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CHOSEN JUNE, 1805.

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PREFACE.

THE communications and extracts in this ninth publication of the Trustees are presumed worthy of perusal, as calculated either to afford instruction, or to gratify curiosity. Some of them are entitled to particular attention.

The first letter on the subject of *potatoes*, contains a valuable addition to the history of experiments on this species of culture, and in conjunction with the several documents respecting it in the preceding numbers of the society's papers, will serve to furnish ground for decisive conclusions upon this important article of cultivation.

The pleasing account of the MILLWARDS is printed here to show "the uses of keeping a family together, of concentering its labours under the direction of its heads, of excluding strangers from it, of employing the fragments of time, and of making the most of a little."

The agriculture of the *Netherlands*, of which some description is given, has long been considered as conducted upon the best principles, evincing the efficacy of culture to remedy defects of soil.

Such information on the growth and uses of the Egyptian *millet*, as the Trustees have received from very respectable sources, is inserted for the benefit of any who may think this plant deserving of trial and experiment.

The treatise on the *food of plants* may instruct and entertain those, who are desirous of seeing the application of science to the purposes of art.

The letter on *beans* establishes the advantage of selecting for seed, the first which appear on the vines.

A model of the cider press described by Mr. DODGE is lodged in the office of the Secretary of the Commonwealth, for the inspection of gentlemen, who wish to view it. A press of this kind, though it appears to be new to Mr. D. has been used for a long time in some parts of the State, and particularly in this vicinity, and found very convenient.

The papers on butter and cheese are republished from the pamphlet issued by the Trustees, in 1793, because they are valuable; and because, though once printed, so much time has elapsed, that they will be new to most readers.

Since the last publication of the Trustees, a munificent provision has been made for the establishment of a Professorship of Natural History and a Botanic Garden at the University in Cambridge. The Trustees of the Massachusetts Society for promoting Agriculture, constitute a major part of the Visitors of this institution. They hope to be able to discharge this part of their trust, in such a manner as to promote the interests of agriculture, as well as of other arts, connected with the science of Nature.

PREMIUMS

OFFERED BY THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

.....

1*st*. TO the person who shall discover an effectual and cheap method of destroying the Canker-worm, and give evidence thereof, to the satisfaction of the trustees, on or before the 1st day of October, 1807, a premium of *one hundred dollars*, or the society's gold medal.

2*d*. And a premium of *one hundred dollars*, or the society's gold medal, to the person who shall, on or before the 1st day of December, 1807, discover an effectual, and the cheapest method of destroying the Slug-worm, and give evidence thereof, to the satisfaction of the trustees.

3*d*. To the person who shall produce the largest quantity of wool, meat, and tallow, from the smallest number of sheep, not less than one score, raised on his own farm, a premium of *thirty dollars ;* to be claimed on or before the 1st day of August, 1807.

4*th*. To the person who shall invent a cheap method of raising water, for the purpose of irrigating land from rivers and ponds from ten to twenty feet above the level of the same, and give evidence thereof to the satisfaction of the trustees, on or before January 1, 1808, *one hundred dollars*, or the society's gold medal.

5*th*. To the person who shall present to this society the most complete (being nearly complete) Hortus Siccus, exhibiting distinct specimens of the greatest variety of grasses, in general use, and specify, to the satisfaction of the trustees, their respective qualities, productiveness and usefulness as food for different kinds of animals, the gold medal, and *fifty dollars ;* to be claimed on or before the 1st of October, 1807.

6*th*. To the person who shall produce, from seed, the best growth of thrifty trees, not less than 600 in the whole, and in the proportion of 2400 to the acre, of any of the following kinds of forest trees, viz. oak, ash, elm, sugar maple, beech, black or yellow birch, chesnut, walnut or hiccory, *twenty five dollars ;* if all of oak, *fifty dollars*. Claims to be made on or before the 1st of October, 1807.

7th. To the person who shall ascertain by accurate analysis, the constituent parts of several fertile soils respectively, and in like manner the parts of several poor soils, and thus shall discover the defects of the latter; and shall show by actual experiments, how the said defects may be remedied by the addition of earths or other ingredients, which abound in the country, and in a manner that may be practised by common farmers, *fifty dollars.* And if it shall appear to the satisfaction of the trustees, that, upon an extensive practice, the improvement of the poor soil would be more than equivalent to the expense of the improvement, the addition of *one hundred dollars.* A minute description of the several soils, and all the circumstances attending the processes, cultivation, and results, will be required. Claims to be made on or before November 1, 1807.

8th. To the person who shall, by actual experiment, on a qauntity not less than half a ton, shew the best method of curing clover hay with salt; regard to be had to the quality of the hay and the saving of labour, and the shortness of time between cutting and packing it in the mow, the silver medal, or *thirty dollars;* and to the person who shall shew the next best method, *twenty dollars.* Samples of the hay to be exhibited, three months after it is cured, to a majority of the selectmen or to the settled minister and justice of the peace in the vicinity. Claims to be made on or before the last Friday of November, 1806.

9th. It is required that the communications, for which the foregoing premiums are offered, be accompanied with proper certificates from the selectmen, magistrates, or clergymen of the vicinity, or other vouchers, to the satisfaction of the trustees; that they be delivered in without names, or any intimation to whom they belong; that they be severally marked in such a manner as each claimant shall think fit; the claimant sending also a paper, sealed up, having on the outside a corresponding mark, and on the inside his name and address.

By Order of the Trustees,

JOHN AVERY, Secretary.

AGRICULTURE.

CULTURE OF POTATOES.

BEVERLY, OCTOBER 8, 1805.

DEAR SIR,

LAST spring, recurring to the report of the committee of the London Board of Agriculture, on the culture and use of potatoes, my attention was drawn to the communication of Dr. ANDERSON, whose experiments on the management of this vegetable, formerly published, appeared to have been conducted with uncommon exactness. In that communication, he recommends the planting of sets (cuttings of potatoes) of not less than *two ounces* in weight, as yielding, on the same ground, at least double the crop that is produced from the *smallest* cuttings, which, he says, some *thrifty* managers are careful to employ. And in a note, he adds, That an economy of this sort had been recommended in the newspapers; to wit, "to cut off thin slices from the surface of the potatoe, with an eye in each, to be employed as sets, and the nucleus in the heart to be kept for food. It is (says he) scarcely possible to devise a direction that would with greater certainty insure a deficient crop; unless it be another practice that has been recommended, from the same quarter, with equal strenuousness, *that of planting sprouts without any bulbs at all.*" But in the same report is published a letter to SAMUEL HAYES, Esq. from THOMAS KING, Esq. written in consequence of his having read the Rev. Dr. MAUNSELL's treatise on propagating potatoes, by planting the *sprouts* alone; from which let-

ter a very different conclusion may be formed. Mr. KING, (whose letter is dated in 1794) says, that about two and twenty years before, he had raised very fine potatoes from the *sprouts:* and that "few years had since passed in which he had not planted, more or less, *sprouts.*" He mentions another gentleman doing the same; and that the labourers, who had laughed at his folly, could not, on taking up the produce, distinguish the drills planted with *sprouts*, from those planted with *potatoes:* they were all remarkably good." "I have (says Mr. KING) planted *potatoes*, and the *sprouts* of potatoes, on the *same day*, and always observed the *sprouts* to come up about three weeks *sooner* than the *potatoes.*

Mr. KING's letter, written with intelligence and candour, to a friend to whom he appeals as a witness of some of the facts, left no room to doubt the correctness of his statement; and as he had, for upwards of thirty years, been employed in making experiments on the culture of potatoes, and in Ireland too, of all countries the most noted for their culture, I suspected Dr. ANDERSON's remark on the planting of *sprouts*, was the confident expression of an *opinion*, without an *experiment.* I was hence induced to make one for myself, though on a very small scale. The result has proved so satisfactory, that I shall certainly, in future years, plant all the good sprouts my potatoes shall afford.

THE EXPERIMENT.

On the 20th of last May, in my garden (in that part a sandy loam) was dug, about ten inches deep, a vacant strip, nearly six feet wide, and seventy two feet long. In this were formed, with a hoe, two drills, about four inches deep, and two feet apart; and in each drill was strowed a usual quantity of stable manure. This strip I divided into three parts, each twenty four feet long. In *one*

drill of that length I planted *potatoes* and common *cuttings* of potatoes (the sort a reddish purple) about six inches apart; and in the drill beside it, of the same length, I planted *potatoes* and *cuttings* of a white (or pale yellow) sort, which was wont to yield a larger crop than the purple. In the next twenty four feet, I planted *both* drills with *sprouts* of the purple potatoe; and in the remaining twenty four feet, I planted *both* drills with the *sprouts* of the white, or pale yellow, potatoe. The sprouts of both sorts were about three inches long.

Contrary to Mr. KING's, the shoots from my sprouts appeared above ground about two weeks *later* than those from the potatoes and cuttings; and were (and for a long time continued) so slender and feeble, that I despaired of any produce worthy of notice. The ground being light and clean, they required, and received, but very little hoeing; just enough to destroy the few weeds, which sprung up among them. However, in the latter part of summer, the stems from the sprouts throve well, and at length became, though less numerous, yet nearly as luxuriant as those of the potatoes and cuttings: all continued green until this day, when I took them up; the frost of last night having killed the leaves and small branches of the stems. The several products were as follow:

	lbs.	*oz.*
No. 1. Sprouts of the white sort produced 150 potatoes, weighing - - - - - -	41	8
35 do. small, - - - - - - - -	1	12
Total, from 16 square yards, or about half a rod of ground - - - - - - - - -	43	4
No. 2. Sprouts of the purple sort, whole produce from 16 square yards of ground -	33	
No. 3. Whole potatoes and cuttings, of the white sort, growing on 8 square yards of ground, total - - - - - - - - - -	46	

No. 4. Whole potatoes and cuttings, of the purple sort, growing on 8 square yards of ground, total - - - - - - - - 26 *lbs.*

The 150 potatoes of No. 1. were all marketable, weighing, on an average, nearly four and a half ounces; twelve of the largest weighed nine pounds. They were generally more fair and handsome, than any others of the sort, raised either in the field or garden.

The potatoes of No. 2, were fair and well sized, but with a greater proportion of small ones, than No. 1.

The products of the *whole* potatoes, in No. 3, and No. 4, were generally rather smaller than those from the cuttings.

It was manifest, from the long spaces between the shoots growing from the sprouts, that many of the latter had perished. Had they been planted nearer together, so as to have sent up as numerous stems as the potatoes and cuttings, I doubt not the products would have been as great: though probably they were fairer, and individually bigger, by having more room to grow in.

In handling the two sorts of potatoes, I was inclined to think the purple were specifically heavier, than the white: and desirous of knowing the weight of a bushel of potatoes; I filled a half bushel measure with the white, heaping them up as usual, and found their weight to be thirty three pounds. The same measure of the purple, also weighed exactly thirty three pounds. So I consider the weight of a bushel of potatoes to be sixty six pounds.

On these *data*, then, it will be found,

That No. 1, produced at the rate of 197
No. 2, - - - - - - - - - 151
No. 3, - - - - - - - - - 421
No. 4, - - - - - - - - - 238
} bushels an acre.

I have been induced to give you these details, on account of the greatly diminished crops of potatoes of the present year, occasioned by the severity of the drought; being satisfied that *sprouts*, as far as attainable, may, the next spring, prove an efficient substitute for potatoe sets. Mr. KING says, "Sprouts are fit for planting at any time after they acquire roots sufficient to support themselves, independent of the mother potatoes; which they generally do when about three inches long: and as the [fibrous] roots increase in number and strength, those parts of the shoots between the first set of roots and the potatoes shrink and dry up; and, as I conceive, no more nourishment is received from the potatoe by that channel. My happening to observe this, gave me the first idea of planting sprouts."

One caution in setting *sprouts* may be useful; *to plant them as soon as possible after separating them from the potatoes:* for, like all other tender, succulent shoots, they wither very soon after being separated from the parent stock. The want of due attention to this point, probably caused many, which I planted, entirely to perish.

I have had boiled some of the white potatoes produced from the sprouts: they prove equal to any of the sort grown in the common way. Seeing, then, that the produce of *sprouts* is in *flavour equal*, and, when having more room, *superior* in *size*, and *fairer* in *form*, than the product of the *potatoes* themselves; what room is there to doubt of the sprouts being, upon the whole, *at least equal*, for seed, to potatoes, or their cuttings; provided so many sprouts be planted as will produce an equal number of shoots or stems? Mr. KING, indeed, says, "he is confident" [and it will be recollected that he says this after about twenty years' experience] "that sprouts will produce as good, if not better crops, than potatoe sets, and more seldom fail of

growing." An abundant growth of stems, in number as well as size, seems, generally, to indicate the size and number of potatoes at their roots. Whole potatoes have many eyes ; and the cuttings commonly two or more: hence, partly, their greater number of stems than appeared from the sprouts in my experiment : and hence the propriety of planting more sprouts than cuttings ; whether the planting be in hills, as in New England, or in drills (continued rows) as in the middle States, and in Great Britain and Ireland.

It would seem that Dr. MAUNSELL recommended setting the sprouts *upright ;* which would render their planting much more tedious and expensive. Mr. KING says, " he always found the sprouts to answer when laid *horizontally*, covering them as potatoe sets are covered." In my experiment, they were so laid and covered.

I have said above, *that an abundant growth of stems seemed to indicate a like growth of potatoes at their roots :* at the moment of making this remark, it occurred to me, that, as far as one instance would go, I could immediately test its correctness. I had taken up two detached hills of potatoes, which proved to be the same white kind mentioned in the experiment, and their stems lay on the ground. Their product of potatoes exceeded any I had ever before witnessed, being (with a few of the same sort from two or three stems which grew within a foot of one of the hills) a full half bushel by measure, and consequently weighing about thirty three pounds. I now measured the length of their stems, and weighed them. They averaged five feet in length, and weighed thirty three pounds. They were green and full of sap, the frost having killed only their leaves. Yet I have no doubt that these potatoes and stems all proceeded from two or three potatoes or cuttings ; but the first shoots sent

forth such numerous and long branches, as increased them to the weight mentioned. They grew on a deep, rich soil, in a low part of my garden, where it was too wet to till in the spring; so, at a convenient season some manure was spread over it, and ploughed in, the spot being reserved for cabbages. The two or three potatoes or cuttings had probably been scattered there with the manure; and the shoots having thus accidently sprung up, were suffered to grow. They were hoed two or three times, but so little earth had been drawn up about the stems, that the tops of the hills did not rise two inches above the common level of the adjacent ground. Indeed, at the taking up, I found several of the potatoes without a covering; whence they had acquired the green colour, which always appears in potatoes so exposed. The plants ought to have been so much earthed up, as to cover all the potatoes: for when exposed to the sun and air, they acquire, with their green colour, a very ill flavour, and perhaps a noxious quality.

