Ferrand, but now Professor of the University, preserved even those substances which most easily spoil in their natural state, without drying, boiling or pressing them, without shutting them up hermetically, or covering them with a protecting coating. It is said that this new method has not been discovered by accident, but that only pure scientific principles were brought into use. Lamy has not yet published his secret, but two of the chief operations he uses are known.

One consists in coagulating the albuminous substances by which usually the corruption is introduced, and in the use of a gas. In many cases, it is sufficient to let the operation of the gas continue some days, in order to protect the substances for a long time from spoiling. In certain substances, as in game, fruits and greens, the first operation is perfected by another. This latter has for its object to remove from the atmosphere which surrounds the substances, its oxygen, without which corruption can not commence. This removal is effected by certain salts, but which in no wise come in contact with the food, and therefore also, can exert no injurious effect on them. The two main principles which it brings into use, therefore, are to arrest the exciters of corruption, and remove the free oxygen.

Lamy, exhibited numerous specimens which were adapted to excite wonder. We saw two shoulders of mutton, of which the one already for five, the other ten years, had withstood corrupton, although both of them were hung up in the open air, and protected by no coating against the effect of the heat and other injurious influences.

Further, there was to be seen a splendid roebuck that had already been preserved for two years, a salmon, a pike and a turbot, all of which seemed destined to figure on a festive occasion at a splendid banquet. Fowls were preserved with their entrails and feathers; grapes, apricots, cherries, plums, pears, oranges and truffles had perfectly the appearance of fresh ones. Cauliflowers were the most deceptively like in aspect to fresh. Various articles of this kind on the Emperor's table, received great applause. A Parisian fruit-merchant during the whole of the winter before, sold apricots and cherries which had been preserved according to Lamy's method, at 1 to $1\frac{1}{4}$ francs apiece. Lamy stated, that red beets, whole or sliced, beet juice, and even yeast, could be preserved with equal success.

It appears that this mode of preservation requires only a trifling cost; ten centimes, not one silver groschen, (two to three cents,) will preserve one lb. of flesh, and one guilder, (eighty cents,) 2,000 lbs. of beet roots from spoiling. Should all this be established, Lamy's method may justly be regarded as the greatest wonder of the Paris Exhibition. It is comparatively a small matter to preserve food here from one year to another; decidedly of prime importance is the ease with which the food can be prepared without loss, where it is in excess and cheap, and transported where there is a deficiency, and hence is very dear. There are, as we have seen, countries on the wide globe which are richly blessed with a superfluity. Whole mountain loads of flesh are there which is suitable to give strength and support to the hungry in Europe, enfeebled by age, who no more seems to be able to feed her children. Could this flesh be preserved easily and without great expense, there is no doubt, that it would find a profitable market with us, to the great advantage of the poor classes. The same is the case with respect to vegetables.

Experiments for carrying out the ideas just developed, have already been made, especially in America. The attention which has lately been turned again to the solution of this problem, so important especially to the poorer classes, and on which reflecting minds have been earnestly engaged for centuries, certainly belongs to the characteristic peculiarities of the Paris Exhibition. We are only doing an act of justice, when we confess that France leads the way in this enterprise of useful industry. How very much we have cause also, to follow this honorable example, the picture of a subaltern officer of ONCE and NOW, teaches us, by which the Kladderadatsch (the German Punch) has set all to laughing.

We can not quit the French division in the Paris Industrial Exhibition, without noticing, somewhat in detail, the Bouillon cakes and flesh-biscuit. The former have also, and jnstly so, become of poor repute, because on their being dissolved in water, for the most part, they have not the slightest resemblance to flesh-broth. But still the so-called soup-cakes appear even now to play a great part in France.

Meat-broth is one of the most important means of nutrition, as its numerous ingredients contain all that is requisite for the formation of flesh. Its restorative power is acknowledged, especially among the sick at the period of convalescence; here it can be replaced by nothing. For the sustenance of the masses, concentrated meat-broth can only become important when it is afforded suitably manufactured in regions where flesh exists in great quantities. In different places, for example, in Australia, the best beef costs hardly 5.14, pfg., (about one cent) per lb. The means for providing it is very simple. Half an hour's boiling of the finely chopped meat with eight to ten times the quantity of water, is entirely sufficient to draw out of the flesh all the ingredients that are important for nutrition. Before the further evaporation of the meat-broths, it is absolutely necessary that the fat should be carefully removed by skimming off; otherwise the fat easily becomes rancid, and thus the manufacture is wholly useless. The evaporation of meat-broth until it stands by to cool, must be conducted by a gentle fire and as the best way, in a water bath.

Long before Liebig's standard scientific experiments respecting flesh and its preparation as food, the importance of flesh for nutriment was acknowledged. Especially the French physicians and chemists, as particularly Parmentier and Proust, with affecting words, pointed to the benefits which evaporated meat-broth might afford the sick, particularly wounded soldiers. The endeavors of these noble men succeeded in causing that in various places where the conditions were favorable, experiments should be made to introduce this new branch of industry. The so-called "portable soup," came into trade in the form of cakes, but it did not at all correspond to excited expectations, because the principles of the preparation were defective. The price also was much too dear.

