

S 12

LETTERS AND PAPERS

O N

Agriculture, Planting, &c.

ADDRESSED TO THE

Bath and West of England Society,

FOR THE ENCOURAGEMENT OF

Agriculture, Arts, Manufactures, and Commerce.

VOLUME IV.

S. 12.

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SELECTED FROM

THE CORRESPONDENCE

OF THE

Bath and West of England Society

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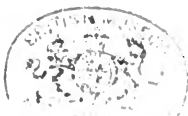
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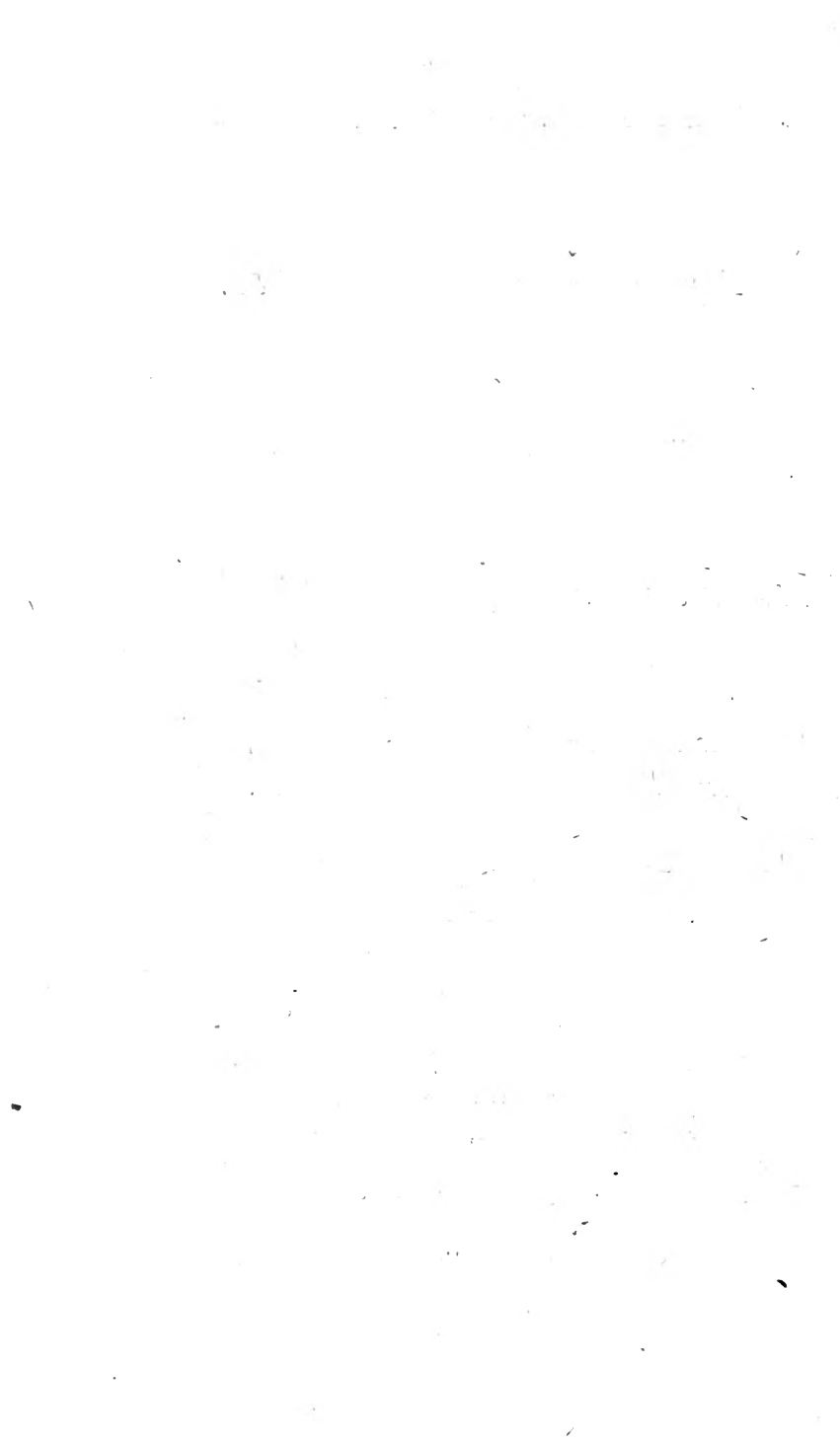
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VOL. IV.
THE SECOND EDITION.

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INTRODUCTION.

INTRODUCTION.

THIS Society having, in its Book of Premiums for 1787, announced an intention of soon publishing a Fourth Volume of Papers; the public had certainly a right to expect an earlier fulfilment of that intention.

For the delay, several reasons might be assigned; among which, and not the least operative, was the decease of Mr. EDMUND RACK, the late useful and ingenious Secretary of this Society. By that event was dissolved an ideal arrangement of materials; and even for some time was suspended, a certainty to whom some few of the MSS. had been lent for perusal.

On adverting, afterwards, to the promise of publication, some of the most active Members of the Society, though agreeing

on the propriety of printing a fresh volume, were perhaps less urgent than formerly about the expedition of the measure. The absence of many of the country gentlemen during the last summer, and the greater propriety of determining on the time of printing, when the Committees should be more united, was another reason of a temporary delay. But this interval was not unoccupied with business of a similar nature, and of no inconsiderable importance; which was the superintendance of the press, through the printing a second edition of the former three volumes—all of which are now completely reprinted.

Among the many proofs of the usefulness of this Society, and the public respect which has been paid to its past progress, the complete disposal of the first edition of those volumes, and the increase of the public demand, make at once a convincing and a pleasing testimony. But while the necessity for a new edition of former volumes was
flattering,

flattering, due care to preserve a reputation for usefulness became a new incentive to deliberation and the proper choice of materials. Of this deliberation and care, it is hoped the present volume will furnish some evidence.

The caution which has been used, has given time for remarking the different opinions that have been imparted, by particular gentlemen on the general subject of publication; and it may not be improper here to acquaint the public, that though this Society can never wish to *withhold* those articles of practical communication which it is its plan to *encourage*, yet the importance of *publishing well* appears too great to be hazarded by any arbitrary adherence to stated periods.

On a work like this, written by a variety of hands, and on an almost equal variety of subjects, every man, who in connexion therewith considers the fallibility of human skill, and the varied complexion of the human
 b 2 mind,

mind, will anticipate *criticism*. Neither from works of this sort, on which may possibly depend the success or disappointment, profit or loss, of subsequent experiment, should the patrons of improvement wish to have the strictures of experience and intelligence averted.

An ingenuous and candid reader will not be less thankful for a new hint, or a new result of experiment, which he finds to be fraught with his own and the public advantage, because it is not unaccompanied in the same volume by inequality and imperfection! — And in return for the liberality of reception which this Society is confident of finding with the public, we think it incumbent upon us to give the following assurance, viz. That the sterling worth of those animadversions which proceed from real knowledge, and from that zeal for the advancement of truth which this Society has mainly in view, will be ever gratefully distinguished from the casual cavils of inexperience, or irrational attachment to custom.

The

The first Article in this Volume, the communication of a Gentleman of large experience in rural science, is long and elaborate. But as the subject is confessedly of great importance in the present improved system of cultivation, it is presumed that no apology can be necessary for inserting, at large, a piece which is evidently the result of uncommon ingenuity, and practical observation. The value of *Potatoes*, both as an article of husbandry, and general consumption in families, is now so fully established, that no argument is required to enforce it. The series of facts, thus given by Dr. ANDERSON, and interspersed with numerous remarks resulting from those facts, it is presumed, will throw very considerable light on the properties and value of the root in question. And if some experiments should be found of comparatively less importance than others, and some conjectures of a less certain tendency, the Society cannot but be assured, that a large tribute of public praise will be paid to the

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the author of the essay:—a man, who, while eminently conversant in the abstruse and elegant departments of science, could devote so much time and pains to the culture of a single root; but a root on which the subsistence and comfort of a large part of the poor of these kingdoms has been known to depend.

The piece on the subject of a *Commutation* for *Tithes*, by Mr. BENJAMIN PRYCE, has been honoured with a public mark of this Society's approbation. The subject, with relation to agricultural improvements in this nation, is of the first collateral importance. And though it may possibly be objected, that any alteration in the present system of Church establishment is not an object of contemplation within the province of an agricultural society, nor a subject on which such an association may be fully qualified to judge; yet is it unquestionably a subject, on which any body of men, as well as any individual, has a right to form and to give an opinion. The influence which any system, for tithing the
produce

produce of *husbandry*, must have upon its progress, will be ever proportioned to the wisdom or imperfection of the system so established. And in general, though the body of farmers should be allowed to be personally *interested* in shifting the burden which lies immediately upon them, it may be also fairly allowed that they are the best judges of the irksomeness of the mode whereby they are taxed in their labour.

In the present age of liberal enquiry, which has reached the minds of intelligent farmers, as well as other citizens of the realm, there are not wanting many among them, who fully discriminate between the present legal rights of the clergy, and the erroneous ideas of religion and policy which gave rise to the peculiarities of those rights. They are convinced, in common with all men of sense and reflection, that while it is their present duty to pay the clergy their due, according to the legal establishment, and to give them as little trouble as possible in the payment; yet that they
are

are warranted in *complaining* of a system, which both in its nature and tendency is unequal, inconvenient, and vexatious.—Hence it is not unnatural for such a Society as this to countenance a discussion of such a topic, and to consider itself as acting the part of a *common friend* to the Clergy and the Laity, by endeavouring to point out a mode of support for the former, more equal and righteous among themselves, more compatible with the principles of peace, more promotive of universal improvement, and, which is especially desirable, less invidious to the claimant.

Such were the views of this Society in offering a premium for the best-written paper on the subject of a Commutation for Tithes: and though the Society is not so sanguine as to expect, that through their means a national tithe revolution shall be brought about; yet have they a hope, that, by agitating the subject, the attention of ingenious men, both in and out of parliament, may be the more excited

cited

cited to attempt some possible improvement, where improvement is so much to be wished.

The two next following papers, from the ingenious Mr. WIMPEY, respecting the culture of *Turnips*, the management of the *Dairy*, &c. are inserted as practical treatises, on subjects of established importance; and it is presumed they will not be found to diminish the reputation of their intelligent author. On the former subject much has been written in detached publications; and from the importance of the Turnip husbandry, both as a system of cultivating the soil, and as an abundant source of food for cattle, too much praise cannot be easily bestowed.

It were much to be wished, that the example of Mr. WIMPEY may excite other Gentlemen, equally capable of reflection and experiment, to bend their attention to the properties and management of this delicate plant; till, if possible, such a knowledge of it may be obtained, as to enable the farmer

to

to guard it more effectually from its grand enemy the FLY; by the ravages of which so much real calamity is frequently produced. Of the latter subject, treated by Mr. WIMPEY, it would be needless to expatiate on its general utility. The enormous advance of the prices of butter and cheese, especially the latter, within the last very few years, has rendered an enquiry into the general conduct of the Dairy, and of Dairy farming, particularly commendable; and it must give the Society and the Public great pleasure to find, that men of Mr. WIMPEY'S abilities and information turn their attention to a department of rural œconomy, so much connected with the comfortable supply of the rich and the poor man's table.

The extracts of letters from Sir THOMAS BEEVOR are interesting in their kind, as might be expected from the elegant pen of so accurate an experimentalist; and it is not without reason that we hope to receive from Sir THOMAS, as well as from several other Gentlemen,

tllemen, another year, such accounts of the nature and effects of the *Mangel Wurzel*, as a vegetable for the table, and a food for different kinds of cattle, as may determine the value of this new and celebrated exotic.*

TO DR. FOTHERGILL, and Mr. HAYES, for their laudable attention to the cultivation of *Rhubarb*; and to the latter Gentleman for his other communications, the Society, on the public behalf, has been laid under new obligations.

The remarks on *Fruit Trees*, from Mr. GRIMWOOD, Mr. SAMUEL, Mr. GILLINGWATER, and our scientific correspondent Mr. GULLET, will be found interesting, not only to the lovers of horticulture in particular, but to our country readers in general.

* It is with pleasure the Society embraces this opportunity of paying a full tribute of respect to Dr. LETTSOM, (though not an immediate correspondent on the subject) for that steady and laudable zeal which he has shewn for the introduction of so promising a root into this country. By such generous exertions, whenever well directed, an individual may secure, even against the force of prejudice, the most lasting advantages to his fellow-citizens, and to posterity.

To

To the experienced and accurate Mr. ONLEY, of *Stifted-hall* in Essex, the Society owes many thanks for his present and past favours, and solicits the continuance of his correspondence. When Gentlemen of such practical knowledge, and exact observation, are disposed to favour institutions of this kind with their support, we may hope to gratify the public attention with a beneficial and lasting effect.

To Sir JOHN ANSTRUTHER, the Society continues to be indebted for careful records of experiments, in a branch of husbandry growing into general esteem, and which can never be better recommended than by repeated experiment, calculation, and comparison.

To Mr. NEHEMIAH BARTLEY, no small share of commendation is due, as well for the variety of his useful experiments, as for the candour and liberality with which he imparts them.

The

The correspondence of Miss HENRIETTA RHODES, whose attentive observation and judicious opinions do equal credit to herself and her sex, the public cannot be wanting to value; and this Society wishes her continued remarks on the curious subject of her particular attention.

Mr. WINTER'S own publication has anticipated what we might otherwise have had pleasure in communicating from his pen; but too much credit cannot be given him for his practical exertions, and endeavours to promote the *Drill* husbandry. His drilling machine, of which we give a representation by his own plate, promises much utility on lands favourable to such a mode of cropping; and the public has great reason to expect the gradual advancement of this mode, through different parts of the kingdom, to the great increase and perfection of the different species of grain, as well as the saving of prodigious quantities of seed, heretofore lost to the nation.

The

The Reverend Mr. COOK, (a description of whose drilling machine was given in our last volume) having furnished for this publication an ample account of the success attending the use of that machine; we insert the same on a principle of impartial justice to him, and of unbiassed attention to the public advantage.

TO Mr. WOODBINE, Mr. WAGSTAFFE, Mr. CROCKER, Mr. HAZARD, Mr. WEBB, Mr. POTTICARY, Mr. ANDREWS, Mr. KIRKPATRICK, Mr. TRIFFRY, Mr. BAKER, and various other correspondents whose names do not appear, the Society owes a return of acknowledgements for their obliging miscellaneous communications;—such acknowledgments are cordially returned, whatever reasons may have induced an omission of some articles, both well intended and respectably written.

Lastly, we have to acknowledge very particular obligations to Dr. FALCONER, for the excellent Essay with which this volume concludes. The co-incidence of the Doctor's design

sign with the public views of this Society, is sufficiently obvious. The preservation of a class of men who are the hands and sinews of national strength, is a first object of sound policy, as well as of genuine benevolence. If that praise be just, which has been fully bestowed on a sentiment of GOLDSMITH,

“ But a bold peasantry, their country’s pride,
 “ If once destroyed, can never be supplied,”

we cannot be too studious of preserving their health and vigour. And while many of our readers will be pleased and instructed by the Doctor’s judicious counsel, his piece will be considered as highly worthy the adoption of the Society, and worthy himself as one of its original founders:

To conclude. Though the Society cannot undertake to vouch for the perfect accuracy of every account, nor for the justice of every opinion contained in the mass of materials, which from time to time we may be able to lay before the public; yet may we reasonably

reasonably hope, that the continued communications of our correspondents, on various important matters, will be found an accumulation of science either immediately obvious, or remotely tending to national good. And if, in some unavoidable instances, an inequality of intrinsic knowledge should be discovered, it is but the inequality of human endeavours, ever to be expected.

Those Gentlemen, who, from their own practice and sagacity, are the best qualified to discriminate between truth and error, will ever be found the most disposed to candour. And while every man desirous of improvement in rural pursuits will make trial of a new process with caution; any new acquisitions of agricultural skill, which may take their rise even from the suggestions of theory, will be deservedly considered as so many testimonials to the public benefit of establishments like this.

BATH, *May* 1, 1788.

LETTERS

L E T T E R S

T O T H E

BATH AND WEST OF ENGLAND AGRICULTURE SOCIETY.

To the SECRETARY.

SIR,

I Observe with pleasure that the Society instituted at Bath, for the encouragement of Agriculture, Arts, Manufactures, and Commerce, continues to publish many valuable letters and papers communicated by gentlemen in every part of this island. And as I am disposed to believe that these papers are very generally read, I have been induced to communicate to you the result of a few experiments I have made on the culture of Potatoes, which contain some discoveries that such friends as I have imparted them to think of great importance. If the Gentlemen of your Society shall view them in the same light, and think them worthy a place in their next volume, these papers are much at their service.

VOL. IV.

B

Having

Having attended very particularly to the subject of agriculture for many years past, I have observed with not less concern than amazement, the small advances that have been made in this useful art, when compared with that of other arts of less general utility, and have endeavoured to investigate the cause of this phenomenon. I find it less difficult to discover the cause of this stationary state of our knowledge, than it is to remove the obstructions that stand in the way. Without entering here upon the question at large, I shall content myself with observing, that the length of time necessary for making an experiment in agriculture, and the difficulty of discovering all the circumstances that may vary its result, are among the chief causes of the small progress that has been made in this useful and necessary art. Man, impatient of delay, and anxious to get forward, becomes tired of the snail-like progress he must make if he were to submit all his facts to the test of *experiment*. To avoid that tiresome progress, men in general have been willing to admit *experience* as a mode of acquiring knowledge on this subject, sufficiently accurate for all the purposes of life. Among practical farmers this is so much the case, that they rely entirely on *experience* as an infallible guide, and condemn *experiments* as absurd

absurd and unnecessary. By this means the subject is only imperfectly investigated, and uncertainty pervades every department of it.

In compliance with common custom, by *experience* I here mean those general observations, collected from an extensive course of practice, which, by frequently recurring, have made a deep and lasting impression on the mind ; and by *experiment*, I mean those special trials that have been made to ascertain particular facts with accuracy. In the first case, facts are admitted as proved by the frequency of their recurrence, and the supposed notoriety of their correspondence with each other, without being subjected to any other criterion of accuracy but a general recollection of their frequency and universality. In the last case, like mathematical truths, nothing is admitted till it be clearly proved. Upon a fair investigation it will appear that a practical farmer, in different circumstances, must sometimes place reliance on the one, and sometimes on the other of these two modes of acquiring knowledge ; and that without the aid of both, he never can understand his business compleatly.

The business of a practical farmer naturally divides itself into two branches. *One* that embraces

the œconomical detail of the operations of husbandry; *the other* relates to that degree of scientifick knowledge which directs to those operations that ought to be performed. In the first sense he may be compared to a *mason*, in the last to an *architect* of a new building. Now, though it should be admitted, that, by a constant course of attentive *experience*, a man may in time acquire such a knowledge of the detail of the practical operations of husbandry as could not otherwise be obtained, and might thus come to know, by a sort of mechanical habitude, without much forethought or reflection, the various obstructions that usually occur in the course of business, and the easiest means of surmounting them;—though he may come to know in what manner to conduct his different operations, so as not to interfere with, or to interrupt one another, and be thus able to make such use of time, as that none of it be either misapplied or lost by the different persons he has occasion to employ;—yet all these allude only to the first department of business, which, of whatever importance it may be to the success of those who follow the business of agriculture for a subsistence, is only a part of that profession; and much knowledge remains to be acquired in the other department of agriculture, with regard to
 which

which *experience* would serve but as a very imperfect instructor.

It is indeed impossible for any man who practises agriculture to avoid observing, that better or worse crops may be obtained from the same field in different circumstances, and that certain soils are better adapted to yield good crops of one kind of produce than of others. It is as impossible for a man, whose subsistence depends upon the produce of his fields, to avoid forming conjectures as to the causes of these diversities; and in the course of a long and attentive observation it must probably happen, that some of these *conjectures* may be right. But as this judgment is formed merely from a complex view of *the whole*, in which a great variety of particulars are blended indiscriminately together, it is impossible for the mind to distinguish in this way, with any degree of certainty, those circumstances that are of *essential* from those that are of *trivial* importance. The imagination is thus left at full freedom to exert its influence; and ill-grounded theories so warp the mind as to make it believe that it sees certain facts as clearly proved, which are nothing else but a specious delusion. Nor is it possible ever to correct the false judgments that are thus formed, but by calling in the aid of experiment; which, by carefully separating

rating every circumstance that can in any case affect the result, and viewing it distinct and apart from all others, gives full room to perceive what degree of weight it ought to have in every practical case, and to shew how far it is either essential or unimportant.

The experiments which accompany this letter, and the observations that result from them, sufficiently evince the justness of these remarks, and afford a very convincing proof of the necessity of subjecting the different cases that daily occur in agriculture to the test of accurate experiment, if ever we hope to obtain such a thorough knowledge of facts as to introduce that degree of steadiness in the practice of husbandry, of the want of which we have still reason so justly to complain.

I hope any apology for the trouble I now give you will be unnecessary. I remain, with great respect for the worthy members of your Society,

Sir,

Your most obedient, and

most humble servant,

Cotfield, near Leith,
Nov. 28, 1786.

JAMES ANDERSON.

ARTICLE I.

Miscellaneous Experiments and Observations on the Culture of Potatoes, and some other Plants; written originally in the year 1778, with some additional Remarks of a later date.
By JAMES ANDERSON, L. L. D. F. R. S.
and F. S. A. Scot.

PAPER FIRST.

ON THE NATURE OF THE SEEDS MOST PROPER FOR
BEING PLANTED.

THE Potatoe has been cultivated in Britain for half a century past, with great advantage to the community; but many particulars respecting its culture are still involved in uncertainty. To point out the means by which that uncertainty may, in some cases, be removed, is the chief design of the following essay.

§. I.

Among other particulars, it still remains a doubt with practical farmers, whether it is most profitable to use small potatoes *uncut* for seed, or large

ones cut into pieces. This does not indeed appear to be a matter of *doubt* with any one individual, if he alone should be consulted on this head; but the uncertainty appears when many are consulted. Every one is ready to decide positively in favour of one or other of these modes of practice; but when the votes are collected, it is found that they are nearly equally divided between the two; and when enquiry is made into the reasons on which these opposite opinions are founded, it appears that they rest upon no better foundation than theoretical conjectures: for I have never been able to learn, upon the most attentive enquiry, that a single comparative trial has been made with a view to ascertain this fact. The culture of this plant never attracted my own particular attention till lately, and therefore I never did think of ascertaining this fact by experiment till the year 1776, at which time the following comparative trial was made with that intention.

EXPERIMENT FIRST.

April 26, 1776, Four rows of potatoes were planted in a piece of garden ground, without dung, for the sake of the experiment; there being no variation of soil in any part of the experiment ground. These four experimental rows were planted contiguous to one another, and at equal distances; other potatoes were planted on each side of them, at the same distance as they were from each other,

to render all these rows as much alike each other as possible in all respects. The four experimental rows consisted of plants of the following kinds:

1st row. Small potatoes planted whole.

2d. Potatoes somewhat larger than the former, cut into two equal parts.

3d. Pieces cut from the small end of large potatoes, with one eye in each.

4th. Pieces cut from the large end of the same potatoe, with one eye in each.

To understand the meaning of the last part of the experiment, it is necessary to observe, that the kind of potatoe used in this experiment (and in all the other experiments in this essay, where not otherwise related) was that commonly known here by the name of the *white kidney potatoe*. The bulbs of this kind of potatoe are usually of an oblong shape, flatted a little, having one end considerably smaller than the other: the colour yellowish white, without any tinge of redness. The small end of this potatoe, which is always opposite to the umbilical eye, by which it adheres to the stem, is usually filled with a cluster of bud-eyes, very close upon one another; so that the slices taken from this end, with a single eye in each, are of necessity very small; whereas those that are cut from the opposite end, in which the eyes are placed much thinner, are always of a much larger size.

These potatoes were properly hoed, and kept free from weeds during the summer, and on the 30th of October they were dug up, and, after being properly cleaned, the
weight

weight of the produce of the respective rows was found to be as under, in avoirdupoise weight.