The abundance of stems, in this instance, with the corresponding mass of potatoes, not only corroborate the observation above expressed, but tend, together with the potatoes and their stems in my experiment, to confirm an opinion I have long entertained, that neither Indian corn nor potatoes are the better for *hilling;* except in respect to the latter, drawing up so much earth, (if the mode of planting the sets, and their *disposition*, or manner of growing should render it necessary) as shall insure a covering to the bulbs, at their full growth. Dr. ANDERSON says, "an opinion is very generally entertained, that when the stems [of potatoes] are laid down in the earth, they send out bulbs from these stems, in great abundance. I can say [he continues] from experiments very carefully con-

ducted, that I have not found this to be the case in the smallest degree; but that laying down the stems and covering them, [meaning, doubtless, covering them entirely] with earth, *diminished* the produce." And on the subject of mowing the stems as fodder for cattle, he says, "My experiments prove, in the most decisive manner, that the farther growth of the potatoe (the bulb) is entirely stopped, the moment that the stem is cut over." Hence it may be inferred, that any operation by which *a considerable portion* of the stems shall be *shut up* from *light* and *air*, will proportionably diminish the crop. Yet in the improved mode of culture proposed by Dr. ANDERSON, he directs, that at each horse-hoeing, (which he would repeat every fortnight, the weather permitting) the earth be raised up a little higher upon the plants than before; and at the last hoeing, he says, "the earth should be raised as high up to the stems as possible." But he assigns his reasons: "In this way, the [fibrous] *roots* have a deep bed of mellow, friable earth to range in on both sides, *which is in no danger of being drenched with too much moisture*, (the most destructive enemy of the potatoe) and the bulbs have full room to swell, in a light, spongy bed at top." But *our* common misfortune is, to have *too little moisture:* we, therefore, ought to provide for our potatoes a different bed; which, while sufficiently "light and spongy" shall best insure an adequate supply of moisture. The means are, I believe, deep tillage, a rich manure at bottom, the coarsest manure, penetrable by the potatoe shoots at top, keeping the ground clean from weeds, and, instead of high hills or ridges, leaving, at the last operation of the plough and hoe, the surface of the ground nearly level.

If this communication shall appear to you to merit the attention of the trustees of the Agricul-

tural Society, you will have the goodness to lay it before them.

I am, my dear Sir, very truly yours,

TIMOTHY PICKERING.

Hon. GEORGE CABOT, Esq.

P. S. Thinking, since my letter was concluded, that the difference in the time of their coming up, between Mr. KING's sprouts and mine, may present some difficulty, I offer the following solution.

If you have noticed the sprouting of potatoes, as the warmth of the spring advances, you will recollect that at the base of each sprout are thrown out many roots, which, like the spread hand grasping a ball, embrace the body of the potatoe. These roots continue to extend themselves (multiplying at the same time, by numerous ramifications) in search of food; while the sprouts grow rapidly in length. Doubtless, these fibrous roots may derive some nourishment from the moist air, in which they thus vegetate: but the chief resource of roots and sprouts must be the mother potatoe, to which they still adhere by the short necks between the roots and the body of the potatoe. Now when these sprouts are separated from the potatoe, it is the short neck of each which breaks, and the roots naturally remain attached to their respective sprouts. Then if these sprouts are planted in the earth, they will be in the condition of any other transplanted vegetable; a cabbage plant, for instance. This, from the loss of its numberless fibrous roots, which, in the ordinary mode of drawing from the seed bed, are nearly all stripped off, receives a check; and does not recover, and sensibly grow, until, after many days, fresh fibres begin to shoot from the principal broken roots; just so it must be with the newly planted potatoe sprout. Violently torn from the maternal

breast, its growth is stopped; and will not be renewed, until its roots take hold of the mother earth, and there, extending and multiplying, gather new food to foster the sprout. Then the latter begins to rise, and at length appears a stem above ground.

Now to the best of my recollection, the potatoes and cuttings used in my experiment, had sprouts upon them, more or less advanced, at the time they were planted; and therefore were in condition to *continue growing* from the moment the earth received them; and, consequently, must soon have appeared above ground: and such was the fact.

Why, then, did Mr. KING's not come up so soon by three weeks, as his mere sprouts? I answer: because his cuttings, when planted, had no sprouts upon them, but *eyes only;* which are long in pushing up into stems. I am warranted in this answer, by facts stated, (though for other purposes) by Mr. KING himself. "Dr. MAUNSELL says there is no use in having the sets of potatoes cut, and let to lie any time before they are planted. I, (says Mr. KING) am of a different opinion; because I am convinced a set will *not sprout*, until the cut be *healed;* and therefore, if the cutting be performed long enough before the setting [planting] to allow time for the cut to heal or dry, so much time will be gained by the planter." This demonstrates that he cut his sets *before* they had *sprouted.* And as *healing* and *drying* the sets mean the same thing, he must, consequently, after cutting, *spread* them to the drying air, and thus effectually prevent their sprouting, until committed to the earth. If suffered to lie in a *heap*, he says they are apt to *heat*, and produce *curled stalks*, and a *bad crop.*

I will trouble you with but one more observation. I presume the stems which proceed from planted *sprouts*, are merely a continuance, or extension, of their previous growth; which, therefore, Dr. MAUN-

SELL might think an *erect position* might facilitate: but Mr. KING's long experience, (with which my single trial agrees) proves this not to be necessary. And the natural tendency of the shoots of other plants, might, beforehand, have led to the same conclusion. If, for instance, a pea vine, rising a foot or more in height, finds no bush or twig to lay hold on, it reclines, or falls to the ground: but immediately its end turns upward, and continuing to grow, rises into the air; resting its elbow on the ground. So in the case of the potatoe sprout, which, while attached to its parent potatoe, and this remains unmoved, always takes an erect position; upon being planted *horizontally*, its end, as soon as its growing is renewed, turns upward, and rises into a stem. T. P.

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Extract from an account of a cottager's cultivation, *in* Shropshire, *in* England; *by* Sir WILLIAM PULTNEY, Bart.; *taken from the 26th report of the* Society for bettering the condition, and increasing the comforts of the Poor; *dated May*, 1805.

WITHIN two miles and a half of Shrewsbury, a cottager, whose name is RICHARD MILLWARD, has a house, and adjoining to it, a garden and land; making about *one acre and one sixteenth* of an acre, including the garden. He is a collier; and the management of the ground is in a great measure left to his wife. The soil was a thin covering of about three or four inches of strong loam, over a *clay* impregnated with iron, and considered as the worst soil. They pay three shillings sterling of yearly rent for the house and land. It was leased to them 38 years ago for three lives, one of which is dead.

The wife has managed the ground in a particular manner, for thirteen years, with potatoes and wheat, chiefly by her own labour; and in a way which has yielded good crops, fully equal or rather superior to the produce of the neighbouring farms, and with little or no expense.

The *potatoe and wheat land* (exclusive of the garden) contains sixty four digging poles of land, (eight yards square to the pole, seventy five of which make an acre) and is divided into two parts. One of the divisions she plants alternately with potatoes, and the other is sown with wheat. On the wheat stubble, she plants potatoes *in rows;* and sows wheat on the potatoe ground. She puts *dung* in the bottom of the rows where she plants the potatoes; but uses *no dung* for the wheat. And she has repeated this succession for nearly the thirteen years; but with *better success and more economy* during the last six or seven years.

She provides manure, by keeping a *pig*, and by collecting all the manure she can from her *house*, and by mixing with it the *scrapings of the roads*, &c. She forms it into a *heap and turns it*, before she puts it on her ground for potatoes.

The ground is dug for potatoes in the month of March and April, to the depth of about nine inches. (This digging would cost six pence per pole, if hired.) After putting in the dung, the potatoes are planted in rows, about twelve or fourteen *inches distant*. The sets are placed about four or five inches apart in the rows.

When the potatoes come *above ground*, the *weeds* are destroyed by the hoe; and the earth *laid up on both sides to the shoots*. And this is repeated from time to time, as the season requires. Hand weeding is also used when necessary.

In the month of *October*, when the potatoes are ripe, she takes off all the stalks (or haulm) of the

potatoe; which she secures, to produce manure by means of her pig. She now goes over the whole with a rake, and takes off all weeds; and before taking up the potatoes, she sows her wheat on as much of the ground as she can clear of potatoes *that* day. They are taken up with a three pronged fork; in which her husband assists; and by the *same* operation, the *wheat is covered deep.* She leaves it *quite rough;* and the frost mellows the earth; and by the earth falling down, it adds much strength and vigour to the wheat plants in spring. Her crops of wheat have been of late always good; and even this year (which in this country has not been favourable for the wheat-crop,) she has thrashed out fifteen Winchester bushels from thirty four poles; though part of her wheat has suffered by the mildew. The *straw* of her wheat she carefully preserves for *litter* to her pig, and to increase her *manure.* When her potatoes are gathered, she separates the best for use, then a proper quantity for seed, and the small potatoes are given to her pig.

She has sixteen poles for her *garden;* upon which she plants peas, beans, and a part with cabbages; but has early potatoes and turnips the same year *on the same ground.* She sells her early potatoes, and peas and cabbages, and boils the turnips for her pig.

The only other expense of feeding her *pig*, is two or three bushels of peas; and when fit to kill, it weighs about three hundred pounds. She buys it at the age of four or five months, about the month of February; and it is killed about the month of January in the following year.

When she first began this method of alternate crops, and for several years after, she depended on the neighbouring farmers for ploughing the land and harrowing, both for the potatoes and wheat; but as the farmers naturally delayed to work for

her, till their own work was chiefly over, her land was not ploughed in proper season. She has been for the last six years independent of the farmer.

She is careful to *sow no more land at a time*, than she can clear of potatoes that day.

OBSERVATIONS BY THE SAME WRITER.

This mode of culture proves, that potatoes and wheat can be produced alternately upon the same land, *for a long course of years*, provided that a small quantity of manure be every year used for the potatoes, and it shews that a cottager may procure food from a small portion of land, by his own labour, without any expense.

Both wheat and potatoes have been reckoned exhausting crops ; but this mode of culture shews, that great crops of both may be long alternately produced ; which may probably be imputed to the culture by the spade and hoe, to the manuring every second year for potatoes, to the careful destroying of weeds, to the planting and sowing in the proper season, and to the preventing the earth from being too loose, (by the mode of sowing the wheat before the potatoes are taken up.)

An experienced farmer is of opinion, that the same culture and succession of crops, will answer on almost any land, if properly drained and skilfully managed ; for that although strong land does not answer well for potatoes, nor very light land for wheat ; yet that cultivation and manure, (and particularly the manure of lime) will soon render strong land, when drained, more loose ; and will make light land more firm, especially if cultivated with the spade and hoe. *April* 5, 1805.

Remarks on the English Accounts of the cultivation employed by the MILLWARD *family; by a member of the Kennebec Agricultural Society.*

FROM the above English accounts it appears, that the same soil is laboured and manured *every other* year, to make it produce an exhausting crop *every* year; for the potatoe crop only is assisted, and this crop occupies the same ground only once in two years. Perhaps this is the only instance in common farming, of the cares of one year answering for two crops of such different natures, sown and reaped at such distant periods, one after the other.

The clay bottom, bad as it was from its mixture with iron, nevertheless evidently served to retain both manure and rain water; but at the same time, as it was very near the surface, it rendered the soil liable to suffer from dry weather. We must therefore carry our inquiry farther, if we wish to see all the causes of these singular effects.

The ground, then we may perceive, by being left rough when the potatoes were dug, formed little hills for covering the seed from cold during the winter; as also little holes, which drained away the water from the surface, but retained it to settle down into the earth, there to be ready for use in the summer; while the frost and rain made the surface level again in the spring. The frost also, with rain produced great *change of place* in the particles of the soil, during the winter and spring; and the rough surface of the soil presented a great extent to be exposed to the beneficial influence of the air; especially as this surface was perpetually *changing*. The different depths of covering left to the seed, seems to have provided an assortment of wheat plants differently rooted, so as to leave one or other of them capable of meeting all the chances of weather; and consequently, so as to furnish at

proper intervals, at least one plant suited to the nature of the season.

The perishing of some of the seed, from want of covering, or from ravages of birds, &c. was of little consequence ; as experience must have taught the MILLWARDS how much seed was, on the average, necessary for their land, under every circumstance. It was with a view to save their seed from birds and other enemies, that no more seed was sown in a day, than answered to the potatoes to be dug in that day.

It is unfortunate that we hear nothing of the *quantity* of potatoes raised by our cottagers. We may presume, as this crop had particular favour shewn to it, that it was at least in proportion to the crop of wheat.

The potatoes were in the ground about six months ; for the English climate, during the growing season, is less forcing than that of America. Many in the United States do not allow more than four months for the growth of their potatoes ; some allow only three. But a potatoe, like an apple, may look large, and not be ripe ; for both the apple and potatoe ripen after they have got to their full size. Want of ripeness is a great defect in a potatoe ; and probably injures both its keeping and its fitness for seed.

The MILLWARDS consumed their best potatoes, and reserved only their second best for seed. Here seems to have been an error. By using the best for seed, the whole crop would soon have improved. In good cultivation, the whole crop becomes tolerably even ; especially if the planting has been early, and the earthing of the potatoe has not been too frequent. The weeding of the potatoe, it must be observed, is distinct from the earthing of it.

The English commonly plant their potatoes in rows. Perhaps such rows would admit of a simple

instrument, managed by a man and boy, to pass along between them, for the purpose of weeding and earthing.

It will be observed, that the MILLWARDS are not said to have had any instrument or machine, beyond a spade, a hoe, a three pronged fork, and a wheelbarrow; the rest was, in general, accomplished by hands and fingers; by eyes and diligence; if we add a rake, a sickle, a flail, and a pitchfork, still the cost will not be much. This was another way of rendering themselves independent of their neighbours, as well as of capital and of expense.

The manure was new for the potatoes, and old and mellow for the wheat; that is, it was by turns, in a state to be suitable to each. The soft nature of the straw and stubble, and of the roots of the wheat, and also of the potatoe stalks, added to that of the weeds, made manure of an excellent quality for yielding to the swelling of the potatoes. The weeds, it will be remembered, were weeded up before they seeded. As the chief means of renewing the weeds was from the scraping of the roads, the effects of winds, or the act of some animal, the wheat had a chance of being comparatively clean.

In short, accident seems to have suggested, and practice to have confirmed the system of the MILLWARDS; and such advantages naturally belong to those who labour for themselves, and who know every foot of their own territory, and the issue of every thing done upon it. The uses of keeping a family together, of concentering its labours under the direction of its heads, of excluding strangers from it, of employing the fragments of time, and of making the most of a little, are too evident to be insisted upon. Let the example then be imitated, with such changes as may suit the American climate; but let the labour of the field, as much as possible,

be spared to the female, who, if a good house wife and mother, will have much to do within doors.