First, through Liebig, in 1847, we obtained accurate knowledge of the elements of flesh, and thus, too, we learned the reason of the efficacy of meat-broths. Before this, there was another view respecting it, but one which proved utterly erroneous. In the preparation of meat-broth on the large scale, a property wholly peculiar was soon observed; the existence in a certain concentration produced by the glue which by the continued boiling of the flesh was formed of the tendonous tissue of the muscles. This substance was regarded as the principal vehicle of nutritiousness, and soon they wholly ceased to prepare the "portable soup" from flesh, as the tendons, feet, cartilage and bones, else almost worthless, afforded a much better jelly. The gain for the manufacturers was at the same time much greater, but the consumer fared badly by it; instead of meat-soup, he bought glue that differed from the common joining glue of the cabinet-makers in nothing else than the enormous price.

In France, it was believed that gelatine—the objectionable name "glue," they had banished—was called upon to play a great part for the welfare of suffering humanity. In order to give a firm foundation for the doctrines of the new gospel, they concluded immediately to substitute for meat, in the great hospital of St. Louis, at Paris, broth of one-half quantity of bone jelly. Soon they had occasion to observe that the jelly was no ways nutritious; but as the proprietors of manufactories who in France prepared bone and other rejected portions into jelly, maintained with bold front the opposite, the French Academy were induced to bring this question into the circle of their investigations. After a ten year's conflict, finally the so-called gelatine committee, which consisted of the most celebrated chemists (Thenard, d'Arcet, Dumas) and physicians, and met under the presidency of Magendie, handed in a report to the Academy on the 20th of August, 1841, which occupied seventy-eight pages in the *Révue Medicale*. The conclusion to which they came was decidedly unfavorable to the jelly; they utterly denied to it capacity for nutrition. Dogs which were fed with it died rather than take the offered food; even rats which so greedily fall upon everything, left this food untouched. In itself, the jelly was tasteless, and excited disgust in eating it. Even when it was mixed with strong meat-broth, the result was in no respect more favorable. At a later period, for the first time, could this damnatory judgment, given from experiments, be scientifically established. The glue which otherwise is contained in only a very little quantity in real meat-broth, (two parts in one thousand,) contributes not at all to nutrition; far more, the eating of it is injurious, as is proved by multiplied experiments. The chemical nature of the glue furnishes a conclusion respecting it. Glue contains nitrogen, even 18 per cent., therefore more than the protein-substances so important to nutrition. And yet the former can not be substituted for the latter; glue, in general, hardly ever exists as such, in animal bodies, but first originates by means of continued boiling by a fire, from the tissue which hence thus bears the name of the glue-producing tissue. Though it is scarcely to be questioned that this tissue which plays a very important part in animal bodies, arises from protein-substances, yet it is as well-established, that the glue is not capable of forming protein-substances in animal bodies. Just as little is glue capable of supplying the means of nutrition that are free from nitrogen. It does not disappear as do these, without a trace in the animal bodies, but overloads the blood, the universal nutritious fluid, (and which contains no glue-yielding substances at all,) with nitrogenous combinations, that exert a directly disturbing influence.

Against the conclusion of the Academy, the French manufacturers rose up with all their might; they inscribed on their banner the entirely false sentence, "Glue bears the same relation to gelatine, as dried up flesh does to fresh." Lainé, especially, came out against the report of the Academy. He appealed to the fact that for fifteen years he had furnished gelatin-cakes to the fleet and the army, as also to the expeditions to Morea and Algiers, and that these cakes had found applause, as well of the generals and officers, as of the soldiers. But he did not here reflect, that the jelly in these cases was in no wise given out as the exclusive, or even the chief means of nutrition, and on this account, the injurious effects could not so much fall under view. The Exhibition teaches us that the endeavor of the French manufacturers to turn off from themselves the prejudicial influence of the report was not wholly without success. Not only has this branch of industry gained a firmer foothold beyond France, but it also appears that even the scientific world are in doubt as to the assertions of that report. It is completely established, that the glue is not in a condition to replace permanently, the protein-substances. But on the other side, it is believed, that they go too far in denying to glue any value as a means of nutrition. It is regarded as probable, that the jelly may, especially, be useful to re-convalescents, yielding a substitute for the glue-producing tissue that has been used up, and so indirectly limits the use of protein-substances from which that tissue would otherwise be formed.

But it is not hence said, that all soup-cakes consist of glue. In Russia, especially, they prepare such as satisfy all the requisitions. The broth made of them has no disagreeable smell and taste, and especially when used with greens, affords a very nutritious food.

A wholly different kind of soup-cakes were exhibited by a company which made it their object to realize a profit on the great abundance of flesh of South America, for Europe. These cakes consist of fresh meat and greens both dried. The flesh has lost none of its nutritious value by the action of the water and fire, and for this reason these cakes are very well adapted to afford a nutritious dish.

Already, at the London Exhibition, the meat-biscuit of Gail Bordon, attracted the greatest attention. They resembled much the usual ship-biscuit in outward appearance; but they combined meat and flour in the simplest and cheapest form that could be imagined. First, there is prepared from meat a broth, and this is evaporated by a gentle heat to the consistency of syrup; then the flour, in sufficient qnantities, forms a dough from which the biscuit are made. Their surface is perforated with a pointed instrument, and then they are placed in the oven to dry.

The meat-biscuit can be easily transported and may be kept for a long time. They attract indeed, some moisture from the air, but still in so slight a degree that they do not mold. They were carried, for example, on a voyage from New York to China and back, without any change being perceptible. Another specimen had been preserved for a year in a bag without experiencing the slightest decomposition. Furnished with a small supply of meat-biscuit, one can now traverse the immense wild solitudes of Texas and other parts of the New World with safety. We need hear no more now of the great sufferings to which the caravans of travelers, for weeks and months destitute of intercourse with men in the inhospitable regions, so frequently fall victims, in consequence of the want of food. It has already been introduced into the American navy.

