

Observations on such nutritive vegetables as may be substituted in the place of ordinary food, in times of scarcity.

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[Price 1s. 6d.]

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PLACE OF
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IN TIMES OF SCARCITY.

EXTRACTED FROM THE FRENCH OF
M. P A R M E N T I E R.

Fas est vel ab hoste doceri.

L O N D O N:
PRINTED FOR J. MURRAY, FLEET-STREET.

MDCCLXXXIII.

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IN TIMES OF SCARCITY

EXTRACTED FROM THE WRITING OF

M. P. A. R. M. E. N. T. E. R.

L O N D O N :

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MDCCLXXXIII

P R E F A C E,

BY THE TRANSLATOR.

*A*T the present period of scarcity and dearness of provisions, when the common people have been already excited to discontent and tumult, by the distress that has so soon begun to press upon them, and by the prospect of the still deeper distress in which they will probably be involved before another harvest; and when, besides a great army and fleet, distant islands are to be maintained out of stores, perhaps little more than sufficient for home-consumption; it is incumbent upon every man to propose publicly whatever means he may suppose likely to avert or alleviate the impending calamities.

*There are perhaps few publications better calculated to promote so desirable an end than
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vi P R E F A C E.

the Essay of M. PARMENTIER, which gained the prize proposed by the Academy of Besançon, in 1777; and appeared in 1780, considerably enlarged and improved, under the title of "Recherches sur les vegetaux nourrissans qui dans le temps de disette, &c."

The author is advantageously known by several works, in which the skill of the Philosopher is united with the benevolence of the Citizen of the World: his Treatise on the Chestnut, his Perfect Baker, his Oeconomical Essay on Potatoes, and the book above-mentioned, are so many instances of the ardour and success with which he has laboured in the service of the most numerous, and therefore the most valuable class of society.

The frequent and severe attacks of scarcity, and even of famine, felt in France, render researches like M. PARMENTIER's an object of the highest national importance; and, unhappily, the present year has afforded ample proof, that no fertility of soil, or skill in husbandry,

can absolutely secure any nation against such disasters.

As the Work from which the following observations are extracted, has been well received by the judicious and humane in every part of Europe, it will probably be asked why it was not published entire, rather than in its present mutilated form? The answer is not difficult, and it is hoped will be satisfactory. The author has entered into so many minute investigations, both chemical and physiological, as to render his Work not only too bulky for those for whose benefit the present publication is designed, but above their comprehension: such details can be interesting to the physician and philosopher only; whereas general utility is the object of the following pages: in this view, the articles relating to the matter of nutriment—to the constituent parts of corn—the numerous objections to Potatoes, and bread of Potatoes, with the answers—besides many others, have been omitted: and with the part that has been retained, considerable liberties have been taken;

for

for every paragraph and sentence, which did not convey some useful information, has been suppressed.

Whether any of the preparations pointed out by M. PARMENTIER may be useful to the navy; or whether they deserve to be enumerated among those visionary projects, which every day obtrude upon the attention of those who fill high and important offices in the state, let the ministers of the marine determine. Should Potatoes be found, on further trial, to possess the antiscorbutic virtues of late attributed to them, they will become an object hardly less interesting in times of the greatest plenty than in those of scarcity, especially since a mode of preserving them to any length of time has been discovered. The cultivation of them, already carried to a great height, cannot be too much encouraged; for, as M. PARMENTIER observes, (and the present season furnishes a remarkable instance of the truth of his observation) the years most unfavourable to grain yield the most abundant crops of this valuable root.

Dec. 1782.

OBSER-

OBSERVATIONS, &c.

CHAPTER I.

OF THE USE OF POTATOES IN SUBSTANCE.

AMONG Potatoes there are infinite varieties of colour, bulk, shape, consistence, and taste: but these varieties are not always, as it hath been pretended, the effect of soil, season, and care bestowed in cultivation; they arise from a real difference of species; for there are corresponding differences in the parts of fructification; the flowers being sometimes of a cineritious grey and dirty white, and sometimes of a pale red or fine blue; the verdure of the leaves, the stalk and fruit, are also subject to varieties; there are both

early and late Potatoes : it nevertheless appears that the constituent parts of the roots are always of the same nature, differing only in proportion.

ALTHOUGH the good effects of Potatoes in substance are fully proved by the daily use which whole nations and several of our own provinces make of them, yet they have not escaped the shafts of calumny. How many imaginary evils have been imputed to them ! How many forged tales would have been circulated against them, if a multitude of writers, well qualified to decide concerning the effects produced by food in the animal œconomy, had not defended and justified that which is afforded by these roots ! It was on such an occasion that the Faculty of Medicine at Paris being consulted by the Comptroller-general on the wholesomeness of Potatoes, charged with causing diseases in some of our provinces, made a report highly favourable to them, and well calculated to dissipate all apprehensions.

BUT

BUT as it would be insufficient to remind prejudiced persons, that in the most populous provinces of Germany many millions of men subsist almost entirely on this food; or to quote the remark of an excellent observer concerning the Irish, whose chief nourishment consists of Potatoes:— (The Irish, says he, are robust: they are strangers to many diseases by which other nations are afflicted; nothing is more common than to meet with persons advanced in years, and to see twins playing about the hut of the peasant.)—I conceived, that in order to quiet all alarms, and to remove every subterfuge of prejudice, it would be necessary to enter upon some chemical discussions and enquiries.

I THEREFORE proved, by a long train of experiments, that Potatoes in their natural state contained three distinct and essential principles, when each was examined by itself; *viz.* 1. a dry powder, resembling the starch contained in grain; 2. a light fibrous matter, of a grey colour, and of the

same nature as that contained in the roots of pot-herbs; 3. lastly, a mucilaginous juice, which has no peculiar properties, but may be compared to the juice of succulent plants, such as borage and bugloss.

I NEXT distilled Potatoes in a retort; they gave out an immense quantity of water, which towards the end of the operation became more and more acid; next there passed a light and an heavy oil, resembling that generally obtained from the parts of plants containing flour. A pound of these roots leaves scarce 36 grains of earthy residuum which has all the characters of vegetable earth.

WHAT effects then are produced by the boiling which these roots are made to undergo before they are eaten? It tends to combine these different principles more intimately, and to form a whole more soluble and of easier digestion. To divide the Potatoes afterwards by means of a grater, and to set them under the press,

would be to little purpose: it would be impossible to express a single drop of water, or to precipitate a particle of starch.

IT is well known that the vessel in which Potatoes have been boiled is by that operation coloured green, and they sometimes leave behind them a slight acrimony sufficiently sensible to the throat: now these circumstances afforded sufficient scope to the vilifiers of this valuable plant, to impute several diseases to it: but I further proved that these two properties do not belong to the whole of the root, but only to the red skin by which it is covered externally, and that several other roots present the same phænomena, such as radishes, which lose their colour as fast as they come in contact with boiling water, tinging it with a green hue, and at the same time parting with their well-known pungency; and lastly, that this colouring matter with which the skin of the Potatoe furnishes water, is simply extractive, and contains nothing virulent or saline.

BESIDES, how can this green colour be noxious, when roasted Potatoes, which retain it, are as wholesome as boiled? nay, they are more favoury and delicate; an advantage arising from the dissipation of the aqueous fluid, and perhaps from the same extractive matter which communicates the green colour to water.