A Member of the Kennebec Agricultural Society.

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EGYPTIAN MILLET.

PORTSMOUTH, (N. H.) DEC. 2, 1805.

DEAR SIR,

In compliance with your request, I have made inquiry of the several gentlemen in this neighbourhood, who have cultivated the new species of grain, which is here generally called Jerusalem wheat, respecting its history, culture, and properties, the result of which is :

That two years last spring a few seeds of a singular kind of grain, which were found in a crate of ware, at Exeter, were sown in a garden there ; the novel appearance of which, in the fall of the year, attracted the attention of many, and among others, of a Mr. Goss, of Greenland, who, thinking it necessary to give it some name, called it Otaheite corn ; he procured some of the seed, and sowed it the next year on his farm, and there Col. WALKER and his son saw it. The son had seen a description of grain, called Jerusalem wheat, cultivated in Ireland, published in the Dublin Magazine, by the Agricultural Society there, which was republished in one of our papers, and concluded this to be the same species of grain. Col. WALKER procured of Mr. Goss a small quantity of the grain, and distributed it to several gentlemen of this town, who raised it in their gardens. Col. WALKER, on the twentieth of May, sowed one and a half jill in drills two feet apart, but set the seed in the drills as thick as he would any small seeds ; the inconvenience of which

he discovered soon after it came up; but he suffered it to grow notwithstanding: the soil was high, dry, and gravelly, and some butchers, without Col. WALKER's knowledge, had buried a quantity of blood there the year before, which burnt up the grain at one end of the drills, extending nearly one quarter the length of them; he hoed it twice to kill the weeds; the stalks grew about six feet high, the produce which was gathered on the tenth day of October, amounts to one and a half bushel.

Col. MOSES WOODWARD obtained about half a jill of seed, and sowed two rows of it in a field, on the eighteenth day of April; the rows were eighteen inches apart, and he dibbled the seed at six inches distance, but the seed rotted in the ground. On the fourteenth of May, he planted in holes three feet by two and a half feet asunder, three hundred sixty holes in all, placing five kernels, at suitable distance, in each hole. The ground was stiff, hard and cold clay, covered with about two inches of soil near a wall, and was broke up the same spring to destroy the sord, was not manured, and was hoed twice to destroy the weeds, but was not hilled, as in raising Indian corn. About three seeds from each hole came up, and produced generally three stalks apiece, which grew about six or seven feet high; the grain is formed in a head on the top of the stalk: he gathered on this piece twelve hundred heads, which, on an average, contained one jill of seed. On the third of June, he planted the remainder of his seed; but being injured by the drought, it did not come to maturity. Col. WOODWARD thinks the time of planting Indian corn, is the proper time of sowing it, and that it should be dibbled six inches apart, in drills three feet wide. The stalks and leaves make excellent fodder for horses and cattle, but the value of the grain yet remains uncertain. Those who pretend to have

seen it abroad, call it by different names, and describe it differently. The stalk and leaves bear a near resemblance to Indian corn, and I believe it will be classed in that genus, rather than be accounted any species of wheat. In the description of the Jerusalem wheat, the grains are said to be large and round; these are flat like the kernel of Indian corn. Mr. CAZEAUX, the French commissary here, shewed some of this grain to an Irish gentleman, who called it the greater or larger millet, and said it was common in Ireland.

One gentleman in this town has been so curious as to count the grains in one head, and found it to contain twenty five hundred and fifty four. If three of these heads are produced from one kernel, the increase is very great.

We have procured a small quantity of it to be ground and bolted, and have made it into bread of different kinds, but all of them prove very ordinary. Yeast, or leaven, does not produce any fermentation in it; but when made into a batter and baked in thin cakes, it is palatable while warm.

I have the pleasure of sending you some of the flour, and a small quantity of the grain for seed. If it will not answer for bread, it may be valuable for other purposes.

I am, very respectfully,
your most obedient servant,
NATHANIEL ADAMS.

HON. DUDLEY A. TYNG.

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BOSTON, NOVEMBER 12, 1805.

DEAR SIR,

LAST year I obtained a head of Egyptian millet, (Holcus Dura) weighing five ounces, the grain of which weighed four ounces. This was

planted in April, in the manner of Indian corn, five grains in a hill, making three hundred and eighty nine hills. From these, seventeen hundred and two heads were cut on the first of October, and about fifty were broken off by the wind early in the season. The whole produce was seven bushels of fair, clean, and plump grain. Comparing it with the same number of hills of Indian corn, the product was rather better, but the millet does not spread so far, and might have been doubled on the same quantity of land; and two rows, planted in drills eight inches apart, with room for a horse plough between the rows, proved that this would have been a better method of planting, than in hills nearly four feet apart.

When Indian corn began to be injured by the drought, the millet grew more rapidly, and not a head was blasted. Some that was near a brook, on cold, wet land, was not ripe, till late in October; that on warm loam, was the fullest, and largest, and early ripe; that on warm gravel, earlier still, but not so large. One row I manured with plaster of Paris in the hills, which was only one foot high, when the other was three; a spoonful of plaster was then put round each stalk, and in three weeks, it equalled the other in height.

It is the opinion of some farmers, that half an acre of good land will produce, with less expense, as much of this grain, as an acre will of barley, oats, or rye.

I send you a few heads, and will add some of the flour, when I get it from the mill, and any of your friends that are disposed to try it, may have as much of the seed as they will plant.

I am, sir, your humble servant,

R. WEBSTER.

DR. AARON DEXTER.

FROM THE FARMER's MAGAZINE, (SCOTLAND.)

ON PLANTING OSIERS AND WILLOWS.

If you please to lay before the publick, the following method of planting willows in the fens of Cambridgeshire, you will probably render essential service to many of your readers.

In the fens, many holts, (as they are provincially called) or plantations of osiers, are raised, which beautify the country, keep the stock warm in the winter, and provide much useful wood for baskets, cradles, and all kinds of wicker work, and also for cribs for cattle to eat straw or hay out of, and to make stows or hurdles to fence in stacks, part lands, &c. &c.; or they make hedges that will last four years well; and if alllowed to grow five years, many of them would make good fork shafts for hay or corn.

These holts, or plantations of osiers, are commonly made in the middle of the land, in the north and east corners, and sometimes at any end, side, or place, that appears most easy, or in any respect the most desirable.

The situation and size of these holts vary exceedingly: sometimes they are made, in the middle of lands, from ten to sixty yards square; and in others, in the sides or ends, of from one yard wide to ten, and from ten to one hundred yards long.

The mode of planting is very simple; first to dig the land from six to twelve inches deep, and then to prick down cuttings of four years growth and eighteen inches long, at about three feet distance from each other. The soil should be moor or clay, or any that is low and wet: if drowned half the year, it will be but little the worse.

These holts or osier plantations, must be fenced round either with dikes, which is most common,

or with hedges, as is most convenient. The proper season for making them, (though they seldom fail of growing at any time) is from the fall of the leaf, till very late in the spring, and the sets are very cheap. Such plantations are cut annually for baskets, skeps, scuttles, cradles, and all kinds of wicker work; but when the osiers are kept for sets, or to make hedging wood, or for stows or hurdles, they are cut only once in four years.

Our mode of planting red or white willows will likely be acceptable; therefore a few words shall be given on that subject.

Now when wood is growing scarce and dear in Britain, and likely to become more and more so, gentlemen of landed property should cause many red and white willows to be planted on their estates; and it answers well for tenants that have long leases to make such plantations, as they turn out a profitable concern. Indeed, in all leases, my opinion is, that the tenants should be taken bound to raise a given number of young willow trees. Even tenants at rack rent should not be excepted, because the measure would produce important advantages to the country.

Either the red or white willows will grow well, as may be seen in all the fen parishes. They will prosper on all kinds of fen, moor or moss, or wet or low lands; on any kind of clay, loam, or mixed soils; but should never be planted on any high, dry, or burning lands.

These willows are always planted of cuttings or boughs, commonly of four years growth; the sets have frequently the tops cut off, and are left about eight feet long; but, before planting, they should have the thick end put in water three or four weeks, which makes them grow the better. When the planting season arrives, holes are dug about two feet deep, and at nine or ten feet distance; the sets are

then put in, and the holes filled up with earth. After the sets are planted, if the weather be very dry, they should be watered sometimes during the first year of their growth. Such plantations should be either fenced in, or stock kept from them for a few years, till they are covered with a coarse, thick bark, that stock will not eat. Those which were topped before planting, should be cut every four years, when they will produce many sets to plant fresh fields, or valuable wood for other purposes.

But it is a most excellent plan not to cut the tops off the sets when they are planted, but to let them grow for timber, and only cut the side boughs off every four years for sets, &c. These willows will grow, in most situations, more rapidly, I believe, than any other wood, and to a prodigious large size, even as large as oaks or elms. The wood is very tough and durable, when kept dry or painted, and is valuable for buildings, and other purposes. It is a proverb in the fens, that "a willow will buy a horse, before an oak will buy a saddle."

I am yours, &c.

A Cambridge Agriculturalist.

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FROM THE FARMER's MAGAZINE, (SCOTLAND.)

Observations on the best and most economical Method of Boiling Potatoes.

SIR,

IN your supplement, a receipt is given for boiling potatoes, which I have formerly seen; and it was then said to be recommended by Count RUMFORD. Admitting it to have been recommended by that celebrated economist, I must affirm, that the receipt is calculated not only to boil, but, at the same time, to spoil the potatoes, cooked

in the mode therein recommended, when they are in the smallest degree of an inferior quality: particularly by putting in cold water from time to time, to lessen the heat of the water in the pot, and boiling them with their skins on.

The fact is, that to render potatoes mealy, *they must be boiled in the most expeditious manner possible:* and for accomplishing this, I give you the receipt followed by my own good wife at home. Potatoes of last year's growth are generally of an indifferent quality; but any attentive housewife who tries both methods, can then judge which deserves the preference.

1*st*, Pick out the quantity to be used as nearly of an equal size as possible, let them be well washed, and the skins scraped off, as is done with carrots, taking out the eyes, and any earth that remains about them, with the point of a knife; when the potatoes are large, they may cut into two, three, or four pieces; throw them one by one, as they are done, into clean water, and rinse them well about, before they are put into the goblet.

2*dly*, Put the scraped potatoes into a goblet that has a tight, well fitted cover, with as much clean water as will barely cover them; throw in a little salt; fit on the cover as closely as possible, for keeping in the steam, and increasing the heat, *and place the goblet on the hotest part of a hot fire*, in order that it may boil as rapidly as possible. Whenever the potatoes are enough boiled, they must be taken off the fire, otherwise they will immediately begin to absorb the water (to the detriment of their mealy quality;) which being poured off, the goblet is again put upon the fire, with the cover off, to dry up the moisture; they are then taken out with a spoon, and put upon a dish for serving up to table.

Potatoes, *boiled in this manner*, will be found perfectly clean, more mealy than when dressed with

the skins on; besides, when they come to table in this last mentioned state, it is certainly a very disagreeable operation, taking off the skins, by soiling the fingers, dirtying the table cloth, confusing the plates, and taking up the time and attention of the eaters, when they ought to be better employed. The mode here recommended, is also more economical; for if part of the potatoes should fall down into meal, it is found perfectly clean, and fit for being made into a pudding; but when the skins are left on, the mealy part being attached to them, is entirely lost, or only fit to be given to swine or poultry.

I am your old friend, E——.

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On the Agriculture of the Netherlands. By the Abbe MANN. *Extracted from the 5th volume of* HUNTER'S *Georgical Essays.*

THE characteristick features of the Belgick peasants are, *industry*, great *economy*, and a strong *attachment* to the methods and customs of their predecessors.

Few people are more attached to their customs and practices, than the Belgick peasants. They seldom change their methods of agriculture, being persuaded that their forefathers were as wise and knowing as themselves, and that what they did, is the best themselves can do.

As to the methods of agriculture, or the nature of crops, the government of the Low Countries takes no cognizance of them, but leaves every one to do what he thinks best; and certainly, private interest and the love of gain, are the best stimulants on this head, and seldom fail to excite each one to cultivate his ground in the manner, and with the productions, which he finds most profitable. Experience thereon is his only rule and guide.

The most universal land measure in the Low Countries, is the *bunder*, or bonier. In Brabant and Hainault, it contains four hundred square perches or roods, of twenty feet long ; so that the square rood contains four hundred square feet, and the bunder, one hundred and sixty thousand. The rood varies in different parts, as does also the foot, which, in general, is less than the English one. On an average, the bunder may be reckoned three English acres. In Flanders, land is usually measured by what is called a *ghemet*, a measure containing three hundred square roods ; the rood being in some places twelve, in others fifteen Flemish feet long : but, in some parts of this province, a bunder or bonier is in use, containing four hundred square roods, as in Brabant and Hainault ; but the rood varies in different cantons, from ten to twenty feet in length. The bonier contains four journals of land.

In the rest of this essay, I shall treat briefly of the methods of agriculture, in different parts of Flanders, Brabant, and Hainault, distinguishing them according to the different nature of the soil, and confining myself to such practices as are generally established in each. As the difference of climate is insensible within these limits, I shall prefer the order which results from the soil, to that of locality, as the practices of husbandry, in an extent of flat country, not exceeding one hundred miles any way, are determined in a great measure, by the soil alone.

The different soils I shall speak of, are the following :

1. The sandy heath of the Campine of Brabant.
2. The parts of Brabant contiguous to the Campine.
3. The strong clayey soil of Walloon Brabant, and the northern parts of Hainault.

4. The soil of the middle region of Brabant, being a mixture of sand and loam.
5. The light, sandy soil about Bruges.
6. The rich loam of the districts of Ghent, Courtray, and Maritime Flanders.
7. The artificial soil of the Pays de Waes.

The Campine of Brabant.

It is well known that the Campine of Brabant, which is the northern part of that province, consisted originally of sand covered with heath, interspersed with lakes and extensive marshes, and here and there, with woods of fir. Tradition supposes it to have been once a part of the sea. To this day, where cultivation has not extended, the soil of itself produces nothing but heath and fir. The sand is of the most barren and harsh kind, nor can it be rendered fertile, but by continued manuring. As the property of this ground may be acquired for a trifle, many have been the attempts of private persons to bring tracts of it into cultivation: every means have been tried for that purpose, and government has given every possible encouragement to it. But I have not heard of any one, however considerable might be his fortune, that has succeeded in it, and many have been ruined by the project. What is cultivated in the Campine, is owing to the religious houses established in it, especially to the two great abbeys of Tongerloo and Everbode. Their uninterrupted duration for five or six hundred years past, and their indefatigable industry, have conquered these barren, harsh sands, and rendered many parts of them highly productive. The method they follow is simple and uniform; they never undertake to cultivate more of this barren soil at a time, than they have sufficient manure for; seldom more than five or six bunders in a year;

and when it is brought by labour and manuring into a state capable of producing sufficient for a family to live on, it is let out to farmers on easy terms, after having built them comfortable habitations. By these means, many extensive tracts of the Campine are well cultivated, and covered with villages, well built houses, and churches. The abbey of Tongerloo alone, furnishes about seventy of its members as curates to these parishes, all of whom owe their existence to that original stock. I may add here, and that from the undoubted testimony of the historians of the Low Countries, that the cultivation of the greatest part of these rich provinces, took its rise from the selfsame means, eight hundred or a thousand years back, when they were in a manner, one continued forest.