In the short space of half an hour, the meat-biscuit with from twenty to thirty times more water, to which a little salt and some spice is added, by boiling, yields an excellent and nutritious food, which possesses the characteristic taste of fresh meat. An ounce of this meat-biscuit is sufficient for a meal. According to the expression of the London jury, a pound of this biscuit contains the nutritious substance of five pounds of the best beef mixed with one half a pound of flour. Ten pounds of this biscuit would be sufficient to keep up not only the sound health for a month, of one man, but also the strength of a laborer.

In France, too, the manufacture of meat-biscuit has already been imitated. We had opportunity to observe that meat-biscuit is a common means of provision among the French on voyages. The composition of the French meat-biscuit is different from that of the American; it contains flour, meat in substance, (boiled,) and the inseparable greens. Eight and a half ounces of this biscuit which contains seventeen per cent. of dried meat, gives six portions.

The French Division formed the principal rooms for food at the Paris Exhibition. Of seventy-five European exhibitors, fifty-three, as we have already metioned, were from France. Further, Germany furnished six; Pfaff, inDamstadt, Boehm, in Wurtzburg, Bouillon and Milk: Carstens, in Lubec, Mulsow & Co., and Neuenschwender, in Hamburg—the last displayed milk; Luxemburg, one; England, five; Holland, four; Portugal, three; Belgium, Demark, potatoes and greens; Norway and Tuscany, each one. The other parts of the world were also repesented; Australia and Canada, each three; Martinique, one—Milk; Algiers one—meat-biscuit. C. Dastre, from Cape Town had exported a fine display of boxes, which concealed inside sheep's kidneys, boiled beef and veal. Many of the tropical islands had already undertaken to realize what we have mentioned above—to feed with the crumbs that fall from their richly-set tables, hungering Europe.

In France, this branch of industry has been fostered for years, and for this reason, the important development it has made, need not be wondered at. Especially for luxuries, there has already been secured an extended market; in all the regions of the world they are already known, and find willing customers. The French Exhibition of 1849, presented a rich selection of the most various manufactures, though indeed some of them appeared to be more as aids to the art of cooking, than special articles of business. The meats for food, according to Appert's method, were not then exclusively employed in the navy; their use had already become common. Especially was this the case with delicacies, as game, greens and fruits. A different price only was desirable; the condition of the food itself was excellent.

The extraordinary scarcity of the last year, brought the necessities of the poor in a lively manner before the view. Much has been spoken and written on the causes of this scarcity. The most various opinions respecting it have been published. And yet we may say, that in the discussion of this question of the highest importance to the life and welfare of the nations, it has been entered into but superficially. The existence of the necessity no one can deny. It however did but little in lessening it, to have proved that the laboring class in former times were yet worse than at the present day. This may be; but in the waste of their words of comfort, it has been forgotten that in consequence of the advance of civilization, the demands which the laborers of the present day make on social life, were not known to this class centuries ago. As little consolation does it give to point to the extraordinary advances which agriculture has made within the last thirty years. The omnipotence of speculation and commerce to which the appeal is so often complacently made, is wholly dashed to pieces by many great and small accidents. Of as deeply affecting results as the extraordinary scarcity of the bread fruits, is on the other hand, again, their unusual cheapness. But now, the consideration of a long period, shows that these extremes on both sides, form not the exception but the rule. Hence the inquiry how to meet it, belongs to the greatest and most important problems which the reflective spirit of man can undertake to solve.

The two greatest monarchs of the last century were deeply penetrated by the seriousness of this question, and sought to obtain a solution by means which their times furnished. Some weeks after his mounting the throne, Frederick II. wrote to Voltaire, that the increase of the welfare of his people engaged all his anxious care. This great spirit did not rest satisfied with words only; he proceeded also, immediately to action, and carried into execution a measure which gained him great fame. He determined to erect in every province of his State, magazines of grain, and with such comprehensive stores, that they might feed the whole collective population for one and a half years. To give vitality to this work, he needed immense sums, and these Frederick II. provided for without endangering thereby other far-reaching plans.

Thus, Frederick II. made himself the regulator of the price of bread; he had the grain market wholly in his own hands; for he possessed the power to aid as well in the greatest scarcity as in an equally injurious one of the too great cheapness of the grain. To secure the welfare of his people, he established a highest as well as a lowest price of grain. If in times of scarcity the market price reached above the maximum, then the granaries were thrown open for consumers. In the case of the reverse, in times of excess, when the market price sunk below the minimum, and thus there was danger that the too great cheapness might ruin the husbandman, the State-magazines offered to the producer sure protection. If he could not get rid of his crops in the market at the lowest price established by the State, then he furnished them at that price to the king's granaries.