SOME of the advocates for Potatoes, alarmed by this green colour, and persuaded that it exists in their juice, have proposed to extract it, and substitute water in its stead; but there cannot perhaps be a more absurd proposal. In our islands the juice of the mangœ is separated because it is really poisonous; I have also imitated the process of the Americans in several indigenous, farinaceous roots, which without this previous extraction would be very dangerous: but the juice of the Potatoe is far from containing any thing similar; like all the other principles, it is essential to it when we would eat it in substance. In order to separate it, the aggregation
must

must be broken, the fibrous nets must be torn in pieces, and the expressed residuum be employed only in the form of pap; which, instead of adding to the wholesomeness of Potatoes, would make an insipid, heavy, and indigestible food.

THE vegetable kingdom affords no food more wholesome, more easily procured, or less expensive, than the Potatoe. It is well known with what resources it furnished the Irish in 1740; many families would have been swept away without this supply: the eagerness with which children devour it, the preference which they give it to the chestnut, would seem to shew that it is well adapted to the constitution of man: persons of all ages and temperaments feed upon it without experiencing the slightest inconvenience. In the last German war these roots were the resource of many soldiers, who happening to be separated from the main body of the army, would have fallen sacrifices to fatigue and hunger, if they had not met with Potatoes, which they eat

in excessive quantities after simple boiling, and with no other seasoning than a good appetite: gratitude induced several of them to import the plant into their own country, where it was unknown: they cultivated it with skill, and set an example which was soon imitated. At present there is scarce an elegant repast where Potatoes are not introduced with emulation in various disguises; and the great consumption in the Capital, proves that they are no longer despised there.

THE excessive price to which grain has been advanced of late years, forms a remarkable æra at which the beneficial qualities of Potatoes have been begun to be tried in many places. An officer of distinction, while he was improving one of his estates, grew a great quantity of Potatoes, but being well acquainted with the stubbornness of rustic prejudices, he was aware that the eloquence of example would be infinitely more persuasive than whatever he could say: he had five dogs, a yard well
stocked

stocked with poultry of every sort, twenty cows, and two pigs, to feed daily: he explained to his servants his intention of nourishing all the animals with Potatoes alone; by which means the grain which they would have consumed might be employed for the service of men. His orders were punctually obeyed, because the punishment of disobedience was the dismissal of the first who was guilty of it. Pretending afterwards that the Potatoe was difficult of digestion, he forbade his servants to eat them. These contrivances produced the expected effect, and thus he made this plant an object of attention in his neighbourhood.

IF we consider all the properties of Potatoes, we shall be forced to acknowledge, that if there really exists a medicinal food, it is to be found in these roots. All the English authors who have spoken of Potatoes, regard them as light and very nutritious. Ellis, who paid great attention to the culture of them, bestows the most
pompous

pompous epithets upon them, and announces them as the food of all others most suitable to his countrymen, on account of their general practice of eating great quantities of flesh. Lemery in his Treatise on Food, and Tissot in his Essay on the Diseases of People of Fashion, agree in recommending strongly the use of Potatoes: But I will select a few observations from the great number of which I can answer for the truth, by way of reply to the objections that have been brought against Potatoes.

M. ENGEL in his Instructions how to cultivate the Potatoe, informs us, that several of his friends who had lived three years almost on Potatoes alone, experienced no inconvenience, and were far from being fatiated: among others he mentions a maiden lady 33 years of age, who was in so bad a state of health, that her appetite was quite gone and her stomach incapable of digesting any thing, when she happened to take a fancy to live on Potatoes; she experienced such happy effects from this diet,

diet, as to recover her gaiety, plumpness, and appetite in a short time.

A MERCHANT of a very strong constitution was so reduced by an illness of nine months continuance, that he voided his food just as he took it; one day he thought of eating Potatoes, by which he was so much benefited, that he declared to me that the good state of health which he now enjoyed was owing to them alone.

I HAD a relation of a keen appetite, and in the habit of using constant exercise: he could not eat the seeds of any leguminous plant without being afterwards tormented by the heart-burn, but found that Potatoes never produced any such effect. I know some persons who live on milk and Potatoes alone, not being able to digest any other food: I am acquainted with others who have been cured of a scorbutic taint by the moderate use of Potatoes; their stomach, so far from being weakened, acquired greater strength and vigour.

THESE

THESE observations, which might easily be multiplied, and which are confirmed by my analysis of Potatoes, prove how far these roots ought to be exempted from all suspicion of lying heavy on the stomach of those who use them for food, since every pound contains $11 \frac{1}{2}$ ounces of water, and the $4 \frac{1}{2}$ ounces of solid parts remaining, afford scarce a drachm of earth.

ANOTHER objection still subsisting in force against the wholesomeness of Potatoes is, that as they belong to the family of Solanum, they must needs possess narcotic properties; but experience has long since shewn how little such botanical analogies are to be depended on. Is it not well known that the family of convolvulus, which is in general acrimonious, pungent, and caustic, and supplies medicine with its most drastic purgatives, affords in the Battata a mild saccharine aliment, which, to be used for food, needs only to be boiled? It is indeed true that some observations with which I have been favoured, seem to
shew

shew a soporific virtue in the Potatoe; and as I have no interest in concealing any thing, I will set them down here.

A DOMESTIC of the Baron de St. Hilaire, after a malignant fever could not recover his sleep: his master ordered him to sup on Potatoes; and that very night he slept six hours without intermission: the continuance of the same practice produced the same effect, without causing any change in his constitution.

MR. M. of a meagre habit, but of an uninterrupted good state of health, during two years made constant use of roasted Potatoes, seasoned with a little butter and salt; having been always before accustomed to eat very sparingly at his evening meal, he acquired from relish the habit of eating six or seven of the largest Potatoes for supper: it is proper to remark, that he ate bread in proportion: he never experienced any inconvenience from this practice; but what induced him to abandon it was, that
being

being obliged to rise early, he supposed that his sleep was more profound, and that he awaked with greater difficulty; he however thinks that these effects arose from the excess, and that he should have experienced the same thing from any other supper, exceeding the bounds of moderation. When he eats Potatoes he is not sensible of any change in his state of body.

I ADDUCE this last observation with the greater pleasure, because, the philosopher who is the subject of it, may be quoted as an authority in medicine. If excess in this food induces sleepiness, what other excess would not be attended with more pernicious consequences? if we even suppose this soporific virtue to be inherent in the Potatoe, continual use will make it quite ineffectual, as it happens to all kinds of aliment, which have been supposed, on no better grounds to possess particular properties. The quantity of water contained in Potatoes, may moderate the effervescence of the
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blood,

blood, by giving it a greater degree of consistence, but without rendering it at the same time more viscid.

THE property which of all others renders the Potatoe so valuable in the country, is, according to the testimony of the faculty of medicine at Paris, its improving the quality and encreasing the quantity of the milk of animals: it produced this effect on the nurses of the poor infants of the parish of St. Roch: at least the physicians of this parish, in their printed certificate, attest that this food is not only more wholesome than any other procurable by the poor, but likewise that it prevents many diseases to which children are subject, and by which great numbers are cut off, such as ulcers, diseases of the eyes, atrophy, &c.

CHAPTER II.

OF THE USE OF POTATOES, IN BREAD.

WHILST Potatoes were considered in France only as an additional article to the luxury of our tables, their usefulness as a food was little attended to; they did not become a serious object till the possibility of converting them into bread, that is to say, of increasing the quantity of that prepared from the flour of different grains, was perceived. I must own, that in 1771, when I was analysing these roots, I had this object in view; persuaded that in the form of bread they would be an useful supplement in times of scarcity of grain, and that at all times it would be a sure way of making it serve from one harvest to another in those districts where Potatoes are much cultivated; and by these means also they might be appropriated for food when they could no longer be eaten in substance.