	<i>lb. oz.</i>			<i>lb. oz.</i>
1 st row, - -	18 0		3 ^d row, - -	12 5 $\frac{1}{2}$
2 ^d - -	16 13		4 th - - -	36 4

The difference between the produce of the third and the fourth rows appeared to me astonishing: and as the plants in the fourth row consisted of much larger pieces, and as those in the third row were smaller than any of the others, this experiment seemed to indicate, that the weight of the produce depended in a great measure on the weight of the seed planted.

It likewise seemed, from this experiment, that whole potatoes might in some cases be more profitable for seed, and in others less so, than cuttings; for the first row exceeded the second and third, though it fell greatly short of the fourth. The cuttings in the fourth row were much larger, and those in the third much smaller than the whole potatoes in the first.

It deserves to be remarked, that the vigour of the stems of each of these rows was nearly in proportion to the weight of produce above stated,

It is also of importance to remark, that although the soil, at the time of planting, was in every respect equal through the whole of the experiment ground; yet, at the time of taking up the plants, that part on which the fourth row grew, was in much better order, and seemed to be much richer, than that where the others had grown, especially the third.

It is likewise worth noting, that a row of the potatoes which grew beside these, having been taken up by itself, and the bulbs cleaned, was found to weigh 23 pounds. These were from seed cut in the ordinary random way.

§. II.

As the foregoing experiment seemed to point towards an important discovery with regard to the culture of this valuable plant, I resolved to repeat it next season with still greater accuracy, which was accordingly done as under.

EXPERIMENT SECOND.

In the month of April, 1777, a piece of ground was prepared for the experiment. This had been in grass some years, and now got a flight kind of trenching barely to cover the sward, without any dung. It was found that this small piece of ground could contain exactly twenty plants in length, at sixteen inches from each other; and it was divided into rows crossing these at right angles, at the distance of sixteen inches from each other also; so that the plants stood in square sixteen inches from one another, in every direction. The soil of this patch was thin and poor, infomuch, that when in grass, the crop was so scanty as scarcely to admit of being cut with the scythe; but no dung was put upon it, on account of the difficulty of spreading it so equally as not to affect the accuracy of the experiment.

On the 5th of May, twenty plants of each of the following kinds were provided and planted, each kind by itself, in a single row; all the plants in each row being, as nearly as possible, of one size. A row of potatoes cut promiscuously

miscouously having been first planted next the edge of the plot for the sake of accuracy.

1 st row. Small potatoes whole. The twenty plants together weighed	-	-	-	} ounces	5½
2 ^d . Small potatoes cut in two	-	-	-		3¼
3 ^d . Small pieces cut from the small end of large potatoes, with one eye in each	-	-	-	}	1½
4 th . Pieces of an equal size with the former, cut out of the large end of large potatoes, with one eye in each	-	-	-	}	1½

[N. B. *Though it was not expected that any difference could arise from the difference of circumstances here noted, yet as this had never been ascertained by experiment, the fact was not certainly established. This trial was meant to give it the certainty wanted.*]

5 th . Large pieces cut from the great end of the same potatoes that were employed in No. 3 and 4, having only one eye in each,	-	-	-	} ounces.	26¼
6 th . Large potatoes, from which all the eyes had been cut out, save one about the middle part of the bulb	-	-	-	}	121½
7 th . Large potatoes with one eye only, left in the small end of the bulb,	-	-	-	}	123½
8 th . Large potatoes planted whole, as nearly as could be got, of an equal size with the former,	-	-	-	}	124½

[N. B. *No. 6 and 7 were intended to discover whether the produce continued to increase with the weight of the seed planted. The leaving only one eye was intended*

to make these plants resemble, as nearly as possible, those in No. 5. The variation between No. 6 and 7 was with the same view as that in No. 3 and 4. No. 8 was intended to discover if plants are damaged in any respect for seed merely by being wounded, and what is the result of planting seeds with many or few eyes.]

EXPERIMENT THIRD.

On the same patch of ground that was prepared for the foregoing experiment, and immediately contiguous to the 8th row in the preceding experiment, (one row only intervening, which will be afterwards taken notice of) was planted on the same day with them, seven other rows of seeds, being each of them exactly of the same size and weight with the foregoing; so that it was an exact repetition of the same experiment, intended to save time. The only difference between them was, that the seventh row was here entirely omitted for want of room. The general result of these two experiments was as under; the uppermost row of figures, where double, denoting the result of experiment 2d, and the undermost of experiment 3d.

No. of rows,	No. of seeds that germinated.	Weight of seed.		No. of roots produced.		Weight of the produce of each row.		Average weight of the produce.	
		lb.	oz.	Average		lb.	oz.	lb.	oz.
1st,	{ 19 } { 20 }	5½		{ 122 } { 125 }	123½	{ 6 0 } { 8 12 }	7 6		
2d,	{ 19 } { 16 }	3¾		{ 107 } { 131 }	119	{ 5 13 } { 6 0 }	5 15½		
3d,	{ 17 } { 15 }	1½		{ 62 } { 54 }	58	{ 2 8 } { 1 15 }	2 3¼		
4th,	{ 17 } { 17 }	1½		{ 56 } { 86 }	71	{ 2 3½ } { 3 0 }	2 9½		
5th,	{ 20 } { 19 }	26		{ 190 } { 192 }	191		12 2¼		
6th,	{ 20 } { 19 }	7 10½		{ 315 } { 258 }	286½	{ 19 3 } { 16 15½ }	18 1¼		
7th,	{ 20 }	7 11½		{ 374 }	374	18 10½	18 10½		
8th,	{ 20 } { 26 }	7 12½		{ 470 } { 330 }	400	{ 21 5½ } { 20 3½ }	20 12½		

From

From these two experiments thus carefully collected it appears, that there is such a near coincidence between the produce of the corresponding rows in each experiment, as gives us reason to believe, that the average obtained from each row is nearly what would result in general practice from planting feeds, corresponding to those planted in each of these rows respectively; so that the corollaries deducible from thence may be admitted as general rules in practice.

§. III.

It may, in the first place, be inferred, by a careful review of these two experiments, *that the produce is not materially affected by planting for seed, either whole potatoes or cuttings, or large or small potatoes merely as such; for that it is only incidentally that either of these particulars can affect the crop.* The whole potatoes in the first row yielded a smaller produce than the *cuttings* in the 6th row. Seed from *small* potatoes yielded a smaller produce than was obtained from *large* ones, in the 5th, 6th, 7th, and 8th rows; but it yielded a greater produce than was obtained from *the same* large potatoes, in the 3d and 4th rows. It seems, in the *second* place, to be a fact confirmed by every step in both these experiments, *that the weight of the crop is always in some measure influenced by the WEIGHT of the seeds planted.* The third and fourth rows, in which the seeds were *lightest*, yielded the poorest crop; and a progression from lighter to more weighty, is observable

able in the *produce*, as well as the seeds through the 1st, 2d, 5th, 6th, 7th and 8th rows. Some trivial variations do not disturb the general rule, which seems to be sufficiently established by the general result of the first six rows.

§. IV.

Of all the experiments in agriculture that I have ever seen recorded, that in question exhibits the most interesting result, whether we consider it with respect to the principle from which the phenomena originate, or its great importance in agriculture as a *practical* art. In this last respect, indeed, it promises to be of the utmost utility, because by it we are taught, that without any alteration in the soil or culture, but merely in consequence of a proper attention to the state of the seed to be planted, a crop *nine* times as weighty may be obtained in one case as in another. Is it not astonishing, that a circumstance of such amazing influence should not have been discovered by accident long before this time? And does not this afford a most convincing proof of the necessity of subjecting the common modes of husbandry to the test of actual experiment, in order to obtain a rational degree of certainty, instead of those conjectural opinions that individuals are so apt to rely upon with unsuspecting confidence?

That

That the nature of the substance from which a plant is to be produced, should have *some* influence on the future vigour of that plant, seems not unreasonable to suppose; yet I believe that even the warmest imagination could hardly induce one to suspect *a priori*, that such an extraordinary degree of vigour could be communicated, merely by an increase in the *quantity of matter* contained in the seed. To me, this circumstance appeared the more surprising, as the result was extremely different from what I had found by some former experiments was produced by plump and lean grain employed as seed. The experiment was as follows:

EXPERIMENT FOURTH.

With a view to know of what consequence it was in the practice of agriculture, to employ plump or lean grain for seed, I planted, April 2d, 1770, upon a small bed of ground in a garden, one hundred of the plumpest grains of oats that I could pick out from a large parcel of *unmixed* oats, in five rows, five inches row from row, and one inch between each plant in the rows. On another equal spot in the same ground, I planted at the same time, and in the same manner, one hundred of the hungriest grains I could pick out from the same parcel of oats: but to insure against contingencies, I also took as many of the small hungry grains as equalled *in weight* the hundred plump grains above-mentioned, which, when numbered, I found amounted to one hundred and seventy. These 170 grains I planted in five rows, each of the same length as the former, and distant from each other five inches, so that the hundred and
seventy

seventy bad grains occupied precisely as much ground as the hundred good grains.

RESULT.

No. 1st. That division on which a hundred good grains were sown, produced ninety-five plants.

2d. That on which a hundred lean grains were sown yielded ninety-six.

3d. That division on which was sown the one hundred and seventy hungry grains, yielded also ninety-six.

On the first appearance of the seed leaves above ground, those of No. 1st were broader, and more succulent than those of the other two plots; but as the plants advanced towards perfection, the difference in appearance gradually began to disappear, and long before harvest it was not possible to remark any difference in the healthiness and luxuriance of the stalks in any of the three divisions. The grain when ripe was equally healthy in No. 3d as in No. 1st, and the crop seemingly as weighty in every respect: but this I could not ascertain with the certainty I wished, on account of the destruction by birds.

The result of this experiment was, in truth, very contrary to what I had expected. If No. 2d only had been sown with the lean grain, I should have attributed the health and vigour of the plants to its thinness: but, without the aid of that circumstance, the plants in No. 3d were equally strong and vigorous. I mean not, however, at present, to make any farther use of this experiment than barely to remark how very dangerous it is in farming, to rely implicitly on reasoning from analogy between two cases that are not *in every respect* alike, though they may resemble each other in many striking particulars. It would

not, for example, seem very unnatural for a person who had made only *one* of these experiments, to conclude *from analogy*, that the result in the somewhat similar case, which he had not tried, would be similar to that which he had tried: yet it appears, that with regard to grain (that kind of it at least which had been proved) a difference in the *weight* of seed, if it has *any* effect on the future crop *at all*, is so little as scarcely to be perceptible; whereas, with respect to the plants of potatoes, it is so great as to augment or diminish the total amount of the crop in the *ratio* of nine to one. This, at the same time that it should teach the farmer to be extremely cautious how he suffers his mind to be influenced by vague reasoning, ought strongly to incite him to redouble his attention, and by well-chosen experiments endeavour to obtain some kind of certainty in the knowledge of many particulars, wherever he finds that his opinions have been adopted in consequence of early prejudices, or crude indigested notions arising from theories that have not been sufficiently understood.

§. V.

But although it appears, from experiments *first*, *second*, and *third*, sufficiently obvious, that the crop of potatoes is augmented by the weight of seed, yet it also appears from experiments *second* and *third*, that the weight of produce is not augmented *in the same proportion* with the weight of the seed: for although the weightiest seeds have always yielded the weightiest crop *in proportion to the extent of ground*, yet the lightest seeds have as invariably produced the greatest return *in proportion to the weight of seed planted*.

planted. That the reader may be enabled to observe every particular relating to these two proportions, the following table has been constructed. In this table is expressed the quantity of seed, and the produce of an English statute acre, proportioned to the weight of seed and produce in the different rows of the preceding experiments, together with the returns from the seed in each row, and the clear produce after deducting the seed.

That those who choose it may be able to follow these calculations, they need only to be informed, that an acre would contain 24,502 plants at sixteen inches from each other: all the other data necessary are expressed above.

Rows corresponding to those of the same numbers in Exp. 2d and 3d.	Quantity of seed required to plant an acre in the proportion of each row reduced to bushels and decimals. <i>Bush. Dec.</i>	Quantity produced from an acre, in the proportion of each row, reduced to bushels & decimals. <i>Bush. Dec.</i>	Proportional returns of seed from each row.	Clear produce from an acre, in the proportion of each row, after deducting the seed. <i>Bush. Dec.</i>
1st,	7.50	161.30	21.4	153.80
2d,	5.13	130.5	25.3	125.37
3d,	} 2.05	52.6	25.7	50.65
4th,				
5th,	35.5	266.5	7.5	231.00
6th,	167.4	396.1	2.4	228.7
7th,	168.6	400	2.3	231.4
8th,	170.2	453.9	2.6	283.7

From this table it appears, that the 3d and 4th rows, in which the smallest quantity of seed was planted, yielded the greatest returns, *in proportion to the seed*, but the smallest *in proportion to the extent of ground*. The returns of seed being as 25.7 to

one; whereas that of No. 8th was only 2.6 to one. But the total average produce of the 3d and 4th rows was only 52.6 bushels; whereas that of the eighth row was 453.9 bushels.*

To obtain a just notion, however, of the profit that would be derived from cultivating a field in the one or the other of these ways, it is necessary to deduct the seed in both cases from the gross produce, the remainder only denoting the free produce. The last column in the table above marks this free produce, in all the different cases above stated. And from this table it appears, that the total free produce from the smallest seed here employed was only 50.65 bushels per acre; and that where the largest seed was employed, amounted to 283.7, so that one acre in the last case yielded nearly as much free produce as six acres in the first.

Hence it seems reasonable to infer, that it is in no case profitable to plant small potatoes, or small cuttings, unless where it is meant to increase as fast as possible a favourite kind; in which case it may be sometimes eligible to plant pieces very small, as in that way the kind will be most quickly multiplied.†

* By experiments more at large since that time, and on a richer dunged soil, I have obtained a return from seeds even larger than those in No. 8th, in the proportion of at least *ten* to one, so that the very small returns in this experiment must be ascribed to the great poverty of the soil.

† Since the above was written, I find reason to believe, that the returns from *large* potatoes may be augmented greatly beyond what it was in this experiment; whether

§. VI.

By comparing No. 6th and 7th with No. 8th, in experiments second and third, there is some room to suspect that the seeds may possibly have been injured by the wounds they received in having their eyes cut out, as the produce in No. 6th and 7th does not seem to be quite so great in proportion to the seed as in No. 8th. But this difference is not so considerable as to enable us to speak with any degree of certainty. Had it even been greater than it is, there would still have been room to doubt whether it had been occasioned merely by wounding the seeds, or in part also by diminishing the number of the eyes. The following experiments would tend to elucidate these particulars :

1st. Take any determinate number of potatoes, all of one sort, and of an equal weight each, and having separated them into two equal parts, plant all those of one division *whole*, and let all the plants of the other division before planting, be wounded with a knife in many places, without cutting out any of the eyes. Observe the result.

2^{dly}. Take, in the same manner, another determinate number of potatoes, of the same sort, all of equal weight, and having selected an equal number of the same kind of potatoes somewhat larger each than the former, wound these last deeply in various places, and cut out from them

whether it could by any peculiarity of culture be brought to equal that from small, my experiments, which have been interrupted by other avocations, do not enable me to say—but it is not at all improbable.

several deep slices, so as to reduce them to an equal weight with the former, taking care not to cut out or wound any of the eyes. Plant these in equal circumstances, and observe the result.

3dly. Repeat the experiment of the 7th and 8th rows of experiment second, with proper caution: for I have a suspicion, that in my experiment the eyes in the plants of the 7th row had not been cut out deep enough, to prevent them from sending forth stems.

4thly. Take some large fleshy cuttings, with one eye only in each, all of an equal size, and having selected an equal number of whole potatoes, equal in weight to those cuttings, plant them, and observe the result.

[Since the above was written, other avocations have prevented me from repeating these, and many other experiments proposed in this essay. To some the importance of these experiments will appear doubtful, and many will feel a strong propensity to foretel what would be the result, and therefore will think it unnecessary to prove it by actual trial. This presumptuous propensity has tended in a wonderful degree to retard the progress of agriculture, and cannot be too cautiously guarded against. Before we can attempt to make any *decisive* experiments on the best method of cultivating this plant, so as to obtain in every situation the greatest possible crop that circumstances admit of, all these previous questions must be fully discussed. From the few experiments above recorded, we are enabled to perceive in what manner many hitherto inexplicable peculiarities recorded concerning the culture of this valuable plant may be accounted for, that have been explained far otherwise.

Tho' it does not appear probable that the mere wounding the bulbs will affect the crop, yet it is certainly within the

the

the bounds of *possibility*, and therefore the fact should be ascertained. As to diminishing the number of eyes, the *probability* that it may affect the crop appears very strong. Every stem which springs from a potatoe becomes in time a distinct plant, which spreads its own roots around, and sends forth its own clusters of potatoes in the same way as if it were a distinct and separate plant. By having many or few of these, therefore, the crop may certainly be affected—but how far no one at present can say; and therefore no one can make an accurate comparative experiment on the culture of potatoes in general.]

§. VII.

There seems to be no reason to suspect that eyes taken from any particular part of the bulb are possessed of a degree of proliſiacy greater than those taken from any other part of it, independant of the *size* of the fleshy part that adheres to the eye. This appears by comparing the 3d with the 4th, and the 7th with the 8th rows in the foregoing experiments.

[It is however highly probable that a difference in the crop, either with respect to the number and size, or general weight of the whole, would result from planting *large* cuttings of equal weight, taken from the big end of large potatoes, or from the point, as many eyes would be in the last in comparison of the first. This is therefore one of the many preparatory experiments that requires to be made.]

§. VIII. Hitherto

§. VIII.

Hitherto I have only taken notice of the total *weight* of the crop; but as the *value* of that crop is, in many cases, affected by *size* of the bulbs, it is necessary to attend to those circumstances that may tend to increase or diminish their size. With a view to that particular I have, in the preceding experiments, recorded the *number* of potatoes produced in every case, as well as their weight.

It is commonly imagined, that if the seeds planted contain many eyes, the bulbs produced will be numerous, but small; and that larger bulbs in smaller number are produced in plants that have only one, or few eyes: hence it is concluded, that *whole* potatoes planted for seed will always produce a greater number of *small* potatoes; and cuttings will yield larger potatoes, though fewer than those. It does not, however, appear, that this hypothesis is supported by the foregoing experiments. In the average table, §. II. we find that the bulbs produced from the 3d and 4th rows, which consisted of plants with one eye only in each, were smaller, as well as less numerous, than those in the 1st and 8th rows, which consisted of plants that contained many eyes. On the other hand it appears, from the same experiments, that the bulbs
produced

produced from the 5th row, in which the seeds contained one eye only, were larger than those in the 8th row, (consisting of plants with many eyes) in the proportion of 20 to 24 nearly. I would draw no conclusion on this head from the 6th and 7th rows, because, as I have already observed, I suspect that some of the eyes in these had not been cut out deep enough to prevent some of them from pushing out stalks; for I observed that in these two rows, as well as in the 8th, there were many stems arose from each plant. It deserves however to be remarked, that several stems sprang from the roots of the others, and some of these at a considerable distance asunder, although in these I think I am certain there was only *one* eye in each cutting, for I cut them all with my own hand, and was as careful as possible to examine them with attention; so that nothing *certain* can be inferred from the number of stalks that sprung from one plant.

§. IX.

It is commonly imagined that the size of the bulbs is augmented, and their number retrenched, by cutting off the supernumerary stalks at the first hoeing, so as to leave only one stem at each plant; but I never heard of any experiment by which this fact has been ascertained. Therefore in equal circumstances

cumstances plant two rows of the same kind of potatoes whole, the plants being all of equal weight; and in the first hoeing cut off all the stems save one to each plant in one row, and in the other leave all the stems. Observe the result.

Plant at the same time other two rows in every respect as the former, but instead of cutting off the supernumerary stems, *pull* them up by the hand.— Observe the result.

[Since the above was written, I attempted this experiment, but I found that new stems sprung up from those that were cut over, so as rather to augment than diminish their number, and also to retard the ripening of the stems; and as these stems bleed considerably when cut, it seems probable that the plant must be weakened thereby. But as this experiment was not made with sufficient accuracy, no *certain* conclusions can be drawn from it.

It appeared to me that if potatoes were planted very shallow, more stems were always produced than if they were planted deeper; but in no case where potatoes are planted whole, does it seem that a stem is produced from every eye. Perhaps the best way of diminishing the number of stems from large potatoes, is either to let them spring before they are planted, or to take them up soon after they have germinated, and to rub off the young sprouts as many as you incline. The germ becomes a plant adhering to the present bulb, whose roots spread on its surface before they strike into the ground, and in that state may be easily separated, and possibly might be employed as plants.

I have

I have yet made no experiments to try if the crop be sensibly affected by planting the seeds deep or shallow, and by consequence do not know what is the most proper depth to plant them at. This particular requires to be elucidated.]

§. X.

Although it appears, from the foregoing experiments, that the weight of the crop was always greatest where the seeds planted were the most weighty, yet it would be too rash in us from thence to infer that as great a crop could *in no case* be obtained from the same extent of ground, if it were planted with small potatoes or small cuttings, as if it were planted with large ones. For, as it is probable that the more bulky seeds would require a greater space to nourish them properly than small ones; so it is not *impossible*, that if these small seeds were planted at a proportionally smaller distance, the crop might equal that obtained from the larger ones. Though it does not seem *probable* that this would be the case, and though it appears probable, were it even so, that the practice would be troublesome and inconvenient, far beyond any benefit that could result from it; yet our first business should be to ascertain how the matter of fact stands, and then enquire into the other circumstances depending on that fact. To do this in a proper manner, a numerous set of experiments would be required, somewhat upon the following plan.

The

The first step would be to ascertain what is the distance that ought to be allowed between each plant, when the seeds are of any given size, so as to obtain the most weighty crop.

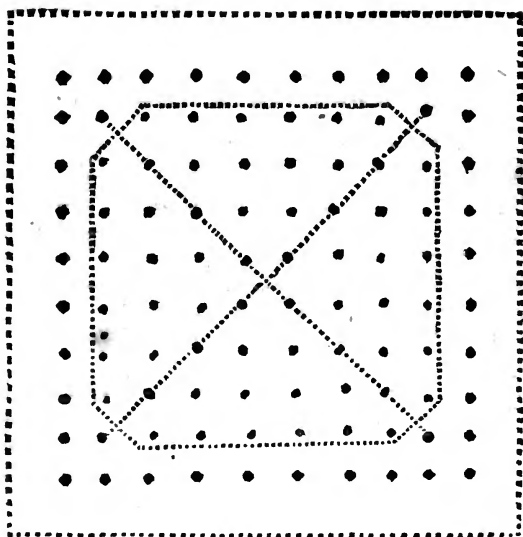
FOR EXAMPLE :

Let it be required to ascertain at what distance from *one another* potatoes weighing half a pound each (that is equal to ten pounds of seed in our experiment) should be planted, so as to insure the greatest possible crop.

To do this let a plot of ground be made choice of for this experiment, which was of a good quality, and as equal as possible in every part. Let this be divided into small squares, each of which should be sufficient to contain exactly one hundred plants, at each of the distances it was intended to ascertain. These squares should be divided from each other by a single row of potatoes planted at one foot distance from each other in the rows ; and each of the squares should be so divided as to allow every plant in the outside rows to stand at the same distance from the division rows, as from the other rows in the square. That is to say, each square should be divided into *eleven* equal parts, on every side, so as to allow *ten* free rows every way, as in the following DIAGRAM, on which the small dots represent the division rows, and the larger dots the hundred experimental plants.

DIAGRAM.

D I A G R A M.



If the whole 100 plants were taken up and weighed, it is probable the experiment would be the more accurate; but should that trouble be thought too great, the sixty plants contained within the inner line of small dots would answer perfectly well; or should that be thought too many, still the 16 plants in the diagonals, with four near the centre marked also with dots, so as to make in all twenty, would answer the purpose sufficiently. All that is here required is, that a certain order of selection should be previously adopted, and most strictly adhered to; for should a random selection of a certain proportion of the plants be permitted, this might be done in a particular manner either through prejudice or favour, which might affect the accuracy of the experiment.—A square spot divided in this manner should be set apart for each of the undermentioned distances between

tween

tween the plants, beginning at twelve inches ; as that is surely as little as ever could be judged necessary for plants of the size here specified. The distance between the plants in the other squares to increase as in the table below.

Plants weighing ten pounds per score.