The idea of this beneficial arrangement is, indeed, most simple, but it is again so great, that it, of itself, proclaimed loudly the deep spirit of this admirable man. The advantage which the energetic prosecution of this measure afforded to the Prussian people, was so evident, that the noble Joseph II., who was eager to share in the illustrious fame of his great neighbor, sought to tread in the same path. Not formed to follow Frederick II. in his glorious career of the fame of his arms, he made the welfare of his people the object of his life. In an edict of 9th of June, 1788, Joseph II. commanded that every subject cultivating the soil, of the four kinds of grain which he raised, after deducting the seed-corn, should carry the third part of the amount of seed-corn needed for otherwise defraying the winter and summer seeding, to the granaries of the parish, and continue this contribution for three years, in order that, in every province, on every estate, and in every provincial city, stores might be brought in large enough to cover the winter and summer seeding for one year. These stores were to serve for the purpose of sustaining the needy husbandman in case of necessity, and so protect him against want and suffering. First, the excess should be applied to the support of others suffering from want. Where this edict was obeyed, it fully proved of the greatest advantage. But in spite of all repetitions and greater stringencies of the command, it did not succeed even to the latest period, in securing admission and obedience in all places. As a reason of this, the government assigns the indolence of the subordinate officers, which they could not change, notwithstanding all their admonitions and detailed instructions. Good-will can not be supplied at any time by command and compulsion. But, by itself, this regulation was only a half-way measure, which had in it much that was hateful. The name even, "Contribution-grain," was, of itself, a very displeasing one.

In our day, the question has become more and more urgent, from year to year, especially, as in the course of time, divers beneficial arrangements of patriarchal antiquity have disappeared. The otherwise so rich sources of aids in years of scarcity, the income of nature garnered up, which dispensed upon the market in the times of want, in many ways, afforded relief, have become more and more exhausted since persons have begun to convert the income of their crops into cash. Hence, the solution of this question becomes continually more prominent; already, the policy of self-preservation urges us to remove the difficulties which every day assume a more threatening aspect. To Frederick alone belongs the honor of having shown, that the problem is not incapable of being solved. The demand of the future is unavoidable; the hour is certainly not far off in which this question will most seriously require a solution. But the times now are different from the days of Frederick II., and on this account, so must be the means. The people still look in years of necessity, confidingly, to the governments; hence they expect relief, while the means of the State are entirely insufficient to afford the aid. In the year of scarcity of 1817, the French government expended almost eighteen and three-fourths millions of thalers ($15,000,000) in the purchase of grain, and they could thus provide the country with bread for only eight days. "Help yourself and God will help you!" is also said here. It is the voluntary association of all, only, which can cause the need to disappear. Many things have been done in our day to reach this end; but the beginning is yet very small.

The Savings associations, and funds for the sick, the soup-establishments and similar plans, exist more in cities, but like drops, which disappear without a trace in the ocean. The main object, is the gathering up of the crops in the time of abundance, and their preservation for the year of want. This question has been discussed in very many ways within the last years; but until now, it has been preached in deaf ears.

First of all, it is absolutely necessary to become convinced that as in respect to the common mode, salting of flesh, so too, the usual method of preserving grain on floored rooms, is precisely the least to be recommended. Here, indeed, the disposition of man comes to our aid; but leaving himself to this, a person too often neglects the necessary precaution. If any one consider the rooms which usually serve for the laying up of stores of grain, the greatest defects are at once obvious. The board-flooring offer in the thousand unevennesses, joints and hollows, the surest loop-holes to insects for the propagation of their young. The roofs, of unequal thickness, allow numerous passages for rain and snow. Further, little care is taken to keep off fowls, rats and mice from the stores. Attention is rarely paid to a sufficient ventilation, or again, the rain and snow are suffered to have free entrance through the opened hatchways and windows. In this way, your large heaps are exposed to ruin, more than any one would imagine. Besides, this method of preservation demands the greatest precaution. The heaps of grain must often be shaken up, especially in sultry and hot days, to protect it from fermentation, and the ravage of the grain-worm. By this labor, the grain is rendered dearer. If, now, we reckon the further loss by fire,—and immediately after the harvest, these are most frequent in the country,—it will be evident to every one, that a great quantity is lost from the blessing of the land, year after year, without being of any benefit to man.

The stores of grain are best preserved by the perfect exclusion of the atmospheric air; then no repeated shaking of it up is necessary; losses by conflagrations, as well as by mice, rats and insects, are impossible. Generally, the grain will keep much longer and better in this way, than in the usual magazines. Here, again, we may go to school to the ancients. Already, Pliny and Curtins Rufus, relate, that in the granaries of that time, which, alas! are mostly dried up for us, especially in Asia and Africa, in Cappadocia, France, and even in Spain,—they preserved the rich supplies in subterraneous pits. These were called Siri's or Silo's. Pliny boasts of them, that they would preserve grain, in the ear, unhurt, for fifty, and, indeed, one hundred years. Such pits, according to the assertion of Tacitus, were also in use among our German ancestors. Even to-day, we find them in the countries of the South, in Hungary, Sicily, France, Spain, &c., of various sorts; among us, in the course of time, they have grown out of use, and therewith has vanished also the passage of Tacitus,—*de moribus Germaniae Chap* 16,—from the memories of many. For when, recently, these best methods for the preservation of grain were again proposed, they were generally resisted, on the ground that such arrangements were practicable only in warmer regions, but not in our country, as here the rougher circumstances of the climate would be too unfavorable. But this pre-judgment has long been contradicted by practice, though without the Silos having found a more extended introduction.

Having shown how excellently flesh can be kept by total exclusion from the air, it is needless to waste many words further respecting the application of this method to grain. We know that the atmospheric air hastens the decomposition of all organic substances, and that insects of every kind are attracted, and very much favored in their development, by nothing more than by this process of decomposition. The old proverb says, "one evil seldom comes alone." If the assertion of Pliny goes for nothing, yet modern times afford us still more striking examples. There have been found in Egyptian mummies, grains of wheat which, sown in the ground, have perfectly developed themselves. These grains, therefore, have thus, for thousands of years, preserved their germinating power, most perfectly, just because, during the whole time, they were without contact with the atmospheric air.