IT

IT was scarce found that Potatoes mixed with common dough, are made to disappear, by means of kneading, so as to form an homogeneous and well-raised mass, when these roots were believed to be changed into real bread. Enthusiasm laid hold of men's minds; different methods were proposed, each person boasting his own: the consequence was, that many, misled by a deceitful appearance, have asserted, and even now repeat, that they have prepared, seen or eaten bread made of Potatoes; they have even gone so far as to dispute for the honour of the invention; though the Irish had recourse to this substitute almost as soon as they began to make use of Potatoes. Their attempts are preserved in several parts of the Philosophical Transactions; to which I refer those who may yet cherish the hope of advancing any claims relating to this point: I would at the same time beg them not to confound any longer, bread in which Potatoes are introduced,

and that consisting of these roots alone and unmixed.

FIRST attempts, however imperfect, are always received with joy, especially when the substance in question has any connection with the subsistence of the most indigent class of citizens ; but even with the most upright intentions it seldom happens that the advantages that may be derived are not exaggerated. To introduce into dough composed of flour, leaven, and water, $\frac{1}{3}$ or $\frac{1}{2}$ of a watery root, without at all prejudicing the product, was a most agreeable prospect, when considered in an æconomical view: that the saving was not in proportion to the quantity of the substitute employed, could be learned only from experience.

ANOTHER circumstance not attended to, and which nevertheless deserved attention, was, that the pulp of Potatoes mixed with wheat dough, so much increases the mechanical effect of the glutinous part of
that

that grain, that it swells too much during the preparation and in the oven; hence the bread is extremely light, continues but a short time in the stomach, and passes too soon into the lower intestines.

SHOULD we admit that half the weight of this bread consists of Potatoes, it will not follow that the nourishment is increased in the same proportion; there can be at most but one part, of which the nutritious effect is equivalent to an equal quantity of flour of wheat: let me confirm this by an instance;—suppose two pastes of an equal consistence, the one consisting of 4 pounds of pulp of Potatoes, and as much flour of wheat, the other of flour of the same grain unmixed; the first will afford less bread; this bread will contain more water, and will not be so nutritive as the second mass, because the Potatoe can furnish but one-third at most of its weight in farinaceous matter, that can be compared with the flour of grains; the surplus is nothing but the

water of vegetation, which keeps the principles of these roots at a distance from each other, and in a state of great division.

WITH respect to the disappearance of Potatoes in the above-mentioned mixture, this phænomenon ought to cause no more surprize than others of daily occurrence; as for instance, when pulpous fruits, such as the pumpkin, gourd, the herbaceous stalks of plants, the fleshy roots, are added to flour of wheat, ought it to be concluded that all substances which, without being farinaceous, can be so assimilated with dough as not to be distinguishable except by the organ of taste, are transformed into bread? or that when the mass has been increased two-fold, and even three-fold, the nutritive virtue has received an equal augmentation? Several facts prove the contrary: and the inhabitants of the Pays de Vaud, among others, who have been much accustomed to eat this mixed bread, complain that the appetite is not easily satisfied with it.

IT

IT would undoubtedly be wrong to infer from this observation, that the presence of Potatoes is capable of impairing the nutritive effects of the substances to which they are added, and of consequence that the practice of mixing them with the flour of different grains ought to be discontinued; but let me repeat it once more, they can nourish only in proportion to the quantity of substantial matter which they contain; and it would be ridiculous to require as much nourishment from a watery root as from a dry seed, which in order to be used as a food, must previously be combined with a fluid.

IF there are particular circumstances in which recourse should be had to the supplement of Potatoes for the preparation of white bread, it must be when the quantity of wheat is not in proportion to the consumption. As it is the common food of the rich and the inhabitants of cities, it is of little importance whether it is more or less substantial; in general

it is only an addition to other meats; but this does not hold with respect to the brown meal of the same grain; it has not so much viscidty as the white; the mixture of Potatoes gives it more bulk, lightness and quality.

NEXT to wheat, rye is the most valuable grain; both, mixed or separate, afford, if well prepared, a very excellent bread, without the necessity of any addition: but when they are scarce, and brought from a great distance, and very dear, the Potatoe, if there is a sufficient stock, would make a saving of other grains, which serve the most indigent class.

IF it is important to set bounds to the practice of using Potatoes to enlarge the bulk of wheat and rye bread; it is proper to remark, that this practice is extremely wholesome for barley, buck-wheat, maize, oats, millet, &c. with which bread is prepared in different districts of the realm; for this bread, whether composed of the
meal

meal pure or mixed, is constantly heavy, close, and ill-tasted. In this case the addition of an equal part of Potatoes would occasion very desirable changes in these several kinds, by giving tenacity and viscidness to the dough, by promoting the fermentative motion, by weakening and even destroying the disagreeable taste peculiar to each of them.

IN the present case, not only the quantity of bread will be increased, but the quality will be improved; a great advantage for the poor in general, and even for whole districts, which consume only these kinds of grains. For the sake of this class of people, it will be proper to point out a method by which the grain may be saved and the bread improved. In this view, I will give a receipt for the composition of this bread; it will serve as a model for every other proposed to be made in this way with all farinaceous substances indiscriminately, provided they are in a proper state for making bread:

TAKE any quantity of Potatoes, well crushed and bruised; mix them with the leaven prepared the evening before in the usual way, with the whole of the flour designed for making the dough, so that one-half may consist of pulp of Potatoes and half of flour; knead the whole with the necessary quantity of warm water; when the dough is sufficiently prepared, put it in the oven, taking care not to heat it so much as usual, not to shut it up so soon, and to leave it longer in; without this essential precaution, the crust of the bread would be hard and short, while the inside would have too much moisture and not be soaked enough.

WHENEVER it is proposed to mix Potatoes with the dough of different grains, either to save a part or to improve the bread, these roots should be reduced into the form of a glutinous paste, because in this state they give tenacity to the flour of small grain, which are always deficient in this respect.

THE other ways of preparing Potatoes before mixing them with the flour, are not nearly so advantageous as boiling them; these ways may be reduced to two principal ones: according to the first, they are taken raw and grated; here they are employed without losing any part of their juice and skin: the second consists in cutting them in slices, then baking, and afterwards taking them to the mill: but the bread in both cases is dark-coloured, close, and ill-tasted.

WERE all these methods even less defective than they are in reality, they do not obtain the end proposed; *viz.* saving the expence of boiling, and the other operations; for it will cost at least as much to grate or dry the Potatoes: it is not only necessary to boil, but also to crush and manage them so as to give them the consistence and form of a tenacious and viscid paste, in order that they may produce the effects above described.

LET

LET me recapitulate. It cannot be doubted, that if wheat and rye were very scarce, and their high price obliged men to seek a supplement in other grains, it would be better to have recourse to a mixture of Potatoes: they may besides serve to give other grains a superior degree of goodness. It is well known, that in times of dearth, necessity, incapable of making any enquiries when excessive, always guides the hand to objects ill calculated to fulfil our intentions, and productive of effects the most opposite to our wishes.

BUT, in circumstances affording no other means of subsistence but Potatoes in plenty, the conversion of them into bread would be advantageous, because there are multitudes so habituated to live upon bread, that they would not believe that their appetite was satisfied, if food was offered them in any other form.

I COME now to describe the preparation,

tion, which is to serve as a basis for all the farinaceous plants, afterwards to be pointed out as proper to supply the place of our common aliments when they fail.

C H A P T E R III.

OF THE WAY TO MAKE BREAD OF POTATOES, WITHOUT MIXTURE.