A Campine farm of twenty bunders is stocked with two or three horses, seven or eight cows, some oxen, and is cultivated with coleseed, clover, rye, oats, and little or no wheat. It is hardly necessary to add, that potatoes, turnips, and carrots, are cultivated, not only in the Campine, but throughout all the Low Countries. But the culture of spergule, *(alcine spergula major)* is more peculiar to the north of Brabant, though not confined to that tract alone. It serves the cows for autumn food, and the butter of this season is called spergule butter, of which the Campine furnishes a great quantity, especially to Brussels, where it is employed for the use of the kitchen, as being both cheaper and more profitable than any other for that purpose. This plant is sown where corn has been reaped, after the ground has been lightly ploughed. Cows are tethered on it in October, and a space allowed to each one, proportionable to the quantity of food which is proper for her. This pasture lasts till the frosts come on.

As spergule gives but little straw, and consequently little manure, the farmers supply the want thereof, in the following manner. The peat or sods which are cut from the heath, are placed in the stables and cow stalls, as litter for the cattle. The ground under them is dug to a certain depth, so as to admit a considerable quantity of these peat sods, and fresh ones are added, as the feet of the cattle tread them down into less compass. These compose so many beds of manure, thoroughly impregnated with the urine and dung of the cattle. This litter is renewed at proper times, and that which is removed from the stables and cow stalls is laid up in heaps, till it be carried into the fields where it is to be spread. This mixture produces a compost of excellent quality for fertilizing ground, where corn is to be sown. By these means a far greater quantity of manure is produced from the peat, than could be had by burning it, as is done in some parts. In the Campine of Brabant, the main object which the farmers have in view, is to obtain a great quantity of manure, without which, all attempts to cultivate that barren soil are in vain.

Besides butter, the Campine furnishes the rest of Brabant, and Brussels particularly, with great quantities of fat fowl; the markets are constantly supplied with them, and they are preferred to any other of the same kind. They are not less sought for and esteemed in South Holland.

The parts of Brabant contiguous to the Campine.

There are no great farms in these parts, and hardly any such thing as tenants; each farmer is a proprietor; and as he cultivates his own ground, it is clear that he will do all he can to render it fertile, without impoverishing it: far different in this respect from the tenant, who only seeks his own tem-

porary interest, by forcing the soil, during his lease, if he has no assurance of renewing it, indifferent how much he may impoverish the land for the future.

There are many meadows in these districts, which give regularly two crops of hay, one at midsummer, the other towards the end of August. It is not observed, that frequent mowing impoverishes those meadows whose soil is deep and fat. If others of inferior soil appear spent, the custom is to sow them for three succeeding years with oats, and the last thereof mixing clover with the oats ; by this means, they become excellent meadows anew.

In proportion as the ground rises from the meadows, it diminishes in goodness, becoming at last a rough, brown sand, mixed with pebbles ; and under this is a stratum of compact clay, through which water filtrates with difficulty. Such ground as this, gives small crops of rye, but it is excellent for black or turkey wheat, *(bled Sarrazin.)*

The productions of this part of the country are, wheat, rye, barley, oats, and turkey wheat ; and as food for cattle, spergule, clover, turnips, and potatoes. They cultivate also rape, coleseed, and flax, chiefly for their oils ; and also tobacco. I shall add a few observations on some of these.

The good corn land of this canton never lies fallow ; the only rest that is given it, is to let it lie a year in the clover that was sown on it with the corn the preceding year ; and then it returns again to corn, which is produced in its former abundance. It has been observed, likewise, that the best crops are produced when the corn is sown thin.

Turkey wheat, made into paste, and fried with fat bacon, is the ordinary food of the peasants of these parts, and also of the Campine. It serves them likewise for fatting their fowl ; of which, as was said above of the Campine, they feed great

quantities for the markets of the rest of Brabant and of Holland.

Great quantities of spergule are likewise cultivated in this district. It is sown immediately after the corn is reaped. This plant is excellent in the latter season for cows: it is wholesome, and increases the quantity and the goodness of their milk; and the butter made from it is fatter, and keeps better, than that made from grass in May and June. Spergule serves likewise for manure, in light soils, on account of its succulent and fat nature; being ploughed down while it is still green, it serves as a partial amendment for sowing wheat on the ground.

Clover is sown along with rye, barley, oats, wheat, and even with flax. Clover seed is a great branch of commerce in this country. When they do not choose to let the clover grow up for seed, it is cut at least three times in a year. After the last cut, the plant is ploughed under, and makes a good manure; and with a little dung added to it, wheat or rye are profitably sown on the ground.

Turnips and carrots are sown indifferently with any sort of corn; insomuch that in autumn, after the corn is reaped, the fields appear covered with them; and it is observed, that those which grow in this manner, are better than those planted in gardens, and are an excellent and healthy food for both men and cattle.

Potatoes are here likewise of great use for both. Their culture serves to amend ground newly broken up, by dividing and lightening its too compact parts, and rendering it thereby proper for sowing rye on the following year.

Coleseed *(colza)* and rape require a strong soil, and rather dry. Flax exhausts the ground, and is detrimental to the culture of corn on it. Tobacco produces a still worse effect of the same kind.

It has been found of great use in this part of the country, to divide the land into small fields, enclosed with ditches and quickset hedges, which shelter the vegetation from the dry winds and frosts of the spring; nor are they less useful in long droughts, for the same reason. The ditches are receptacles for the water, which runs off in rainy seasons, and contribute also to the growth of the hedges, which are cut for faggots every five or six years. Oak, beech, birch, poplar, hazel, &c. are planted for these hedges, the growth of which is kept down by frequent cutting.

Walloon Brabant, and Northern parts of Hainault.

The soil I shall speak of under this head, is in general a cold, compact clay, almost impenetrable to rain, and in droughts hard and full of cracks. In ploughing, the furrows are made from eight to twelve feet in distance. Lime and marl are found to be the best manures for this ground, which is manured one year in three. Long experience has shown, that the earth, after ploughing, must not be too much broken; for if it be, the rain forms it into an even compact mass, which afterwards dries and hardens, so as to become like one of the barn floors of the country; whereas, when the earth is left in clods, these crumble away insensibly during winter and spring, and thereby cover gradually the roots and young stalks of the corn.

Culture of Wheat. The ground whereon wheat is to be sown, is completely dunged, and ploughed five times; the first time in November, the second in March or April, the third at midsummer, at which time the dung is spread on it, the fourth in August, the fifth and last in September. Four raziers, weighing one hundred pounds each, are usually sown on a bunder, which gives in its turn, fifty ra-

ziers, when the crop is good. When lime is used for manure, four waggon loads are usually laid on a bunder.

Rye. This is sown on land that has been dunged and sown with wheat the foregoing year. Two ploughings suffice. The sowing is begun about the twentieth of September, if the weather permits; and in the spring, clover is sown on it. The crop is usually ripe in July.

Meteil. Wheat and rye sown together are called meteil. This mixture is sown, like rye, on a ground that has borne wheat the preceding year, and which has been ploughed in the same manner. The sowing and reaping time of meteil are a little later than those of the rye.

Oats. They are sown preferably on land which has borne clover; and in this case one ploughing suffices.

Clover. Clover is sown along with wheat and rye; twenty pounds of seed are used for a bunder. An artificial meadow of clover, remains good for two years; but in the spring of the second year, forty tubs (cuvelles) of ashes, each weighing about sixty pounds, are spread on a bunder: but this quantity varies according to the season, and the nature of the ground.

Potatoes and Carrots, are great articles of cultivation in these parts, and used for both men and cattle; but the methods have nothing peculiar.

Turnips, are sown on a well dunged ground, about the middle of July; and before the end of September, if the season be favourable, they are fit to be given to the cattle, who feed partly on them, as long as they remain good.

Horsebeans, *Peas*, *Vetches.* All these are cultivated in these parts of the Low Countries, without any material difference in the manner, from what is practised elsewhere.

Colzat, or Coleseed. It is sown about the middle of July, and the young plants are transplanted about the end of September. This is done with a narrow spade, sunk into the ground, and moved with the hand forwards and backwards, which simple motion makes a sufficient opening to receive the plant: a boy or girl follows the labourer with plants, and, putting one of them into each hole, treads against it to close it up. If the plantation is done with the plough, the plants are placed at regular distances in the furrow, and are covered with the earth turned up by the succeeding furrow. Some time after the coleseed is planted, the foot of the stalks are covered by means of a common spade, or hoe, with the earth near it, which furnishes nourishment for the plants during winter, by the crumbling of these little clods of earth over the roots. The coleseed is reaped about midsummer, or later, according as the season is more or less advanced: it is left on the field for ten or twelve days after it is cut, and then thrashed on a kind of sail cloth, spread on the ground for that purpose, and the seed carried in sacks to the farm. When the crop is good, a bunder produces about forty raziers, of eighty pounds weight each. It is to be observed, that the ground whereon coleseed is to be planted, must be dunged, and twice ploughed, the same year it is put in use.

Flax. The land for sowing flax, must be carefully cleaned from bad weeds, and well dunged. Some farmers, for the sake of getting better crops of flax, sow it on clover ground, which they dung towards the end of September, and plough afterwards. One hundred and eighty pounds of seed are sown on a bunder as soon as spring comes on. When the flax is about four inches high, it is carefully weeded, without which precaution the weeds would stifle the plants; and this is repeated, as often

as the weeds get head anew. When the crop is good, a bunder yields about four hundred pounds weight of flax. The flax of this part of the country, is much inferior in quality, to that produced about Courtray and Menin.

In these parts of the Low Countries, the farms are usually much greater than in Flanders, and in the middle region of Brabant, where the land is richer. In Hainault, all farms of above seventy bunders have been divided; but this has not extended to Walloon Brabant, where there are still many great farms.

A farm of seventy bunders* is usually distributed as follows; ten bunders of meadow, ten of wheat, twelve of rye, three of winter barley, one of spring barley, eight of oats, four of horsebeans, peas, and vetches, and eight of clover; which together, make fifty six bunders in cultivation, the other fourteen lying fallow, in all seventy bunders. For cultivating such a farm, eight horses are necessary: and it is stocked with sixteen cows, twelve oxen, and a flock of two hundred sheep; besides hogs and fowls in proportion.

The Middle Region of Brabant.

The land is here a mixture of sand and loam, which make an excellent light soil, but not so rich as that of Flanders, though preferable perhaps for corn. The usual productions of this part of the country are wheat, rye, oats, barley, beans, peas, vetches, clover, turnips, carrots, and potatoes. No ground here lies fallow: the farms are seldom extensive: forty bunders may be taken for an average. The distribution of a farm of this size, is usually into about six bunders of meadow, and thirty four of arable land.

* About two hundred and ten English acres.

These last are manured almost yearly, with from twelve to sixteen waggon loads of manure to each bunder, those in clover excepted. On these it is usual to spread, in March, turf ashes brought in boats from Holland. From eighty to one hundred tubs of about sixty pounds weight each are employed for a bunder, one third of which is kept to be spread after the first cut. Many of the Flemish farmers make great use of these ashes, which being highly impregnated with salts, enrich the land so as to render it capable of producing excellent crops of wheat, without any other manure, except turning under the clover it was sown with the preceding year.

In most farm yards, a deep ditch is dug near the cow house, into which the urine of the cattle runs, and a sufficient quantity is gathered, for spreading over two or three bunders, which proves an excellent manure.

The arable part of such a farm as I am speaking of, is distributed as follows: five bunders of wheat, five of rye, two of meteil, two of barley, four of oats, two of beans, peas, and vetches, five of clover, four of turnips, carrots, and potatoes, and five of coleseed; in all, thirty four bunders; the other six being meadow.

The following rotation is used in the culture of these parts. The ground being well manured, the first year coleseed is planted; the second year it is sown with wheat; and the third with rye, without dunging. From two to three raziers of wheat, of eighty pounds each, are usually sown on a bunder, and when the crop is good, it yields from thirty to forty raziers of the same weight.

Some farmers spread turf ashes on the ground where they have sown turnips and carrots, as well as on that sown with clover, &c. and then pass the harrow over it.

In a favourable year, a journal (a quarter of a bunder) of land well manured, will produce from fifty to sixty sacks of potatoes.

Those that feed sheep in the districts where no land lies fallow, feed them as well as their other cattle, with corn, beans, peas, vetches, turnips, and other roots.

Agriculture of Flanders; and first in the environs of Bruges.

The quality of the soil varies greatly in different parts of the district of Bruges, although the main constituent of it be every where a light sand. In many parts, continual manuring and cultivation have rendered it extremely rich; in some spots, for want of these, it is less so; but a more extensive population would soon bring them into the same state as the rest.

There are many large farms in this part of the country, belonging in general to the rich abbeys; those of lay proprietors are for the most part less; and those of which the farmers themselves are proprietors, are still smaller. The culture in these cantons is regulated as follows:

A ghemet, or measure of land, is manured the first year with dung, or, near Bruges, with a boat load of street dirt from that city; it is then sown with flax; the second year wheat is sown on it; the third year, rye; the fourth year it is again slightly manured, and sown with oats, or turkey wheat, and sometimes with clover, turnips, carrots, parsnips, or potatoes.

Clover is sown along with oats, and only lasts a year; it is afterwards ploughed, manured, and sown with wheat and flax.

Broom is sometimes sown as an amendment for bad land, and pulled up at the end of the second

year during winter. The ground is then dunged, ploughed, and cultivated with later crops, sown in the spring.

Turnips, carrots, parsnips, and potatoes, supply in these parts the want of meadows, and great care is taken to preserve them during winter, for food for their cattle. Turnips, carrots, and parsnips are laid in the earth, in round heaps, of eight or ten feet in diameter at the bottom, and five or six feet high; when the first layer is placed, it is covered with long straw; and so on alternately to the top. These heaps are opened in the winter or spring, according as the farmer has need of them for feeding his horses and cows; they are given likewise to early lambs, when young grass is wanting.

Potatoes are kept in deep holes dug in sandy ground, where they are seldom hurt by ordinary frosts, and keep good till far on in the spring.

In this tract of country, there are many little woods of oak, elm, beech, alder, and here and there, fir of the maritime kind. Great quantities of willows are planted, and some are let grow up into trees, out of which are made windlasses for the boats and barges of the country: these sell dearer than oak.