But the experiments, too, which have been instituted in Austria, show that the preservation in Silos is precisely the cheapest, and, as is usually the case, the now universally adopted method, is the dearest. If, for instance, for a definite quantity of grain, we put—

The cost of preservation in Silos at 100, then the preservation of the same amount in grain-towers, according to Sinclair, reaches to 140.

The preservation of the same in Vallery's grain-cylinders to 212.33, and,

In the usual cribs, including the shoveling of it about, almost to 277.78.

Still more solidly are all the prejudices which are prevalent among us against Silos, contradicted by the Mansfeld Cupriferious Slate-Mining Company. This mining company has the reputation of providing for the welfare of their workmen, in such a way as scarcely exists in any other industrial company. Among other things, they have hit upon the arrangement, deserving of all praise, of providing their laborers in time of necessity, with bread; and, indeed, at a far lower price than it commands at the time in the market. For this object, the company have for twenty years made use of Silos. Here we may learn how such repositories are constructed.

First, the ground for the site is carefully selected; it must be dry, and protected from overflows. The most appropriate soil for this, is a water-tight loam, free from sand. In this, is dug out a cylindrical pit of 16 feet diameter, and 31 feet depth, which space is suited for the reception of 100 to 120 wispels,* (probably about 3,750 to 4,500 bushels.) If the

* The wispel varies in different parts of Germany from 30 up to 70 bushels. As the particular country of this writer is not known, it

loam is very binding, it needs no wood-structure; but it is to be protected against the rain by an easily built cover. Then the pit is walled up. In the Mansfeld, this is done by slag from the surrounding mines, and gypsum, which is mixed with coal-tar. In other places, well-glazed bricks and hydraulic-lime will serve the same purpose. If the bottom has been paved in this way, the walls are carried up 13½ feet diameter in the clear, and 16½ feet perpendicular. The space between the ground and the wall is filled in with dry loam, carefully stamped down tight. Then the wall is built above with a semicircular dome of 6½ feet high, from common slag; this, at the top, has an opening of 2½ feet wide, and on this, finally, is raised the neck, 5 feet high. The dome and neck are likewise surrounded with dry loam firmly pounded down. The first cost of construction of a Silo of the above given dimensions, among the Friedeberg mines does not usually amount to 100 thalers, (about $80.)

If the ground is less favorable, every danger threatening moisture is removed, by surrounding the space immediately containing the grain, at a distance of 1–2 foot, with a second wall, and the space between is pounded down tight with clay. Further, the mason-work in the interior of the pit, is all coated with asphalt, so that the penetration of

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is impossible to give the precise amount in English. If the usual one of grain is taken, a wispel will be about 37½ bushels, and the capacity would be as indicated above.—Tr.

moisture is wholly impossible. Besides, in the construction of the Silos, it must, at the same time, be observed, that the depth be that to which the greatest variations of temperature of the air do not extend. If the mouth lies below six feet, the grain is no longer exposed to the influences of the outward heat, and at this depth it is also perfectly secured from the frost. If an addition is made, and a shed is built over the Silo, then there is not the slightest reason to fear the moisture, warmth and cold. Planting of trees near Silos, is not to be recommended.

In the filling up of a Silo, the following measures of precaution are observed in the Mansfeld ones.

First, there is maintained in the pit for several days, a moderate coal-fire, in order to remove every trace of moisture. The pouring in takes place at intervals, so that the grain may lie perfectly level. For this, some weeks are needed, and fine, dry weather is to be chosen. It is, of course, understood that the grain must be well-dried. When the pit is filled up to the neck, then there is spread upon the surface of the grain, a layer of dry, long straw, and on this, there is put dry loam up to the opening of the mouth, which is firmly pounded down. Lastly, the opening is shut with a closely-fitting stone, and this again is covered up to the surface of the ground with loam.

In other places, they lay the bottom all over abundantly with dry straw or chaff, and pour upon it two to three inches of fresh burned lime. Over this is spread a coarse linen cloth, in such a manner that it rises somewhat on the sides, in order to render easier the laying of dry straw and burnt lime. As the grain in pouring in rises on the side-walls, these are further laid with straw and lime, which are both held fast by the pressure of the grain. The layer of straw and lime serves for the reception of the moisture from the grain; thus the moulding and dampness of the fruit are prevented. In the Mansfeld Silos this does not seem to have occurred; on this account, here the moisture was attracted to the uppermost layer of the grain, and that lying immediately next to the encircling walls, which were more or less spoiled, according to the duration of the preservation. But the loss was of no great consequence; varying from only 0.75 to 1.5 per cent., and this refuse, for the most part, was yet of some value as cow-feed.

In the Silos of the Mansfeld Mining Company, they have preserved grain, uninjured, from five to thirteen years. The products, when taken out, were almost exactly the same; the rye, even after seventeen years, afforded a good, fine-tasting bread. Even the first outlays of the year 1837 and 1838, yielded a very favorable result. The loss in 2,000 scheffels only amounted to 30 scheffels or 1.5 per ct. In consequence of this satisfactory experiment, the number of Silos, of the given dimensions, was increased to thirteen. Ten lie in the neighborhood of the Friedeburg mines, and three at Sangerhausen. For filling up these, were used the cheap years of

1848 and 1849. The purchase amounted to 1,375 wispels, at the price of 1 thaler to 1.3 sgr. per scheffel. The grain remained beneath the ground four to five years; the scarcity in the autumn of 1853, compelled the opening of the Silos, and again they gave surprisingly favorable results.