PREVIOUS to any attempts to convert the farinaceous parts of plants into bread, it is necessary to prepare them by certain preliminary operations: the intention of these operations is to dispose their constituent parts to unite with water, and thus to give them a degree of softness and flexibility, favourable to the fermentative motion which is to take place among them. Such is the chief end of the process which I am now to describe; it naturally precedes the task of the baker, in the fabrication of any bread whatever.

Of

Of the Starch of Potatoes.

AFTER having repeatedly washed the Potatoes, in order to separate the dirt and sand, divide them by a grater of tin set in a wooden frame and resting on a searce; empty it when full into a larger vessel: the grated Potatoe affords a liquid paste, which grows darker coloured on being exposed to the air; pour some water on this paste, and stir it about with a stick or your hands, and pour the whole into a searce placed over another vessel; the turbid water which passes through, carries the starch along with it, and deposits it at the bottom of the vessel: the reddish water is to be thrown away, and fresh quantities are to be added till it is no longer tinged.

AFTER this first operation, the process of the Starch-maker should be exactly imitated; the precipitate, when well washed, is to be taken out, divided into parcels, and

and set upon sieves or boards exposed to the sun in order to dissipate the excess of moisture ; as it dries, the dirty grey colour changes to a shining white : this substance is real starch, and by being sifted through close sieves, acquires a tenuity equal to that of the finest starch of wheat.

WHAT remains on the sieve, although deprived both of starch and extractive matter, may serve, like bran, for feeding cattle : it may also be reduced to powder, for a purpose which I shall have occasion to mention in speaking of the brown bread of Potatoes. There are situations where nothing should be lost, especially of the objects of immediate necessity.

R E M A R K S.

THE most important observation that occurs here, is, that Potatoes, to whatever variety they may belong, and in whatever condition they may happen to be when they are used, provided they are raw, constantly

stantly afford starch, differing only in quantity; hence Potatoes spoiled by frost, germination, or too ripe, may be used for this purpose.

IF it should be requisite to employ the starch immediately, and circumstances not allowing time to provide a stock, or to wait till it can be dried and passed through the searce, it may be used as soon as it is separated; but the water, which constitutes about one-half of its weight, should be deducted. I even think that I have observed, that in its wet state it renders the dough a little more tenacious, and the bread whiter.

IT is necessary to break the aggregation of the integrant parts, to tear in pieces the fibrous nets, and to force the starch contained in them to quit its place of residence: wherefore an instrument calculated only to slice or bruise these roots, would be quite uselefs in the present case.

To

To these observations let me add, that though all sorts of Potatoes are capable of being changed into bread, the round, grey ones afford most starch; every pound produces nearly from two to three ounces: but as I have already remarked, the season, soil, and cultivation, have great influence in this respect.

Of the Pulp of Potatoes.

As soon as the Potatoes are well baked or boiled, they should be peeled, and then crushed with a rolling-pin or the hand upon a table. Scarce have they lost their form, when they begin to stick together and to form a paste, which grows more and more elastic and spongy, without the necessity of adding any fluid: this process is to be continued till every lump is broken; then it is to be set aside: and the whole should be thus reduced.

As Potatoes do not acquire the tenacity of a pulp but whilst they are yet warm,
and

and as by a necessary consequence the pulp itself loses its viscosity as it grows cold, the trouble of boiling these roots several times a day may be avoided, by putting them, boiled and peeled, to soak a short time in the hot water designed for kneading: by these means they are made to regain under the rolling-pin their viscosity; a quality essential and indispensable in the fabrication of bread.

THE pulp of Potatoes may be kept two days and longer, according to the season, without danger of spoiling. It then indeed is not so tenacious, and does not so nearly resemble the glutinous matter of wheat; and it is of the greatest importance that it should bear the strongest resemblance to this matter, both in tenacity and elasticity, the other chemical properties in which these two substances differ from each other, being totally insignificant in the making of bread.

REMARKS.

Manuscript of the Author. June 11. 1794. C. 1. 1.

R E M A R K S.

IT is with Potatoes as with the roots of pot-herbs and leguminous seeds: the nature of the water has a singular influence on the success and quickness of the boiling. The hardness of the water may be diminished by boiling. But Potatoes should never be drowned, nor should the vessel which contains them be ever uncovered, because the water, after it has been reduced into vapour, should be driven back, in order the better to insinuate itself into the texture of each tubercle, to penetrate and combine more perfectly its constituent parts; in consequence of which they are sooner boiled and more flavoury. This observation holds with respect to all vegetable, fleshy, and aqueous substances, which ought not when they are boiled to be drowned with water, unless they contain a matter necessary to be extracted, and in that case too much water cannot be employed.

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I HAVE observed, that the preparation of starch admitted indifferently every sort of Potatoes in every possible state; but we cannot hope for the same advantages in obtaining the pulp; this preparation requires choice; the red sort seems to afford the most tenacious and elastic paste, and consequently merits preference: it is of great importance that they should be found and free from defects.

IT would be impossible to make bread of Potatoes without the aid of the pulp, since it is that alone which gives tenacity and visciduity to the starch, which is quite destitute of these qualities.

Of the Leaven of Potatoes.

MIX half a pound of pulp of Potatoes with an equal quantity of the starch, and four ounces of boiling water; set the mixture in a warm place: in forty-eight hours a slight vinous smell should be exhaled from it; and now a fresh portion of
 starch,

starch, pulp, and water, should be added, and the mass again exposed to the same temperature for the same space of time: this operation should yet be repeated a third time. The paste thus gradually turned sour may be considered as a first leaven.

IN the evening dilute this first leaven with warm water, mix equal parts of starch and pulp in the proportion of one half of the dough, so that for every twenty pounds of dough ten of leaven must be prepared; when the mixture is exactly made, put it in a basket, or leave it in the kneading tub all night, taking care to cover it well, and to keep it warm till morning.

R E M A R K S.

THE tedious and troublesome preparation of the first leaven will be avoided after the first baking, because a piece of the dough may be set aside and kept.

THE trouble attending the preparation of this first leaven, may be avoided by introducing at the first baking some leaven of dough or yeast, without the necessity of mixing the starch and pulp; I will even observe, that it does not gain the character of good leaven, till some time after its formation: this law is common to every leaven prepared in the same manner, even to that of wheat, for the bread is always stiff and heavy when such a leaven is first used. My motive for pointing out so long a process was, to prove that the Potatoe was capable of serving for the elements of leaven, and that, like grain, it might be made to undergo the bread fermentation, without the aid of any foreign agent.

Of the dough of Potatoes.

IN order to prepare the dough, the leaven should be set in the middle of the starch, surrounded by the pulp, divided into pieces; it should be diluted with some warm water, to which half a drachm

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of salt for every pound of the mixture should be added; and when the whole is confounded by kneading, it should be subjected to the different operations proper to increase its viscidty and tenacity; that is to say, it should be lifted up, gathered and beaten; but the fists should not be thrust into it, which is a very general but very bad practice in the making of bread of all sorts.

As soon as the paste is kneaded it should be divided and formed into loaves of a proper size, which should be set in tin moulds, sprinkled over with bran or starch, to prevent the adhesion of the dough, which generally takes place without this precaution: the moulds should be covered with a wet cloth, and left in a warm place for two or three hours, according to the season.

R E M A R K S.

As it is easy to obtain bread of different degrees of consistence, by only varying the

quantity of water used for kneading, it follows that it may also be obtained lighter or heavier from Potatoes, by varying the process in the same manner.

THE quantity of salt may also be varied: the water ought always to be near the boiling point; and we need not fear lest it should destroy, as when wheat flour is used, the tenacity of the dough, on the contrary, at this temperature, it contributes to increase it; thus the same end is often attained by different and even opposite means.