Lands on the Rivers Lys and Scheldt, from Menin and Courtray, to Ghent and Dendermonde, and also of Maritime Flanders.

The soil on the flat banks of the Lys and the Scheldt, is reckoned among the best in Flanders: it is, in general, a rich, sandy, moist loam, become almost black with a long and uninterrupted cultivation. Hardly any great farms are found here; those of from sixty to eighty ghemets are counted the greatest, and they are generally less, as the land is richer.

In the largest of these farms, there are seldom more than three or four horses, and ten or twelve cows. The farmer employs from twenty to thirty waggon loads of dung for three ghemets of land, and only fifteen or sixteen loads, if it be street dirt, from the great towns, or turf ashes brought by water from Holland.

These lands produce grain of every sort in great abundance, as also every kind of esculent roots, which are given to the cattle in winter, along with their hay. The meadows along the rivers, and in other parts of this rich and moist soil, are superiorly good, and the clover is the most luxuriant I ever saw. It is usual to spread, in the spring, sixty sacks of turf ashes on three ghemets of clover sown the preceding year, which proves an excellent manure to it.

A great branch of culture in these parts, and particularly in the districts of Courtray and Menin, is that of flax, of which they produce an immense quantity, and of the finest kind. The expense of this culture is great, the labour bestowed on it in weeding, is almost uninterrupted, and the damage it does to the soil in exhausting its vegetable juices is beyond measure; but in return, a good crop will almost buy the ground. To recover the soil after a crop of flax, clover and spergule are sown on it, and turned down for manure.

The plough used for this fine light soil, has a little wheel and an immoveable sower: one horse serves to draw it, or two at most, in the strongest of this ground.

Lands uncultivated, and fields lying fallow, are here unknown. There are few woods in this part of the country: but all the fields are enclosed with hedges, and thick set with trees, insomuch that the whole face of the country, seen from any little height, seems one continued wood.

The agriculture in Maritime Flanders is much the same with that now spoken of, as the soils of each bear a great resemblance; only that near the sea is more moist, the meadows are more extensive, and little or no flax or spergule are there cultivated. If there be any material difference between these soils, it consists in the greater quantity of marine substances, which enter into the composition of the soil of Maritime Flanders, than of that in the inner part of the country, and these add to it an additional degree of fertility.

The castlery of Furns, and the environs of Dixmude, abound more in excellent meadows than any other part of the Low Countries: the number of horned cattle fed there is immense, as is also the quantity of butter produced and sold, chiefly at Dixmude market: and it is of the best quality, both for richness and keeping.

The Pays de Waes.

The land of Waes is the district lying on the north side of the Scheldt, between Ghent and Antwerp; it is a perfect flat, and is reckoned the richest part of Flanders. The original soil was pure sand, and its present state of fertility, is owing to the great number of its industrious inhabitants, who cultivate a few acres round their dwellings, of which, for the most part, they are proprietors. The natural meadows are rich, and the great number of cows, which the inhabitants keep, furnish manure in great abundance: but they are not content with this alone; great quantities of turf ashes are brought thither from Holland, as also a great part of the street dirt and dung from Brussels, Antwerp, and Ghent, besides what is had from the many rich and populous towns and villages, with which this district is covered.

The farms being so very small, few horses are kept in the land of Waes; the ground is chiefly worked with the spade and hoe, which the extreme lightness of the soil renders easy. If a plough be used, it is of the most simple kind, without wheels, and drawn by one horse. All these contribute together to give a richness and fertility to the soil of this tract, which surpasses almost what can be imagined. No spot lies uncultivated.

The common method of culture is as follows: a bunder of land is manured, once in seven years, with from forty to fifty cart loads of dung and town dirt. The first year it is sown with hemp; the second, with flax; the third, with wheat; the fourth and fifth, with rye; the sixth, with oats; and the seventh with clover, turkey wheat, turnips, or carrots. Fallow ground is unknown here.

Spergule is sometimes sown about mid August, on land that has borne wheat; and in October, the cows are put into it. The spergule which they cultivate for seed, is sown in March, and reaped in June.

It is to be observed, that the riches of the land of Waes consist chiefly in the culture of flax and hemp; the other crops being in general for their own use, and for home consumption, which indeed is very considerable, on account of the great population of this district. The produce of their flax and hemp is so considerable, that in a good year, they are reckoned to amount almost to the value of the ground.

The agriculture of the land of Waes, passes, indisputably, for the most complete and perfect in all the Netherlands.

FROM THE FARMER's MAGAZINE, (SCOTLAND.)

On the Propriety of bruising Oats with a Machine, for such Horses as do not grind them sufficiently with their Teeth.

SIR,

HAVING some time ago heard the above subject discussed in a society of respectable farmers, I was rather surprised to find much difference of opinion, on a question which might have been so easily decided by experiment.

It was contended by some, that oats vegetated on a dunghill, after passing whole through the stomach of a horse. And, on the other hand, it was stated, that although whole oats were to be found in horse dung, they had parted with their farinaceous and nutritive properties in their passage through the horse, and were become either empty husks, or contained only an insignificant portion of mucilage, without any power of vegetation ; and that the oats growing on dunghills, were such as had fallen from the horses' mouths while feeding.

I beg leave to state, that I accidentally noticed a large quantity of whole oats in some dung just passed from a horse, and, upon examining them, they appeared to be quite sound: I thereupon had the dung mixed with mould in a garden pot, and, in about a fortnight, the oats began to vegetate very freely, and are at this time two or three inches above ground.

It is not convenient to me to follow up this experiment, and I therefore confine my statement to saying, that *oats have vegetated after passing through one of my horses.*

This fact must have been repeatedly ascertained ; but as it is by no means generally received, you may think it worth while to take further notice of

it; and since it is connected with very important considerations in the branch of agriculture, relative to feeding, it cannot be too frequently impressed on your readers.

From the above, I am induced to suggest the utility of bruising all grain that is to be given to horses, so as the full benefit of the nutritive matter therein contained may be procured.

I am yours, &c. *T. N. P.*

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FROM THE FARMER's MAGAZINE, (SCOTLAND.)

On the Use of Parsley as Food for Horses and Cattle.

SIR,

As your magazine is solely devoted to the purposes of agriculture, every fact, and every experiment that tends to enlarge our knowledge, and to promote the ends of that great national concern, ought to have a place in it. I am induced, from this motive, to lay before you an experiment upon a small scale, which I never heard had been made before, but which may in time become of great publick utility, if it shall be found, upon farther trial, to succeed as well as in the case to which I allude. You may fully depend on the truth of the fact itself.

A friend of mine having occasion to observe the partiality of black cattle for the common garden parsley, and their preference of it, when growing, to almost any other green food, took it in his head to try how it would succeed in a field that he was going to sow down for pasture. He accordingly sowed two or three ridges with parsley seed, and the rest of the field with clover and rye grass. As soon as the field was ready for pasture, he led his cattle into it, and it was perfectly evident that they

preferred that part which was sown with the parsley, to any other part of the field, insomuch that they never touched the rest, while there was a single blade of parsley to be had. Horses were equally fond of it. He had not an opportunity to try sheep upon it; but the probability is, that they would, if possible, have been fonder of it, and thriven better, than any of the other two. This, therefore, seems worthy of a farther trial. We know that black cattle, sheep, horses, and indeed every other animal, always prefer that food (when they have it in their power to make a choice) that is most agreeable to them, and most conducive to their health. We know also that parsley is a most wholesome vegetable for the human species. It is a powerful antiseptick. If we were to reason from analogy, we should suppose that its beneficial properties should extend to the animal creation in general. As it is a perennial plant, it will answer well for fields that are to be laid down for pasture for a considerable while. Sheep, in particular, being of a tender and delicate constitution, and especially subject to bowel complaints, its antiseptick quality may be of great use to correct these. The difficulty may be at first to get the seed in any considerable quantity; but that may soon be remedied, if the experiment be thought worth while. I would suppose that the ground upon which it is sown must be good, in good condition, and clean, otherwise it will not have a fair trial.

AGRICOLA.

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FOOD OF PLANTS.

The following account of the probable food of plants, is taken from a late celebrated English work. Its principal object is directed to the mixture of

different earths, and the use of animal and vegetable matter as manures to support the new plant, and the advantages that arise from the use of these articles, in a crude state, that in their decomposition or putrefaction, the surrounding earth may be impregnated with those volatile parts that commonly evaporate and are lost in the air; as is easily discovered by the offensive smell, which never ought be suffered to escape, and is attended with a loss of the most valuable parts of the collection, but which is completely preserved when scattered over a large surface, mixed and covered with the earth in small portions.

" Plants, after they have germinated, do not remain stationary, but are continually increasing in size. A tree, for instance, every season adds considerably to its former bulk. The root sends forth new shoots, and the old ones become larger and thicker. The same increment takes place in the branches and the trunk. When we examine this increase more minutely, we find that a new layer of wood, or rather of alburnum, has been added to the tree in every part, and this addition is made just under the bark. We find too, that a layer of alburnum has assumed the appearance of perfect wood. Besides this addition of vegetable fibre, a great number of leaves have been produced; and the tree puts forth flowers, and forms seeds.

" It is evident from all this, that a great deal of new matter is continually making its appearance in plants. Hence, since it would be absurd to suppose that they create new matter, it must follow that they receive it by some channel or other. Plants, then, require food as well as animals. Now, what is this food, and whence do they derive it? These questions can only be answered by an attentive survey of the substances which are contained in vegetables, and an examination of those substances, which are necessary for their vegetation.

If we could succeed completely, it would throw a great deal of light upon the nature of soils and of manures, and on some of the most important questions in agriculture.

"In the first place, it is certain that plants will not vegetate without water; for whenever they are deprived of it, they wither and die. Hence the well known use of rains and dews, and the artificial watering of ground. Water, then, is at least an essential part of the food of plants. But many plants grow in pure water; and therefore it may be questioned whether water is not the only food of plants.

"This opinion was adopted very long ago, and numerous experiments have been made in order to demonstrate it. Indeed, it was the general opinion of the seventeenth century; and some of the most successful improvers of the physiology of plants, in the eighteenth century have embraced it. The most zealous advocates of it were, VAN HELMONT, BOYLE, BONNET, DUHAMEL, and TILLET.

"VAN HELMONT planted a willow, which weighed five pounds, in an earthen vessel filled with soil, previously dried in an oven, and moistened with rain water. This vessel he sunk into the earth, and he watered his willow sometimes with rain, and sometimes with distilled water. After five years, it weighed one hundred and sixty nine pounds and one quarter, and the earth in which it was planted, when again dried, was found to have lost only two ounces of its original weight. Here, it has been said, was an increase of one hundred and sixty four pounds, and yet the only food of the willow was pure water; therefore it follows, that pure water is sufficient to afford nourishment to plants. The insufficiency of this experiment to decide the question, was first pointed out by BERGMAN, in 1773. He shewed, from the experiments of MARGRAFF, that the rain water employed by VAN HELMONT,

contained in it as much earth as could exist in the willow at the end of five years. For according to the experiments of MARGRAFF, one pound of rain water contains one grain of earth. The growth of the willow therefore, by no means proves, that the earth, plants contain, has been formed out of water. Besides, as Mr. KIRWAN has remarked,* the earthen vessel must have often absorbed moisture, from the surrounding earth, impregnated with whatever substance, that earth contained; for unglazed, earthen vessels, as HALES and TILLET have shewn,‡ readily transmit moisture. Hence it is evident, that no conclusion whatever can be drawn from this experiment; for all the substances which the willow contained, except water, may have been derived from the rain water, the earth in the pot, and the moisture imbibed from the surrounding soil.

"The experiments of DUHAMEL and TILLET are equally inconclusive; so that it is impossible from them to decide the question, Whether water be the sole nourishment of plants or not? We owe the solution of this difficulty to the experiments of Mr. HASSENFRATZ.

"He analyzed the bulbous roots of hyacinths, in order to discover the quantity of water, carbon, and hydrogen, which they contained; and by repeating the analysis on a number of bulbs, he discovered how much of these ingredients was contained in a given weight of the bulb. He analyzed also kidney beans and cress seeds in the same manner. Then he made a number of each of these vegetate in pure water, taking the precaution to weigh them beforehand, in order to ascertain the precise quantity of carbon, which they contained. The plants being then placed, some within doors, and others in the open air, grew and flowered, but produced no

* Vide Irish Translation.
‡ Ann. de Chem.

seed. He afterwards dried them, collecting with care all their leaves and every other part which had dropped off during the course of the vegetation. On submitting each plant to a chemical analysis, he found that the quantity of carbon, which it contained, was somewhat less than the quantity which existed in the bulb, or the seed from which the plant had sprung.

"Hence it follows irresistibly, that plants growing in pure water do not receive any increase of carbon; that the water merely serves as a vehicle for the carbonaceous matter already present, and diffuses it through the plant. Water, therefore, is not the sole food of plants; for all plants, during vegetation, receive an increase of carbonaceous matter, without which they cannot produce perfect seeds, nor even continue to vegetate beyond a certain time; and that time seems to be limited by the quantity of carbonaceous matter, contained in the bulb, or the seed from which they grow. For DUHAMEL found, that an oak which he had raised by water from an acorn, made less and less progress every year. We see, too, that those bulbous roots, such as hyacinths, tulips, &c. which are made to grow in water, unless they be planted in the earth every other year, refuse at last to flower, and even to vegetate; especially if they produce new bulbous roots annually, and the old ones decay.

"So far, indeed, is water from being the sole food of plants, that, in general, only a certain proportion of it is serviceable, too much being equally prejudicial to them as too little. Some plants, it is true, grow constantly in water, and will not vegetate in any other situation; but the rest are entirely destroyed when kept immersed in that fluid beyond a certain time. Most plants require a certain degree of moisture, in order to vegetate well. This is one reason why different soils are required for different

plants. Rice, for instance, requires a very wet soil: were we to sow it in the ground on which wheat grows luxuriously, it would not succeed; and wheat, on the contrary, would rot in the rice ground.

"We should, therefore, in choosing a soil proper for the plants which we mean to raise, consider the quantity of moisture which is best adapted for them, and choose our soil accordingly. Now, the dryness or moisture of a soil depends upon two things; the nature and proportions of the earths which compose it, and the quantity of rain which falls upon it. Every soil contains at least three earths, silica,* lime, and alumina,† and also sometimes magnesia. The silica is always in the state of sand. Now soils retain moisture longer or shorter according to the proportions of these earths. Those which contain the greatest quantity of sand, retain it the shortest, and those which contain the greatest quantity of alumina, retain it longest. The first is a dry, the second a wet soil. Lime and magnesia are intermediate between these two extremes: they render a sandy soil more retentive of moisture, and diminish the wetness of a clayey soil. It is evident, therefore, that, by mixing together proper proportions of these four earths, we may form a soil of any degree of dryness and moisture that we please.