In the opening of two Silos, which were filled with 6,406 scheffels, there was an excess of 171 scheffels, or, after deducting the grain spoiled, 80 scheffels, and so still an excess of 91 scheffels. Including all the interest and cost, the price of the grain preserved, amounted per scheffel, to 1¼ thaler, while the market-price in that region, ranged from 2½ to 3 thalers. Hence, the Mining company were in a condition, without suffering material loss, to let their laborers have the grain at a price of 1 thaler 5 sgr.,—cheap, indeed, for the state of circumstances then prevailing, and at 42.44 per cent. of the market-price. The whole store lasted till the end of June, 1854.

The College of Land-husbandry, in Berlin, were induced to bring to the knowledge of husbandmen, the favorable results which the Mansfeld Mining Company had obtained in the preservation of grain; but it appears that these words have not fallen upon a fruitful soil. In the province of Saxony, they went further. In 1854, they called for formation of a Silo-Bank, by means of stocks or bond shares. The ground capital of the company, was to amount to one million of thalers; and, in in order to bring it within the reach of those of small means, there were to be given out 37,000 shares of the stock, at 25 thalers, whereby the payment of course should become valid. For this they wished, in the time of abundance, to collect and store up 37,000 wispels of grain, and in the time of want, sell it within the province, in order as far as possible, to counteract the ruinous fluctuations of the price of grain, and certain usurious speculations. But at that time, there was a depression in stocks, to which only too soon followed the bad news which had not yet broken in upon our country. Though it was believed to have been proved to demonstration, certainly, that no loss was to be feared in this business, but a considerable gain to be hoped for; yet the matter appeared to have found no approval with our monied men. At least, there was nothing made public respecting the result of these efforts.

We might here expect, that their own interests would have stimulated the intelligent husbandmen, during the universal affliction of our days, to make arrangements for the preservation of the potatoes, in carefully prepared Silos Of itself alone, this would have afforded little help; but it is more the question, whether or not the use of sulphurous acid, one of those substances which must powerfully act against putrefaction, would have been of service. For this end, it would be necessary by some kind of apparatus, to be able after the pot was filled, and a small opening still remained, to burn sulphur in the ground, where it was situated. The fumes might then be conducted into the pit, and thus fill it with them, before it is entirely closed up. The good service which this process has afforded in the preservation of wine, as well as that which the use of sulphurous acid has contributed in the preparation of sugar in the colonies, make the experiments alluded to very desirable. But, as it was in Goethe's day, so it is at the present day, men are quick with words but slow in deeds. Thus, much as the necessity of our times demands it, yet it is a very long time before good advice takes root. And so the thousands, yea, millions, must wait still a long while with empty hands and empty stomachs for the comfort of the future.

NOTES.

The following items which I have taken from pages 295 and 296 of Wells' Annual or Scientific Discovery, for 1857, are appropriate to the subject of the preceding treatise.

"Joan Wothly, of Zoffinger, Switzerland, has obtained a patent for the following method of preserving meat. The meat is first cut into pieces of about 10 lbs. in weight, and separated from the bones. These are then dusted over with sugar and salt, and allowed to stand about two days, and are then subjected to pressure in order that all the blood and serous matter may be forced out; or in place of being pressed, they are moderately cooked before packing. They are then placed in casks lined with melted fat.

Each piece is covered with a piece of white paper well-greased, packed in the barrel, and fat poured in to fill up the spaces between the pieces. This meat cask is then closed and placed within a larger one, and the space between the two filled up with sand, which is a good non-conductor.

M. Demait, of Paris, has patented a peculiar method of treating flesh to preserve it for use, like our common smoked beef. The meat to be preserved is cut into pieces and strung on a cord at a suitable distance apart from one another. These are then hung on rods and suspended in an air-tight chamber, which has a furnace at its bottom. The chamber is then heated up to about one hundred degrees Fahrenheit, and a preparation of four ounces of the flour of sulphur, two and a half ounces of lime, and a handful of green mint leaves is thrown upon the fire, and the doors closed. An opening in the bottom of the chamber admits the gas from the furnace, to the action of which the meat is submitted for eighteen hours. At the end of this time the meat is withdrawn and suspended in a moderately warm room, where it is dried. This process is to make finely flavored dry meat, capable of keeping a long period. The pieces of meat are pressed to remove the blood before being strung on the cords.

Joseph Hand, of London, has also secured a patent for preserving meat by a process varying but little from the above. It consists in exposing the meat in a close chamber, to the action of binoxyd of nitrogen, nitrous acid, and sulphurous acid, in a gaseous state, either singly or combined.

M. Martin de Lignac, of Paris, has also been granted a patent for preserving meat. It consists in cutting raw meat into cubes about an inch square and subjecting them in close chambers to currents of warm air at about seventy-five degrees Fahrenheit, until the meat has lost half its weight, It is then powerfully compressed in cylindrical tin boxes to about one-fifth the space occupied before it was dried up. The lids of the boxes are then soldered on and a small hole left in the top of each. The boxes are then submitted to a heat of two hundred and twelve degrees, to raise any moisture in the meat into a steam, when they are soldered up perfectly tight."

Besides the above the following receipts and statements drawn from the same valuable annual collection of scientific facts, will without doubt be of interest to the reader of this volume.