THE time required by the dough to attain the proper degree of fermentation cannot be exactly ascertained, because it is regulated by the season: this must be learned from experience: I will only remark, that it is always rather longer than that required by wheaten dough.

Of the Baking.

WHEN the leaven has been prepared the evening before, the kneading properly executed, the dough turned immediately afterwards, and distributed in moulds, the operator should yet wait two or three hours before he heats his oven, and this process requires two hours; then the dough may be put in, after the surface has been moistened again: it should be kept in the oven an hour, or two hours at most.

R E M A R K S.

THE bread in question requires a long continued fermentation, and an oven very gently heated.

IN order to induce persons to use all the precautions I lay down, it is necessary sometimes to explain their effects: Now I recommend turning the dough as soon as it is kneaded, lest while it continues in

the lump its viscidty should be so far impaired as to prevent its being handled and shaped: the surface should be kept moist lest it should be suddenly seized by the heat, and becoming hard and thick hinder the baking of the center, and the exsuding of the moisture from the soft part.

C H A P T E R IV.

OF THE BREAD OF POTATOES.

BY this method I will venture to assert, from various and repeated trials, that the Potatoe, which hitherto hath not been converted into a well-raised bread, without the mixture of at least an equal quantity of some flour, may be made to assume that form without any foreign assistance: the whole artifice consists in subjecting these roots to two previous operations

tions before the application of the usual process of the baker.

BREAD of Potatoes is then composed half of starch and half of pulp, with half a drachm of salt to every pound of the mixture. The water, which constitutes about $\frac{1}{3}$ of the whole mass, is totally dissipated during the baking; hence, in order to obtain a pound of this bread, three pounds and an half of Potatoes, *i. e.* nine ounces of starch, and as much pulp, are requisite. But it is of consequence to remark, that in this diminution our roots lose only their excessive moisture. The nutritive matter which they contain, so far from being impaired in its effects, must necessarily have gained by the bread fermentation, a process that is well known to improve all farinaceous substances indiscriminately, by increasing their bulk and solubility.

It is possible to obtain from Potatoes a brown bread yet more economical. In
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order to effect this, these roots and the fibrous matter remaining on the sence after the extraction of the starch, should be dried, and then reduced to powder, with which an equal quantity of boiled Potatoes, reduced to a pulp in the manner described above, should be mixed: in this case peeling them may be dispensed with, since the kneading performed by robust arms will completely divide the skin; but this brown bread, whatever care is taken in preparing it, is always close, heavy, and ill-tasted.

YEAST diluted with water, is the proper ferment to be employed, wherever brewing is practised.

I WOULD propose to add one-twelfth of meal in the preparation of this bread; by this means fifty pounds of grain, scarce enough for a month's sustenance, would furnish bread for the whole year.

CHAPTER V.

OF THE BISCUIT OF POTATOES.

IN order to prepare biscuit of Potatoes, mix a little yeast or leaven diluted with hot water, with one pound of pulp of Potatoes, and as much starch; of the whole form dough, and knead it long; after which, separate pieces of about three quarters each, and flatten them so as to leave them about twenty-four inches in circumference, and fifteen or sixteen lines in diameter.

WHEN the dough has been thus divided and shaped, set it upon plates, and in about an hour afterwards put it in the oven, first pricking it with an iron instrument, provided with several teeth, in order to prevent it from swelling, by promoting the evaporation from every point.

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As this dough contains but little water, it is more difficult to be baked; hence it must be left in the oven longer than the bread, for two hours at least, and the rather as it ought to be baked more.

THE biscuit at its being taken out of the oven should be set in a warm place, that it might cool gradually and be deprived of its moisture, which is continually exhaled as long as the heat subsists. It is of great consequence not to pack it up under five or six days after it has been made, and to keep it in as dry a place as possible.

BISCUIT of wheat in general loses $\frac{1}{3}$ of its weight in the oven; hence in order to obtain half a pound, $\frac{3}{4}$ of the firmest dough must be used. Our biscuit undergoes a nearly equal loss; the water employed for diluting the leaven, and which is sufficient for kneading, is dissipated entirely, together with a portion of that which forms a constituent part of the pulp.

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DIFFERENT kinds of biscuit, according to the length of the voyage and the latitudes to be traversed, are prepared from wheat. In cold and dry climates biscuit is less liable to spoil; its first alteration proceeds from its attracting the moisture of the air, becoming internally mouldy, and contracting a bad smell, whence it soon becomes food for worms. This inconvenience may be always prevented, by drying the wheat perfectly, grinding it well, and not separating, as it is the practice of some places, the flour from the coarser part, (*le gruau*) which is the driest, most savoury, and most nutritious part of the grain.

THE quality of biscuit does not always correspond to that of the grain of which it is made; it often depends on the process: every nation seems to have adopted one peculiar to itself; this uses a great quantity of leaven, that very little, a third none at all; and yet the taste of the biscuit depends on the quantity of leaven. As that made of Potatoes is naturally insipid,

lipid, a drachm of salt might be added to every pound, without disposing it to spoil.

THE biscuit in question, when well prepared, has all the properties of common biscuit; it breaks short, is sonorous, and does not crumble on being steeped in water. The opinion of several competent judges, to whose examination it was submitted, was extremely favourable to it. The minister of the marine accepted and patronized it, observing, that the only way of learning whether it would keep as long as wheaten biscuit, was to put it on board some vessels. This direction was carefully executed; but there is every reason to apprehend that it has fallen a prey to some of the enemy's privateers.

BUT if I may be allowed to form a few conjectures from its appearance, and the nature of the farinaceous substance of which it consists, I think it may reasonably be presumed that it will stand long voyages;

ages; and, without desiring to set it in competition with common biscuit, it seems to have one advantage over the latter, since the Potatoe containing no saccharine or glutinous substance, the biscuit made of it must be less liable to attract the moisture, and consequently to spoil.

THE Potatoe grows plentifully every where, and especially in our islands, of which it is a native; so that the inestimable advantage of victualling ships there may be obtained, especially at a time of dearth of corn, and in circumstances when dangers at sea render communication difficult and hazardous.

I HAVE already mentioned the antiscorbutic quality attributed by some authors to Potatoes: Mr. MAGELLAN has lately communicated some observations to the Academy of Sciences, which prove that these roots are really capable of curing the scurvy: how much more probable is it then that it will prevent this disease, so formidable

formidable to sailors? Thus this useful class of men would find a preservative in their daily food: it would even be desirable to put on board a certain quantity of this biscuit at all times; it would become the regimen of those whose blood shewed a tendency to scurvy.

WHY should not the different kinds of Potatoe bread which I have described, and which keep sweet for a long time, be embarked on board our vessels? In order to make the experiment, two loaves newly baked, consisting of wheaten flour mixed with Potatoes, were sealed up and entrusted with a captain of a vessel ready to set sail for Spain, with an injunction to leave one in the open air and the other in his chamber. The captain returned from his voyage, and even from another undertaken ten months afterwards: these two loaves were found equally good. This fact, which proves the benefits that may be derived from this bread, is preserved in the registers of the Royal Society of Agriculture at Rouen.

CHAPTER

CHAPTER VI.

OF THE COARSE FLOUR, SALEP, AND
SAGO OF POTATOES.

BY giving directions how the Potatoe may be reduced into various forms, I do not pretend that it acquires at the same time all the medicinal qualities attributed to each of the substances with which I compare it; my intention is only to point out the wholesome resources which this root is capable of affording to man, in the state of disease, when these substances fail.

Of the Coarse Meal of Potatoes.