In the 1st square to be placed at 12 2d ditto at 13 3d — 14 4th — 15 5th — 16 6th — 17 7th — 18 8th — 19 9th — 20 10th — 21 11th — 22 12th — 23 13th — 24	INCHES APART.	In the 14th square to be at 25 15th — 26 16th — 27 17th — 28 18th — 29 19th — 30 20th — 31 21st — 32 22d — 33 23d — 34 24th — 35 25th — 36 Which it is imagined will be the greatest distance that need be tried.	INCHES APART.
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Let all these plants be carefully hoed and attended to, and when the plants have attained a perfect maturity, let the produce of each square (or of such proportion of it as should be thought proper) be carefully weighed. The result would shew, with some degree of precision, what would be the distance at which seeds of the size here specified ought to be planted, so as to yield the greatest crop on a given extent of ground.—But, as it is highly probable that the result of this experiment would be different if it were tried on rich and on poor soils, it would be proper to have it several times repeated, trying it on the richest and most highly manured spots, and on others declining from that till they approached to as great a degree of sterility as this crop could be profitably reared on. Thus would the farmer come to know the proper distance at which he ought to plant his potatoes in all cases. The other

other experiments that follow in this section, ought to be varied in the same manner.

And as it is also possible that potatoes of different sorts may require a different distance between them, even where the plants are of the same weight, it should be always understood that an experiment of this kind is only to be absolutely relied on when applied to the particular kind of potatoe that was actually tried ; therefore, if any experiments of this nature are recorded, the kind of potatoe that was tried should be particularly specified. After this, it is scarce necessary to add, that no intermixture of kinds should be admitted in any of these experiments.

We ought, in the second place, to endeavour in the same manner to ascertain what is the most profitable distance at which plants of all different sizes should be planted. With this view, a number of plants of equal sizes should be selected and arranged into classes by weight, as in the table below, so that the foregoing experiment can be repeated through all its varieties with each class of plants. We shall make the first class consist of plants of half a pound each, or ten pounds per score, as it will be more convenient to weigh the plants by scores than separately; smaller divisions being thus more obviously perceptible than if the plants were weighed individually. The weight of the other numbers is marked in the second column.

<i>Plants weighing per score.</i>			<i>Plants weighing per score.</i>		
		<i>lb. avoird.</i>			<i>lb. avoird.</i>
Class 1st	—	10	Class 6th	—	5
2d	—	9	7th	—	4
3d	—	8	8th	—	3
4th	—	7	9th	—	2
5th	—	6	10th	—	1

In

In all these classes the distances should be the same as above, viz. from 12 to 36 inches, varying in each square one inch. In those that follow the greatest distance need not exceed 24 inches, and the smallest distance should be as low as six inches :

Plants weighing per score.			Plants weighing per score.		
		oz.			oz.
Class 11th	—	14	Class 15th	—	6
12th	—	12	16th	—	4
13th	—	10	17th	—	2
14th	—	8			

Which we will suppose the minimum :—perhaps all below eight ounces might have been omitted, without any detriment to the practice of agriculture. But no harm can ever accrue from ascertaining with accuracy any number of facts in agriculture.

This has the appearance of being a very formidable set of experiments; and it would, no doubt, require a good deal of trouble, and some expence, to execute it properly; so that it should fall to the share of some of those gentlemen of opulence and high rank, who take delight in the study of agriculture. Perhaps few experiments that could be named, would be productive of greater national benefits than that which is here proposed: nor would the expence to a man in easy circumstances be an object of great consequence. Somewhat less than five acres of ground would be sufficient to execute the whole set of experiments *once over*, so as to ascertain with some tolerable accuracy the most advantageous distance for planting each size of seeds, on one class of soils, considered as to their richness, and lead to many probable conclusions as to other soils, which would be of the most extensive benefit in general practice; and the crop obtained would probably repay the greatest part,

part, if not the whole of the expence. Were such a set of experiments carefully made, and properly published, it would probably advantage the publick many *millions* a year. How much is it to be regretted that a national experimental farm is not set apart for making such experiments in agriculture, as it does not besit practical farmers to make at their own expence!

[In practice at present, some persons choose to plant large, and others only very small cuttings or little potatoes, yet every man invariably plants them at one distance in all cases, planting the small seeds as wide as the large, when he chances to have them of different sizes. This being the case, it seems impossible, if the foregoing experiments can be relied on, (and I have found by many trials they certainly may) but that the largest crop must always be obtained from that field which has been planted with the largest seeds—other circumstances being nearly alike. And as the variation arising from this hitherto unobserved peculiarity may be extremely great, may we not reasonably conclude that some of those extraordinary variations in the produce of potatoes, which have been remarked, but not accounted for in any probable manner, may have arisen solely from this circumstance?]

§. XI.

To enable individuals to estimate without much trouble the amount of any crop of potatoes they wish to examine, I here subjoin a table, shewing the number of plants that would be contained in an acre at each of the forementioned distances, and the weight of produce from twenty plants in each

case, when the whole produce of an acre would be twenty-five, fifty, seventy-five. One, two, three, four, five, six, seven, eight, nine, ten, eleven, or twelve hundred bushels of 56 pounds each—beginning with six inches and ending with thirty-six inches distance from plant to plant :

That is to say,

When the plants stand at six inches from each other every way, an acre contains 174,240 plants.

If the crop is equal to 100 bushels per acre, the produce of twenty stems would be 0.631 pounds and decimals:

If the crop was equal to 500 bushels per acre, the produce of twenty plants would be 3.15 pounds and decimals:

And if 100 bushels per acre, the produce of 20 plants would be 6.31 pounds, as in the first line of the table.

And after the same manner all the others are to be read in the following table:

Distance



Distance of plants from each other.	No. of plants on an acre.	That amounted to		
		25	1,100	1,200
		Bushels. lb. dec.	Bushels. lb. dec.	Bushels. lb. dec.
6	174,240	0.152	6.94	7.56
7	123,013	0.218	9.61	10.48
8	98,010	0.285	12.56	13.70
9	77,440	0.361	15.90	17.34
10	62,726	0.446	18.63	21.42
11	51,840	0.540	23.76	2.592
12	43,560	0.642	28.28	30.84
13	37,116	0.754	33.18	36.20
14	32,003	0.877	38.59	42.10
15	27,878	1.005	42.23	48.24
16	24,502	1.142	50.28	54.84
17	21,704	1.292	56.80	61.96
18	19,360	1.445	63.60	69.38
19	17,375	1.611	71.10	77.34
20	15,681	1.782	78.43	85.56
21	14,223	1.968	86.61	94.48
22	12,960	2.160	95.07	103.70
23	11,857	2.380	104.73	114.24
24	10,890	2.571	113.12	123.46
25	10,036	2.789	122.74	133.90
26	9,279	3.017	132.77	144.84
27	8,604	3.254	143.18	156.20
28	8,000	3.500	154.00	168.00
29	7,458	3.754	165.18	180.20
30	6,969	4.017	176.77	192.84
31	6,527	4.289	188.73	205.88
32	6,125	4.571	191.13	219.42
33	5,760	4.861	213.88	233.32
34	5,426	5.155	226.84	247.46
35	5,120	5.454	239.97	261.78
36	4,840	5.841	257.03	280.40

By the help of the ments, or in any other field where there should be selected for the average, it is propose a *hundred*: multiply by 5, for five inches distance 100 plants were selected. 855, and so of others. In like manner may be got by subtracting the lesser from as low as 20 bushels. Example: find the nearest number to that to be, which being about the third part give 625 per acre. Any other case may

§. XII.

In the foregoing experiments no attention was paid to ascertain any other part of the produce but the weight of the bulbs only; but as it may happen that the weight of the stems, and the quantity of *apples* produced, may, in some cases, be an object of value, it is worth noting that the strength and weight of the stems were in all the foregoing experiments apparently much in the same proportion as the weight of the bulbs; the stalks being invariably stronger where the crop of roots was weighty than where it was light. The produce of *apples*, should these ever be found to be an object of value, (which there is great reason to think will be the case) increases in a yet higher degree than the potatoes themselves, when the seeds planted are very large; when the cuttings are small, scarcely one apple is seen in a field; when they are large plants, the apples are numerous and of great magnitude, hanging in clusters of nine or ten together; so as in some cases I have known them produce at the rate of more than 200 bushels per acre.

[I mean to make some experiments on the uses to which these may be applied; the result of which shall be in due time communicated to the publick.]

PAPER SECOND.

ON THE EFFECTS OF CUTTING THE STEMS OF
POTATOES WHILE GROWING, &c.

§. I.

THE stems of potatoes, if cut while growing, and used green, are found to be a wholesome food for cattle and horses. But though some farmers maintain that the produce in potatoes is not lessened by having the stems cut off while they are in a state of vigorous vegetation; others as positively insist that the crop is essentially injured by that operation. It is proper that this point should be ascertained. Probably the crop is hurt if the stems are cut over before they have attained a certain point of maturity, though it is possible they may be afterwards cut without doing any essential injury to it.

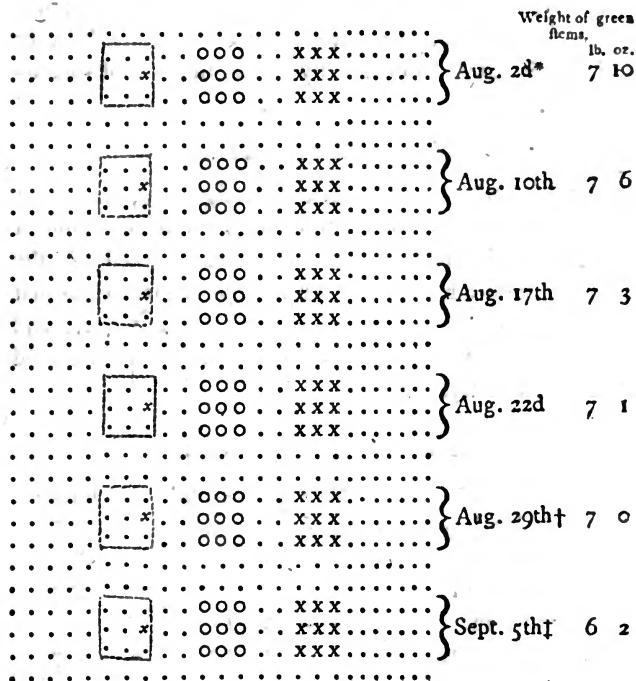
The following experiments were made in the year 1779, with a view to ascertain the foregoing particulars:—

EXPERIMENT FIFTH.

With a view to ascertain the weight of green stems of potatoes at different periods of their growth, NINE stems of potatoes, being part of three rows, and three plants in each row, were cut over in the middle of the field as represented by

by the figures 0 0 0, &c. in the following diagram, at the several periods marked on the right hand, and were found at each cutting to yield the weight of green fodder marked at each of the periods respectively.

D I A G R A M.



* August 2d.—At this time the flowers were just beginning to open.

† August 29th—At this time the apples of the white sort employed in the experiment were well formed. Red potatoes in the same field just coming into bloom.

‡ September 5th—At this time the stems of the white potatoes were beginning to fade. Apples, some of them ripe. Red potatoes just past the blossom, and in full verdure.

It appears from this experiment that the green stems are weightiest at the time potatoes come into blossom, (in this experiment the weight of an acre of green stems was then equal to 12 tons and a half nearly) and that they become gradually lighter, as the crop approaches nearer to maturity.

Cows eat this forage very readily, as do horses also; but it is not in general accounted a very nourishing kind of food.—It is eaten most readily when in its most succulent state.

EXPERIMENT SIXTH.

[To ascertain the proportional weight of a crop that would be obtained from a field of potatoes of this kind, if taken up at different periods, one stem marked *x* in the foregoing diagram was taken up at each of the periods that the nine stems in the last experiment were cut over, and they were found to produce when weighed and numbered as under respectively :

Produce from one stem of Potatoes.

	Weight	lb.	oz.	Number.
August 2d	-	-	0 3 $\frac{3}{4}$	- 21
August 10th	-	-	0 7	- omitted.
August 17th	-	-	0 9 $\frac{1}{2}$	- 10
August 22d	-	-	0 14 $\frac{1}{2}$	- 15
August 29th	-	-	0 13	- 7
September 5th	-	-	1 7	- 8

From this experiment it would seem, that if the whole crop had been taken up on the 2d of August, it would have yielded no more than three ounces and a half per stem, (at the rate of 125 bushels per acre) and if let stand till the 5th of September, it would have yielded twenty-three per

per stem, (868 bushels per acre) so that at the first period the crop would have attained only about one-seventh part of its whole bulk.

The reader, however, must be cautioned not to rely implicitly on this experiment as conclusive, on account of one material impropriety in the mode of conducting it. *One stem only can never be supposed to afford a fair average of thirty-two thousand; more especially when it is adverted to, that the seeds planted were in this field cut in the usual random way; so that one might have been found by accident much larger than another, and by consequence would greatly affect the accuracy of the trial.*—Had the nine stems contained within the small dotted lines in the diagram been taken up at each period, much greater reliance could have been had upon it. We shall afterwards find that there is some reason to conclude, that the result of this experiment is not far from the truth: but as many important lessons to the practical gardener and farmer could be deduced from this experiment, if carefully made, I cannot help recommending it to the attention of the reader, as one of those radical experiments that cannot be too carefully made and adverted to. For were it known with certainty what is the deficiency of weight that in all cases would accrue from taking up any one kind of potatoe at a particular period of its growth, the practical agriculturist could compute with great accuracy whether the additional price he could receive for the produce at an early period, together with the use he could make of his ground after it was cleared, would be sufficient to indemnify him for the loss in quantity. Those who mean to try this experiment would do well to advert to the following particulars:

1st. To the equality of the size of the seeds at planting.

2^{dly}. To

2dly. To the progress of the growth of the plant at each period.

3dly. To the different kinds of potatoes with which it is tried. And,

4thly. To the nature of the weather at the time.

EXPERIMENT SEVENTH.

With a view to ascertain whether any loss, and what, as to the weight of potatoes, was sustained by cutting over the stems at different periods, all the plants whose stems were cut over in experiment 5th, were allowed to stand till the 28th of October, at which time they were all taken up, and the produce of each parcel separately weighed. On the 28th of October also, nine other plants marked xxx, &c. see the foregoing diagram, being part of three rows, three plants in each row, that grew contiguous to the potatoes cut, (two rows intervening, so as that they could not be influenced by the opening occasioned by cutting the stems of the potatoes o o o, &c.) were taken up by themselves and separately weighed. This, it was supposed, gave a very fair average of what the *cut* plants would have yielded, had they been allowed to remain uncut; and of course, that the difference between the weight of each of these patches shewed the loss of crop occasioned by the cutting of the stems at the different periods indicated.

These particulars are expressed in the following table;— to which is added a column, denoting the total loss of crop *per acre*, that would be sustained by cutting over the stems at each period respectively.

Time

Time when the stems were cut over.	Produce of nine plants cut over; taken up October 28th.		Produce of nine plants uncut; taken up Oct. 28th.		Difference between the produce of nine stems cut and uncut.	Loss of crop per acre, occasioned by cutting over the stems.	
	Weight.	Num.	Weight.	Num.		Wt.	Bushels.
	lb. cwt.		lb. oz.		lb. cwt.	lb. dec.	
August 2d	2 12	78	12 12	101	10 0	35.000	624
August 10th	5 8	100	13 11	96	8 3	28.650	511
August 17th	6 2	90	13 12	94	7 10	26.691	476
August 22d	9 5	103	13 13	97	4 8	15.750	281
August 29th	10 10	110	14 1	100	3 7	12.031	214
September 5th	12 0	102	13 8	96	1 8	5.250	93

From this experiment it appears, that if the stems of this kind of potatoe be cut over about the time they are coming into blossom, there would be a diminution of the crop of ten parts out of twelve nearly, of the whole produce, or a loss at the rate of 624 bushels per acre; and that a proportional loss would be sustained by cutting the stems at any future period of their growth. Hence it is obvious, that the loss by this practice would be much greater than could be counterbalanced by any advantage that could be derived from the green stems, as feeding for domestic animals.

Though it also appears from this experiment, that potatoes advance but very little after the stems are cut over; yet, by comparing this experiment with the former, it would seem that they did advance a little. This may be inferred from the following table;—the first column of which is the result of experiment 6th, multiplied by nine—and the last is taken from experiment 7th.

	Produce of nine plants taken up at the periods mentioned in the margin.	Produce of nine plants cut over at the same periods.	Difference; being the increase after the stems were cut.
	lb. oz.	lb. oz.	lb. oz.
August 2d	2 1 $\frac{1}{2}$	2 12	0 10 $\frac{1}{2}$
August 10th	3 15	5 8	1 11
August 17th	5 5 $\frac{1}{2}$	6 2	0 13 $\frac{1}{2}$
August 22d	9 4 $\frac{1}{2}$	9 5	0 0 $\frac{1}{2}$
August 29th	7 5	10 10	3 5
September 5th	12 15	13 8	0 9

Though

Though I must again observe, that no accurate conclusion can be drawn from the result of experiment 6th; the unusual great produce of the stem taken up August 22d, and the smaller produce of that of the 29th, were probably owing to the larger size of the cutting in the first than in the last, or to some other unobserved circumstance. This comparison therefore only affords a probable reason to suspect, that the plants do increase somewhat after they are cut over, though but a little.

EXPERIMENT EIGHTH.

To ascertain whether a benefit might in any case accrue from replanting the stems of potatoes that were taken up for an early crop, and to what that might amount, the stems of the different plants that were taken up in experiment 6th, were all immediately replanted after the bulbs were taken off and weighed. It was found that these plants readily took root, and produced another crop of potatoes that season, the amount of which, when suffered to remain in the ground till the 28th of October, and the proportion that this second crop bore to the first, is denoted below: one stem being in both cases multiplied by nine, to admit of their being the more readily compared with the result of the other experiments mentioned in this section.

	First produce from 9 stems, taken up at the times de- noted on the left hand.	Second produce of nine stems replanted.	Difference be- tween the first and se- cond pro- duce.	Total produce of both plant- ings from nine stems.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.
August 2d	2 1 $\frac{3}{4}$	Torn up by accid.		
August 10th	3 15	2 11 $\frac{3}{4}$	1 3 $\frac{1}{4}$	6 10 $\frac{3}{4}$
August 17th	5 5 $\frac{1}{2}$	1 2	4 3 $\frac{1}{2}$	6 9
August 22d	9 4 $\frac{1}{2}$	0 9	8 11 $\frac{1}{2}$	9 13 $\frac{1}{2}$
August 29th	7 5	0 4 $\frac{1}{2}$	7 0 $\frac{1}{2}$	7 9 $\frac{1}{2}$
September 5th	12 15	0 4 $\frac{1}{2}$	11 10 $\frac{1}{2}$	13 3 $\frac{1}{2}$

It thus appears that a small quantity of potatoes may be obtained by replanting the stems, if taken up at a very early period;

period; yet this, at the best, is but a trifling acquisition, and probably can never in any case be worth the expence; especially when it is also adverted to, that the second produce of potatoes thus gained are always bulbs of so small a size, as to be of very little value in proportion to their weight. It may be a satisfaction, however, to some to know, that in case a stem of a particular kind, of which one has very few, be pulled up by accident before the potatoes are fit for seed, it need not be altogether lost, but that by replanting it the kind may be still preserved.

Where a few early potatoes are wanted, the most economical practice is to pick out with the fingers (which may be easily done in a well-dressed soil) those bulbs that have attained the size fit for use, leaving the stems in their place, with the small potatoes upon them to grow till they also attain a size fit for being used.

§. II.

The foregoing experiments were all made with one kind of potatoes; nor have I taken notice above of any other varieties. But as there is a very great diversity in this respect, and as the properties of one kind are often very different from those of another, our knowledge of the value, and most proper mode of cultivating this plant, must be very incomplete, until the farmer shall know the different weight of crop, &c. that he could obtain by cultivating any one kind in preference to any other; for different sorts are known to vary very much from each other in regard to prolificacy, as well as in
 several

several other respects. A necessary set of experiments therefore would be a comparative trial, in equal circumstances, of all the different kinds, with a view to ascertain the weight of produce that could thus be obtained from each.

The only experiment under this head I ever made, was the following:

EXPERIMENT NINTH.

At the same time that the potatoes in experiment 2d were planted, I made choice of twenty plants of a different kind of potatoe, that is usually distinguished in Aberdeenshire by the name of the *Dutch cluster potatoe*. The bulbs of this kind are of an irregular roundish knobby form. The colour of the skin a yellowish white, with a faint pinkish tinge about the eyes, especially before it is quite ripe. The colour of the pulp yellowish white—consistence viscid, not mealy: taste sweetish. The eyes are pretty deeply sunk in the bulb. The stalk and leaves are neither so long, nor so dark in the colour, as most other kinds; but are generally numerous, more erect, and less jointed. Blossoms white, with a pale pink or purplish tinge, numerous and large. These are succeeded by apples, which in this kind are generally abundant, and of a large size. The umbilical fibres do not in this kind spread to any considerable distance from the stem, so that the bulbs are usually found in a cluster close to the root, to which they firmly adhere. It is reckoned a great bearer.—These are the principal characteristics that at present occur to me for distinguishing this kind, which I only do from memory.

Twenty whole potatoes of this kind, which weighed exactly 123 ounces, were planted in a row immediately contiguous

contiguous to the eighth row in experiment 2d, (which weighed also 123 ounces) at the same time with them, and both rows were managed in every respect exactly alike. They were also taken up, and the produce weighed at the same time, when the weight of each was found to be as under:

The 8th row in experiment 2d, consisting of	}	<i>lb.</i>	<i>oz.</i>
the white kidney potatoe—the produce			
weighed - - - - -		21	5½
The row of Dutch cluster potatoes - - -		27	1
		6	11¼
Difference - - -			

Which is equal to about 150 bushels per acre in favour of the Dutch cluster potatoe. Though no absolute dependance can be had on one experiment only, yet it plainly appears, that much benefit might be derived from the experiments proposed in this section, if properly executed.

§. III.

The reader will please to take notice, that all the experiments above recorded (those in section 1st, paper 2d, only excepted) were made upon a poor undunged soil, for the sake of accuracy; so that the crop, upon the whole, was very poor. I have never yet had a proper opportunity of making any trials that could with accuracy ascertain what might be the greatest crop that could be obtained from an acre: nor indeed can that point be fully ascertained, till the experiments suggested in section Xth,

Xth, as well as to comparative trials mentioned in the last section, with some others, shall have been made. From some trials I have made, but with less accuracy than to admit of being here recorded, I have reason to be satisfied that the *possible* produce from an acre is much greater than most persons at present imagine to be obtainable. I mean to prosecute these experiments next season, if I am not prevented by some unforeseen accident, and shall not fail to communicate the result to the publick in due time. But though my intention is to try to elucidate this subject myself, I beg leave warmly to recommend it to others also; for it is impossible that a matter of so much importance can be too fully investigated.

§. IV.

The reader who has attended to the accounts that have been published of the various crops of potatoes that have been obtained by different persons in different situations and circumstances, cannot fail to have observed, that the diversity in the total produce *per acre*, is much greater than can well be accounted for, by any particulars of the soil or culture that have been taken notice of: such a diversity, however, will now no longer appear wonderful, when he remarks, that the *size* of the seeds planted has never in any instance been sufficiently
adverted

adverted to: so little indeed has this been done, that it is only casually that it is taken notice of at all; though the foregoing experiments clearly prove it to be of the most essential importance with respect to the total amount of the crop.

PAPER THIRD.

OF ARDENT SPIRITS AFFORDED BY POTATOES.

§. I.

THE uses of the potatoe as a food for man, and the domestick animals he rears, are already pretty well known; but it is not in general understood that from this plant may also be obtained a vinous spirit, of an excellent quality, in very large proportions. A good many years ago an account of an experiment made in Sweden to ascertain this fact was published in the memoirs of the Philosophical Society of Stockholm. This, together with some obscure hints I received from the late ingenious Dr. John Gregory, of some similar experiments that had been made with success in the North of Scotland, induced me to make the following trial.

EXPERIMENT

EXPERIMENT TENTH.