METHOD OF PRESERVING MILK.

"One table-spoonful of a solution of soda, made by dissolving one ounce of carbonate of soda in a quart of water, is introduced into a quart bottle nearly filled with new milk. The bottle is then corked, the cork being securely fastened, and the bottles are put into a copper or other vessel containing cold water, which is to be gradually brought to the boiling point, after which the bottles must remain in the water till cold, when they may be packed away."

"The following improved method of preserving milk has been discovered and patented by Mr. F. H. Louis; the milk is to be mixed with well clarified raw sugar, four ounces to the gallon. It is then to be evaporated with agitation. When nearly solid, it must be pressed into cakes of suitable size. Steam may be used for the evaporation; or if time is no object, spontaneous evaporation in very shallow pans, with the fluid not more than one tenth of an inch in depth, or a drying chamber may be used, the temperature not to exceed one hundred and twenty-two deg. Fahrenheit. The cakes remain sweet and fresh for a long time, and are soluble in warm water. Another process is to heat the sweetened milk nearly to the boiling point, and before it becomes cold, to curdle it by rennet or a weak acid. The curd is separated from the whey, and by strong pressure, after washing in cold water, it is obtained free from adhering water. The whey is to be evaporated to dryness. The curd placed over a slow fire, is continually stirred, and the dried whey added very gradually, with a small portion of bicarbonate of soda. After a while the ingredients melt and unite. A small quantity of finely pulverized gum-dragin hastens the solidification. Cream may be preserved by the same method."—*Chemical Gazette.*—From *Wells' Annual Scientific Discovery for* 1850, *pp*. 184, 5.

The following method may be the same as the foregoing, though elsewhere mentioned.

SOLIDIFIED MILK.

"A new method of making solidified milk, as adopted with success, by Mr. Blatchford, of Amenia, Dutchess Co., New York, is thus described in the New York Medical Journal, for October, by Dr. Doremus :—

"To 112 lbs. of milk, 28 lbs. of Stuart's white sugar were added and a trivial portion of bi-carbonate of soda, a tea-spoonful, merely enough to insure the neutralizing of any acidity, which in the summer season is exhibited even a few minutes after milking, though inappreciable to the organs of taste. The sweet milk was poured into evaporating vessels of enameled iron, embedded in warm water heated by steam. The heat of the water is regulated by a thermometer. By means of blowers and other apparatus, a current of air is also created between the covers and the solidifying milk ; "connected with the steam engine is an arrangement of stirrers for agitating the milk slightly while evaporating, and so gently as not to *churn* it." It is thus by constant manipulating and warming, reduced to a creamy-like powder, then exposed to the air to cool, weighed in parcels a pound each, and by a press with the force of a ton or two, made to assume the compact form of a tablet (the size of a small brick) in which shape it is covered with tin foil, &c."

The doctor adds : "Some of the solidified milk which had been grated and dissolved in water the previous evening, was found covered with a rich cream ; this skimmed off was soon converted into wine-whey by a treatment precisely similar to that employed in using ordinary milk. It fully equaled the expectations of all ; so that solidified milk hereafter ranks among the necessary appendages of the sick-room. In fine, this article makes paps, custards, pudding and cakes, equal to the best milk. For our steam-ships and packets, for those traveling by land or by sea, for hotel purposes, or use in private families, for young or old, we recommend it cordially as a substitute for fresh milk.—*Wells' Annual of Scientific Discovery, for* 1855, *p*. 26.

Gail Borden Jr's process of concentrating and preserving milk is thus described in a recent public journal. "The milk as it is received from the farmers in cans of six to eight gallons each, is at once deprived of its animal heat by placing the pans in ice-cold water. It is then while in the cans subjected to a heat of one hundred and sixty to one hundred and ninety degrees, a few degrees below boiling point. Thus prepared the milk is immediately transferred to the boiler, a huge receptacle of cast iron of incalculable strength. While there subjected by means of steam, to a heat of from one hundred and twenty to one hundred and fifty degrees, the air is withdrawn by two nicely adjusted air-pumps, and the process of evaporation commences. The vapor as it forms, and this it does with surprising rapidity within the vacuum, is as rapidly condensed and thrown off by means of the pumps, and so quick is the process, that according to our information a boiler of five hundred quarts can be reduced to one hundred and twenty-five quarts within one and a half hour. The liquid thrown off by the evaporation is clear like water, has a sickish, unpleasant taste, in no way resembling milk, and its smell is slightly offensive. It is considered that the concentrated article is rendered purer by the process, to say nothing of its other advantages."

"Mr. Borden's process is simple. He evaporates seven hundred and fifty of the eight hundred and forty parts in all milk, and leaves as a residuum a thick paste which can at any time be reconverted into milk by restoring the water. One tea-spoonful of the condensed substance to four of pure water, will make rich country milk precisely as it comes from the cow, while one in five will produce a richer compound than is often sold in cities. The addition of one or two parts of water makes a rich cream.

Mr. Borden has established a condenser (capable of reducing 5,000 quarts per day,) in Litchfield County, one of the richest grazing districts in Connecticut, where the unadulterated article can be bought at two cents a quart. The heat is applied under a covered kettle from which the air is thus evaporated. The remainder is brought to market. It will be sold in New York at about thirty-two cents a quart. This will bring the cost when restored by the addition of four times its bulk of water, to sixpence a quart. The milk trade of New York, amounts to over $4,000,000 per year. That of Boston must exceed $1,000,000 per year." "This fluid suffers no deterioration from a long voyage."—*Puritan Recorder, Sept.* 18, 1857.