UNDER the name of *gruaux*, it is usual to comprehend the seeds of the grasses, grossly divided by mills, and freed in part from their cortical cover. The way of turning them to use resembles the original use of farinaceous substances in gene-

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ral ; it consists in diluting and boiling them in a nutritious vehicle. Now Potatoes, boiled or roasted, before they have been dried, cannot be brought under this denomination ; they rather form a kind of salep, as I will soon shew.

WHEN the Potatoes have been cleaned and peeled, they should be sliced, and laid on scarces covered with paper, which are then to be placed in an oven : they very soon shrink, lose their transparency, and in twenty-four hours become friable enough to be broken to pieces by the action of the mill or pestle. When they are only bruised, they may be distinguished by the name of coarse meal, and by that of flour, when reduced to a fine powder.

THE slices, when dried, are wrinkled and tarnished at the surface, and internally whitish : when you bite them, you think you have wheat or rye between your teeth : they are rather longer in boiling than the
 roots

roots when whole and fresh ; they besides have a dark grey colour, and their taste is somewhat different.

THE flour obtained from dried Potatoes, is soft to the touch, but the colour is a dirty grey : if an attempt is made to form a ball of it with water, it acquires scarce any tenacity ; when diluted and boiled, like other kinds of coarse meals, (such as oatmeal, &c.) in milk, broth, or any mucilaginous decoction, it diminishes their transparency, assumes the consistence of broth, emits an odour resembling that of paste of flour, and its taste is less agreeable than the Potatoe itself before it is dried.

IT would be in vain to hope, that grinding and dressing, which have so much influence on the quality of flour, are capable of improving that of Potatoes ; as the extractive matter which they contain, has not been combined by the operation of drying, it is so far developed as to be

very sensible, both to the eye and the taste, in every preparation into which it is introduced; either in wheaten bread, which it renders disagreeable and brown, or in porridge, which is of a yellow colour, and unpleasant taste; it may indeed be corrected by sugar or aromatics.

FROM what has been said, it appears that the flour of Potatoes should be distinguished from the starch; since the one is an approximation of the constituent parts, in consequence of the evaporation of the aqueous fluid, whilst the other is one of the principles formed by vegetation, and very easily separable, provided these roots have not undergone the action of fire.

THE flour of Potatoes may be long kept without alteration; it needs only to be sufficiently dried, and to be secured from moisture, and the destructive animals which it allures: it appeared to me quite as good, after a year had elapsed, as the
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first day of its preparation ; nor could I ever perceive any appearances of germination, at the return of spring, or that it changed colour, as some have advanced, with a view, no doubt, of depreciating such kind of food.

IT would be infinitely more expeditious to dry the Potatoes whole ; but I have long since learned from experience, that however small they happened to be, it is impossible to dissipate the whole of the watery principle ; they become soft, and spoil, sooner than part with the remaining moisture, which prevents their being reduced to powder. I have often exposed Potatoes to a heat of 100—120°, in order to prevent them from shooting or sprouting ; this method effectually deprives them of this faculty, but at the same time greatly injures the organization ; these roots, half dried, are not so delicate when boiled, and they cannot be long kept without suffering internally.

As it is very difficult to clean Potatoes, on account of their inequality, and to peel them raw, unless they have been soaked for some time in water; the smoothest may be selected for this purpose, and the skin may be taken off at the time of gathering: women and children may be charged with this task.

I MUST however observe, that whatever care may be taken in culling, cleaning, drying, and grinding Potatoes, neither the coarse meal nor the flour can ever be brought to possess every advantage; however you may prepare them, you must not expect to have an aliment under this form as pleasant as it is wholesome; what a difference, when they are boiled before they are dried! Two products are obtained, which have nothing in common but the same source.

Of the Salep of Potatoes.

THE bulbous roots of the family of orchis, when they have been boiled, cleaned,

ed, dried, and reduced to powder, receive the name of falep; the use of this substance is well known, when we wish to procure a substantial and easily digestible nourishment. The Potatoe, subjected to the same preparation, resembles it so strongly, that it may not only be substituted in its stead on many occasions, but likewise, in case of want, supply the place of the fresh roots, till the next crop is ripe.

WHEN Potatoes are nearly boiled, take them from the fire; peel, slice, and set them in or upon an oven after the bread has been drawn; in thirty hours they will be dried enough, and will have lost $\frac{3}{4}$ of their weight.

THE trouble of slicing them, especially when it is proposed to reduce them to powder, may be avoided, by making the above-mentioned pulp, and spreading it in thin beds in a stove; but they should

be boiled and reduced to pulp only as they are dried, lest they should turn sour.

THE Potatoe, by being boiled, sliced, and dried, acquires the transparency and hardness of horn; it breaks short, and the fracture is somewhat like that of glass; it does not attract the moisture of the atmosphere, is pounded with difficulty, and affords a dry whitish powder, resembling that of gum arabic: this powder dissolves in the mouth, and with water forms a mucilage. Such are the general properties of salep.

IN Switzerland and Alsatia, an instrument contrived on purpose for breaking Potatoes has been used with advantage; it consists of a cylindrical pipe, pierced at the bottom with a number of small holes, like a skimmer, through which the Potatoes are forced, after they have been peeled, dried slowly, and boiled: thus a kind of vermicelli is formed; hence the Genoese and Italian pastes may be imitated,
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by mixing the powder of Potatoes with the pulp, and adding the usual seasoning. This mixture is easily hardened, and swells very well in hot water.

IF the observations of ELLIS and MARGELLAN, on the antiscorbutic virtue of Potatoes, should be confirmed by further experiments; if this virtue, as there is every reason to believe, resides in the extractive matter; these roots, which have lost nothing by being boiled and dried, will be more efficacious in this disease than the bread and biscuit, that have been deprived in part of their extractive matter: they will have over fresh Potatoes the advantages of occupying less room, of being laid up any where, of keeping longer, and of becoming, in a moment's boiling, a wholesome and mild food, comparable to that of the Potatoe itself. The pulp used for making the bread, may be prepared in the most dead season of the year; and this would be a sure mean of having these
roots

roots for food when they can no longer be had in substance.

POTATOES in salep do not, like the meal, alter the whiteness of wheaten bread when they form a part of it, or different jellies or broths; they preserve their colour, taste, and smell, because the extractive matter is confounded with the starch and parenchyma by boiling; whereas simple desiccation acts on each of these principles separately, and causes an alteration, which makes dried Potatoes so much inferior to those that have undergone a previous boiling.

WHEN this salep is to be administered, it should first be reduced to a fine powder; an ounce of it should be boiled in an half-pint of water, for a quarter of an hour, and then passed through a cloth; a little sugar and cinnamon should be added: when it grows cold, it becomes a whitish kind of jelly, and should be given every two hours, in the dose of one or two spoonfuls,

fuls, according as the case requires. When it is proposed to make a mucilaginous ptiſan, like rice or barley-water, the ſame quantity of ſalep may be diluted in a quart or three pints of water; it may be made pleaſant by any ſyrup ſuited to the diſeaſe.

HERE it will be objected, that my new ſalep is nothing but Potatoes, of which the different principles have been approximated by the evaporation of the exceſſive moiſture; and that it cannot be conſidered as ſimilar to a bulbous root, in which mucilage is extremely attenuated. I reply, that the boiling produces in the Potatoe a mucilage, on which the drying afterwards acts, by deſtroying the viſciditiy, and bringing it to the ſtate of jelly. Beſides, I have given it with advantage, in caſes where ſalep was indicated, in bilious cholics, in diarrhœas, and in all diſeaſes depending on acrimony of the lymph. But I do not wiſh to dogmatize in medicine, or to rob the rich of their ſalep, which

which costs them 20 francs a pound : the expence of mine will be very trifling ; and I may surely be allowed to call it the salep of the poor.