February 15th, 1777, I set apart two *Aberdeenshire* pecks of potatoes by measure, which I have since found were each equal to 36 pounds by weight, so that the whole was 72 pounds. These potatoes were boiled in a cauldron till they were brought to a soft pulpy state; they were then bruised, and made to pass through a strait riddle along with some fresh water; the skins being kept back by the riddle, which were thrown away. The pulp was then mixed with cold water, till the whole amounted to about twenty gallons English. This was allowed to cool till it attained the same temperature as would be proper for mixing yeast with wort; when some yeast was put to it, as if it had been yeast to wort from malt. In ten or twelve hours a fermentation began, which continued very briskly for the space of ten or twelve hours, but at the end of that time it began sensibly to abate; from which circumstance I was afraid my experiment would fail. After waiting for some time, and in vain, warming it a little, with a view to renew the fermentation, I determined to stir it briskly to see if it could be renewed by that means. This produced the desired effect, and the same operation was renewed every day, and the fermentation continued to go on in a proper manner for a fortnight. At the end of this time the fermentation abated, and could not be renewed by agitation or otherwise; and the liquor, having been found upon trial to have acquired a kind of acid, slightly vinous taste, was judged fit for distillation. It was then distilled with due caution, care having been taken to stir it in the still, until it began to boil, before the head of the still was applied; and the fire was afterwards kept up so strong as to keep it boiling briskly till the whole was run over. This was intended to prevent the thick matter from subsiding to the bottom; for I was afraid that without this precaution,

tion, it would have acquired a *still-burnt* flavour; and I found by experience in one instance, that this kind of *em-pyreuma* was of an exceeding disagreeable kind, resembling in flavour the fumes of burning tobacco.

In consequence of these precautions and due rectification, I obtained an English gallon of a pure spirit, considerably above proof; and about a quart more of a weaker kind, a good deal below proof. This was, in every respect, the finest and most agreeable vinous spirit I ever saw. In taste it somewhat resembled very fine brandy; but it was more mild than any brandy I ever tasted, and had a certain kind of coolness upon the palate peculiar to itself, by which it might be readily distinguished, by a nice judge, from every other kind of spirit. Its flavour was still more peculiar to itself, but it more nearly resembled brandy impregnated with the odour of violets and raspberries, than any thing else to which I could compare it. [A single glass of it put into a bowl of rum punch, made it appear as if it had consisted half and half of rum and brandy, impregnated with the juice of raspberries.] It seemed to derive this flavour from a subtle essential oil, of a very singular kind—for although it rose with the first spirit that came over, it still continued to come over, without any sensible diminution or change of flavour, till the whole of the spirit was entirely drawn off. It was also so difficult to be dissipated, as to scent with its own perfume a drinking glass, into which the spirit had been poured, for more than twenty-four hours after it had been emptied, and apparently quite dry; and this perfume, after the spirituous flavour was totally dissipated, appeared to me the most agreeable I had ever met with. I have been at the greater pains to describe this kind of spirit in its state of perfection, because I have since heard of and seen some spirits, said to be drawn from pota-

toes, which, for want of skill or caution in the operators, was intolerably nauseous. As others may fall into the same errors in attempting to perform the same operation, I shall hazard a few remarks on the cautions necessary to be observed in attempting to extract vinous spirits from this or other roots; for want of attending to which particulars, many attempts of this kind have no doubt failed.

§. II.

Every philosophic enquirer knows that vinous spirits are entirely the produce of fermentation, and cannot be obtained from any substance whatever, till it has undergone that chemical process: but many of those who attempt experiments of this kind, are neither sufficiently aware of the necessity of this previous step, nor acquainted with the means of exciting it, or of conducting it properly, which frequently frustrates their attempts.

If any vegetable in an unfermented state be distilled, there is, for the most part, obtained by that operation, a portion of native *essential oil*, strongly impregnated with the peculiar taste or flavour of the substance from which it is obtained: but if the substance be properly fermented, that essential oil disappears, and in its stead a new substance is obtained by distillation, altogether different from the former in many respects. This substance is called *vinous spirits*, or *alcohol*, when in its highest rectified state.

But

But if any vegetable substance be subjected to distillation before it has been made to undergo a *proper degree* of fermentation, a *part* of it only rises in the state of *vinous spirit*, and a *part* of it also rises in the state of *native essential oil*; which, mixing with the spirit while in the state of vapour, and being dissolved therein, communicates to that spirit a taste and flavour very different from that of the pure spirit by itself, which is, for the most part, extremely nauseous and disagreeable. It has pretty much the same effect as if a quantity of the raw vegetable substance should be distilled along with another quantity of it that had been *properly* fermented. In all those cases, where the volatility of the native essential oil is nearly the same with that of the spirit, it is evident that no care in the process of distillation can prevent them from being blended together in the same process.

From hence it appears sufficiently obvious, that if ever we hope to obtain the pure genuine vinous spirit without adulteration from any vegetable substance whatever, it is of the very greatest consequence that the fermentation be properly carried on, so as that the whole of the matter susceptible of fermentation shall be equally and entirely assimilated before it be committed to the still. This is on all

occasions necessary; but it is peculiarly so in those cases in which the native oils are very abundant, or volatile, or disagreeable. In distilling malt spirits, this circumstance is seldom sufficiently attended to; the fermentation being usually hurried forward with a rapid carelessness, in consequence of which some part of it is converted into vinegar, before other parts of it are assimilated at all. Hence it necessarily follows, that the malt not only yields a smaller *quantity* of spirit, but affords that spirit also of a much inferior *quality* to what it would have been if the fermentation had been duly conducted. Spirits that are drawn from ale, which has been accidentally allowed to run into the acetous fermentation, are always, on this account, of a quality far superior to that obtained from malt by any other process.

In attempting therefore to obtain a spirit from roots or other vegetable substances, the first point to be attended to is, to conduct the fermentation properly, and to push the vinous fermentation as far as it can be made to go. I am disposed to ascribe the success I had in this experiment, beyond what others have experienced, in a great measure to this cause, and to the care that was taken to prevent it from obtaining the slightest empyreumatic taint during the distillation; though it may also have been occasioned by some other unobserved peculiarity.

One particular I remarked relating to the distillation of this spirit, that deserves to be mentioned. In distilling from malt, it is found that towards the end of the operation a quantity of weak spirit is forced over, which is strongly impregnated with a very disagreeable oil, that very much debases the whole of the spirits, if it be suffered to mix with them. To separate this from them, with as little loss of good spirit as possible, constitutes one of the principal niceties in the process of distillation from malt. But no such phenomenon occurs in the distillation from potatoes; for I could perceive no difference between the taste of the very weakest spirit towards the end of the operation, and that which came over at the beginning or any other part of the process, if equally diluted with water. It would seem that the oil, to which this spirit owes its fragrance, is in all parts of the process seemingly the same, and always agreeable; contrary to the *gout*, or *goo*, as it is pronounced, of malt.

§. III.

I have described above, with all the accuracy I could, the whole process and phenomena that occurred in distilling spirits from potatoes, as I observed them when the process was conducted under my own eyes. This process I repeated twice, about

the same period of time, with the same success. But it is also just to observe, that though it has been since that time several times attempted by my direction, under the care of another person, on whose accuracy I thought I could depend, it has invariably failed in as far as respects the peculiar fragrance of the spirits above described, though in every other respect the result was the same with mine: the same yield of spirit of equal strength being obtained, which was distinguished by the same cool sensation on the palate, and in every respect an excellent spirit, though divested of that unusual fragrance above described. I have often wished to repeat the experiment myself, and so to vary circumstances as to try to discover the cause of this peculiarity; but the revenue laws are so strict at present, that a private man cannot venture to have a still in his possession for the sake of making any experiment of this sort, without subjecting himself to a very heavy penalty; and as I should very much dislike any thing that had the appearance of evading the laws, I have thus been, very much against my will, prevented from repeating these experiments. Certain, however, as I am with regard to the fact, (which if necessary could be attested by many persons who tasted the spirits) I have no scruple in publishing it fairly to the world, leaving it to time,
and

and to others who have opportunity to make these experiments, to discover the causes of this peculiarity, and other particulars relating to it.

If the vegetable substance that is subjected to fermentation contain but a small proportion of fermentable matter, it will not be possible ever to free the spirits from the peculiar flavour of the vegetable; for that large proportion of unassimilated matter being subjected to distillation, along with the fermented liquor, will of necessity yield its oil by the heat employed to distil the spirits. This seems to be particularly the case with regard to carrots, parsnips, and turnips, all of which I have tried, and found that although they could be made to undergo the process of fermentation, and to yield a considerable proportion of ardent spirits, yet that these spirits were strongly tainted with the flavour of the vegetables from whence they were obtained, and so intolerably nauseous, that they never could be employed for food by man. In the process above described, the whole of the matter of the potatoes was subjected to distillation. What effect would have been produced by separating the gross sediment from the transparent fluid above it, after the fermentation was over, either as to the quantity or quality of the spirit, I had not an opportunity of

remarking; but should ever the process of extracting spirit from potatoes be attempted on a large scale, it would be of importance to try to separate that sediment before distillation, as that process would be rendered much easier, and less precarious, in consequence of that operation.

If ever this manufacture should be attempted, it deserves also to be remarked, that the farinaceous powder which subsides to the bottom after the fermentation, seems to have suffered very little change in its taste or appearance by the process, as it very much resembles boiled potatoes in all respects, so that it might probably go as far, as food for domestic animals, as the potatoes themselves would have gone in their native state.

I shall only farther add on this subject, that I attempted to obtain a fermentable liquor, by bruising the potatoes raw, and pouring water of different degrees of warmth upon it, as is used in mashing malt, but could never thus succeed in exciting any degree of fermentation. It always afforded a viscid roapy liquor, that remained unaltered after the addition of yeast to it. I now return from this long and interesting digression.

PAPER FOURTH.

OF THE MARKS FOR DISTINGUISHING DIFFERENT
SORTS OF POTATOES FROM EACH OTHER:—ITS
UTILITY, &c.

§. I.

I Have had occasion to observe, in some of the foregoing parts of this essay, that there are several varieties of potatoes, which differ from one another considerably in some of their most essential properties. These varieties are indeed so numerous as renders it impossible for almost any person not to have remarked them, yet no one is so well acquainted with all these varieties and their properties, as to know with certainty which kind would be most profitable to cultivate on every particular occasion; for want of which knowledge, much loss must be annually sustained by the public. But till some method shall be adopted for distinguishing each kind from another with certainty, it is in vain to hope for any comparative trials that could be of material utility to the farmer. To begin this system of classification as to this particular, the following hints may be of use.

As it is impossible to convey a distinct idea of the small variations that require to be here attended to,

to, in so easy a manner as by comparing every variety with one kind that shall be considered as an universal standard, to which all descriptions should refer; the first step therefore will be to fix on one kind that shall be proper to be considered as an universal standard. The difficulty is to find a kind that may be distinguished from all others, by such striking characteristics as to prevent a possibility of mistaking it.

In casting about with this view, it seems to me that the kind known in Scotland by the name of the *wife* potatoe, promises to answer this purpose better than any other, because it is distinguished from other kinds by *one* very obvious peculiarity, viz. that of never carrying any blossom or fruit. [Since the above was written, I have seen some other sorts that carry no blossom, but these may be very easily distinguished from it by some other of its obvious characteristics.]—Its peculiarities are as under. In form the bulbs of this kind are remarkably regular, being all of the shape of a heart, somewhat longer than its due proportion, and flatted a little one way. The fibre by which it adheres to the stalk, which I would call the *umbilical* cord, adheres to the great end of the bulb, and the point of the small, and is thickly covered with,

with eyes. The skin is smooth and thin; its colour a pale red, rather brighter at the point than elsewhere. Its flesh is of the mealy sort; the taste rather tending a little to sweetishness. The fibres, to which the bulbs adhere, do not ramble very wide, nor do they keep so close to the stem as some other kinds; they neither push very deep, nor rise extremely near the surface. The bulbs themselves are never remarkably small, nor uncommonly large, but of a good equal size, and it is reckoned a good bearer.

By attending carefully to these marks, it might in general be well known; and when any person was once possessed of a plant or two of this standard kind, with which all others could be compared, he would thus be able to point out with accuracy the smallest discriminating peculiarity, so as to be in no danger of mistaking any others that should be the object of discussion.

This fundamental step being first taken, I would recommend, that in every description attention should be given to specify all the following peculiarities:—

Below Ground.

The general form and size of the bulbs.

Their colour.

The

The smoothness or roughness of the skin.

The consistence, that is, the mealiness or viscosity, and taste, of the bulb.

The colour, length, thickness, &c. of the umbilical cord.

Their tendency to go deep, or to rise near the surface; to ramble wide, or to adhere close to the stem.

The time when the bulbs knot and set; marking, not by the kalendar only, but also compared with the advance of the plant above ground.

The time when they attain perfect maturity with respect to size, and also that period of their growth at which they lose the herbaceous, and attain the farinaceous taste.

Their general prolificacy.

How long they may be kept, at what season they are in greatest perfection for eating, &c.

Particulars observable above ground.

The general height, colour, and form of the stem.

Their tendency to push out many or few stems from a root.

Whether they carry blossom or not.

The form, dimensions, and colour of the leaves.

The form, colour, and general habitude of the blossom, where there is any.

The time at which the blossom appears.

The tendency they have to produce few or many apples.

The tendency they have to produce those excrescences on the stalks that resemble potatoes below ground, which may be called air potatoes.

The

The comparative hardness or tenderness of the leaves, in respect of frost or other variations of weather that affect them.

Particulars that concern the whole plant.

The soil which seems best to suit each kind.

The mode of culture that best agrees with them.

The accidents which are most liable to affect them; and in general every particular that could indicate any difference between one kind and another.

§. II.

Those who have not been accustomed to attend to the growth of this plant, will perhaps think that some of the above marks are of no moment: and some of the particulars they will not be able to understand. To obviate these objections, a few explanations are necessary.

The potatoe, because it grows below ground, has been usually called a *root*—but improperly. It more nearly resembles a kind of underground fruit; and in conformity with this idea, the French have given it the name of *Pomme de Terre*, ground apple. This fruit has a set of organs peculiarly adapted for its production, in the same manner as every other kind of fruit above ground has a set of organs for their production; which organs appear at the proper

proper period, carry the fruit, and then decline, in a manner exactly analogous to what happens below ground with the potatoe. The potatoe plant, when it begins to vegetate, sends forth roots into the ground, by which it imbibes its nourishment like every other plant; but after it has arrived at a certain period of its growth, it begins to shew its fruit, bearing apparatus below as other plants do above ground. This below ground consists of a set of fibres quite distinct from the roots, which are at first of a tender fleshy consistence, usually of a whitish colour, which is in some kind blended with a slight tinge of red. These gradually extend themselves around the plant to a greater or smaller distance in different kinds of potatoes, and from these in due time spring out the bulbs, or fruit, appearing at first like small excrescences upon the fibres, which gradually expand, and assume their proper shape as they advance towards maturity, very much resembling, in these particulars of their growth, the progress of the cones of the larix tree upon its small fibrous branches. These fruit-bearing fibres become by degrees less bright in colour, and more firm in consistence; and assume a dark colour and stringy consistence, as they advance towards perfection. This set of fibres I would distinguish by the name *umbilical*, from the great similarity in
office

office they bear to the animal organ so called; and because they never yet have obtained an appropriated name.

Different kinds of potatoes do not differ from one another more in any one respect than they do in the form, colour, habitude, time of springing forth, &c. &c. of this apparatus of fibres; so that this ought not only to be attended to as one mark of distinction between different kinds, but also as a particular that may on some occasions influence the mode of culture that would be proper for particular kinds. I shall give one example.

It is found by experience, that some kinds of potatoes may be profitably cultivated by means of the horsehoing husbandry; (possibly under due regulations this might be always of use) but in some cases that mode of culture is attended with danger; for, should the kind of potatoe that is thus cultivated have a tendency to send out these umbilical fibres early and to a great distance, if the plough should be employed after these were shot forth, it might cut them off, which would have a very different effect from cutting the roots that absorb food for the plant. The stems might thus indeed be increased, but the produce in fruit much diminished. I have seen a field of horsehoed potatoes, which,

which, owing to this circumstance, although a very luxuriant crop above ground, yielded when taken up only a very few well-formed bulbs; the umbilical fibres being at that time in a succulent growing state, and covered with small crude potatoes that would have required a very long time to bring them to maturity. Late and *deep* hoeing, even with the hand-hoe, is, on this account, with some kinds of potatoes highly pernicious.

On the other hand, there are some kinds of potatoes that never send these umbilical fibres above a few inches from the stems, which would not be liable to the same objection, as there would be no danger of having them cut by the plough; and other sorts send these fibres directly downward to a great depth, so as to be in no danger of being in any case wounded by the hand-hoe.

Other kinds of potatoes have a tendency to send out bulbs at every joint of the stem, even above ground; but unless these be covered with earth they never acquire the colour or taste of real potatoes, although they have the exact shape and appearance. I have seen some stems of potatoes, especially in a rainy season, that were covered with these green potatoes to the very top, and have numbered fifteen or sixteen on one stem, some of them
of

of the size of small hen's egg's: [And I once met with a cluster of that kind of potatoes, consisting of about twenty bulbs, that occupied the place of potatoe-apples, springing all from one foot-stalk that adhered to the stem, precisely in the same way with that which supports the blossom and seed vessels.—This I have still in my possession.] Nature seems here to indicate, that the stems ought to be covered in part with earth to blanch them, (potatoes that grow below ground, if laid bare while in their growing state, assume the same green appearance) which would probably in these kinds augment the crop considerably; although with regard to such kinds as have no tendency to produce bulbs along the stem, the operation of covering them would probably be much less beneficial. Care, therefore, should be taken to select the first of these kinds of potatoes, where it is intended to rear them, after the Irish fashion, in *lazy beds*.

I have mentioned this tendency to produce potatoes on the stems above ground, as one means for distinguishing different kinds from each other; for although a few kinds are endowed with this quality of producing bulbs above ground, in the same way as some pease that produce pods both above and under ground; yet this in the one case as well as

the other seems to be contrary to the ordinary oeconomy of both kinds of plants, and therefore serves as a proper mark of distinction.

§. III.

The potatoe admits of being transplanted as easily as most other plants, especially if this be done before the umbilical fibres spring out. Doubtless this property might be laid hold of with advantage for cultivating those, especially of the early sort; though I do not know that it has ever yet been attempted to be carried into practice.

P A P E R F I F T H.

OF RAISING POTATOES FROM SEED.

§. I.

IT is not many years since it was first discovered that potatoes could be reared in Europe from actual seeds, the produce of our own climate; but this fact is now ascertained without the possibility of a doubt. As many improvements have been said to result from this mode of culture; and as the descriptions hitherto given of the effects that result from

from it are lame, and have been delivered with such a mysterious air, as to give me no distinct notion of the matter; I resolved to satisfy myself experimentally on that head, which was done as under:

EXPERIMENT ELEVENTH.

Upon the 23d day of April 1776, I sowed, on a bed of good garden mould, some seed potatoes that had been gathered the former autumn, and had been preserved among some dry straw all the winter, to prevent them from being injured by the frost. The apples, which had been packed up whole, were by that means so much dried, that I found it a difficult matter to separate the seeds sufficiently, which occasioned the plants to come up in tufts much thicker in some places than others. The young plants appeared above ground in about ten days, and advanced vigorously during the summer, especially in those places where they were not too thick. On the 3d day of November thereafter, they were carefully taken up, when it was found that some of them were nearly as big as a pigeon's egg, gradually decreasing from that to the size of common pease, many of them being no larger. A few of the largest of these were boiled, and others roasted, with a view to discover if they possessed that rich almond-like taste, which some persons had said the potatoes raised from seeds always possessed in a remarkable degree. They were found to eat very well, but not one bit better than other good potatoes of the same kind that had been raised from sets in the usual way. The remainder were carefully packed up to guard against frost, and were thus preserved for planting in the spring.

April 20th, 1777, these small potatoes were planted in a bed of good garden mould, in rows one foot asunder, and at four inches on an average apart in the rows. On this occasion I began to plant at one end of the bed, the rows going across it, and proceeded regularly towards the other end, always selecting the largest bulbs I could observe. By this means it naturally happened, that the biggest plants were all placed at one end, and gradually diminished towards the other end of the bed, where the very smallest were planted; and as the last of these came to be very small indeed, I gave them less room in the rows, decreasing, as the plants diminished in size, from six to two inches. All these plants were equally cared for during the summer; but it was observable that the stems which grew from the largest plants were from the beginning exceedingly large, luxuriant, and healthy, in comparison of the smaller ones. The leaves of these were broad and healthy, and the whole plant above ground appeared at least *ten times* greater than the puny plants that sprang from the small seeds. They were all taken up in the month of October, when it was found that the largest seeds yielded a good crop of potatoes, many of which were as big as a hen's egg; but those produced from the smaller seeds did not in general exceed the size of a horse-bean, and many of them no bigger than small pease. None of the plants shewed blossom this season. The bulbs were carefully preserved for planting in the spring.

[These potatoes were accordingly planted in the month of April 1778, in rows about a foot from each other, and the largest were planted at the distance of one foot in the rows, the smaller being placed closer as their size diminished, so as that the least stood about four inches apart in the row. The largest seeds again produced by far the most luxuriant

luxuriant and weighty crop, and a few, and but a few of them, shewed any blossom; but none of the bulbs, not even those from the largest plants, were nearly of such a size as those produced from very large potatoes: nor did they afford nearly the same produce per acre as was obtained from old potatoes planted on the same soil at eighteen inches apart. The facts wished to be established by this experiment being now ascertained, and I being engaged in other interesting pursuits, it was not thought necessary to continue it longer. The following corollaries seem to be clearly deducible from it.]

§. II.

From the accounts I had received of potatoes raised from seed, it did not appear to me clear whether new bulbs were produced from these potatoes in the second or third year of their growth, or whether these potatoes during that time continued only to increase in bulk, without producing other potatoes from them. It was always said that they did not *attain perfection* till the third year from the seed; and what was meant by their attaining *perfection*, I could not gather from any accounts I had seen. And as it was said they could be obtained by this means much earlier in the season than others, and were possessed of many other singular qualities, I could not tell what judgment to form of it. From the foregoing experiment, however, it clearly appears, that after the first year these seedling potatoes push forth stems and bulbs exactly in

the same manner as any other potatoes planted for seed, and agree entirely with them in other respects; the largest in this case, as in every other case, as in every other case, whether cuttings of old potatoes or whole ones be planted, always producing the largest bulbs and the most weighty crop.

As to the notion of their attaining their full size on the third year, and not before, this seems to have originated merely from inaccurate observation. It does not seem possible to assign any precise period at which these bulbs will invariably attain perfection, as that must in general depend on many accidental circumstances. It appears that the size of the bulbs produced in the second and third year depend in a great measure on the bigness of those that were planted; and that this will be influenced by the richness of the soil, and the distance allowed to the seedling plants the first year. I know no circumstance that could so well be assumed as such a probable criterion of the potatoe having attained perfection, as that of its pushing forth flowers and producing seeds *properly so called*. Now, although none of the plants in my experiment produced flowers in the second year, yet it is not improbable, that on some occasions, if the seeds were sown very thin and on a rich soil, the bulbs of the first year's growth might be much larger than any of those raised

raised by me;—so neither is it in the least improbable, that in that case some of the best of them might produce blossom in the second year. On the other hand, as the bulbs of the second and even of the third year's produce, produced from the smallest plants, were some of them not so large as some of those of the first year's growth, and as the vigour of the plant, and the size of the bulbs, and quantity of blossom produced, evidently depend on the size of the potatoes planted, it is probable that these small bulbs would require a year longer than the former to attain the same symptoms of maturity. In short, as the vigour of the future plant, &c. seems in this case to depend very much upon the size of the bulbs planted for seed, it is probable that if two plants of very unequal magnitude were picked off from the same stem, and planted out as seeds, the one of them might be found to have attained its full degree of perfection, so as to carry blossoms and fruit in abundance, while the other yielded none at all; and if the same process were repeated, the same phenomena might be produced *in infinitum*. The *age* therefore of the plants, by which we must here be understood to mean the number of years from the time that the seeds were sown, can give no precise indication of the state of the crop that may be expected from them, independent of the size of the bulbs.