"But whatever be the nature of the soil, its moisture must depend, in general, upon the quantity of rain which falls. If no rain at all fell, a soil, however retentive of moisture it be, must remain dry; and if rain were very frequently falling, the soil must be open indeed, if it be not constantly wet. The proportion of the different earths in a soil, therefore, must depend upon the quantity of rain which falls. In a rainy country, the soil ought to be open; in a dry country, it ought to be retentive

* Flint. † Clay.

of moisture. In the first, there ought to be a greater proportion of sand; in the second, of clay.

"Almost all plants grow in the earth, and every soil contains at least silica, lime, alumina, and often magnesia. The use of these earths is to administer the proper quantity of water to the vegetables, which grow in the soil. But as all plants contain earths as a part of their ingredients, is it not probable that earths also serve as food for plants? It has not yet indeed been shewn, that those plants which vegetate in pure water, do not contain the usual quantity of earth: but as earths are absolutely necessary for the perfect vegetation of plants, as they are contained in all plants, and are even found in their juices, we can scarcely doubt that they are actually imbibed, though only in small quantities. Mr. TENNANT has ascertained, that magnesia, when uncombined with carbonic acid gas, is injurious to corn, when employed as a manure; and that lime which contains a mixture of magnesia, likewise injures corn.* This important fact demonstrates, that earths are not mere vehicles for conveying water to plants. The same conclusion follows irresistibly from the experiments of SAUSSURE, junior. That philosopher analyzed the following plants, growing in a granitic and in a calcareous soil, namely, pinus abies, pinus larix, rhododendron ferrugineum, vaccinium myrtillus, junniperus communis. The result was, that the plants which grew in the granitic soil contained most water; the proportion of charcoal was nearly the same in both; but the proportion of earths corresponded nearly with the nature of the soil. The plants which grew in the granitic soil, contained a considerable proportion of silica and metallic oxides; those which grew in the calcareous, little or none of these bodies, but a greater proportion of calcareous earth than the granitic plants.

* Phil. Trans. 1799. British.

"All plants contain, likewise, various saline substances; and if we analyze the most fertile soils, and the richest manures, we never find them destitute of these substances. Hence it is probable, that different salts enter as ingredients into the food of plants. It is probable, also, that every plant absorbs particular kinds of salts. Thus sea plants yield soda by analysis, while inland plants furnish potass. The potass contained in plants, has indeed been supposed to be the produce of vegetation; but this has not been proved in a satisfactory manner. We find potass in the very juices of plants, even more abundantly than in the vegetable fibres themselves. But this subject is still buried in obscurity; and indeed, it is extremely difficult to make decisive experiments, on account of the very small quantity of potass, which most plants contain.

"The phosphorus, too, and the iron, and other metals which are found in plants, are, no doubt, absorbed by them as a part of their food. We may suppose also, that the sulphuric and muriatic acids, and perhaps even the nitric acid, when found in plants, are imbibed by them along with the rest of their aliment.

"Nothing is at present known concerning those saline substances, which form an essential part of the food of plants, though it has been long remarked, that certain salts are useful as manures.

"Water, then, and earths, and perhaps also salts, form a part of the food of plants; but plants contain carbon, which cannot be derived from any of these substances; consequently, some substance or other besides, which contains carbon, must constitute a part of the food of plants. Mr. Giobert mixed together the four earths, silica, alumina, lime, magnesia, in proper proportions, to constitute a fertile soil; and after moistening them with water, planted several vegetables in them; but none of his plants grew

well, till he moistened his artificial soil with water from a dunghill.* Now it is certain, from the experiments of HASSENFRATZ, that this water contains carbon; for when evaporated, it constantly leaves behind it a residuum of charcoal.† We know likewise, from a great variety of experiments, that all fertile soils contain a considerable quantity of carbonaceous matter; for all of them, when exposed to heat, are susceptible of partial combustion, during which a quantity of carbonic acid gas escapes. Thus FOURCROY and HASSENFRATZ found that nine thousand two hundred and sixteen parts of fertile soil, contained three hundred and five parts of carbon, besides two hundred and seventy parts of oil; which, from the analysis of LAVOISIER, we may suppose to contain about two hundred and twenty parts of carbon. It follows, therefore, from the experiments of these chemists,‡ that nine thousand two hundred and sixteen parts of soil, contain five hundred and twenty five parts of carbon. But these nine thousand two hundred and sixteen parts of soil, contained eight hundred and six parts of roots of vegetables, which were excluded from the analysis; consequently a fertile soil contains (exclusive of the roots of vegetables) about one sixteenth of its weight of carbon.

"But the carbon must exist in the soil in a particular state of combination, otherwise it does not answer as food for plants: for instance, powdered pitcoal, mixed with earths, is not found to act, at least immediately, as a manure; yet pitcoal contains a very great quantity of carbon. Farther, it appears from the experiments of Mr. HASSENFRATZ, that substances employed as manures, produce effects in times proportioned to their degree of putrefaction; those substances which are most putrid,

* Encyc. † An. de Chem.
‡ Vid. Encyc. mett. Physiol. veg.

producing the most speedy effects, and of course soonest losing their efficacy. Having manured two pieces of the same kind of soil, the one with a mixture of dung and straw highly putrefied, the other with the same mixture newly made, and the straw almost fresh, he observed that, during the first year, the plants which grew on the land manured with the putrefied dung, produced a much better crop than the other : but the second year, (no new dung being added) the ground which had been manured with unputrefied dung, produced the best crop ; the same thing took place the third year, after which, both seemed to be equally exhausted.* Here it is evident, that the putrefied dung acted soonest, and soonest exhausted. It follows from this, that carbon only acts as a manure when in a particular state of combination ; and this state, whatever it may be, is evidently produced by putrefaction. Another experiment of the same chemist renders this truth still more evident. He allowed shavings of wood to remain for about ten months in a moist place, till they began to putrefy, and then spread them over a piece of ground by way of manure. The first two years this piece of ground produced nothing more than others which had not been manured at all ; the third year it was better, the fourth year it was still better, the fifth year it reached its maximum of fertility ; after which it declined constantly till the ninth, when it was quite exhausted.† Here the effect of the manure evidently depended upon its progress in putrefaction.

"The particular state into which carbon must be reduced before it be fit for the food of plants, is not known exactly, the different combinations of carbon having been, in a great measure, overlooked. And yet it is evident, that it is only by an accurate ex-

* Annal. de Chem. ch. xiv.
† Ann. Chem.

amination of these combinations, and a thorough analysis of manures, in order to discover what particular combinations of carbon exist in them, and in what the most efficacious manures differ from the rest, that we can expect to throw complete light upon the nature and use of manures, which is one of the most important subjects to which the farmer can direct his attention. We know, from the experiments of Mr. HASSENFRATZ, that all those manures which act with efficacy and celerity, contain carbon in such a state of combination, that it is soluble in water; and that the efficacy of the manure is proportional to the quantity of carbon so soluble. He found that all efficacious manures gave a brown colour to water; and that the water so coloured, when evaporated, left a residuum, which consisted in a great measure of carbon. He observed, too, that the soil which gives the deepest colour to water, or which contains the greatest quantity of carbon soluble in water, is, other things being the same, the most fertile.

"This is not, however, to be understood without limitation, for it is well known, that if we employ excessive quantities of manure, we injure vegetation, instead of promoting it. This is the reason that plants will not, as Mr. DUHAMEL found by experiment, vegetate in saturated solutions of dung.* One of the combinations of carbon which is soluble in water, and with which we are best acquainted, is carbonic acid gas. It has been supposed by many philosophers, particularly by Mr. SENNEBIER, that this gas, dissolved in water, supplies plants with a great part of their carbon. But Mr. HASSENFRATZ, on making the experiment, found that the plants which he raised in water, impregnated with carbonic acid gas, differed in no respect from those which grew in pure water, and did not

* Ann. de Chem

contain a particle of carbon, which had not existed in the seeds, from which they sprung :* this experiment proves, that carbonic acid gas, dissolved in water, does not serve as food for plants. It appears, however, from the experiments of RUCKERT, that when plants growing in soil are watered daily, with water impregnated with carbonic acid gas, they vegetate faster than when this watering is omitted. He planted two beans in pots of equal dimensions, filled with garden mould. One of these was watered almost daily with distilled water, the other with water, every ounce of which was impregnated with half a cubic inch of carbonic acid gas. Both were placed in the open air, but in a situation where they were secure from rain. The bean treated with the water impregnated with carbonic acid gas, appeared above ground nine days before the other, and produced twenty five beans ; whereas the other produced only fifteen. The same experiment was tried on other plants with equal success.† This shews us that carbonic acid gas is somehow or other useful to plants, when they vegetate in mould ; but it gives us no information about its mode of acting. Some soils, we know, are capable of decomposing it ; for some soils contain the green oxide of iron : and GADOLIN has proved, that such soils have the property of decomposing carbonic acid gas.‡ Indeed almost all soils contain iron, either in the state of the brown or the green oxide ; and BEAUME has shewn that oils convert the brown oxide of iron into the green.§ Now dung contains a quantity of oily substance ; and this is the case also with rich soils. One use of manures, therefore, may be, to reduce the brown oxide of iron to the green, that it may be capable of decomposing carbonic acid gas ; and the carbon, thus precipited, may

* Ann. de Chem.
† Crell's Annals, 1786.
‡ Annal de Chem.
§ Kirwan Irish Trans.

enter into some new combination, in which state it may serve as food for plants. But it is more probable, that the carbonic acid enters the plant combined with some other body, and that its decomposition takes place within the plant itself.

"INGENHOUSZ observed long ago, that soils have the property of absorbing oxygen from the atmosphere.* This observation has been lately confirmed by HUMBOLT; and upon repeating the experiment, I found that new turned up soils does absorb oxygen from the air, giving out at the same time a portion of carbonic acid gas. It can scarcely be doubted, that this absorption has an influence on vegetation, especially as watering plants with weak solutions of oxy-muriatic acid, accelerates vegetation. But we know too little of the subject at present to be able to specify, precisely, what that influence is.

"Such is the present state of our knowledge, respecting the food of plants, as far as it is supplied by the soil in which they vegetate. It is probable that it is imbibed by the extremities of the roots only; for DUHAMEL observed, that the portion of the soil which is soonest exhausted, is precisely that part in which the greatest number of the extremities of roots lies. This shews us the reason why the roots of plants are continually increasing in length. By this means they are enabled, in some measure, to go in quest of nourishment. The extremities of the roots seem to have a peculiar structure, adapted for the imbibing of moisture. If we cut off the extremity of a root, it never increases any more in length; therefore its use as a root has been in a great measure destroyed. But its sides send out fibres, which act the part of roots, and imbibe food by their extremity. Nay, in some cases, when the extremity of a root is cut off, the whole decays, and a new one is formed in its place. This,

* Journ. de Phy.

as Dr. BELL informs us, is the case with the hyacinth.*

The extremities of the roots contain no visible opening. Hence we may conclude, that the food which they imbibe, whatever it may be, must be in a state of solution; while the absolute necessity of water, renders it probable that water is the solvent. And, in fact, the carbon in all active manures, is in such a state of combination, that it is soluble in water.

"All the salts which we can suppose to make a part of the food of plants, are more or less soluble in water. This is the case also with lime, whether it be pure, or in the state of a salt; magnesia and alumina may be rendered so by means of carbonic acid gas; and BERGMAN, MACIE, and KLAPROTH, have shewn, that even silica may be dissolved in water. We can see, therefore, in general, though we have no precise notions of the very combinations which are immediately imbibed by plants, that all the substances which form essential parts of that food may be dissolved in water."

.....

CIDER PRESS.

NEW CASTLE, (MAINE) JAN. 6, 1806.

BELIEVING that the Massachusetts Agricultural Society wish to encourage every useful improvement, I have taken the liberty to forward to you for their inspection, a pattern of a cider press, on a new construction, which I have formed, and which appears to answer a valuable purpose. I am sensible that every thing is not new to others, which is so to ourselves; but as I have never seen any thing of the kind, I am led to conclude, that if any thing like

* Monch. Mem.

it has been known to others, they have not sufficiently felt the importance of communicating their knowledge for the good of the publick. With a view to have the improvement fairly tried, and the publick generally benefited by it, I would request you to present the pattern, and description accompanying it, to the Trustees of the Massachusetts Agricultural Society. Should they approve of it, they will take such measures to bring it into more general use, as they may think proper.

With sentiments of high esteem, may it please your Excellency, I would subscribe myself, your very humble servant,

PAUL DODGE.

His Excellency Governor STRONG.

.....

A new, clean, and easy Method to make Cider.

THE apples, after being ground, are put into a curb or vat, and levelled with a shovel; then covered with a plank, and blocked up as usual. It may be pressed with a long beam or short cider screw, but hay screws are best. The cider may be pressed in two hours. Two men and a boy may make twenty barrels in one day. As no straw is used, it may be made in cold weather, if the pumice does not freeze.

The girts must be four feet eight inches inside, four inches and an half square, made of the best of timber, with hinges and bolts in proportion. The slats, three feet 3 inches long, one inch and a quarter thick, three inches wide, and half an inch apart. The eye bolts may be drawn with an iron bar with ease, and any quarter of the vat taken off, to take out the pumice.* A curb of this size will hold

* See the pattern, which is in the Secretary's Office, at the New State House.

pumice enough to make ten barrels of cider. I have made cider in this new way two years, and find it is done with half the usual labour, and the cider clear. The above can be attested by many.

PAUL DODGE.

New Castle, Dec. 3, 1805.

.....

Experiment, showing the Importance of selecting the first ripe Seeds, communicated to the Trustees of the Agricultural Society, by JAMES FREEMAN. *Sept.* 1, 1805.

To ascertain whether the ripening of seeds can be forwarded, by sowing those which are the earliest ripe, I have made experiments, all of which have been successful, on several different sorts. It will be sufficient to mention one only.

In the year 1801, I planted the case knife bean. The pods first formed, which are commonly those nearest the root, were reserved; and when about the quantity of a peck was fully ripe, they were gathered on the same day. The largest and fairest of the seeds were planted the next year, and the first formed pods reserved as before. The same method has been pursued without any variation, till the present year: by means of which, whilst the bean has not degenerated in its quality, the ripening of the seeds has been forwarded twenty six days; as will appear from the following

TABLE.

Planted.	Gathered.	No. days
1801, May 20,	Sept. 9,	112
1802, May 11,	Aug. 21,	102
1803, May 10,	Aug. 8,	90
1804, May 8,	Aug. 4,	88
1805, May 6,	July 31,	86

The first column denotes the time of planting the seeds; the second, that of gathering the seeds, which were first ripe ; and the third, the number of days which elapsed between the time of planting and the time of gathering.