Of Sago of Potatoes.

SAGO is well known to be a feculency, separated by searces, and washed from the farinaceous pith contained in certain palms, very common in the Molucca islands. This feculency, which is not soluble in water unless it boils, which then increases considerably in bulk, and changes into a transparent jelly, is nothing but real starch. Now, as I think I have proved that this substance is identical, like sugar, in whatever body it may happen to be contained, the starch of Potatoes may supply its place entirely.

THE form of small grains, in which sago is imported, and the reddish colour, are occasioned by the degree of heat employed by the Indians for drying it. The
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way to extract the starch from Potatoes has been already shewn ; it would be possible to bring it to a perfect resemblance with sago, if it could be supposed that drying, carried to a great length, could at all influence its œconomical properties.

WHEN sago of Potatoes is to be used, put a spoonful in a saucepan, and add gradually a pint of water, or milk ; it should be set to boil over a slow fire, and stirred constantly for half an hour ; sugar and aromatics may be added.

How many stomachs, naturally weak, or enfeebled by excess or disease, and incapable of digesting solid food, would be relieved and even cured by the use of salep and sago of Potatoes ? Each affords a wholesome nutriment, easy of digestion, and adapted to fulfil the same indications as salep and sago properly so called. They are restoratives for convalescents, old persons, and children. The Tapioca of the Americans, which is nothing but the
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whiteſt and pureſt ſtarch of the magnoe, affords excellent and very wholeſome broths for debilitated and conſumptive patients.

POTATOES, I repeat it, may ſupply the place of ſalep and ſago, in times of plenty ; two ſubſtances imported from very diſtant countries, and on that account liable to be ſuſpected of improper mixtures. If they are ſpecifics for our diſeaſes, their exorbitant price prevents the poor from profiting by them. The ſubſtitutes here propoſed will coſt almoſt nothing : four pounds of Potatoes afford one pound of ſalep ; and ſix pounds, one of ſago.

SHALL we for ever lay the two Indies under contribution to ſatiſfy our principal wants, and value only what is imported from far, and has the merit of growing in another hemisphere ?

CHAPTER VII.

OF THOSE FARINACEOUS SEEDS AND
ROOTS FROM WHICH IT IS NECESSARY
TO EXTRACT THE STARCH.

IT has been long a prevailing opinion, that seeds belonging to the great family of grasses, were the only receptacle of starch: but it cannot now be doubted, that it is to be found in pulse, and in a great number of other seeds and roots belonging to various classes. I would almost venture to alledge, that there is no part of fructification in which it is not contained; that it is identical, from whatever substance it is extracted; and that the starch of seeds is not more attenuated than the starch of roots.

IT seems to me that berries and stone fruits cannot contain starch, because their pulp is too soft to hold and support a solid
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body: but my conjectures respecting apples, and other like fruits, were very different; for, as they are firmer, they may well serve such purposes: but my enquiries made with this view, were fruitless. M. DUVAL also suspected the same thing, in consequence of some experiments more successful than mine. We tried together, whether his suspicion was well founded, and we actually found starch in some sweetish cyder-apples, whilst others of a sourer taste did not afford an atom.

STARCH then is contained not only in roots, bark, stalks, and seeds, but in fruits likewise: there remain only leaves and flowers, and I would not assert that it may not be found sometimes in them; and the rather, as I have examined, and obtained from several of them a mucilage nearly resembling it: then it may be said, that all the organs of plants are proper for the formation of starch as well as of sugar, two substances differing in their nature and properties.

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which, as it passes through a close searce, will carry along with it a matter that will deposit itself gradually at the bottom of the wooden or earthen vessel set to receive it: after some time, pour off the liquor, and wash the deposited matter repeatedly with fresh water, till it becomes perfectly insipid; then expose it to the most gentle heat; as it becomes dry, it turns white, and presents a friable matter, without colour, taste, or smell, exhibiting all the characters that distinguish starch.

Of all the plants mentioned below, the root, or its bark, are the only parts proper for the object in view: it should be gathered in autumn, should be chosen fresh and succulent, cleared from its hairy filaments and its coloured coats; it should also be cleaned and washed till the water appears quite transparent and colourless.

As all the bitterness of the horse-chestnut, the asperity of the acorn, the causticity of the arum and ranunculuses, the burning acrimony

acrimony of the bryony, &c. remain in the water employed to separate and wash the starch, it is proper to use wooden instruments to stir the mixture, as the hands might suffer.

THE starch separated from the seeds and roots mentioned below, when well washed and dried, is perfectly identical: but it is not sufficient to separate it from the substance in which it is contained; it is moreover requisite to give directions how to convert it into food. It may be introduced, either alone or mixed with the pulp of Potatoes, into the dough of various grains, to make an addition to the quantity of bread. Bread may be made without flour of any kind, by the process described above; but if the Potatoe should also fail, the pulpous fruits of the cucurbitaceous family, such as the pumpkin, which are sometimes added to wheaten dough in various proportions, may be substituted: lastly, should every other re-

source fail, the starch representing flour would still serve for food; it would be sufficient to dilute it in some vehicle, in order to obtain a very nutritious broth or jelly.

I HAVE used the several starches extracted from the following plants, without distinction, nor was it possible to tell from which it had been procured: when there is a slight difference perceptible in the taste, smell, or colour, it should be attributed to the number of washings rather than to any essential difference of nature.

The Horse-Chestnut*.

The Acorn.

[THE roots only of the following vegetables afford starch in considerable quantity.]

* This is not an indigenous tree of this country, nor very often to be found in it. In France there are whole forests of it.

Common Burdock,	Arctium Lappa.
Deadly Nightshade,	Atropa Belladonna.
Bistort Snakeweed,	Polygonum Bistorta.
White Bryony,	Bryonia alba.
Meadow Saffron,	Colchicum autumnale.
Meadow-sweet,	Spiræa filipendula
Masterwort,	Imperatoria Ostruthium.
Black Henbane,	Hyoscyamus niger.
Pimpernel-leaved Dropwort, -	} Cœnanthe Pimpinelloides.
Obtuse-leaved Dock,	Rumex obtusifolius.
Sharp-leaved Dock,	Rumex acutus.
Water-Dock,	Rumex { Aquaticus an Britannica ?
Wake Robin,	Arum maculatum.
Bulbous Crowfoot,	Ranunculus bulbosus.
Knotted Figwort,	Scrophularia nodosa.
Dwarf Elder,	Sambucus ebulus.
Common Elder,	Sambucus nigra.
Common Flag,	Iris pseudacorus.
Stinking Flag,	Iris fœtidissima.

CHAPTER VIII.

A LIST OF SUCH FARINACEOUS SEEDS
AND ROOTS AS MAY BE USED ENTIRE
FOR FOOD.

ALL the parts of plants have a particular season in which they may be gathered in their highest perfection: fruits and seeds have generally no fixed period, but it is necessary to wait till they are quite ripe: as to roots, opinions are yet divided with respect to the time of gathering them: they are indeed succulent in spring; but it may at the same time be remarked, that the liquid vehicle which then abounds, having not undergone a sufficient elaboration, is rather watery than mucilaginous; that part of this vehicle should acquire nutritive properties; and that these advantages cannot be had together, except at the decay or fall of the leaves: this consideration alone should make us give the preference

preference to the opinion of those who maintain that roots should be gathered in autumn.