Although,

Although, in compliance with the use that others have made of the term, I have spoken of potatoes attaining a period of perfection that has been denominated *maturity*, I must here enter a caveat about this application of the term, as being indefinite and inaccurate. I saw no room to suspect that the potatoes raised from seed had not in the first year, though small in size, attained as great maturity; that is, in proper circumstances, were as well ripened, and as fit for use, as others of the same size ever afterwards would become. Nor are the largest potatoes of the same kind, if taken from the stem at the same period of its growth, seemingly much inferior to any thing superior in taste, and other qualities that could indicate *maturity*, to those of a smaller size. The term *maturity*, therefore, in the sense above given, seems to be extremely improper, and should be entirely confined to denote the degree of ripeness that the plants had attained in the season they are produced in. It seems that a certain *size* of potatoes planted for seed, the soil and climate given, is necessary for producing a plant of such vigour as will push out blossoms and fruit, and that till it attains that degree of vigour *at least*, it never produces bulbs below ground of the largest size. But what the other circumstances are which tend to augment the size of the bulb to the greatest possible degree, we cannot as yet possibly say.

§. III.

In conformity with the notion that *precisely* three years are necessary for bringing to perfection the first bulb raised from seed, it has been asserted, that no method is so proper for obtaining potatoes very early as to plant these seedling potatoes after the second year's growth pretty early in the third spring, to suffer them to remain in the ground for some time, and to dig them up in the months of June or July; when, it is said, they have attained their full size and due perfection in every respect. But I did not find from experience the smallest foundation for this beautiful hypothesis. It has already been said, that no augmentation in the size of the parent bulb takes place, after being planted, in this case more than in others. The parent bulb in all cases wastes away and consumes, and it is the young bulbs produced from the fibres of the plant that spring out from it which are ever fit for use. I dug up several of these seedling potatoes in the second and third years of their growth, in the months of June and July, and could observe no difference between the progress these plants had then made, and their whole œconomy, and others of the same kind planted in the usual way. The bulb planted as seed wasted away nearly at the same period in both cases,

cases, and the fibres from which the seeds originate began in both to appear about the same time, and they seemed to be in every respect alike.

The earliness of potatoes, *ceteris paribus*, seems to depend upon the nature of the kind planted, more than any other circumstance. Two kinds of potatoes planted at the same time, and upon the same soil, shall differ so much from one another in this respect, that the bulbs of one kind will be fully formed and of considerable magnitude, before the umbilical fibres of the other have begun to spring forth, exactly analagous to what happens with regard to early and late kinds of pease. It is possible, however, that in potatoes of *the same kind* these fruit-bearing fibres may spring forth somewhat earlier in very vigorous plants than in such as are more weakly; but I am ignorant if ever this fact has been hitherto ascertained. It is well known that rather the reverse of this happens with pease and beans, as the most weakly plants (to a certain degree) of these classes of vegetables come earlier than such as are extremely luxuriant.

[In the year 1779, I obtained from London a potatoe under the name of the early Henley potatoe; the bulb is a dirty white; form very round, not deeply indented at the eyes; skin smooth and
fine,

fine, but not silky. The stem low and dwarfish, of a pale green colour; carries scarce any blossom, but the few flowers that appeared were of a pinkish white, umbilical vessels very short, consistence tending rather more to the viscous than farinaceous; taste somewhat, though very slightly, sweetish; the bulbs never of a large size, seldom exceeding that of a large hen's egg.

By some trials I made, which, not having been done with the accuracy I think necessary, I do not specify particularly, it appeared that if this kind had been taken up at the beginning of August, and at that time compared with the white kidney sort employed in my former experiments, the Henley sort would have afforded a crop *more than double* of what the other sort would have afforded. But had the crop been allowed to remain in the ground till the middle of October, the kidney sort would have produced more than twice as much as the Henley kind. My experiment was sufficiently accurate to allow me to rest satisfied with this result.

Hence it appears, that it would be equally bad œconomy in one who intended to lift his potatoes in the month of August, to plant the *kidney* sort, if he could get the Henley, as it would be for him who intended to let them remain in the ground till
October,

October, to plant the *Henley*, if he could get the *kidney* potatoe; for in both cases he would only reap half the crop he might have done, had he made a judicious choice of seeds. The bulbs too of the *Henley* potatoes, at that early season, are much better to the taste than those of the other kind, although the case is afterwards in some measure reversed.

[This is one proof of the very great benefits that would accrue to agriculture, by an accurate experimental attention to circumstances.]

§. IV.

It has been alledged that potatoes, which have been long propagated by means of *bulbs*, lose in time their generative quality, so as to become much less prolific than at first; and it is asserted that those bulbs which have been lately obtained from seeds are much more prolific, and consequently much more profitable for being employed as plants than others: but this opinion likewise I am afraid has been adopted without sufficient examination. I attended particularly to this circumstance in my own experiment, and could not observe the smallest indication of superior prolificacy, in those raised from seeds, but rather the reverse.

That

That potatoes do *not* degenerate in point of prolificacy, in consequence of being long propagated in the usual way, seems to be confirmed by the general experience of all Europe. It is now about a hundred years since the potatoe was pretty generally cultivated in Ireland, and it has been very universally cultivated in Britain for fifty years past, and all that have been reared in it since their first introduction two hundred years ago, a *very few* of late only excepted, have been propagated from bulbs only; so that if they had declined in point of prolificacy, the degeneracy should in this time have been very apparent. Nothing of that kind however was ever remarked, nor any insinuation of that sort thrown out, till the discovery of rearing potatoes from seed was made, when it was for the first time heard of. There are many persons now living who have been in the constant practice of rearing potatoes for thirty or forty years; and notwithstanding the general tendency that mankind have to dispraise the present, when compared with past times, yet none of them have given the smallest hint of degeneracy in this respect. And I am persuaded, when it comes to be fully enquired into, it will be found that this is merely a groundless notion, that has originated from the partial fondness of those who first propagated this plant from seed, in favour of their new discovery.

PAPER SIXTH.

THE DOCTRINE OF SEMINAL VARIETIES CONSIDERED.

§. I.

IT has also been said, that by raising potatoes from seeds many new and valuable kinds may be obtained. An opinion of obtaining new varieties of plants by propagating them from seeds, so universally prevails among naturalists, and it had been so positively asserted as to potatoes, that I entertained no doubt about this matter, and waited with some degree of impatience till the time of taking them up arrived, to see what new varieties I should thus obtain; but to my great surprise, and no small disappointment, I found no *new* kinds among my seedlings. There were indeed among them three or four varieties, but not one of them different from some of the kinds I had before; and as the seeds were picked up at random from a field in which all the different kinds had been intermixed promiscuously, I think there is great reason to suppose that some of the seeds of the different kinds had been promiscuously gathered, to which I attributed the varieties among my seedlings. This I mention however only as a ground for scepticism on this head, and not as a proof. As I did not at the time
doubt

doubt of the fact, I took no precautions to have it ascertained. But this I shall endeavour to do on some future occasion.

My disappointment in this instance, however, made me examine with a greater degree of attention than I had ever before done, the whole popular doctrine of what is called *seminal varieties* among plants; when I found from other experiments I had formerly made, and observations I could recollect, that there is great reason to suspect that the received doctrine on that head is only a popular error. The following facts seem to confirm this opinion.

The phrase *seminal variety* has been adopted by botanical gardeners, and philosophical botanists, to denote certain smaller variations that are observable among plants of the same kind, than they have been able to find marks for discriminating. Plants by them are arranged into classes, which are further divided into *genera*, and these again into *species*. *Seminal varieties* denote different kinds that are all reducible to the same species, and they have obtained their name because it was supposed that they differed from each other only in some small peculiarities that were accidentally obtained from seeds, and that of course plants raised from seeds were apt perpetually to afford new accidental varieties of this sort.

fort. Being thus supposed to be perpetually liable to new changes, these seminal varieties have been totally excluded from every botanical system of classification. As it is supposed that all the different kinds of potatoes usually cultivated in Europe belong to *one* species, and that the different kinds are only accidental varieties that have been casually obtained from seeds, it was very natural to suppose that new varieties of the same kind would arise from seeds whenever they should be sown.

According to the same system, all the different kinds of cabbages, of turnips, of garden pease and beans, &c. are only *seminal varieties*, which, having been produced by accident, may be in like manner again varied by accident; yet that this is not the case, seems to be proved beyond dispute by experience; for every gardener knows, that if he be at due pains in saving the seeds of his cabbages, &c. the same kind may be propagated for any length of time without the smallest variation: experience even goes farther, as it proves that these varieties may not only be kept distinct as long as you please, but that they may also, *in some cases*, be mixed and adulterated almost at pleasure; and that even these adulterated varieties can be made to continue of the same kind without any variation, as long as you shall choose

choose to cultivate them, by a due degree of attention and care. I shall beg leave here to mention a few common and well-known facts, in confirmation of these remarks.

There are two kinds of cabbages very obviously distinguishable from each other, the *red* and the *white*. It is well known that if either of these kinds be cultivated in a district where none of the other is raised, no plants but of that kind will ever be obtained from the seeds there produced. No person who inhabits a part of the country where red cabbages are never brought to seed, ever saw a red cabbage plant raised from seeds of his own saving, nor the reverse. But it is also a fact equally well known, that if both white and red cabbages are reared in the same district, it is impossible, without very great precautions indeed, to keep the two kinds distinct, if an attempt be made to rear them from seeds of their own saving. The plants raised from seeds of the white cabbages become in this case, if nearly an equal proportion of each be saved, tinged with red veins, and those of the red become in some degree white, so that nothing but a mongrel breed, neither true red nor true white, can be obtained. If the proportion of one kind far exceed the proportion of the other, the kind of which there are

fewest soon becomes so much adulterated as to be scarcely in any respect different from the other; and those who wish to have the lesser quantity of a true kind are under the necessity of obtaining seeds from another district, where they are chiefly cultivated. In this manner those of the south of Scotland must obtain red cabbage seeds from Aberdeenshire, and those of Aberdeen must import their white cabbage seeds from elsewhere, if they expect to have them of a true kind. Phenomena exactly similar to these occur in cultivating the red and white beet, the seeds of which always produce a mixed kind, unless they have been saved with great care.

A disciple of LINNÆUS will find himself at no loss to account for these phenomena, by drawing a parallel between the forementioned cases, and the changes that are produced among the animal creation by an intermixture of different breeds of the same kind, which invariably produce a mongrel breed, participating of the qualities of both the parent stocks. I am fully sensible, however, of the danger of being misled by such general analogies in cases of this nature, and should not have relied upon that species of reasoning, had I not been able to produce at least *one* decisive experiment on this subject: though I shall have occasion to shew that
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the rule is by no means so general as some, who rely on theory only, may be disposed to believe.

EXPERIMENT TWELFTH.

Among all the varieties of the turnip tribe, the yellow is the most remarkable, because its colour is not confined to that part of its skin which appears above ground, as in most other kinds, but affects not only the whole of the skin, but the flesh also. It is by much the sweetest and firmest of all the turnip tribe; and instead of being injured by the winter's frost, it is in sweetness of taste, and tenderness of consistence, improved by it. On account of these qualities, it is highly valued for the table wherever it is known; but as it never attains to such a size as the large green-topt field turnip, and is of a consistence rather too firm for cattle whose teeth are tender, it occurred to me that if a mongrel breed could be obtained between these two kinds, it would answer extremely well for feeding cattle; and as the experiment could easily be made without trouble or expence, I resolved to try if such a kind could thus be obtained. With this view, adopting the principles of the sexual system of Linnæus, many years ago I planted some yellow turnips of a true kind for seed, and close beside them on both sides I planted some green-topt turnips. In that situation they were allowed to flower and to perfect their seeds; and as care had been taken to prevent their flower-stems from intermixing with each other, the green-topt turnips were all taken away, and the seeds of the yellow kind were beat out by themselves. These seeds were sown next season, and produced a crop of yellow turnips tinged with a greenish cast above ground, the flesh of which was neither so deep in the colour, nor so firm of consistence, as the genuine yellow kind, and the size considerably larger. It was in every respect a *mongrel*

breed, which produced its own kind without variation for ten or twelve years, that I continued to cultivate it and preserve it from any intermixture with other sorts. If it were not a very easy matter for any one who can have access to green and yellow turnips to repeat this experiment for his own satisfaction, I should have been somewhat shy to mention the fact; but as the experiment is so simple and easily made, I presume any one who doubts it will take the trouble to satisfy himself experimentally about it. The same may be done with white and red cabbages or beets, where these more readily occur.

This experiment, at the same time that it seems in this case to confirm Linnæus's sexual system of the procreation of plants, in a still stronger degree seems to strike at the root of the doctrine of *feminal varieties*, in the sense it has been usually understood to bear, while it pretty clearly accounts for the origin of that doctrine. Men have observed, that in certain cases new varieties of plants, which had not been observed before, have been obtained from seeds. This might naturally happen where several varieties of the same kind of plants were allowed to flower, and to ripen their seeds together. The mongrel breed, especially among the gaudy tribe of flowers, sometimes might possess beauties that did not belong to either of the parent kinds, which would not fail to make them be particularly taken notice of. In this way, before any idea was entertained of any kind of sexual system in plants, this cause of the obvious change produced could not be adverted to, and it would be accounted an accidental anomalous feminal variety: and having observed this fact in several cases, it might be accounted a general law of nature, no pains having been taken to overturn it by opposing facts equally obvious at least. For the experience of the kitchen gardener,

dener, who propagates without any variation of kinds, for centuries together, the different varieties of beans and pease ought certainly, if adverted to, to have excited a doubt at least of the universality of the rule.

In the same manner that I obtained, as above, a new variety of turnips, it might possibly happen that some new varieties of potatoes might in some cases be obtained from seeds. For if the varieties of this class of plants naturally admit of mixture with each other, (which however I doubt) and if several kinds of potatoes should happen to grow in a field mixed together, two or more of these sorts blended together might produce a mongrel breed, participating of the qualities of the parent stocks; but as to new varieties, obtained from seeds gathered from *solitary* plants, I have met with no fact that gives reason to expect them.

The only case that occurs to me just now as seeming to confirm the doctrine of seminal varieties, is that of fruit tree, which I only mention that it may not seem to be overlooked. But I have met with no facts that tend to prove that the generally received notion on this head is *not* hypothetical, and have found some that seem to prove that it *is*. It is in general very confidently asserted, and as generally believed because of that assertion, that the seeds of a grafted apple do not produce trees bearing fruit of the same kind with themselves. This is so generally believed in Europe, that I have never heard of an experiment being made with a view to prove it: but that very good apples are produced from seeds without grafting, is certain by the practice in America, where that operation is entirely laid aside, and where the same kinds of apples are frequently found on different trees in the same way as among the grafted trees in Europe; though doubtless, where the seeds are allowed to sow themselves at random, there must be

much less certainty, than where the practice of ingrafting prevails. Yet even here, on this very subject of apple-trees, we meet with one fact that strongly opposes the doctrine in question. There are two kinds of apples that have been usually employed as stocks on which others have been grafted. One of these is called *free* stocks, and the other *crab* stocks properly so named. The plants of these two kinds are easily distinguishable from each other by an experienced eye, and are well known by every nurseryman. The curiosity is, that in spite of the doctrine of *feminal varieties*, so firmly believed by every gardener, the seeds of them may be bought as *distinct kinds* in every seedsman's shop, and always produce plants according to their kind, wherever the seedsman has been honest. I need make no remarks on this fact.

Were I not afraid of tiring the reader, I could give many other instances of plants, which contain many varieties that rise not above the class of *feminals*, even among trees and shrubs, which *invariably* propagate by seeds their own kind; but shall at present confine myself to the wild or dog rose, many kinds of which produce a fruit called hips, which in the autumn are very beautiful. I have frequently gathered the seeds of particular kinds of these on account of their beauty, and sowed them; nor did I ever in any instance know them to differ in any respect from the parent plant.

§. II.

From what has been already said on this subject, the reader will clearly perceive, that although some classes of plants are certainly affected by being allowed to fructify by the side of particular varieties of their own class; yet that there are others whose varieties

varieties are so distinct, that they seem to refuse all sort of intermixture with each other in any circumstances whatever, and continue invariably to propagate their own kind by seed without any sort of change whatever. This is obviously the case in all the varieties that are yet known of the pea tribe. Not only do the *grey*, the *white*, and the *green*, continue to produce their like without any variation, although they should be reared together in the most promiscuous manner, but even the lesser varieties of each of these sorts keep all their distinguishing properties without the smallest appearance of adulteration. A single charlton pea that grew among a whole field of marrow-fats, if carefully saved, would produce next year a charlton pea of as true a kind as it would have done had it grown perfectly detached from all others; and the same thing is observable with regard to all the other kinds of garden pease. In like manner sweet-scented pease, which consist of four sorts, the white, the purple, the painted lady, and the scarlet, though sown promiscuously, continue each to produce its own kind without any variation. All the kinds of beans possess the same property; as do also lupines, kidney-beans, and many other classes of plants. Hence it is obvious, that considered in this point of view, vegetables may be divided into at least *two* general classes.

One

One class containing all such plants as admit of a promiscuous procreation, if the phrase may be admitted, so as thus to produce a mongrel breed, as is particularly obvious in all the tribe of *Brassica*. The other class, containing such plants as do not admit of intermixture among the different varieties by procreation, each of which continually retains its distinguishing peculiarities, though reared in the neighbourhood of other varieties of the same class. This is particularly the case with all the pea tribe, and perhaps with all the papilionaceous class; though I dare not venture to say, that this rule would prove general. As this distinction has not, that I know of, hitherto been taken notice of, naturalists have not thought of affigning to each order of plants the class they ought to be placed under in that respect. Whether the *solanum* belongs to the one or the other, I cannot tell, and therefore cannot say whether any new varieties of potatoes may be expected from potatoes or not,

Considered in this point of view, there are probably other classes of plants that might be established, with regard to which professed florists may perhaps know something. As I have no pretensions to that name, I mention it here only to bring it under the view of those who have opportunities
of

of investigating such questions. Some plants, when first raised from seeds, are said to produce flowers of one colour only, which afterwards *break* as it is stiled, and become striped, as the tulip. Others, though originally variegated, are said in time to become plain, and afterwards retain that plainness, as the carnation. Whether these things are actually so, I do not take upon me to say, because I know many things of this nature are vaguely and confidently asserted. But if they do exist, it might be of use, for some purposes, to ascertain the plants that are reducible to the one or the other of these classes.

Upon the whole, with respect to the rearing of potatoes from seeds, I think we may safely conclude, that if this practice will ever be productive of any benefits to society, these advantages have not yet been discovered.



PAPER SEVENTH.

OF THE DISEASE CALLED THE CURL IN POTATOES,
AND SOME OTHER PECULIARITIES OBSERVABLE
WITH REGARD TO THIS PLANT.

§. I.

POTATOES are subjected to one particular disease, the *curl*, which it would be improper for me altogether to omit; and though I can say little *positive* as to the cause of this disorder, a good deal may be said on the *negative* side of the question; which, as it may possibly lead to future researches, shall here be added.

The only thing that seems to be positively certain with regard to this disorder is, that it was scarcely, if at all, known till very lately; and in particular that it was not known in the northern parts of this island till a very few years ago, (I myself had never seen it when the former parts of this treatise were written) when, there is great reason to believe, it was introduced by means of seed potatoes imported from the South country: and it is at this moment much less frequent in the Northern and remote parts, than in the Southern and more commercial districts of this island.

From

From this single fact, several corollaries are deducible, which entirely overturn some theories that have been formed to account for this disease. It has been supposed, that nature, fated as it were by having long produced this plant in a climate that was not deemed congenial to it, had become so far exhausted, as to occasion this disease. But if so, the more Northern parts of this island, where the climate is the most unfavourable, should have been soonest affected by it. It has been further supposed, that potatoes that are frost-bitten, (the bulbs are here meant) before they are properly housed, occasion this disease in the plants produced from them; but the curl is least known in those districts where the potatoes are most liable to this accident. It has been said, that potatoes which are taken up before they attained perfect maturity, infallibly became affected with this disease: but in some cold mossy soils, and exposed situations, where the potatoes must often be taken up while they are yet in a state of vigorous vegetation, this disease is scarcely known. It will not be imagined I mean to insinuate that such situations would preserve from the disease, when once introduced in other places around; for that, without doubt, is not the case.

It has been further alledged, that such plants as have been lately obtained from seeds, properly so called,

called, are entirely free from the *curl*. But I have a very striking proof before my eyes at this moment, that this is not the case. A large field, which was planted with potatoes the third year from the seed, has more than one half the plants curled; while another field near it, raised from potatoes that never were, that we know of, produced from seeds in this country, has scarcely one curled plant in the whole.

It is by some alledged, that the soil or season occasion the disease: but that this is not the case, is also plain from the state of a field now in my neighbourhood. Several ridges in it, that were planted with potatoes obtained from one particular person, are very much curled, while the remainder of the field, which was planted with potatoes of the same sort, obtained from a different person, is not at all infested with that disease. In this case the soil and climate were the same, (for the ridges were intermixed with the others) but the crop extremely different.

In the last example it is plain, that the disease depends entirely on the nature of the seed; and it seems to me highly probable that the curl in potatoes, like some hereditary diseases among animals, if once introduced, vitiates the prolific stamina, so as to be perpetuated as long as the infected breed continues

continues to produce others. But this is hazarded merely as a conjecture. Are there any facts sufficiently authenticated, which prove that a plant once known to be infected with this disease, invariably produces diseased plants? Or is it for certain known, that in any case a curled potatoe has been produced from a plant that was perfectly sound, and not in the smallest degree affected with that disorder? Clear proofs by experiments made with the utmost caution are here wanted, and not the result of random observation.

In considering these questions, and comparing them with phenomena already known, it seems difficult to decide which way the probability lies. On the one hand, seeing this disease is, or at least most certainly *was*, entirely unknown in many large districts where potatoes have been long cultivated, it would seem to favour the opinion that it only originated from infected seed:—on the other hand, it is asserted, as a well-known fact, that fields which have been planted with seed that was in the former year very little if at all affected, have been known to produce plants the succeeding year, almost entirely of the curled sort. Should this fact be proved, it would seem to favour the opposite hypothesis; but even here, we shall soon see reason to judge cautiously.

Infectious

Infectious diseases in the animal creation may be communicated in two ways. One class of disorders can be communicated only by descent from parent to child, and can never be communicated by juxta position: another class of diseases can be communicated merely by juxta position, and not at all by descent of blood. Does such a distinction as this prevail among vegetables? Has any experiment been recorded, which proves that any particular disease among plants can be conveyed by juxta position only? Is not the smut in wheat of this class? May it not extend to others? May not a few infected potatoes in this way, if mixed in a large heap, like a subtile leavening principle, infect the whole? Experiments are here much wanted.

But I am far from alledging, that, though it were an established fact that potatoes had been known to be much more infected with the curl, than those from whence the seed was obtained had been in the former year, it would either prove that the disease might originate from other causes than contaminated seed, or make it certain that besides direct descent, the disorder could be communicated merely by juxta position. For though it should so happen, that the disorder could be communicated only by direct descent, the fact above-mentioned might possibly

possibly happen in this way. It is well known that potatoes affected with the *curl*, seldom produce bulbs of a size nearly equal to those of the same kind that are found. This being the case, should one man, from among the heap of those potatoes which were only in a small proportion affected with the curl, select only the small potatoes for *seed*, and otherwise dispose of the large ones, it is obvious he must thus preserve almost the whole of the curled sort for seed, and very few of the sound; and the potatoes raised from this seed must of course be much more infected with the curl, than the parent potatoes were, from which the seeds were obtained.

On the other hand, should another man pick out from the same parent stock only the very largest bulbs he could find, he would probably have scarcely *one* curled plant in the whole field. Thus might the seed from the same heap prove to be, in one field entirely free from the infection, and in the other altogether diseased. Men are in general so careless in observing facts of the nature here alluded to, that we frequently meet with inexplicable phenomena like what we have here supposed. But till these particulars be fully investigated, it would seem to be, from many considerations, the safest plan to select only the *largest* bulbs for plants: for as there

is reason to think the disease proceeds in all cases from the seeds planted, and as the infection must certainly be less virulent in the plants that have been least previously infected with it than others, and as no large potatoes are produced by plants which are strongly affected by this disease, these ought surely to be chosen for plants in preference to others. This I know, that I never yet have observed a curled potatoe among those I have obtained from *large* potatoes planted whole.