As in the second and following years I anticipated the time of planting the seeds (by which means fourteen days have been gained, in addition to the twenty six noted above) to determine what effect later planting would produce, by giving the seeds more advantage from the heat of summer, in the years 1804 and 1805, I put into the ground a quantity of seed, about a week later than that which was first planted. The event which took place, is exhibited in the following

TABLE.

Planted.	Gathered.	N.days.
1804, May 14,	Aug. 8,	86
1805, May 13,	Aug. 6,	85

As very little time has been gained in the present and in the preceding year, I suppose I have now reached, or nearly reached, the *ne plus ultra*. I delay not, therefore, to communicate to the Trustees of the Agricultural Society, the result of an experiment, which confirms the important truth, taught in various parts of their useful publications,* *That, to ensure an early and good crop, the seeds reserved for future sowing should be those, which are the first ripe, and which are, in other respects, the most perfect.*

* See particularly, Publications of Agr. Soc. for 1799, p. 28, and for 1801, p. 15, 17, 18.

On the Management of the Dairy, particularly with respect to the making and curing of Butter. By J. ANDERSON, L.L.D. F.R.S. *&c.*

Extracted from the sixth article in the fifth volume of the Letters and Papers of the Bath Agricultural Society.

WHEN a dairy is established, the undertaker ought to be fully acquainted with every circumstance respecting the manufacture both of butter and cheese; here it is only proposed to treat of the manufacture of butter. The first thing is to choose cows of a proper sort; among this class of animals, it is found by experience, that some kinds give milk of a thicker consistence and richer quality than others. In judging of the value of a cow, it ought rather to be the quantity and the quality of the *cream* produced from the milk in a given time, than the quantity of the milk itself; this is a circumstance of more importance than is generally imagined. The small cows of the Alderney breed afford the richest milk hitherto known; but individual cows in every country, may be found, by a careful selection, that afford much richer milk than others; these, therefore, ought to be searched for with care, and their breed reared with attention, as being peculiarly valuable. In comparing the milk of two cows, to judge of their respective qualities, particular attention must be paid to the time that has elapsed since their calving. To make the cows give abundance of milk, and of a good quality, they must at all times have plenty of food. Grass is the best food yet known for this purpose, and that kind which springs up spontaneously on rich dry soils, is the best of all. If the cows are so much incommoded by the heat, as to be prevented from eating through the day, they ought to be taken into cool shades for protection; where, after allowing them a proper time to ruminate, they should be supplied with abundance of

green food, fresh cut for the purpose, and given them by hand, frequently, fresh and in small quantities, so as to induce them to eat it with pleasure.

Cows, if abundantly fed, should be milked three times a day, during the whole of the summer season, in the morning early, at noon, and in the evening, just before night fall. If cows are milked only twice in twenty four hours, while they have abundance of succulent food, they will yield a much smaller quantity of milk in the same time, than if they be milked three times. Some attentive observers I have met with, think a cow in these circumstances, will give nearly as much milk at *each* time, if milked three times, as if they were milked only twice. In the choice of persons for milking the cows, great caution should be employed, for if *all* the milk be not thoroughly drawn from a cow when she is milked, a diminution of the quantity gradually takes place, and in a short time the cow becomes dry. In the management of a dairy, the following peculiarities respecting milk, ought very particularly to be attended to; some of them are, no doubt, known in part to attentive housewives, but they have never been considered of so much importance as they deserve.

Aphorism 1.

Of the milk that is drawn from any cow at one time, that which comes off at the first is always thinner, and of a much worse quality, than that which comes afterwards, and the richness goes on, continually increasing to the very last drop that can be drawn from the udder at that time.

Few persons are ignorant that milk, which is taken from the cow last of all at milking, which in this country is called *stroakings*, (here *strippings)* is richer than the rest of the milk; but fewer still are aware of the greatness of the disproportion between

the quality of the first and the last drawn milk from the same cow at one milking: from several accurate and important experiments, it appears, that the person who, by bad milking of his cows, loses but half a pint of the last milk that might be obtained, loses in fact, about as much cream as would be afforded by six or eight pints at the beginning, and loses besides, that part of the cream, which alone can give richness and high flavour to his butter.

APHORISM II.

If milk be put in a dish, and allowed to stand till it throws up cream, that portion which rises first to the surface, is richer in quality and greater in quantity, than what rises in a second equal portion of time, and the cream that rises in the second interval of time, is greater in quantity and richer in quality, than what rises in a third equal space of time, and so on, the cream decreases in quantity, and declines in quality continually, as long as any rises to the surface.

APHORISM III.

Thick milk always throws up a smaller proportion of the cream it actually contains to the surface, than milk that is thinner, but that cream is of a richer quality; and if water be added to that thick milk, it will afford a considerably greater quantity of cream than it would have done, if allowed to remain pure; but its quality is at the same time greatly debased.

APHORISM IV.

Milk, which is put into a bucket or other proper vessel, and carried in it to any considerable distance, so as to be much agitated, and in part cooled before it be put into the milk pans to settle for cream, never throws up so much nor so rich cream, as if the same milk had been put into the milk pans, directly after it was milked.

In this case, it is believed that the loss of cream will be in proportion to the time that has elapsed,

and the agitation it has sustained, after having been drawn from the cow.

From the above facts, the following corollaries seem to be clearly deducible.

1. It is of importance, that the cows should be always milked as near the dairy as possible, and it must be of great advantage in a dairy farm, to have the principal grass fields as near the dairy as possible.

2. The practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished, before any part of it be put into milk pans, seems to be highly injudicious, not only on account of the loss that is sustained by agitation and cooling, but also, as it prevents the owner of the dairy from distinguishing the good from the bad cows milk; a better practice, therefore, would be, to have the milk drawn from each cow separately, put into the creaming pans as soon as it is milked, without being mixed with any other. Thus would the careful farmer be able, on all occasions, to observe the particular quality of each individual cow's milk, as well as its quantity, and to know with precision, which of his cows it was his interest to dispose of, and which he ought to keep and breed from.

3. If it be intended to make butter *of a very fine quality*, it would be advisable in all cases, to keep the milk, that is first drawn, separate from that which comes last, as it is obvious, that if this be not done, the quality of the butter will be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the proportion of the last drawn milk that is retained; so that those who wish to be singularly nice in this respect, will only retain a very small proportion of the last drawn milk.

4. If the *quality* of the butter be the chief object attended to, it will be necessary not only to separate the first from the last drawn milk, but also to take nothing but the cream that is first separated from the best milk, as it is this first rising cream alone, that is of the prime quality: the remainder of the milk which will be still sweet, may be either employed for the purpose of making sweet milk cheeses, or it may be allowed to stand, to throw up cream for making butter of an inferior quality.

5. From the above facts we learn, that butter of the *very best possible* quality can only be obtained from a dairy of considerable extent when judiciously managed.

6. From these premises, we are led to draw a conclusion, different from the opinion that is commonly entertained on this subject, viz. that it seems probable that the very best butter can only be with economy made in those dairies, where the manufacture of cheese is the principal object.

As but few persons would be willing to purchase the *very best* butter at a price to indemnify the farmer for his trouble, I am satisfied from experience and attentive observation, that if in general about the first drawn *half* of the milk be separated at each milking, and the remainder only be set up for producing cream, and if that milk be allowed to stand to throw up the whole of its cream, even till it begins sensibly to taste sourish, and if that cream be afterwards carefully managed, the butter thus obtained, will be of a quality greatly superior to what can usually be obtained at market, and its quantity not considerably less than if the whole of the milk had been treated alike.

No dairy can be managed with profit, unless a place properly adapted for keeping the milk, and for carrying on the different operations of the dairy, be

first provided.* The necessary requisites of a good milk house are, that it be cool in summer, and warm in the winter, so as to preserve a temperature nearly the same, throughout the whole year, and that it be dry, so as to admit of being kept clean and sweet at all times.

From the trials I have made, I have reason to believe, that when the heat is from fifty to fifty five degrees on Farenheit's thermometer, the separation of the cream from the milk, which is the most important operation of the dairy, goes forward with the greatest regularity. When the heat exceeds sixty degrees, the operations become difficult and dangerous, and when it falls below the fortieth degree, they can scarcely be carried forward with *any degree* of economy, or propriety.

In winter, should the cold become too great, it might be occasionally dispelled, by placing a barrel full of hot water closely bunged up, upon the table, to remain till cooled. This I prefer to any kind of chaffing dish with burning embers.

The utensils of the dairy must in general be made of wood. As the acid of milk readily dissolves lead, with which the common earthen vessels are glazed, such vessels should be banished from the dairy.

The creaming dishes (for so I call the vessels in which the milk is placed for throwing up the cream) when properly *cleaned*, *sweet*, and *cool*, are to be filled with the milk as soon after it is drawn from the cow as possible, having been first strained carefully through a close strainer.

These dishes should never exceed three inches in depth, whatever be their other dimensions. As soon as they are filled, they are to be placed on the shelves in the milk house, perfectly undisturbed,

* The author here gives a very particular description of the best contrived milk house, or dairy. Vide Bath papers.

till it be judged expedient to separate the cream from them.

In a moderately warm temperature of the air, if very fine butter be intended, it should not be allowed to stand more than six or eight hours; for ordinary good butter, it may safely stand ten or twelve, or more.

It is of great importance to the success of the dairy, that the *skimming* be well performed, for if any part of the cream be left, the *quantity* of the butter will be diminished; and if any part of the milk be taken, its *quality* will be debased.*

When the cream is obtained, it ought immediately to be put into a vessel by itself, there to be kept till a proper quantity be collected for being made into butter. And no vessel can be better adapted to that purpose, than a firm neat made wooden barrel, in size proportioned to the dairy, open at one end, with a lid exactly fitted to close it. In the under part of this vessel, close to the bottom, should be placed a cock and spigot, for drawing off any thin serous part of the milk that may chance to be there generated; for if this is allowed to remain, it injures the cream, and greatly diminishes the richness of the quality of the butter; the inside of the opening should be covered with a bit of gauze netting, to keep back the cream while the serum is allowed to pass, and the barrel should be inclined a little forward, to allow the whole to run off.

The separation of butter from cream, only takes place after the cream has attained a certain degree of acidity. The judicious farmer will therefore allow his cream to remain in the vessel until it has acquired that proper degree of acidity that fits it for being made into butter with great ease, by a very

* The cream should be separated from the edges of the dish, by means of an ivory bladed knife, then carefully drawn towards one side by a skimming dish, and then taken off with great nicety.

moderate degree of agitation, and by which process only, very fine butter ever can be obtained. How long cream may be thus kept in our climate, without rendering the butter made from it of a bad quality, I cannot say ; but it may be kept good for a much longer time than is generally suspected, even a great many weeks. It is certain that cream which has been kept three or four days in summer, is in an excellent condition for being made into butter; from three days to seven, may in general be found to be the best time for keeping cream before churning.

I prefer the old fashioned upright *churn*, having a long handle, with a foot to it perforated with holes, as it admits of being better cleaned, and of having the butter more easily separated from the milk than any others.

Where the cream has been duly prepared, the process of butter making is very easy ; there is however more nicety required, than most persons seem to be aware of; a few *hasty, irregular strokes*, may render the butter of scarcely any value, which, but for this circumstance, would have been of the finest quality. The butter when made, must be immediately separated from the milk, and being put into a clean dish, the inside of which, if of wood, should be well rubbed with common salt. The butter should be pressed and worked with a flat wooden ladle, having a short handle, so as to force out *all* the milk that was lodged in the cavities of the mass. The beating up of the butter by the hand is an indelicate and barbarous practice. If the milk be not entirely taken away, the butter will infallibly spoil in a short time, and if it be much washed, it will become tough and gluey. Some persons employ cold water in this operation ; but this practice is not only useless, but also pernicious, because the quality of the butter is thus debased in

an astonishing manner. In every part of the foregoing process it is of the utmost importance, that the vessels and every thing else about the dairy, be kept perfectly sweet and clean.

Wooden vessels are the most proper for containing salted butter. Oak is the best wood for the bottom and staves. Broad split hoops are to be preferred to all others.

Iron hoops should be rejected, as the rust of them will in time sink through the wood, and injure the colour of the butter. To season a new vessel for the reception of salted butter, requires great care: it should be filled *frequently* with scalding water, allowing it to remain till it slowly cools. After the butter has been cleaned from the milk, as before directed, it is ready for being salted. Let the vessel be rendered as clean and as sweet as possible, and be rubbed all over in the inside with common salt; and let a little melted butter be run into the cavity between the bottom and the sides at their joining, so as to fill it, and make it every where flush with the bottom and sides: it is then fit to receive the butter. Common salt is almost the only substance hitherto employed for preserving butter. I have found by experience that the following composition is in many respects preferable to it, as it not only preserves the butter more effectually from any taint of rancidity, but makes it look better and taste sweeter and more marrowy, than if the same butter had been cured with common salt alone. The composition is as follows:

Take of sugar one part, of nitre (salt petre) one part, and of the best Spanish great salt, two parts; beat the whole into a fine powder, mix them well together, and put them by for use.

Of this composition, one ounce should be put to every sixteen ounces of butter: mix this salt thoroughly with the butter, as soon as it has been

freed from the milk, and put it, without loss of time, into the vessel prepared to receive it, pressing it so close as to have no air holes, or any kind of cavities within it ; smooth the surface, and if you expect it will be more than two days before you add more, cover it close up with a piece of clean linen, and over that a piece of fine linen that has been dipped in melted butter, that is exactly fitted to the edges of the vessel all round, so as to exclude the air as much as possible, without the assistance of any watery brine. When more butter is to be added, remove the coverings, and let the butter be applied close above the former, pressing it down, and smoothing it as before, and so on till the vessel is full. When full, let the two covers be spread over it with the greatest care, and let a little melted butter be poured all round the edges, so as to fill up every cranny, and effectually *exclude the air*. A little salt may then be strewed over the whole, and the cover firmly fixed down, to remain closely shut till opened for use. If this be carefully done, the butter may be kept perfectly sound in this climate for many years.*

It must be remarked that butter cured in this manner, does not taste well till it has stood at least a fortnight after being salted. After that period is elapsed, it eats with a rich marrowy taste that no other butter ever acquires. Butter thus cured, will go well to the East or West Indies.

Butter, in its natural state, contains a considerable proportion of mucous matter, which is more highly putrescible than the pure oily parts of the butter. When it is intended to be exposed to the

* The Epping butter is called the best in England. The farmers make use of a very innocent colouring matter for their winter and early spring butter, which is the juice of carrots. They take clean and fresh carrots, and grate them fine, and squeeze out the juice through a coarse cloth, and mix it with their cream. This gives their butter as fine an appearance as the best June butter, without communicating any taste or flavour.

heat of warm climates, it ought to be freed from that mucilage before it be cured and packed up. To do this, let it be put into a vessel of a proper shape, which should be immersed in another containing water. Let the water be gradually heated till the butter be thoroughly melted: let it continue in that state for some time, and allow it to settle: the mucous part will fall to the bottom, and the pure oil swim at top. When it cools, it becomes opaque and paler than the original butter, and of a firmer consistence. When this refined butter is become a little stiff, and while it is still somewhat soft, the pure part should be separated from the dregs, and then salted and packed up, in the same way as is before directed.