PREPARING AND PRESERVING BUTTER.

The *St. Louis Republican*, states, that E. H. Merryman has invented and patented a machine by which he is enabled to restore to its original sweetness the most rancid butter. It is also designed for preparing and packing butter. It consists simply of two rollers in immediate contact with each other, operated by a crank and spur-wheels. They are placed in a trough and partially submerged in water. As the butter passes between the wheels, every particle is brought into immediate contact with the water, which washes away the butter-milk as fast as it is pressed out. After this it is only necessary to salt and pack it away in close vessels, and it will be preserved sweet and pure for a long time. The machine occupies a space of about four feet by two, and a single person ean work with it 720 lbs. of butter per hour. Rancid butter put into it comes out completely divested of all rancid taste or smell.—*Wells' Annual of Scientific Discovery, for* 1851, *p.* 47.

Mr. Chambord gives the following receipt for the preservation of Eggs. "By submitting a thin stratum of the white and yolks of eggs about one and a half inches thick, upon glass or porcelain plates, to the heat of an oven, a mass will be obtained after twenty-four hours drying, readily pulverized, and which is not altered by the action of the air, after drying again a day. Each pound of powdered eggs thus prepared, when desired for use, requires two pounds of cold water with which it is to be beaten up, and is equivalent to fifty eggs, and may be used for omelets, pastries and other culinary purposes."—*Annual of Scientific Discovery, for* 1855, *p.* 108.

NEW METHOD OF PRESERVING WHEAT.

"A Mr. Adams in a late number of the Journal of the *London Society of Arts*, has made a suggestion for a new kind of granary, by which he thinks that grain may be safely and effectually preserved for any number of years."

He recommends a metallic reservoir like an iron water-tank, and says that "a cubic foot of water-tank on a very large scale, will be found to cost very much less than a cubic foot of tin canister on a small scale."

"This tank should be constructed of small parts, connected by screw-bolts, and consequently easily transported from place to place. The internal parts should be galvanized to prevent rust, and the external part also if desired. It should be hermetically tight at all the points, and the only opening should be what is called a man-hole, i. e., a canister top where the lid goes on, large enough to admit a man. When filled with grain the top should be put on, the fitting of the edge forming an air-tight joint. Wheat put dry into such a vessel and without any vermin, would remain wheat any number of years." An air pump, he mentions, could also be used, and to draw or force a current of warm air through the grain, and carry off the moisture. It might also be buried in the ground, put into a cellar, &c. The grain could be poured in and extracted by an Archimedean Screw. If above ground, a stair or ladder to be used for the upper part, and the lower part formed like a hopper for discharging the grain. "Granaries of this description would occupy less than one-third the cubic space of those of the ordinary description and their cost would be less than one-fifth."—*Wells' Annual of Scientific Discovery, for* 1855, *pp.* 118, 119.

BRINE A POISON.

M. Regnal, of the Veterinary School at Ayort, France, has communicated to the Imperial Academy of Medicine, the results of investigations upon the poisonous properties acquired by brine after a considerable length of time, in which pork and other meats had been salted or pickled. The poisonous properties, he states, are acquired in two or three months after the preparation of the brine, and its use then, mixed with food for any length of time, even although in small quantities, may produce death. A simple solution in salt and water, after the same length of time, does not produce the same effect. The poison acts as a local irritant, exciting violent intestinal congestion and inflammation. It likewise increases the secretion of the skin and kidneys, and exerts a direct effect on the nervous system, giving rise to trembling, loss of sensation, convulsions, &c.—*Wells' Annual of Scientific Discovery for* 1857, *p.* 366.

The following is from the account given by Dr. Ashbel Smith, of the meat-biscuit, mentioned on p. 65, &c. .

Borden's Meat Biscuit.—The nutritive portions of the beef or other meat, immediately on its being slaughtered, are by long boiling, separated from the bones and fibrous and cartilaginous matters. The water holding the nutritious matters in solution, is evaporated to a considerable degree of thickness; this is then made into a dough with fine wheat flour, the dough rolled and cut into the form of biscuits, and dried or baked in an oven at a moderate heat. They are best kept in tin-cases, hermetically sealed; humidity is to be guarded against; the air is of less consequence.

For making soup of the meat-biscuit, a batter is first made of the pulverized biscuit and cold water; this is stirred into boiling water; the boiling is continued some ten or twenty minutes, salt, pepper, &c., being added to suit the taste, and the soup is ready for the table."

Wells' Annual of Scientific Discovery for 1851, *pp.* 80, 81.

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NOTES.

ERRATA.

A few slight errors have escaped the Editor's notice in the printing, as he was obliged to correct and transmit the proof with the least possible delay.

On page 9, 4th line from top, for "have they" read "was to be."
" 11, 14th " " for "with" read "in."
" 21, 16th " " for "condensed" read "condense."
" 26, 3d " " for "1803" read "1809."
" 36, 4th " " for "weigh" read "weighs."
" 40, 4th " " after "carried" insert "out."
" 49, 8th line from bottom, read "Grimaud" and "Bobinet."
" 56, Note 2d " insert "it" before "is."
" 57, line 6th " for "*au*" read "*un*."
" 58, " 12th " read "Chollet."
" 58, " 4th " insert "meat" after "fresh."
" 79, " 6th " for "your" read "yearly."
" 86, " 4th " insert "the" before "formation."