Should it be found that this disorder, like the small-pox or measles among mankind, can be communicated by juxta position only; in that case it would be prudent to select the large bulbs at the time of taking them out of the ground, putting them all in one heap then, without ever letting them touch the small, and thus keep them entirely separate. By these cautions, accompanied with roguing the potatoes as soon as they are fairly above ground, (that is, pulling out all those that shewed the smallest symptom of this disease) it seems to me probable it might be in a great measure, if not entirely, avoided.

Some think the disease is produced by allowing the potatoes to be a little touched by frost during the winter. Certain it is, that a potatoe never can
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be in any respect benefited by frost, and therefore cannot be too carefully guarded against it; but from the facts already stated, it does not seem to me at all probable that ever the disease originates from that cause.]

Besides the above, there are many other particulars relative to the culture of this useful plant, that require to be elucidated, some of which are as under.

It is to be observed, that although the same kind of potatoe be planted in two different fields, the produce of the one often proves to be of a much more mealy kind of potatoe than that of the other; and it has been in like manner remarked, that the potatoes of one year's growth are in general more watery, or the reverse, than those of another season. The causes of these peculiarities do not seem to be as yet fully known, though, as is usual, many things are vaguely asserted on this head, with a sufficient degree of confidence.

It is generally believed that a dry soil, or a dry season, necessarily produce the driest potatoes, and indeed it is so natural to expect, *a priori*, that this should be the case, that it is not surprising if men should not be difficult about admitting the fact. I find good reason, however, to suspect that these

opinions are not altogether well-founded. The year 1775 was the driest and warmest season that has been known in Scotland within the memory of man, yet the potatoes of that year's crop were watery almost to a proverb: on the other hand the potatoes of crop 1777, although it was a remarkably rainy season, were as dry and mealy at least as is common, and much more so than in the year 1775. It deserves also to be remarked, that the crop of 1775 was almost double in quantity to that of 1777. Hence a dry season would seem to augment the produce, though it does not for certain in all cases improve the quality of this crop.

The year 1774 was one of the coldest and most rainy, that has perhaps been known in Scotland. *Quere*—Could that have any effect on the produce of the ensuing season? If it had, the potatoes of crop 1778 should be more watery than usual; for the year 1777 was almost as cold and rainy as 1774. Observe if this shall happen.

[N. B. The potatoes of 1778 were not more watery than usual, therefore this conjecture does not seem to be well founded. The year 1782 was the coldest and wettest season ever known by any man alive: but the potatoes were almost entirely destroyed by frost in Aberdeenshire, before they were taken

taken up, and my attention was so much engaged at that time with more interesting concerns, that the present subject of investigation never occurred, so that I made no remarks on that crop.]

If a dry season does not necessarily insure mealy potatoes, so neither does a dry soil always and necessarily produce that effect. I have frequently seen the same kind of potatoes, and of the same year's produce, reared in two different places; the one of them in a soil which was naturally inclined to dampness, which were much freer and more mealy than the others which were reared on a drier and sharper soil. This I have so often remarked, that I cannot be mistaken as to the fact. I have, no doubt, as often observed that the case has been reversed. I believe it will be also found to be a fact, that potatoes which are raised in those districts of the country, where the soil is of a hot sandy nature, are *usually* more free and tender than those which are reared in countries where the soil in general is cold and damp. Such seemingly contradictory phenomena as those abovementioned are not uncommon in agriculture, and often give rise to false opinions, which are followed by erroneous practice. In order to discover the cause of these seeming contradictions, conjectures may be freely hazarded, if they are delivered only as *conjectures*, not to influence our rea-

soning, but to direct the attention towards proper objects of enquiry and experiment. It is not even necessary that these conjectures should be founded on any facts already known; it is enough if they point towards probabilities, that may be confirmed or refuted by future observations. They ought not even to be considered by the person who hazards them as probabilities, which it imports his character to support, because this would warp his judgment, and pervert his reasoning; but as mere random gropings in the dark, which, if they do not clearly discover what is the direct road to knowledge, will at least in some cases point out what is *not* the track to be pursued, and will at any rate sooner discover it, than if we stood still without exertions or observations of any sort.

With these views I would hazard the following query;—Is the wateriness or dryness of a crop of potatoes in any sort affected by the degree of ripeness that the plants employed for seed may have attained in *the preceding season*? That the maturity they have attained in *the season that the potatoes are used*, does affect the quality of the potatoes, I conceive to be highly probable; and therefore potatoes, which, on account of the richness or other peculiarity of soil, continue in a state of vegetation highly luxuriant, till they are nipped by frost or checked
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in their growth by other inclemencies of season, have much less chance of being dry and mealy, than others of the same sort, which have attained their full growth before the coldness or inclemency of the weather checked them. The present question, therefore, does not relate to this, but to the effects that such unripe plants have upon those produced from them next season. If, upon examination, it should be found that the due maturation of the plants employed as seed had any effect upon the quality of the future crop, it might help us to account for some of the foregoing phenomena; because, in a country of various soils, it might accidentally happen, that the crop raised on a dampish soil was produced from seeds that had grown on a dry warm soil the preceding year, and had been sufficiently ripened, or the reverse; but in large districts, where the soil is in general pretty much of one quality, either warm and dry, or cold and wet, the kind of interchange of seed here alluded to could not so readily take place.

But even if it should be found that the maturity of the seeds affected the quality of the potatoes, it would not follow invariably that the seeds produced on early dry soils would be better than those from later soils, because it might some times happen, from

local position, and other accidental circumstances, that the growth of the potatoes in the dry early soil might be checked by frosts many weeks before those on the other soil were affected; in consequence of which, the plants in the cold soil might attain to more perfect maturity, than those on the drier one. I mention this peculiarity, merely to shew how cautious the farmer ought to be in adopting general conclusions, without carefully attending to all the collateral circumstances that may affect his experiment. I shall only farther add on this head, that I had occasion to know well a dry warm spot of ground, on which the stems of the potatoes of crop 1776 were frost-bitten, at least *six weeks* before those on another spot at some miles distance from it, where the soil was naturally more cold and damp, were in the smallest degree affected by it. It likewise so happened, that the potatoes raised on the first-mentioned spot in the year 1777, (their own frost-bitten* seed was employed) had such a peculiar acrid and bitterish taste, as to be hardly at all eatable; while those in the colder place of that crop had nothing of that unusual taste. Whether this diversity was occasioned by the circumstance here

* Observe, the term *frost-bitten* is here applied to the stems only, and not to the bulbs. The stems were so much hurt by the frost as to turn black and decay, but the bulbs were taken up before the frost had been sufficiently intense to hurt them.

alluded to, I do not take it on me to say. In matters of such nice disquisition as the present, many facts obtained by very accurate observation are necessary, before any conclusion can be relied on.

The following accidental experiment, relating to the subject here in agitation, deserves to have a place:—

EXPERIMENT THIRTEENTH.

In the year 1776, I planted with potatoes a small plot in my garden; it accidentally happened that the one half of it had been in cabbages the year before, and the other half in grass, which, for the sake of an experiment, had lain in that state for three years. The soil was in every other respect the same. The whole was dug over in the month of April, some loose mould having been shovelled up on the top of that part which had been in grass, merely to cover the grassy part of the sod. It was all planted with the same kind of potatoe on the same day, and managed in every respect alike. None of it got any dung. The crop was in both places very good, and nearly equal in quantity; but it was remarked, as a singular peculiarity, that the potatoes which grew upon the part that had been in grass were remarkably mealy, whereas those that grew upon the other division were of a very soft and watery kind. The difference between them was so perceptible, that no person in the family but could have told at once if the servant by mistake at any time brought the one kind instead of the other.

In this case, it is obvious, that the difference in quality was produced entirely by some peculiarity in the soil, and
could

could neither be occasioned by any defect in the seed, nor peculiarity of weather; and on this occasion I imagined I had discovered a circumstance that had hitherto baffled all my researches: for I thought it next to certain that the superior mealiness of the one part of the potatoes in this experiment, was occasioned by the ground on which they were planted having been broke up directly from grass; and although I could assign no probable reason why this should be so, yet as no other difference between them was observable, I resolved to repeat the experiment, to see if the same phenomena regularly occurred. This produced the following trial:

EXPERIMENT FOURTEENTH.

In the year 1777, I made choice of another patch of ground, one half of which had been in culture many years, and the other half was in grass three years old. Both of these were dug over in the month of April, exactly in the same manner as in the foregoing experiment, and were planted as before, with one kind of potatoes on the same day. In every respect these were treated, as nearly as possible, in the same way with those in the last experiment. But when they were taken up at the proper season, to my great mortification, I found that no sensible difference could be observed in the friability of the potatoes obtained from the one or the other division. The reader will also please to recollect, that experiments second and third were made upon ground in like manner newly broke up from grass; but neither were the potatoes that were produced upon it, although it was a dry, sharp, thin soil, not at all remarkable for their dryness or mealiness: they were even much inferior in this respect to those which were obtained from both the divisions of the present experiment; although the soil was, in the last case, of a deeper and damper kind.

It is thus that knowledge frequently eludes the researches of the farmer, after he thinks he has with certainty attained it; but if he be diligent and unremitting in his pursuit, and never gives over, even when he seems to be thrown out in the chace, he will at length lay firm hold of this ever-changing Proteus, and force from him many important secrets exceedingly necessary to be known for the well-being of mankind.

C O N C L U S I O N.

The reader cannot fail to have remarked, that the foregoing experiments and observations only tend to pave the way for an accurate set of experiments, to ascertain with some reasonable degree of precision, the soil, manures, and culture, that are best calculated to produce the largest and best crops of potatoes. Till the particulars above specified be fully ascertained, any attempt to prescribe the best and most advantageous mode of cultivating this valuable plant must be vain and nugatory, as perpetual contradictory facts would occur, which would involve the subject in the same doubt and obscurity as at present. Fully convinced of these things, my aim in this essay has been solely to elucidate some important previous questions. Little more indeed has been done, than to point at what is wanted for enabling us to go forward in a proper manner: and these

these imperfect hints are submitted to the public, in hopes of inducing others, who have better opportunities of making experiments than myself, to exert themselves in an effectual manner to ascertain those points that still are doubtful. I shall myself endeavour, as far as circumstances permit, still to go forward in this tract, and am not without hopes, that in time I may be enabled to speak with some degree of firmness, concerning the modes of culture that are well adapted to insure great and profitable crops of this most valuable plant. At present, I rather chuse to decline entering on that branch of the subject.

N. B. *As there is much diversity in weights and measures in different parts of this country, readers are often greatly embarrassed for want of knowing the exact amount of those that are mentioned in experimental essays. To avoid that inconveniency on the present occasion, the reader is desired to take notice, that, unless where it is specially mentioned to be otherwise, throughout the whole of the preceding essay, an acre means an exact statute English acre of 4840 square yards. A pound means an avoirdupoise pound of 16 ounces, and a bushel 56 of these pounds, or half a hundred weight. Every reader, by the help of this information, may easily bring any weights or measures mentioned to the same standard that is used in his neighbourhood.*

The greatest part of the essay was written in the year 1778: a few observations having been since added, which are distinguished from the original essay by being included within crotchets [thus.]

ARTICLE II.

An Essay on the most practicable method of fixing an equitable Commutation for Tithes in general throughout the Kingdom.

TO THE PRESIDENT, VICE-PRESIDENTS, AND MEMBERS OF THE BATH AGRICULTURE SOCIETY.

THE judicious proposal of the Bath Agriculture Society, for an "Essay on the most practicable method of fixing an equitable commutation for tithes in general throughout the kingdom," reflects great honour on the institution.

It is, I believe, universally acknowledged, that tithes are a great discouragement to agriculture. They are inconvenient and vexatious to the husbandman, and operate as an impolitic tax upon industry. The clergyman too frequently finds them troublesome and precarious; his expences in collecting are a considerable drawback from their value, and his just rights are with difficulty secured: he is too often obliged to submit to imposition, or be embroiled with his parishioners in disputes and litigations, no less irksome to his feelings than prejudicial to his interest, and tending to prevent those good effects which his precepts should produce.

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The writer of this essay has frequently been consulted about the value of tithes, and that of the land out of which they issue; as also on the comparative value of one to the other. It is from observation, and reflection, grounded on experience, that these hints are submitted to the Society. Had the author sufficient leisure and abilities for entering at large into the present establishment for the maintenance of the clergy, and for stating how peculiarly hard it bears on the landholder, when compared with the merchant, the manufacturer, and the artisan; such a discussion, however worthy the attention of parliament, is not the object of this essay.

In the practicable method to be pointed out, it appears indispensable, that a fair, full, and permanent equivalent should arise out of the same property, and be defrayed by the same order of men, as pay tithes at the present day: the more any proposed scheme deviates from this principle, the less practicable will it be found.

LAND FOR TITHES.

A commutation of tithes for land has many advocates, and some very able opponents. The Lord Bishop of Salisbury, in a late excellent charge to his clergy, has amongst other important matters shewn,
with

with great strength of argument, that such a commutation is by no means eligible. The habits of life in which the clergy are educated, and the important office they fill, are ill-suited to the occupation of a farmer. The expence requisite to stock a farm would, to many, be a serious objection. If we consider the land so taken only as property to be let, the most desirable circumstance would be for it to lie compact, and as near the buildings as possible. In extensive parishes, where there are numerous small estates, this object is unattainable. The equivalent in land must in such cases lie in very small parcels, exceedingly dispersed, and be difficult to let to proper tenants at a fair value. A balance must be struck upon each estate, and fences be raised at a great expence. Such parcels as would be eligible for the rector to receive, the landholder cannot always give, without deranging the general œconomy of his farm. Even in those parishes where the property may be given and received with conveniency, and let to one tenant, he is liable to misfortunes, and failures, which would render the clergyman's support more precarious than on the present establishment. The knowledge of soils and their uses, requisite for framing covenants for the preservation and proper management of landed property, will frequently be wanting in the clergy. And the probability

bability that a successor will find the land neglected or exhausted, the fences destroyed, and the buildings in ruins, will not be doubted by such landowners as have declined to renew with their lifehold tenants, and suffered their property to fall into hand.

Whoever has taken an active part in carrying inclosure bills into execution, where the land is exonerated from tithes, must have found it a nice and difficult task to ascertain a proper equivalent. When the proportion of land to be given is fixed by parliament, it is too often done without sufficient information respecting the circumstances of the property. Hence may be assigned a principal cause why the real merits of inclosure bills are frequently depreciated. The great diversity of soils, their different degrees of fertility, various uses and products, and the different expences of cultivation, all operate on this proportion; and what may be deemed equitable on one estate, is frequently injurious to the rector, or to the landholder, on another.

A very able writer* strenuously opposes a commutation of land for tithes, and that chiefly as being injurious to the landholder.

* See Observations, &c. respecting Bills of Inclosure; and calculations shewing the loss sustained wherever lands are given in lieu of tithes.—SANDFORD, Shrewsbury; and BEW, London.

“ Let

“ Let us suppose a farm of 150 acres, at 16s. per acre; rent 120l. The least profit such a farm ought to produce, in order to answer the various expences incident to it, is 300l. It should be more; state it however at that sum, and the account will stand thus :

	£.
Rent, - - - - -	120
Tithes - - - - -	30
Remainder to answer every expence of parish } rates, wages, housekeeping, wear, tear, &c. }	150
	300

“ Here the value of the tithes is equal to a fourth of the rent; and I take this to be the least proportion that the tithes and rent can bear to each other in any case whatsoever, except in rich grazing farms managed at a slight expence. Now that the rector may have a full equivalent of landed rent for these tithes, an allotment must be made worth 30l. a year tithe free. But the tenant pays 150l. per annum in rent and tithes, or 20 shillings per acre; consequently the allotment must contain 30 acres, leaving the remaining 120 in the occupation of the tenant, who must continue to pay his usual rent; for otherwise his landlord must sustain a loss. The account will then stand thus :

	£.
<i>Tenant.</i>	
Rent of 120 acres, - - -	120
Residue for general expences, - - -	120
	240
Produce, reckoning as before at the rate of } 300l. upon 150 acres - - -	240

Rector

<i>Rector.</i>	£.
Thirty acres let at 20 shillings per acre,	30

“ Thus, by a commutation neither benefiting nor injuring landlord or rector, the tenant is reduced from 150 to 120 pounds, to support nearly the same family, and defray within a trifle the same expences. This is an actual loss to him of little less than 30l. per annum.”

It must be acknowledged, that the above writer takes no notice of the expences of collecting tithes, and converting them into money. Servants' wages, horses, carts, reparation of barns and other buildings, waste, threshing, marketing, &c. are considerable deductions. In stating a proportion in the rule of three, the young arithmetician is directed to reduce his first and third terms to the same denomination. It is equally reasonable, if the expences of the cultivator are reckoned, that those of the tithe-gatherer should not be forgotten—that the letting value of land should be compared with the letting value of tithes; not the rent of the one with the produce of the other.

Although this omission does not invalidate the general principle; it enhances the comparative value of tithes to that of land. It is a very common omission in calculations of this sort, and may, in a work of merit, tend to mislead; on which
account

account it is here taken notice of. The same author mathematically demonstrates, that land cannot be given for tithes, in any case whatever, without injury to one or both of the parties concerned—and that the measure of that injury must be a sum nearly equal to the profit which accrues to those who afterwards occupy the tithe allotment. As this is a question of considerable consequence, it cannot be too nicely and impartially examined. Admitting the author's assertion to be *mathematically* true, it is also true that a given quantity of land, rented as part of a very large farm, is generally less valuable to its owner, and to the community, than when it forms part of a farm of more moderate size. If a commutation of land for tithes were only to take place on overgrown farms, neither the landlord nor the public would, perhaps, have any cause to object. But the consequences of such a commutation would be most severely felt by a small land-owner, who is obliged to keep a certain number of horses to till his ground, whether he has a few acres more or less. The profits arising from his labour, even when in full employment, are barely sufficient for a comfortable livelihood: take away a portion of his land, and, like the manufacturer who is obliged to stand still for want of materials, he is in part deprived of the means of maintaining his family.

Through a refined taste, or a mistaken policy, the industrious occupiers of small property, those most useful subjects to the state, have been already too much oppressed, and are in many places nearly extirpated. The good-natured reader will excuse me, if I quit my subject for a moment to deplore the consequences.

The Norman Conqueror, in the plenitude of his power, depopulated thirty villages for his pleasure, which has left an indelible stain on his character. In the present enlightened age, the same ruinous policy is adopted, without remorse or censure. If the homely habitation of industry grows cold and comfortless, avarice whispers that the expence of reparations may be saved, and the land be added to a neighbouring farm. If parks or pleasure grounds are to be extended, whole villages are razed to the ground. Hushed are the cheerful "sounds of population," and the busy footstep is seen no more. The once comfortable, but now dejected inhabitants, are reduced to the hard necessity of earning a scanty morsel in the evening of life, by dint of labour beyond their declining strength; and thus their grey hairs go down with sorrow to the grave:—their beloved children, the comfort of their age, ill-brooking the idea of servitude, where they have seen better days, seek employment in the capital;—disappointment

ment and penury ensue:—the mounds of virtue are now broken, and the ruddy bloom of health exchanged for disease and infamy:—our streets become crowded with ruined innocence; and our prisons with wretched and desperate malefactors!

Where are the benefits to compensate for this mass of evil? The property which maintained ten or twenty families in comfort, is now converted into a single farm. When a tenant is wanted, there are but few competitors. If he fails, the loss is a severe one. The landlord may console, and perhaps reimburse himself by seizing on the farmer's stock; but his feelings are not to be envied; the reputation of his farm is thereby lessened, and the difficulty of procuring a tenant increased. The man who can afford to stock such a farm, can probably live on the interest of his money. He will not embark without a probability of large profit; and that without taking a laborious part. The labour and attention of servants and workmen are more expensive and less effectual than that of a small farmer, who easily superintends his business, and, with the assistance of his children, tills his own ground. The graduated scale of property being broken, and no medium left between the overgrown farmer and neglected cottager, the sinews of in-

dustry become languid. The poor man has nothing to look up to:—No motive for a laudable pride—no incentive to superior industry. The parish poor are his associates; and he observes that, when age or want overtakes them, the dissolute and the worthless are indiscriminately, and *equally*, relieved with the worthy and the industrious.—He therefore literally takes no thought for the morrow. —The produce of his labour is spent without reserve; and his wretched family entailed on the parish:—the land becomes loaded with enormous poor-rates, and its owner, after all his schemes of aggrandizement, wonders to find its value decreased. Such are the evils which prudence would have foreseen; and a humane attention to the rights and interests of mankind should have prevented. But to return.—On the most mature consideration, I am fully convinced of the impracticability of fixing a *general* and *equitable* commutation of tithes for land throughout the kingdom.

COMPOSITIONS.

The fluctuating value of money, and the very small proportion which modusses, or real compositions, made previous to the disabling statute 13 Elizabeth now bear to the value of tithes then compounded for, are convincing proofs that no pecuniary

cuniary payment can be fixed, without the greatest probability of injuring posterity. To remedy this evil, provision-rents have formerly been adopted. But a moment's consideration will convince us that a commutation of tithes for provision-rents, or the produce of the land in a marketable state, would be liable to much trouble and abuse. It would not be eligible even for the farmer; nor can it be expected that the tithe-owner would ever consent to it.

The worthy and learned Prelate before-mentioned, with equal judgment and philanthropy, recommends to his clergy to compound with their parishioners on *moderate* terms. Were this salutary advice universally adopted, it would be for the benefit both of the clergy and the laity. For it is well known that besides the trouble of setting out tithes, and their numerous ill consequences to the landholder and to society, they are in collecting liable to waste, injury, and additional expence: and that there is a very considerable loss between the rector and the farmer, without benefit to the one or the other. But, alas! plain as this truth must appear to every man of experience, the imperfections of human nature are such, that the parties concerned rarely agree on an equitable composition.

To prevent the effects of that partiality, which want of judgment or of candour too often occasions, the ingenious writer before quoted proposes, that the sum which each person shall pay in lieu of tithes should be fixed by two indifferent and skilful persons, with liberty to any of the parties to order a new valuation to be made once in every seven years: the expences to be equally borne by the rector and the parish.

The expence attending a measure of this sort, often reiterated, would be one considerable objection. Many improvements in husbandry are attended with heavy expences, and the return is frequently uncertain. A septennial reckoning with the tithe-owner may damp that spirit of industry, which an exoneration from tithes is meant to produce. A disagreeable anxiety would attend property often submitted to arbitration. And when we consider that men have been perverse enough to let their lands lie unfown, in order to deprive the rector of his tithe, we may take it for granted that there would not be wanting those, who, with an unworthy policy, would take every possible step to warp the judgments of the arbitrators, by depreciating the value of their tithes previous to such septennial, or any other regular valuation.

COMPOSITION TO VARY WITH THE VALUE OF MONEY.

The most unobjectionable commutation that occurs to me, is that of a money payment, chargeable on the occupiers of the land now titheable, but to vary with the value of money, in such manner as for the same income to purchase the same quantity of the necessaries of life, in all times to come.

In order to accomplish this end, it is proposed, that a bill be brought into parliament, not to compel every parish to enter immediately on such a measure, but to enable all parties, who are desirous, to proceed on the business. A very sudden and general change would neither be practicable, nor eligible. It must inevitably be a work of time; and should be carried on rather from conviction than compulsion. The following hints may probably be of some use in framing the principal clauses in a bill for that purpose.

MODE OF PROCEEDING.

That every thing may be transacted in as short a manner, as openly, and at as little expence as possible, the Justices at their general Quarter-Sessions of the peace, held for the same county, and at the nearest distance from the parish where the tithes are proposed to be commuted for, should be enabled
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to authorise commissioners to proceed on the business. Whoever has attended the passing of private bills through parliament, must have observed, that although the allegations of a bill are proved before a Committee, with due care and solemnity, yet the real merits and most material parts, are sometimes but imperfectly understood, or attended to. At a general Quarter-Sessions, it is probable, that several of the magistrates may be well acquainted with the merits and circumstances of the business, and the expence of attendance will not debar the parties from coming forward with the best evidence that can be obtained.

Two months previous to an application to the Quarter-Sessions, a notice should be affixed on the principal door of the parish church, for three Sundays during divine service, setting forth that application will be made on the first day of the next general Quarter Sessions of the peace, held at ———. And also an advertisement to the same purport should be inserted in some country news-paper, which circulates in that part of the county where the lands are situate, in order that the justices and non-resident parties may in proper time be apprised of the business. That such notices have been given, should in the first place be proved upon oath.

oath. The proportion of consenting parties should next be brought forward, and the reasons given by those who withhold their assent should be particularly stated.