Those who wish to see the subject more fully treated, are referred to the original.

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An Account of the manner of making Cheese, in England.

By Mr. Twamley.

In this second great object of the dairy, the same precaution as with regard to the butter, is necessary, viz. The cows ought not to be driven violently before milking, and every utensil must be kept equally clean.

The most common defects of cheese are, its appearing, when cut, full of small holes, called eyes; its puffing up, cracking, and pouring out a quantity of thin whey; becoming afterwards rotten and full of maggots in those places where the whey appeared. All these difficulties proceed from a substance called *slip curd*, a kind of half coagulum, incapable of a thorough union with the true curd, and which, when broken into small bits, produces eyes, but if

in larger pieces, occasions those rents and cracks in the cheese already mentioned; for though this kind of curd retains its coagulated nature for some time, it always, sooner or later, dissolves into a serous liquor. This kind of curd may be produced by using the milk too hot, by bad runnet, or by not allowing the curd a proper time to form. The first may be remedied by the use of cold water. The second, by good runnet, a knowledge of which can only be acquired by long practice. The only rule that can be given for its preparation is, to take out the stomach of a calf, rinse it in cold water, and rub it well with salt and dry it. It may be used immediately on drying, though it is considered best after it is a year old. The best method of making the runnet is, to take one gallon of pure spring water, and boil it; then make it into brine with clean salt, sufficiently strong to bear an egg; let it cool to about blood heat. Two of the skins (or what are commonly in this country called runnet bags) must be put into the brine, either cut in pieces, or whole, as is most convenient; they must steep twenty four hours; after which, it is fit for use. About a tea cup of a middling size, of the liquor, will be sufficient for the milk of ten cows.

In making cheese, supposing the runnet of a good quality, the following particulars must be observed.

1. The proper degree of heat: this ought to be what is called milk warm, which is considerably below the warmth of milk taken from the cow. If too hot, it may be reduced by cold water, without any injury to the cheese.

2. The time allowed for the runnet to take effect: this ought never to be less than one hour and a half.

3. After having the curd firmly formed at the bottom of the tub, the whey must be taken away, and the curd must stand to drain one quarter of an

hour. If any pieces of slip curd are found swimming in the whey, they should be poured off with it, rather than be admitted into the cheese. Some dairy women allow their curd to stand two hours, to obtain a firmness that will require no breaking; but the best method is to break it thoroughly, for the cheese is less apt to be hard.

4. The best method to prevent cheese from heaving, is to avoid making the rennet too strong, to take care that it be very clean, and by no means the least tainted, to be certain the curd is fully formed, which is known by the blue colour of the whey, and by no means to stir it till the air has had time to escape.

5. The best method to prevent the cracking of cheeses, is to salt them in the milk, or after the cheese is formed, which may be done with much more certainty than in the curd, which is a bad method.

6. Dry cracks in cheese are frequently produced by keeping curd from one meal to another, by which means the first becomes too dry and hard, ever, without great attention, to mix intimately with the second.

7. Curdly, or what is commonly called wrinkle coated cheese, is always caused by sour milk. Cheese made of cold milk is apt to be hard and fly before the knife. If the weather is cold, cheese should be kept warm, particularly when first made.

8. Slip coat, or soft cheese, is made entirely of slip curd, and will dissolve into a kind of creamy liquor, which is sufficient proof of the nature of this kind of curd, as already mentioned. It is generally computed, that as much milk is required to make one pound of butter, as two pounds of cheese.

It is remarked by dealers in cheese, as well as other persons, that much the greatest part of the people that eat cheese, have no idea how it is pro-

duced. They finding the best cheese of a yellow colour, naturally conclude that cheese of a pale colour must be made of inferior or skimmed milk, whereas the colour is artificial. The principal ingredient used for colouring cheese is the best Spanish annatto (or what is commonly called in this country, otter) which gives cheese the beautiful colour of the best spring butter, without injuring the taste or quality in any degree. The best method of using it is, to take a piece and dip it into a bowl of milk, and wash off from the piece sufficient to give the milk a deep colour. Then mix the coloured milk with the milk prepared for the cheese, before either runnet or salt is put in. If enough annatto has been used, the whole milk will have a pale orange colour, which will be much increased after the cheese is made.

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To the Corresponding Secretary of the Massachusetts Agricultural Society.

SIR,

THE following observations were drawn up at the request of a gentleman, for his own use. If the Agricultural Society should think that the contents afford any useful hints, I shall be gratified with having contributed something towards the improvement of one branch of that art, which is the most independent, and one of the most honourable pursuits of man.

I do not send it to you from an opinion that I have the best information upon the subject, but that, by a communication of each one's experience, improvement goes forward with rapidity.

I am, Sir,

Your most obedient servant,

ALEXIS.

To Mr. —— ——,

SIR,

AGREEABLY to your request, I have collected the following observations upon the method of making cheese. They are what arose during an experience of but two years. The intention was to have reduced this useful part of rural economy to a regular system, which in this country is left to the operation of chance. This sheet contains but little originality in the principles of this art; they were taken from treatises written in England. If any merit is due, it is for the attention with which these observations were pursued to ascertain the essential parts of these treatises. This art appears so simple, that every country woman would be offended at being thought ignorant of it; yet a few rules may be collected that require to be observed with almost a chymical exactness. They know that runnet will make a curd: a piece is therefore cut off at hazard, and thrown into the milk. If too small a piece is put in, the curd comes very imperfectly, producing what is called slip curd. This is very soft, and the curd thus made, is what is most frequently sold for *cream cheese*. In breaking up the curd, or pressing, this is chiefly squeezed out. That which remains is one cause of eyes in cheese. The fattest part of the milk is most difficult to coagulate, and it is found, that adding more runnet will not perfect the curd, when in this state; the cheese is of course impoverished, when the curd comes imperfectly. But the most frequent error is putting too much runnet, which inevitably gives the cheese a strong pungent taste and smell. It occasions that puffing in cheese which is called *hove cheese*, and being pierced with a knife, will emit a very fetid smell. It is a degree of putrefaction arising from a fermentation, caused by the runnet; a sufficient evidence

that the cheese can never be good, and is invariably full of eyes. Another cause of bad cheese is bad runnet; and whoever has seen many of our country kitchens, will wonder that they ever have good cheese, owing to the very filthy manner of keeping the skins, being either impregnated with smoke, or tainted with flies, and exposed to every disagreeable effluvia that may surround it. To obviate these difficulties, the following is the manner that the runnet was prepared in my dairy. Take the skin, or runnet bag, as soon as the calf is killed; let it be carefully cleaned by hand without touching water; let it then be put into a brine, so strong that it will dissolve no more salt; of this brine, three pints will suffice for a skin; let it be steeped in it thirty six hours, or thereabouts; it may then be taken out of the liquor, put into clean bottles, and corked; it will keep a year, perhaps longer; the skin may then be drawn over a bow, salted and dried as usual; in two or three months, if your liquor should fail you, it may be steeped again. It is said to acquire new strength, but not so much as at first; perhaps the virtue is not wholly extracted by the first steeping, and that it will not yield it all to three pints of water. This second operation, will, however, answer as good a purpose as the first, using two or three skins instead of one. Let one general observation be made, that throughout the whole business of dairying, the greatest attention must be paid to the cleanliness and sweetness of the vessels used, and in the dairy room; and, in some instances, it may not be unnecessary to recommend it to the dairy woman in her own person. In cheese of *one meal*, the milk should be kept as near as possible to its natural heat, till the runnet is put in. I find three tea spoons full to a gallon of milk, to be the average quantity required to coagulate it; but this liquor should always be tried, to ascertain its strength.

The object is to find the smallest quantity that will bring the curd properly, as more than that will injure the cheese. You will perceive that it is convenient to make a large quantity of this liquor at a time, or making it at different times in the spring, when you begin to make cheese, which is seldom till all the calves are killed, let it be mixed and then tried, after which there is no trouble with the runnet; and you may be certain that whatever other defect the cheese may have, it will not be strong or hove; this is solely owing to the too great quantity, or bad quality of the runnet. My cheese tub being made of the same diameter at the top and bottom, I found its contents in gallons, and made a guaging rod, marking on the depth of the tub, and then subdividing that depth, by the number of gallons the tub contained. By putting the rod into the tub, was readily seen the gallons of milk in it. The tub itself might be thus graduated; when you would make servants follow rules, it is necessary that they should be attended with as little trouble as possible. Having put in the runnet, *the milk should not be suffered to cool too soon, as the curd should be sensibly warm when broke up and put into a hoop*, otherwise, the cheese will be in flakes when cut, the curd not uniting when cold. *The curd must not be disturbed in the tub, till it cleaves from the sides and begins to settle.* It may then be cut through chequerwise, and suffered to settle still more; with a proper temperature of air, it will begin to settle in half an hour from the time of setting the milk; cold weather retards it, and may defeat it; if the curd is too long in coming, the cream begins to rise and is lost to the cheese; it should therefore be guarded against. There rises upon the whey, when the curd settles, a thin skim, which should be carefully removed before the curd is taken out, lest it should mix with the curd. As it is

of a more fixed nature than the whey, it will not all squeeze out, nor will it blend with the curd, and where a particle remains, there will be an eye. The curd being well drained of the whey, by breaking it up fine by hand, is to be salted. This is an important part, and of which I am not so well informed as I wish to be. The success of experiments with salt can only be determined by the taste, and this cannot always be done, when the cheese is sold. Salt differs greatly in strength and quality, as is well known to fishermen, and packers of beef. In Ireland, the beef is first strongly rubbed with blond salt, which is mild and penetrating. It is then passed to another hand, who uses a mixture of blond and bay salt, which is harsh and drying, hardening the provisions. From this consideration of the different effects of salt, it may be concluded that bay salt is not adapted to cheese. I also took bay salt, and dissolved it, and then boiled it down; the objectionable parts fly off; and the more violent the ebullition, the finer will be the grain, which indicates its strength, the large grain being the strongest. I liked the salt thus obtained, the grain being as fine as well ground meal. Some of my best cheeses were made with this salt, and the quantity used was one tea cup heaped, to six gallons of milk. This proportion is liable to error, as milk will yield more or less curd, according to the season or quality of the grass; and let it be remembered that cows should never be drove hard, especially just before milking. If the common blond salt is used, it should be reduced finer by pounding, that it may more intimately blend with the curd. The curd being prepared for the press, it appears to me proper that every heterogeneous substance should immediately be pressed out. For this purpose, my first press was powerful, being a lever eight feet long, one end fixed by a pin between two stumps set in

a bench ; near these stumps was placed the cheese ; the other end of the lever was loaded with about two hundred weight of stones ; at the other end of the bench were fixed two stumps, higher than those first mentioned, which are about six inches higher under the lever than the cheese hoops; the other stumps have a cross piece on the top to rest another lever, which is hooked to the end of the first to raise it. The cheese being tended as usual in this press, where it remained twenty four hours, was moved to another bench containing four divisions, being each separate presses, of no more weight than was immediately laid upon them, about two hundred weight. The cheese when taken from the first press, was put into press at one end of this second bench, and remained in each twenty four hours, moving along every day, till arrived at the other end. I suppose three days pressing on this second bench, sufficient for a cheese of twenty five pounds. it was then carried to the cheese room. Screw presses are objectionable, as the pressure does not follow the cheese as it settles. My farm house was fortunately shaded by trees ; but the better to guard against the sun, I had Venetian shades made for the windows, of clapboards painted green, which were cheap and handsome. I also had made slender frames, over which catgut was stretched, of a texture fine enough to prevent the entrance of flies. When the windows were opened, these frames were put in. The cheese room should be exposed on every side except the south, and one or more windows in each side. Attention is much required to regulate the temperature of the air ; strong wind admitted, will dry the cheese too fast, and make it crack ; to prevent this, it is customary with us, to rub the cheese with butter ; in England, they wash it with the new whey, and no butter is used ; this last method I did not try. In hot sultry weather,

cheese will spread. This should be prevented by bandages of tow cloth, or by putting them into cheese hoops. The expense of this extraordinary number of hoops is not great: one cheese saved will pay for ten hoops, and they last many years. They will seldom spread after they have been made a month. In wet weather, it is advisable to burn a little charcoal in the chimney of the cheese room. The quantity of green cheese obtained from milk, was from twenty three pounds to twenty five pounds, from twenty gallons. I have got twenty seven and three quarters from eighteen gallons. They seldom lost in drying more than two and a half pounds, in a cheese of twenty five pounds weighed green from the press. If it is required to have the cheese of a Gloucester colour, take Spanish anatto, rub a lump in a saucer with milk, a little experience will teach the quantity necessary for a cheese; then mix it with the rest of the milk, when it is set for cheese. One ounce will colour four or five hundred pounds, and it is bought of the apothecaries. It is perfectly innocent, and I thought the cheese coloured with it, was higher flavoured; this might have been owing to other causes. To have a good dairy, it must be a particular business, and not attended only at convenient intervals from other work, as a secondary object, nor should a drop of cream be taken from milk appropriated for cheese. This must be inviolably observed. I think that large cheeses generally prove better than small ones; and for this reason should not wish to make a cheese less than twenty five pounds. But if the number of cows is not sufficient to make a cheese of one meal, the old milk should be very well mixed with the cream that has risen, and then put into a large brass kettle to warm over coals free from smoke, the milk being frequently stirred to prevent the bottom of the milk from becoming too hot before the

top y sufficiently warmed, which will be the case without attention. It should be brought as near as possible to its natural heat. To save trouble, our women heat a part very hot, then mix it with the cold; but I have no doubt that this injures the cheese. Putting the milk into deep vessels, and covering them in a damp situation, will prevent the cream from rising so much as it otherwise would.

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MANAGEMENT OF PIGS.

THE importance of the following experiment with respect to the treatment of hogs, copied from a late London newspaper, has induced a member of the Society for promoting Agriculture, to request that it may be published in their next collection, for the attention of the American farmer.

"The following experiment was lately made by a gentleman of Norfolk. Six pigs of the Norfolk breed, and of nearly equal weight, were put to keeping at the same time, and treated the same as to food and litter for about seven weeks. Three of them were left to shift for themselves as to cleanliness; the other three were kept as clean as possible by a man employed for the purpose, with a currycomb and brush. The last consumed in seven weeks fewer peas by *five bushels*, than the other three, yet they weighed more when killed by *two stone* and *four pounds*, upon an average, or six stone twelve pounds upon the whole."