BUT if it is necessary to wait for this season, in order to collect the roots of the uncultivated plants to be mentioned below, how can they be distinguished, since at this time the leaves, which may serve to point them out, are either withered or fallen? Most of them may be gathered before their complete maturity. Besides, it is of small consequence whether they possess the whole quantity of starch which they have in autumn; the circumstances in which it is proposed to have recourse to them admitting of no delay.

IT may be added, that the farinaceous roots of perennial wild plants do not acquire their qualities, consistence, and bulk, in the space of a single year; some require a period of five or six years to arrive at their entire perfection: it is evident, that in this case they will afford much more

starch; which afterwards decreases as their fleshy state decays, and as they approach that period of old-age when they assume the consistence of woody fibres. All these reasons, deduced from experiment and observation, may serve as a proof that it is impossible to ascertain the quantity of starch that may be extracted from a given weight, and consequently the price of the food obtained from them: famine never calculates; and in times of scarcity, gold has scarce any value in comparison of bread.

IF the starch contained in the seeds and roots of wild vegetables was always attended with poisonous juices or pulp, I should certainly continue to propose the extraction of it, in the way already described, because hitherto no better method of applying these plants to the purposes of food has been discovered; but happily there are also uncultivated plants, in which the several principles are as mild as starch, and which may be used for food
without

without separating it. It is of importance to avoid loss when plenty fails, and advantage must be taken of every thing, in order to have necessaries. I only regret that such plants are less numerous and common than the others.

Wall Barley,	Hordeum murinum.
Cock's-foot Panick- grafs, - - }	Panicum Dactylon.
Wild Oat-grafs,	Avena fatua.
Tall Oat-grafs,	Avena elatior.
Floating Fescue-grafs,	Festuca fluitans.
Annual Darnel-grafs,	Lolium temulentum.

[The seeds of this grafs should be exposed to the heat of an oven before they are taken to the mill; the bread should be well baked, and should not be eaten before it is cold. These simple precautions ought always to be observed when new grain is used; they would be the means of preventing the disorders so often prevailing in autumn, of which the real cause is frequently unknown.]

Field Broomgrafs, *Bromus secalinus.*

[The same precautions are necessary to be taken with the feeds of this grafs as with those of the preceding.]

Cow Wheat,	<i>Melampyrum arvense.</i>
Cock's-comb,	<i>Rhinanthus cristagalli.</i>
Hare's-foot,	<i>Trifolium arvense.</i>
Corn Spurrey,	<i>Spergula arvensis.</i>
Knot-grafs,	<i>Polygonum aviculare.</i>
Snakeweed,	<i>Polygonum convolvulus.</i>
Corn Cockle,	<i>Agrostemma Githago.</i>

THE SEEDS of the foregoing may be used for food, but it is from the ROOTS of the following plants that we are to derive the same advantage.

Heath pease, *Orobus tuberosus.*

[The root and seeds may be used for food.]

Wild Carrot, *Daucus Carota.*

Hare-bells, *Hyacinthus non-scriptus.*

[The roots of this plant are said by some
to

to have a poisonous quality, when newly gathered.]

Wild Parsnep,
Pignut,

Pastinaca sylvestris.
Bunium bulbo-castanum.

CHAPTER IX.

A LIST OF WILD PLANTS, OF WHICH
THE ROOTS MAY BE SUBSTITUTED
IN THE PLACE OF POT-HERBS.

W ILD Celery,	<i>Apium palustre.</i>
Silver-weed,	<i>Potentilla anserina.</i>
Canterbury-bells,	<i>Campanula trachelium.</i>
Milk-thistle,	<i>Carduus marianus.</i>
Globe-thistle,	<i>Carduus eriophorus.</i>
Marsh-thistle,	<i>Carduus palustris.</i>
Wild Succory	<i>Cichorium intybus.</i>
Common Comfrey,	<i>Symphitum officinale.</i>
Alexanders	<i>Smyrnum olusatrum.</i>
White Water-lily,	<i>Nymphæa alba.</i>
Female Orchis,	<i>Orchis morio.</i>
Male Orchis,	<i>Orchis mascula.</i>

Man Orchis,	<i>Orchis militaris.</i>
Broad-leaved Orchis,	<i>Orchis latifolia.</i>
Pyramidal Orchis,	<i>Orchis pyramidalis</i>
Yellow Bethlem-star,	<i>Ornithogalum luteum.</i>

LET it not appear surprizing, that among the seasonings which uncultivated vegetables are capable of affording, I do not enumerate any species of Fungus, though they all grow spontaneously on the hills, and in the woods and plains. Most of these singular plants contain a poison of great activity; and, unhappily, we are deficient both in chemical and botanical means to establish certain marks of distinction between them, which may serve to characterize their effects, and at the same time prevent the fatal mistakes every day made in choosing them: it would then be better, as GEOFFROY expresses it, to return mushrooms reared in beds to the dunghill whence they sprung.

WERE it even in our power to render all mushrooms innocent by any particular operation, experience proves that the best
 sorts,

forts, those usually introduced into our ragouts, may become highly dangerous, either because they have been gathered too early or too late, or in a bad season; or from having been exposed for a long time to fogs, the dew or the vapour of any putrefying substance; or lastly, by eating to excess, or from the habit of body at the time of eating. M. DE JUSSIEU has told me, that both he and his uncles were well persuaded that all mushrooms were suspicious. What more respectable authority in botany can I quote in behalf of my opinion? How many accidents, that have happened immediately after meals, have been attributed to causes totally different, while they were occasioned by an immoderate use of mushrooms?

IT would be in vain to hope that a sketch of the horrible but too certain picture of the victims daily sacrificed by mushrooms, would induce men to abandon them; gluttony would still prevail, and, though the most striking instances

warn

warn us every moment of the poisonous principle contained in fungous plants, their reputation has not suffered, but we continue to eat them with equal pleasure and security. Hence, since on this occasion calamity has not rendered us wiser, I will point out with sorrow and reluctance some means of preventing or diminishing the accidents which arise from this source.

THERE should always be an interval between the gathering and eating of mushrooms, during which they should be soaked in cold water, and then blanched in fresh water; and wine, vinegar, lemon-juice, or acidulous plants, should be mixed with the dishes in which they are used. Lastly, it is of the highest importance to chew them well, lest the property belonging to several sorts, of swelling in the stomach, should give rise to enormous pieces, which would be pernicious solely on account of their indigestible bulk.

MUSHROOMS, I repeat it, are not nutritious;

trititious; they only contain a favourable substance, which may easily be dispensed with; and, since there is no way to distinguish the mushroom which is essentially poisonous, from that which may be rendered poisonous by a thousand accidents, let us not hesitate to proscribe it from the class of seasonings, by substituting the heart of artichokes, celery, and the root of parsley, and other garden plants; in which it would be easy, on enquiry, to discover the seducing relish of the deceitful mushroom.

C H A P T E R X.

TO MAKE A LIQUOR WHICH MAY BE
SUBSTITUTED IN THE PLACE OF
BEER.

IN order to obtain liquor which may be substituted in the place of beer, take rye or wheaten bran, and boil it in soft
water;

water ; then strain it, and fill a barrel with it ; afterwards diffuse a leaven, eight days old, in it, and, if the weather is hot, fermentation will take place in less than twenty-four hours ; as soon as the foam that arises through the bung-hole begins to sink, stop it up carefully, and let the liquor rest for some days, that it may become clear. When the bran has been hindered from acquiring any bad taste, this liquor is pleasant enough, has a vinous and acidulous taste ; it is, in short, the lemonade of the poor inhabitants of the country.

So easily is water made to acquire vinous properties, and to quench thirst, that we need not rob the cattle of their bran ; a little honey or sugar, a few saccharine roots diluted in a good deal of water, will suffice.

F I N I S.