PROPORTION OF CONSENTS.

The parties interested in the tithes, or those whose consent ought to be obtained, are, the Bishop of the diocese, the Patron and Incumbent—appropriators holding tithes, and impropiators, with their respective lessees for long terms renewable or for lives. Whatever be the denomination of the parties interested, a general consent should, if possible, be obtained. But as this is not always to be expected, however meritorious the undertaking, it may, perhaps be thought that one dissenting voice on the part of the tithe-owners ought not to negative the business. However, in all cases where the patron is also incumbent, or where the tithes are a lay impropiator's freehold, or wherever the possession and reversion center in one and the same person, such person's consent should be indispensably necessary.

On the part of the land-owners, the consent of the proprietors of three-fourths of the property in quantity or value should be obtained, previous to such application to the Quarter-Sessions. But no
 person

person who consents or dissents as diocesan, patron, incumbent, or tithe-owner, should have any vote as land-owner also. If any opposition be made to the measure, the parties opposing should be heard by themselves or counsel; and, if the magistrates are not unanimous, in order that friendship or party may have no influence, the question should be determined by ballot.*

CHOICE OF COMMISSIONERS.

Three Commissioners, who are men of judgment, integrity, experienced, and disinterested, will transact business much better than a larger number. The act of any two of them should be binding. It is reasonable that the parties should have a good opinion of the persons in whom so considerable a trust is vested. The Bishop of the diocese, the patron, incumbent, or other tithe-owners, or the major part of them, should therefore name one Commissioner, and a majority of the land-owners choose

* If it shall appear that a larger proportion of consents should be obtained, either on the part of the tithe-owners, or that of the land-owners, the author does not object to it. Convinced as he is that the great expence of passing a bill through parliament for each parish *separately*, and of procuring evidence to attend from distant parts of the kingdom, would in many cases frustrate the benefits proposed; he wishes for the consents to be such as would insure its success if brought before parliament. He does not wish for the magistrates to have, what some may think, too great a power; but that the parties should be enabled to proceed in the least expensive manner, pursuant to a general act, in the framing of which every proper precaution should be taken.

another,

another, whose names should be produced at the quarter-sessions, together with those of the consenting parties. The magistrates there assembled should choose the third commissioner by ballot. Partiality or friendship may, perhaps, have some influence on the choice of the *parties*. It is presumed the *magistrates* would be particularly careful to choose a man of character, judgment, and experience. But no magistrate should ballot for such third commissioner, or upon the previous question, if he is interested in lands or tithes in the said parish. A commission or instrument in writing, should then be signed and sealed by the justices there present, empowering the commissioners to proceed upon the business, conformable to the general act for that purpose: which commission or instrument in writing should be deposited with the Clerk of the peace, and an attested copy of the same be delivered to the said commissioners.

THE DUTY AND POWERS OF THE COMMISSIONERS.

In the first place the commissioners should give ten days notice at least, in some country newspaper which circulates in the neighbourhood, of the time and place of their first meeting, and should also give like notice in the parish church immediately after divine service, on two Sundays previous

previous to such meeting; and require that all persons possessed of, interested in, or claiming any tithes, or modusses, lands titheable or exempt, do attend, and give in a particular account of the same. When the commissioners and parties are met, before they proceed to business, each of the commissioners should take and subscribe an oath to the following effect :

I *A. B.* do swear, that I will faithfully, impartially, and honestly, according to the best of my skill and judgment, execute the powers and trusts reposed in me as a commissioner for ascertaining and settling an equitable money payment in lieu of tithes within the parish of ———.

SO HELP ME GOD !

If any modus is set up or claimed by one party, and denied by another, the commissioners should in this, as in all cases brought before them, be empowered to examine witnesses upon oath. But as the legality of a modus may be too nice a question for them to determine, the attorney of each party should, if required, attend;—and if the matter in dispute cannot be settled, the case should be drawn up, agreeable to the evidence, and signed by the commissioners. The parties should be required to fix on some eminent counsel to determine the same. If they neglect to do so, the commissioners may request

request the Lord Chief Baron of the Exchequer, or the Judges at their next assizes, to name one. In default of compliance, the commissioners to submit it to such counsel as they think proper; whose determination should be final.

An accurate survey and plan of the lands will now be wanted. If such is not already taken, a surveyor should be employed for that purpose. A plan of the property will be of great use to the commissioners in the conduct of the business, and should be inrolled with their award. The boundaries and names of lands, as well as the owners, are frequently changed. In process of time, fences are grubbed up and destroyed; several inclosures made into one, or one divided into several; and the ancient names forgotten. Hence it is not uncommon to find that an old terrier, without a plan, is unintelligible. When the commissioners have finished their valuation, and calculated the respective sums to be paid out of the several estates, in lieu of tithes, I would recommend to them to call the several proprietors and tithe-owners together; read over the quality and prices of the lands, and explain, to such as are desirous of information, what principles they have proceeded on. It is a matter of considerable trust and consequence; nor is it necessary that there should be any mystery in the proceeding. Every man,

man, whose property is at stake, has an undoubted right to give his opinion, and to produce evidence relative to such matters as he conceives to be wrong. However contrary this may be to general practice, I have frequently on Inclosure acts experienced the good effects of it. Men who have cultivated land for many years, and observed it at very different seasons, will sometimes furnish useful information. And it does not follow, that this open conduct of the commissioners should betray them into any confession that their judgment disapproves. The sums which the several estates are respectively to pay in lieu of tithes being determined on, a schedule of the same should be affixed against the door of the parish church where the tithes are commuted for. If no objection is made, nor any appeal intended, the commissioners' award should be drawn up, with a plan and terrier, setting forth the lands chargeable and exempt, the money payments now fixed, and the ancient modusses allowed: these, together with their commission, and the oath they have taken, should be inrolled with the clerk of the peace. A copy of the same should also be lodged in a box or chest, within the church or chapel of the parish where the lands and tithes are situate. If any of the estates should afterwards be divided, and alienated in separate parcels, the plan will always shew the
lands

lands originally charged. And the quota for each parcel, after such division, may be fixed by agreement of the parties, at the time of such alienation, or by two assessors, with as little difficulty as its proportion of land-tax.

APPEAL.

If it shall be thought proper, any of the parties who conceive themselves to be injured may have liberty to appeal at some general Quarter-Sessions, within four months after the cause of complaint has arisen; giving the commissioners one month's notice of the same. Though it must be confessed, that appeals in such cases are seldom attended with any good effects. For it is scarcely to be supposed, that any stronger evidence can be produced than that of three disinterested and experienced men, whose judgment and integrity have recommended them; and who have, with great attention, unanimously determined the matter upon oath. But if any one of the commissioners should protest against the proceedings of the other two, an appeal may lie with great propriety.

EXPENCES.

Although it is presumed that the proposed commutation will be desirable both to the clergy and the laity, yet as the inconveniency of tithes is very
great

great to the latter, and as the interest of the former is but temporary, it is proposed that the clergy should be exempt from all expence, except a share of that which may arise on determining whether a modus is or is not legal.

The general pay of commissioners of inclosures, is a guinea per day for time, and half-a-guinea for expences. Whatever charges are incurred on the business should be borne by the owners of the land, in such equitable shares and proportions as the commissioners shall direct. A power should be given, as in inclosure bills, for tenants in tail, for life, or for long terms, to borrow money, and charge it on the lands, keeping down the interest of the same. The commissioners to direct the application of all such money, and to account with the proprietors, when called on for that purpose.

FOR THE SECURITY OF THE CLERGY.

On the present establishment, the clergyman has a right to his tithes as soon as severed and divided into proportionate shares. He is in no danger from the failure of any tenants, except those of his own choosing. It should therefore be provided, that whenever a landlord shall seize for rent, the tenant's effects should be answerable for one year's composition to the tithe-owner; who should also, equally
with

with the land-owner, be entitled to his remedy by distress. But as this remedy is such a one as every man of feeling, and particularly a clergyman, would wish to avoid, it would be proper for him to have the privilege of calling on his parishioners to nominate, at a vestry, two collectors, for whom they should be responsible. The clergyman to allow them three-pence in the pound for collecting. If the collectors of the land-tax were to be appointed for that purpose, it would be but little additional trouble, and would make it well worth their attention.

METHOD OF VARYING THE PAYMENT.

As the value of money or of the necessaries of life rise or fall, on an average, so should the payment for tithes rise or fall in like proportion. The method of doing this should be as simple, and certain, as little complicated, as general, and liable to the least trouble possible. If we attempt to register the various articles out of which tithes issue;—if different commissioners fix these values for different parishes;—if each parish is to be separately considered, and regulated at the end of a certain number of years from its first payment;—if the fluctuating values are from time to time to be determined by particular markets, or by the prices on particular days, it will lead posterity into a labyrinth of trouble;

it would be liable to great abuse, and be productive of much discontent and error. In fixing upon one single standard, by which to estimate the future value of tithes, in proportion to the value of money, or that of the land out of which they issue, perhaps there is no one more proper than that of a bushel, or a quarter of wheat. Wheat is not quickly of a perishable nature. Bread is emphatically called the staff of life. And it generally happens, that when it is dear or cheap, other provisions are dear or cheap nearly in the same proportion. Farmers remark this in an ancient proverb—"Down corn, down horn;"—meaning, that the price of horned cattle, or butchers' meat, generally follows that of bread. Some new productions in husbandry will, often repeated, tire the ground and degenerate. We owe it probably to the goodness of Providence, that the soil once proper for wheat will, at regular periods, with manure and culture, admit of a repetition with the greatest probability of success. Add to this, that its exportation in years of plenty, and importation in years of scarcity, contribute to keep the price of wheat more nearly on a level than that of most other articles.

Suppose the clerk of every principal market throughout each county was, once a year, at the court of general Quarter-Sessions, held the first week

week after the Epiphany, to give in upon oath the average price of a bushel or quarter of wheat, on each market-day, in the several months of October, November, and December. In these months farmers generally thresh out great part of their grain, particularly wheat: for as to oats and barley, they generally contrive to thresh, so as for the straw to be given fresh to their cattle, when the grass is gone, and they live in the farm-yard. The sessions being so soon after, the jury, or any persons who attend the court, will have an opportunity of observing, whilst the market-prices are fresh in their memory, whether the average is a fair one. The average price of each market-day in those months being known, the whole may be added together, and being divided by the number of market-days, will give the average price of wheat the preceding year, in each market respectively.

Suppose the markets for regulating the prices of wheat, in Wiltshire, are, Salisbury, Marlborough, Devizes, and Warminster; and that the average price of wheat found as aforesaid is,

At Salisbury	£.	s.	d.		At Devizes	-	£.	s.	d.
At Marlborough	0	5	2		At Warminster		0	5	4
	0	5	0				0	5	6
							1 1 0		

These added together make one guinea, which divided by 4, (the number of markets) gives 5s. 3d. which is to be entered with the Clerk of the Peace as the average price of a bushel of wheat in the year —, for the county of Wilts.*

If an act of parliament for this purpose should pass, in or before the year 1790, the average price of a bushel of wheat for each year being proved, and registered as aforesaid, until the year 1800; the whole should then be added together; and an average for that period be taken, and published in the court of Quarter-Sessions, and also in such country news-papers as circulate through that county. In the years 1810, 1820, 1830, and at a like decennial period ever after, the averages should be collected. Those parishes where a commutation takes place before the year 1800, may be varied in the year 1810; and those commuted for from the year 1800 to 1810, may be varied in the year 1820: thus,

* The only reasons for preferring the three months before-mentioned, are, that it will be less trouble, and the prices will be more easily remembered by those who attend the sessions, than the prices for a longer period. The markets at this time of the year are generally full, and the period is sufficiently long to prevent any collusion. Whether the exact average of the year can by these means be obtained, does not seem of so much consequence as, whether the average of the first ten years bears a due proportion to the average collected, in like manner, during a period of any subsequent ten years. However, if six months or the whole year be preferred, for collecting the average of each year respectively, it may be done without much trouble; and the principle will remain the same.

Suppose

Suppose the value of a church living be fixed at 100l. per annum, within the decennial period ending at the year 1800; and it then appears that the average price of wheat collected as aforesaid, is for that period at 5s. a bushel; the value of the church living is equal to 400 bushels, or 50 quarters of wheat. In the next decennial period ending at 1810, we will suppose the average price of wheat to be 5s. 6d. a bushel: 400 bushels at 5s. 6d. is 110l. per annum; at which sum the value of the tithes should be fixed for the period commencing at the year 1810, and ending 1820: and so proceed in the same order. The whole sum which each parish or tithing shall be advanced or lowered, will thus be regularly obtained at a stated period without trouble; and the proportionate share of every estate can easily be calculated by any school-boy.

It will probably appear to some, that it would be better to procure or fix a standard or average value for a period of ten years *previous* to the commissioners' valuation in the several parishes respectively. This I have considered with due attention. Arguments may be adduced in its favour: but upon the whole it will probably not be found preferable to the method before proposed.

CONCLUSION.

THE laudable society to which this is addressed, have doubtless considered the numerous inconveniencies attending tithes in kind; and I am not without hopes that the hints herein contained will point to a remedy equally desirable to the clergy and the laity.

The clergyman will no longer depend on a troublesome and precarious subsistence, productive of perpetual discord between him and his parishioners. He will know the exact value of his living before he accepts it. His just dues will be secured to him without trouble, and without risk; and he will no longer be charged with ingratitude to his patron, or oppression to his parishioners. The industrious husbandman now secure in the fruits of his labour, a more vigorous cultivation will ensue:—the clergyman and his parishioners may thus be united in one bond of social union, and every disgraceful animosity be forgotten.

Imperfections are sometimes found in subjects less difficult and complex, even where the united wisdom of the legislature has been exerted. The avocations of the writer of this essay have prevented him from extending his observations, or
being

being more regular in his remarks. Errors, he fears, might have escaped him, but not through negligence. If he has any claim to merit, it is that of having done his best upon a subject, which has hitherto ineffectually engaged the attention of men of great rank and abilities; and which is, confessedly, of importance to a very considerable part of the community.

B. PRYCE.

Salisbury, Sept. 20, 1786.

ARTICLE III.

Strictures on the Husbandry of Turnips, or an Attempt to promote a successful Culture of that useful Root with more certainty than hath been generally practised.

BY JOSEPH WIMPEY.

[In a Letter addressed to the SECRETARY.]

SIR,

IN a collection of miscellaneous papers, written by many different persons, it is to be expected, that we find not only a variety of opinions, but often such as are incompatible and irreconcilable. To a reader who wishes to be informed rather than amused,

amused, this is an unpleasant circumstance, and naturally begets embarrassment, diffidence, and distrust. If, by garbling the papers, we could separate *truth* from *error*, *right* from *wrong*, confirm and establish the former, and discountenance the latter, at least as being doubtful, if not groundless, it would well reward our pains.

I chose not turnips for my subject, on account of its importance altogether, but also because the gentlemen of the Committee did me the honour of asking my opinion of a letter respecting the subject.

Turnips have been generally considered as an article of *precarious* culture; but this is not to be taken in an absolute sense; for every thing was made perfect in its kind; and there are few things that vegetate more freely or more certainly than the turnip in its proper season: but, like all other vegetables, it is more or less precarious, as the circumstances attending its culture are more or less favourable.

Nature has set and appointed seasons for her several operations. The spring months are the proper time for vegetation and the growth of plants; the summer months, for consolidating and maturing
their

their growth; and the autumn, for reaping, gathering and harvesting the same. The farmer, however, in the cultivation of turnips, is obliged to depart from those established laws of nature, to accommodate the crop to his own convenience. The great use of turnips as food for sheep and cattle, is to supply the deficiency of grass and herbage at a season of the year when little of these are to be got; and that turnips may be in perfection at a time they become most useful, the farmer is obliged to postpone sowing them at least three months beyond the time that would be most seasonable, that is, most favourable to their vegetation. For instance, were turnips to be sown in March or April, as the season might prove most favourable, there would be, I conceive, as great a certainty of a crop, as of any other vegetable usually sown in those months: but the farmer, for the reason before given, being obliged to defer it till the hottest season of the year comes on, his success becomes exceedingly precarious, unless he is so fortunate as to have a few rainy days, or cloudy weather and frequent showers, soon after the seed is in the ground. This I conceive is the true and only reason why the turnip is a more uncertain article than those which are sown in due season.

If these observations are just, the provident farmer will embrace every favourable opportunity that offers for sowing his seed. He fortunately is not confined to a few days or even weeks. He has from the end of May to the beginning of August, to perform this work, and he had better defer it even to the last, rather than sow when the weather is hot and dry; for in that case he may sow again and again, and lose both seed and labour. But should the weather be ever so favourable, that alone will not insure him success: there are several other things that are equally necessary.

1st. It is absolutely necessary that the land be very well pulverized. The number of ploughings and harrowings for this purpose cannot be ascertained; that must ever depend upon the nature and condition of the soil. Twice in some land would be more effectual than four times in other; but be the labour whatever it may, it must not be omitted.

2^{dly}. It is equally necessary that the soil be either naturally rich and good, or made so by a proper quantity of manure. Turnips never arrive to a good and profitable size in poor land, without good manure to promote their growth and push them forward.

3^{dly}. It

3dly. It is of great consequence to have seed that is both good in quality and of a good species. I prefer the large green-topped, as being the sweetest and most juicy. Some prefer the red or purple-topped as being hardier; but of which ever sort you sow, if the seed be from the largest and finest transplanted turnips, it is greatly to be preferred, even if it cost double or treble the price of the common sort. I have frequently bought of the seedsmen in London, but it is generally of a mixed kind, and often a great part not worth cultivating. I would therefore recommend it to the farmer to buy the best species he can get, let the price be what it may.*

4thly. As to the quantity of seed, I am pretty much of opinion with another of your correspondents, who advises to be sure to allow seed *enough*, and to that end thinks the safest way is to allow two pounds to an acre, though it is common with many to sow but one. Supposing the seed to be good and the season favourable, a few ounces would be sufficient to stock the land; but as the article is so very precarious, it is by far the safest way to allow seed in plenty, and reduce them afterwards by well harrowing the ground.

* This remark of Mr. Wimpey's is of great consequence: and for the reasons he assigns, the Secretary of the Bath Society makes a particular point of keeping a supply of the finest turnip-feed for such gentlemen and farmers as apply to him.

Lastly.

Lastly. The greater your success in providing a good plant, the greater will be the necessity that the crop be well and carefully hoed; without this, the great advantage to be derived from a good crop of turnips, would in a great measure be lost. Twice hoeing is often sufficient for this purpose, especially if the land be pretty clean; but if it be foul, three times is hardly enough. Hoeing in many places is not well understood, although it be an operation of very little difficulty. Practice is necessary to give dexterity to every kind of work: but a labourer, who has been used to work in a garden, and knows the use of a hoe, would not only perform it well himself with a few hours' instruction, but could teach all the labourers in a parish in a few days, which would greatly reduce the price of that business, it having been exorbitant hitherto in many places.

The business, however, might be made easy, and much expedited by well hoeing the turnips as soon as they arrived at a proper stage of their growth; that is, when they have four leaves; and where the turnips are thick, they might be well harrowed a second time, at the distance of a fortnight or three weeks. This would not only thin the crop, but also greatly improve and encourage the growth of the remainder. In this situation the hoers would readily

readily distinguish all that were proper to be cut up from those that are to remain, whereas, should it be deferred till they are over-run with charlock and other noxious weeds, the labour and difficulty would be more than doubled, and could never be performed so well. I have seen a field of turnips so entirely over-run with weeds, that the hoer worked as it were in the dark, and chopped away at random. Three weeks or a month sooner, the work might have been done at half the expence, and to more than three times the advantage.

As to the mode of planting, I am of opinion that the broadcast is the most productive, if the hoeing be properly performed and in good time. However I am much inclined to think, that the mode of sowing turnips between beans planted in rows, as recommended by several of your correspondents, is a much more certain means of insuring a crop. It exactly corresponds with all my observations on the successful vegetation of that root. A considerable degree of moisture is necessary to the rapid vegetation of that very juicy root, and nothing retains moisture equal to shade; and shade can be obtained and secured by no means so effectually on a large scale, as in the intervals of tall growing plants, as beans or wheat planted in drills.

My

My experimental field, of about seven acres, is now drilled with wheat on three-bout ridges, about four feet and a half wide. It was horse-hoed in December, and I intend shall be horse-hoed again in the spring and summer, as the seasons arrive; in that case the mould in the intervals will be in very fine tilth for turnips, with which I intend to sow them. These may be hand-hoed whenever it becomes necessary, notwithstanding the wheat; and as soon as that is harvested, the ridges it stood on may be ploughed, and the turnips horse-hoed, and perhaps repeated before winter. The crop I propose shall be fed off in January and February, time enough to plant the intervals on which they grew with beans the beginning of March; horsehoing the intervals, as the growth of the beans will permit, to prepare them for potatoes to be planted between the beans the latter end of April or beginning of May.

If this method should be attended with the success I expect, the land may be continually planted with a double crop, that is to say, with wheat and turnips one year, and with beans and potatoes another, in alternate succession. If this course of cropping should be found to exhaust the land, more than the horse-hoeing could replenish, which I do not think very probable, a moderate dressing of dung

dung might be given every fourth year as soon as the turnips are off, to prepare the land for beans and potatoes; the extra expence of which, should it be found necessary, would probably be amply repaid by the increase of quantity. Indeed the benefit would not terminate here; for as one of your correspondents has, I think, rightly observed, it is far better to manure for turnips the preceding year, than immediately before sowing them; and I am sure it is for wheat, especially if the manure be not thoroughly digested and become inoffensive.

Whether plants from new or old seed are most secure from the depredations of the fly, is, perhaps, a question, which cannot be easily determined even by experiments; for concomitant circumstances are frequently so much more operative and powerful as to render the difference between them, if there be any, imperceptible.

It is, however, in the knowledge of every practical man, that new seed sprouts or vegetates several days before old, and I think more vigorously; and it is equally well known, that the healthy and vigorous plants escape the fly, when the stunted and sickly seldom or never escape them. It should seem then, that new seed, *ceteris paribus*, is more secure from the fly than old, and for my own use I would always prefer it.

That

That old seeds are preferred to new in some articles by experienced gardeners is very true, and I believe with good reason; but this furnishes a reason against giving a preference to old turnip seed, contrary to what it is brought for. Old melon and cucumber seed is preferred to new, because the plants from old seed are far less luxuriant and more fruitful. In a former paper we observed, that luxuriance and fructification are very different things; and in a few, perhaps in no genus of plants, are they strictly compatible; but the roots of the turnip can never be too luxuriant, and the more they are so, the more secure they are from the ravages of the fly.

Many are the *nostrums* for the prevention or remedying the evils of this destructive insect; but like a charm for the cure of the ague and the tooth-ache, they are found to be equally fabulous and quackish. It is certainly very bad reasoning to conclude, that because certain things are disagreeable to our smell and taste, they must necessarily be so to creatures of a different kind;—and yet from this source their recommendation seems to originate. From the great encomiums bestowed on *elder*, I was in great hopes a specifick remedy had been found; I therefore determined to give it a fair trial:—accordingly I repeatedly drew elder branches, not only over beds
of

of young turnips, but a variety of other plants; I whipt the ground with them, and strewed the leaves, tops, and tender shoots over the beds; and finding all this totally ineffectual, at length I made a very strong decoction in boiling water, and, when it was cold, watered the plants with it several times. All this had just as much effect, and no more, as walking round the beds in the superstitious garb of a magician, and chaunting *Abracadabra* at every turn.

I am quite of opinion that nothing has yet been discovered which is at all adequate to the purpose, further than it may invigorate and promote the growth of the plants. To this end ashes, soot, or a rich compost of lime and dung, if used in sufficient quantities, may be deemed specifick; but the best means of using them is, either to sow them with the seed, or rather by themselves immediately before, and to well harrow them in, that they may be completely incorporated with the soil. This for the most part would so much invigorate and encourage the growth of the plants, as to be an overmatch for the most vigorous attack of the fly.

If I might be indulged in a wish, I would make it a most earnest one, that no writer in future would advance any thing for a fact, which he himself hath

not had full experience of the truth of. Nothing can be more inimical to the laudable intentions of the societies established for the promotion of useful knowledge, nor can any thing reflect more discredit on their earnest endeavours to promulgate the same, for the general information and benefit of mankind, than promiscuously blending fable with truth, and giving chimeras for discoveries, which never existed but in the imagination of the writer. The *elder nostrum* above-mentioned has, I believe, disgraced almost every repository of papers on these subjects, which hath been published for many years.

To this I would add another wish, which is, that no writer in future would communicate any thing to the society but original papers, without quoting the author from whom such writing was copied or extracted. This would enable the Committee to judge of the propriety of publishing the same, and often prevent the very uncandid imposition, which is too often practised, of passing extracts for originals, and absurdly and dishonestly causing the same thing to be published many times, much to the disappointment and loss of the purchaser.

One offence of this kind I can point out in the 2d volume of your letters and papers, from a gentleman

tleman in Devonshire, signed C. H. in Article XXVIII. on the nature and effects of lime as a manure, which he gives as the united effects of his own experiments and observations on the subject; whereas the whole was extracted from a book entitled "RURAL IMPROVEMENTS," published by myself some years before, as will clearly appear to any one who will take the trouble of comparing the chapter on Lime, page 201, in my book, with the said article.

He is not the only writer who hath purloined from my book; for half a dozen, at least, which have come to my knowledge, have played the same nefarious game. One author (Mr. FORBES) has copied about thirty pages from the said book, but then he has very honestly told the reader from whence they were taken. There is something so very mean, uncandid, and disingenuous in plagiarism, that it is much to be wished an indelible stigma were to be fixed on every offender, to discountenance and prevent a practice so very dishonourable.

NORTHBOCKHAMPTON,

Feb. 8, 1787.



ARTICLE IV.

Of the Necessity of adapting or suiting the Crop to the Nature, Condition, and Circumstances of the Land to be planted ; with an Account of an Experiment to ascertain the Quantity of Butter and Cheese producible from a given Quantity of Milk.

[By JOSEPH WIMPEY.]

THE first and principal object of every husbandman is, to obtain the most profitable crops from the land he occupies. In order to this, it is absolutely necessary, that he suit the articles he plants to the nature of the soil. When art is made to co-operate with nature, our hope is founded on rational grounds. To act in repugnance thereto, is to sail against wind and tide, and there can be little or no hope of making a successful voyage. It is true, that amazing things may be effected by unremitting perseverance and unlimited expence : but the husbandman's province is not to enquire after what is possible, but what is profitable; not what may amuse the curious, but what will reward the diligent, for the benefit of the community of which he is a member, as well as for his own.

Though

Though the lands of these kingdoms consist of a very great variety, they may fitly enough be ranged under two general heads.

First, all such as naturally produce little of any value, either for man or beast; but require the art, labour and attention of the husbandman, to bring them into a state of cultivation, so as to render them useful and profitable. Here the plough becomes a necessary instrument in breaking up, dividing, and pulverising the soil; and hence such lands are denominated—*arable*.

Under the second head may be placed, all those lands which spontaneously produce grass and herbage proper for the feeding and fattening of cattle, the production of milk, of butter, and of cheese. The occupier of the former is properly a corn-farmer; of the latter, either a grazier or a dairyman; and it sometimes happens, that all three functions are exercised in some degree by the same man, as may best suit the different parts of his farm.

From hence it follows, that occupiers of land, who pursue their business upon principles of reason and œconomy, have no choice, whether they will be corn-farmers, graziers, or dairymen. The occupiers of the former are *necessarily* corn-farmers:

for without the plough and its auxiliary instruments, their fields would soon recur to their original wild state, and be overrun with furze, briars, and brambles, and such unprofitable productions as would be of no use or value. The occupier of the latter, is as much bound by his interest to appropriate his lands to feeding or to the pail, as the other is by necessity to plant corn; for when nature has given herbage proper for such purposes, the land is of much more value, and its profits to be acquired with far less labour and risque, than from arable land.

It is true, indeed, that some have been so infatuated, as to plough up good meadow and pasture land, and relinquish a good and certain gain upon a visionary and absurd expectation. And to such, and such only, can the reproof of the ingenious writer of Article IX. in the Third Volume of your papers be applied. All such are justly reprehensible: but surely the occupiers of arable land, as such, are by no means censurable. To expect they should make butter and cheese from land to which nature has denied grass and herbage, would be a task of more than Egyptian difficulty. As it is necessary to have butter and cheese to eat with our bread, it is full as much so to have bread to eat with our butter and cheese; and the most certain way of
obtaining

obtaining plenty of each is, to appropriate the land to the production of such crops as are most suitable to its nature.

It is admitted, that some land has been very imprudently broken up and converted to arable, which was of much more value to the occupier, while it was in grass; at the same time it cannot be denied, that some are as injuriously prejudiced against the plough, and will not consent to have unfertile pastures broken up, although they might be greatly improved thereby. I have now in my eye several fields not far from Waininster, which would be worth double their present value to the occupier, if the owner would consent to their being ploughed and planted with corn at proper intervals.

Pasture fields, when become hide-bound and mossy, bearing little else but a fine wiry grass, almost as void of substance as sustenance, might be expeditiously and effectually improved by the plough. Were such lands planted with wheat on the sod, as practised in the county of Norfolk, and the winter after well manured, and planted with beans the March following in rows with three feet intervals, well horse-hoed till June, and then sowed with turnips to be eaten by sheep the following winter; then in April to be well prepared and
sowed

fowed with barley, and grafs-seeds futed to the foil; there cannot be a doubt, but that the produce the three years fucceeding the crop of barley, would be much more confiderable than it would have been in the fix years, had it continued the whole time in its natural ftate. So that the net produce of the three crops of corn would be fo much clear gain to the occupiers, and proportionally beneficial to the public.

Upon the whole, I think, it may be fairly concluded, that for the lofs of every ton of herbage that has been fufained by means of the plough, twenty, at leaft, have been gained by the well-timed ufe of it. Moft, almoft the whole, of the improvements made in husbandry in the courfe of the prefent century, have been by the prudent ufe of the plough. Turnips, clover, *all* the artificial graffes, efculent roots, herbs, and plants, fo far as refpects field culture and the feeding and fattening of cattle of every kind, have been obtained by its ufe folety, as none of them can be cultivated extenfively without it. Therefore, true as it is, that butter and cheefe, and fome other articles, have advanced almoft double their price in the laft thirty and forty years; and true as it may be, that graziers and dairymen pay their rent more punctually than little corn-farmers, or the occupiers of fmall arable farms;

farms; it can by no means be accounted for upon the principles of an undue and imprudent attachment to breaking up meadow and pasture land. What are the proper and genuine causes of these effects, we may endeavour to explain hereafter.

The writer of the article above-mentioned was exceedingly misinformed, respecting the comparative value of cheese made of milk, which had been completely skimm'd, and what had not been skimm'd at all. The difference in price is, at least, four times as much as the sum he mentions. Skimm'd cheese, I have been credibly informed, hath been sold at Warminster fair, within about four years last, for 12s. 6d. per hundred; whereas the best rammill, say raw milk cheese, sold for from 38s. to 42s. per hundred in the same fair, and prime cheese from the best dairies for 46s. or 48s. The medium prices of the three different kinds, that is to say, of skimm'd, of half new and half skimm'd, and of milk not skimm'd at all, have been 15s. 28s. 40s. per hundred.

As to the best course of experiments respecting the comparative value of butter and cheese, Mr. BILLINGSLEY, in his very judicious remarks on the said article, has given the true, and therefore the best general answer to the question proposed. For
both

both produce and prices are so varied by local circumstances, that, as he observes, “no settled invariable rules for the management of the dairy can with any propriety be established.” The quantity of produce of each article specified, may be easily ascertained on any dairy, but the superior advantage of any course can be determined only by the demands which arise or are promoted by peculiarities of situation.

It is asserted in the said article, “That a tenant of 60l. per annum, in a dairy farm, will get money, while a corn-farm of the same size will starve its occupier, (though perhaps the former gives 15s. per acre for his land, and the other but 10s.) is self-evident.” This is by no means a necessary truth arising from causes established in the nature of the thing, but has its foundation in artifice, as will be shewn hereafter. However, this is not the interesting question. Is it self-evident, or by any means demonstrable, that a corn-farm of 10s. per acre, which would starve its occupier, is by any method convertible into a dairy-farm; and that if the plough should be abandoned, and such land suffered to recur to its original and natural produce, as in that case it must do, would it not starve the occupier, even if he gave but 5s. per acre for such land?

It

It seems to have been totally forgotten, that the lands of *all* corn-farms, be they little or great, were originally pasture, and in that state applicable *only* to grazing or the dairy: and many hundred thousand acres of such land, worth only in that state a shilling or two an acre, have been improved by means of the plough, to 10s. 15s. 20s. per acre, and some much more. Relinquish the plough, and those very lands would, by rapid degrees, revert to their original state of unproductiveness, and consequently would be of no more value. It is with lands, as with the occupations of men: some are incomparably more lucrative than others; but all men cannot be of those occupations which are the most lucrative, nor have they talents for it. Ralph may possess every qualification necessary to constitute an excellent ploughman, but, probably, no education upon earth could qualify him for a Prime Minister, or a Lord Chancellor. So, many fields by proper culture would bear excellent crops of wheat, to which nature has denied herbage proper to fatten a rabbit. Individuals in certain situations may suffer by ill-judged conversion of land proper for grazing to arable; but I am of opinion, the practice is neither of such extent or magnitude, as to advance the price of butter and cheese, even so much as a farthing a pound in the general market. Admitting then

then that the little corn-farmer of 50l. or 60l. per annum, with great labour and assiduity finds it difficult to live; while the dairy-farmer of the same rent, not only carrieth on his business with incomparably more ease, but is getting money at the same time; also that butter and cheese are advanced at *least* a third of their present price within these 20 or 30 years; I say, admitting these for facts, which I believe cannot be denied, we will proceed as briefly as we can to assign the true and genuine causes of the same.

It is a maxim generally allowed, that unless a farmer makes three rents he cannot live. A dairy-farmer, then, 20 years ago, whose rent was 60l. per annum, by this rule made 180l. per annum; so that having paid his rent, he had 120l. left; labour, expences, loss of cattle, and incidental charges, having been usually reckoned another third, the remaining 60l. was for the maintenance of himself and family. But if the produce of dairy-farms be advanced a full third of its present price, what sold then for 60l. will now yield 90l. and consequently the gross amount, which was 180l. then, will be 270l. now; from which 60l. being deducted for rent leaves 210l. and from that sum another 60l. as before for expences, &c. there remains then 150l. so that upon these principles the dairy-farmer has
 a net

a net 90l. per annum, for his maintenance and profit, more than he had 20 years ago. It can be no wonder then, that he punctually pays his rent, and saves money. But it may be said, and indeed very truly, that rents have been generally raised, especially on little farms, nearly in the same proportion, and on some considerably more, and that so much must be deducted from the sum above-mentioned. The remark is just, and the account being rectified accordingly, it will stand thus: instead of 60l. for rent, we must allow 90l. consequently the additional 30l. is to be deducted from 150l. which reduces his net gain to 120l. which is just double what it was 20 years ago, and a very pretty income it is for a man of so small capital, and in so little business. Let us next enquire how, on the same principles, matters stand with the corn-farmer, who is represented as being in a starving and ruinous condition.

The corn-farmer is supposed also to occupy a farm of 60l. per annum; that he, like the former, makes three rents, one for his landlord, one for expences of all kinds, and the other for his maintenance, &c. But his expences will be far more considerable, as well as his labour and care, than the dairy-farmer's, and the surplus of these expences must come out of his share. His farm has been equally raised with the former; therefore he now
pays

pays 90l. instead of 60l. he paid before; the additional 30l. being deducted from 60l. his share, leaves only 30l. to maintain his family, and make good the extra expences of the second share. He has no resource to an advance of price in the produce of his farm like the former, to enable him to pay his advanced rent, which may be easily seen, by comparing the average prices of corn for the last 20 years, with those of the 20 years immediately preceding, which I fear will be found to afford him little assistance. If, then, it was with difficulty enough he made both ends meet before his rent was advanced, how is it possible he should live now upon an income reduced one half, say from 60l. to 30l. or more probably from 40l. to 20l.? What is to be done then? To convert a farm that is properly arable, to a dairy-farm, is impracticable; and were it not, should it be generally practised, it would entirely defeat its own purpose. The remedy, and the only remedy, seems to consist in a reduction of the rents of such farms, and the farmers adopting the modern improved culture, recommended by the very intelligent Mr. BILLINGSLEY, of "judiciously blending *arable* and *pasture*," but I think seldom "in the proportion of *three* of the latter to *one* of the former." If the farmer could get two good crops of artificial grasses, to two or three of corn,

corn, which I think would be more suitable to most lands, perhaps his crops of both would be more beneficial, than on any other division. But every one's mode of practice must be governed by the peculiar circumstances of his farm.

But it may be asked, if breaking up pasture lands, and converting them to tillage, is not the cause of the advance of price of butter and cheese, what is? —I answer, what would raise the price of any commodity whatever; it is forestalling, ingrossing, and monopolizing. And perhaps there is no article in the large circle of commerce, that is so much the subject of those pernicious arts, as butter and cheese.

The cheesemongers in London, many of them at least, are men of large capitals, who have correspondents, agents, and factors, in many, I believe in most, of the considerable dairy counties in England. The prices of butter in large dairies are usually fixed and agreed on at the beginning of the season; and whether the year proves plentiful or otherwise, it makes no difference in the price. What is bought dear, will always be sold dear, where there is no opposition or competitor in the market. I was once at Axminster, when no bread and butter could be had with our tea; the reason being asked, the mistress of the inn assured us it frequently

frequently happened that an ounce of butter was not to be got in town, unless on a market-day; for all the great dairies were under contract with the London dealers, for all they make, at a fixed price, which made it both scarce and dear. At the time she said this, there were 100 tubs of butter piled up in the gateway of the inn, in readiness for the London waggons. Upon enquiry I found, the current price was 7s. 6d. per dozen wholesale, and that the town and neighbourhood was supplied by such little dairies only as were thought below the notice of the wholesale dealers.

A similar mode of practice is followed in regard to cheese. The great dealers in London long since instituted a club, and hold a weekly meeting to regulate their affairs. They employ agents or factors in Cheshire and Lancashire, to buy up the cheese made in those counties, which is done by agreement for whole dairies; they have several ships in their employ, which perform almost the whole carrying business between Liverpool and the metropolis. Not one of these ships is permitted to carry so much as a cheese for any one but the company. At their weekly meetings, they settle the quantity to be brought by each ship, which they proportion to the demand, being very careful that the town shall not be overstocked, but kept rather hungry,

as

as all the rest of the dealers are supplied by them, as indeed is almost all England; for a good Cheshire cheese is hardly to be got even in Cheshire, as I have often heard from the masters of those vessels, who are frequently employed to buy Cheshire cheeses in London, and carry them back again to gentlemen in those counties, who can get none that is good at home. From hence it is easy to conceive, how much the price must be enhanced by two commissions, two freights, and the profit of at least one commissioner, but very commonly of two.

It may be said, this respects a county or two only; but it may as truly be said, that a similar practice obtains almost through every dairy county in the kingdom. Jobbers have established themselves almost every where, who either buy all they can immediately from the dairies, or constantly attend the markets and fairs in the neighbourhood of the dairies, and ingross large quantities, which infallibly advances the price of the whole immoderately. For instance, in Wiltshire, the jobbers, 20 miles and upwards round Marlborough, constantly attend that market, where they buy up and contract for very large quantities of cheese for the ensuing fairs; that is to say, for Newbury, Andover, Weyhill, and Reading; from whence, if they are not

offered a price to their minds, it is sent by water to London, which is a market that infallibly takes off every thing. But here it is got to the end of its journey, and must be sold for whatever it will yield; and this is the reason why not only cheese, but all sorts of grain, &c. are usually sold below the average price which generally obtains throughout England; often indeed considerably under what they yield in the place where they grew, or were manufactured.

Some 30 years since, it was usual for cheese to be sent immediately from the dairy to the fair in surprising quantities, and the price was then determined by the proportion the quantity bore to the demand. The blessings of propitious seasons were then enjoyed in common, and the consumer came in for his proportion; but now this natural and regular course is almost totally perverted by the jobber, and the price is no longer governed by the above proportion, but by the price it cost the jobber, and the profit he thinks fit to put upon it. He is not obliged to comply with the current price, like the dairy-man, who had no other resource; the buyer must conform to his price, or he will try it again and again at other fairs, till he succeeds, or in case of a disappointment, at last it is sent to the never-failing market—LONDON.

Notwithstanding

Notwithstanding the prolixity of this paper, I find myself under a strong temptation to add a few lines in behalf of the little, and too often much distressed farmer. If the occupations of men were to be estimated by the service they render the publick, and the pitiful recompence some have in comparison with others, I believe it would be extremely difficult to find any class of men who are so richly entitled to favour and encouragement as the little corn-farmer. His toil and anxiety are incessant; his labour, from the rising of the sun to the going down of the same, and often much longer; his diet the poorest; his clothing, lodging, and other accommodations, as mean and comfortless as can well be conceived. These are all the recompence he has in general, for his indefatigable and unremitting labour in providing the necessaries of life for the rest of the community; for to the little and middle farmer, are we chiefly indebted for the well-timed supplies of those things, without which we could not subsist. It is the little and middle farmers, who supply the market from harvest to Christmas and onwards. They must raise money to pay servants' wages, tradesmen's bills, taxes, rent, &c. &c. The "whim or caprice, or supposed advantages," which are ascribed to corn-farmers in general, are applicable only to the great and opulent, who are

able to monopolize, as well as cultivate: and some, through an avaricious spirit, would withhold from market, till corn, &c. advanced to a price that would starve the rest of the people. I therefore repeat it, the little farmer, whether he be a corn or a dairy farmer, provided he prudently appropriates his land to the production of the most beneficial crops, cannot receive too much countenance and encouragement from the publick, not only to whose convenience, but subsistence and well-being, he devotes a slavish and most laborious life.

I have already observed, that the distresses of the little corn-farmer are in part owing to the great advance of his rent; but whenever, in the vicissitude of human affairs, the prices of grain shall fall to that low price which a series of fruitful years hath sometimes produced, as for example, between 1730 and 1750, rents will tumble fast indeed, but unfortunately the poor farmer must tumble first. Corn being once at the low price it sold at then, no device or artifice whatever could keep up rents to the pitch they have attained at present. No routine of crops yet proposed, though made with the greatest judgment, would enable the little farmer to stand his ground, and satisfy his landlord.

But

But though so large an advance of rent is one, it is not the only reason of the little farmer's difficulties. It is generally allowed, that to do well, a farmer's capital must at least be equal to three times his rent; but I am well satisfied, if it were equal to five rents, it would be vastly better both for himself and his landlord. What a miserable chance then must both run, when the farmer is scarcely possessed of stock equal to a single year's rent, which I am afraid is too frequently the case. The true judgment of the landlord consists then in letting his farms to tenants, whose capitals are fully adequate to the rent they are to pay, and at such rents as with good management they may be able to pay. Such rents would be *real*, and might be depended upon; but farms let at rents racked up to the highest pitch that tenants with little or no capital will consent to give, are properly not *real*, but *nominal* rents, and such too commonly end in the ruin of both the farmer and his farm. The sure way, therefore, for a land-owner to have the rent of his corn-farms paid as punctually as his dairy-farms are said to be, is to take care that his tenant's capital be fully adequate, and his rent proportioned as favourably to its improved produce, as the dairy-farmer's is to the natural produce of his.

As experiments to determine the comparative value of butter and cheese have been thought of some importance, I take the liberty of presenting one to the society. It is on a small scale, but made with great care and exactness. One hundred and five gallons and a half of milk were properly disposed in pans for skimming off the cream. It produced 36 pounds of butter, and 60 pounds of skimm'd cheese. The low average of good butter, in this neighbourhood, is 8½d per pound. And the skimm'd cheese was sold for 2d. per pound. I am informed this sort of cheese, three or at most four years since, sold only for a penny farthing, or at most three half-pence per pound.

	<i>£.</i>	<i>s.</i>	<i>d.</i>
36lb. of butter at 8½d. -	-	1	5 6
60lb. skimm'd cheese at 2d. -	-	0	10 0

Total - *£.* 1 15 6

Of a like quantity of milk, say one hundred and five gallons and half, were made 106lb. of raw-milk cheese, and 6lb. of whey and butter. The cheese at two months old was worth at least 3½d. per pound, and the whey butter sold at 7d. per pound.

106lb. raw-milk cheese, at 3½d.	<i>£.</i>	1	10	11
6lb. whey butter for 7d. -	-	0	3	6

Total - *£.* 1 14 5

From

From this experiment it appears, that when the butter and cheese, of each sort above-mentioned, will sell for the above prices, a small advantage lies on the side of butter and skimm'd cheese. It amounts to 13d. only in 1l. 15s. 6d. which is about 3 per cent.

Butter from half new milk and half whey would be of a middle quality between the other two, and the cost price of course must be so too; and so must cheese from half-skimm'd milk; but each of these may be varied in goodness according to the proportion of milk and whey, and of the milk skimm'd and unskimm'd; so that the price of the latter may be varied from 20s. to 30s. per hundred. But the advantage of following either course depends upon local circumstances, as was observed before; and the dairy-man, to acquire the greatest profit, must regulate his mode of practice according thereto.

NORTH-BOCKHAMPTON,

Dec. 6, 1786.



ARTICLE V.

Practical Observations on sundry Letters in the Third Volume, and on the Advantage of Friendly Societies.

[In a Letter to the SECRETARY.]

SIR, *Stifted-Hall, Essex, June 20, 1787.*

I Beg leave to acknowledge the favour of the 3d volume of the Papers of the Bath Society. At the 53d Article, Mr. LAMPORT, from an observation of a common husbandman, enquires the reason, why *old* turnip-feed should escape the ravages of the fly more than the new?—I take the liberty of informing you, that on the supposition of its doing so, our best farmers mix together for sowing half of each, in the whole a quart for an acre broadcast; and find that the *new* feed vegetating first, and probably possessing some greater sweetness, affords occasionally sufficient food for the fly, till the whole is grown strong enough to escape. The mere chance of this benefit, for a vegetable crop so very important, is a sufficient inducement for its practice; they are here never hand-hoed *less* than twice at 8s. an acre, beer included.

Sir THOMAS BEEVOR's account of his trial, in the *same mode of culture*, of the turnip-rooted cabbage, is
of

of very great importance, and ought to be followed by every winter-grazing farmer: since a *small* portion of this hardy and abiding plant, cultivated *exactly* as the common turnip, would remedy the great inconvenience and expence that is commonly suffered in the beginning of spring, when on all soils, more especially the heavier ones, turnips must be gone; and no material grass-feed can in common, or to any great degree, be had. From a few plants of this turnip-rooted cabbage, which I raised when it was first talked of, it seemed more suitable to our stronger soils than the common turnip, and far more capable of bearing frost; when boiled, its root has much of the cabbage flavour. An acre or two of this, *as a sure resource*, even if a fallow followed it, would be valuable; but to an English farmer, besides buck-wheat, there are so many feeds, roots, and grasses, for summer-sowing, so well known, that the fallow will probably be unnecessary.

In a note on your 43d Article, it seems doubted whether four horses be equal to the due cultivation of one hundred acres of arable; but it should be recollected, that *with us*, no inconsiderable portion of this is in rotation after corn, under artificial pasturage; and it is *this* plan of modern farming that is the uncontradictable fact in support of all inclosures, as it nearly insures an equal quantity of
every

every sort of cattle to be kept, and an equal quantity of every sort of corn to be raised, on half the land, as was done before the inclosure on the whole; whether it was then, for the former instance, open grazing common, or for the latter, open arable field. How population can be injured, or rather, how it should not *thus* be promoted, may be distinguished by the jaundiced eye of some speculative politician, but is not at all perceivable by any one of common sense and experience, who can laugh at theory, (and happily he has, to console him in his want of knowledge, plentiful food for laughter) when he finds it totally irreconcilable with reality.

I take the liberty of confirming my observations in your 38th Article, on the Cow-Grass Ley [*Trifolium Pratense.*] I have the finest plant of full-eared wheat in this neighbourhood; my thick-sown rye-grass was fed (even in this spring) in the middle of April, a benefit which I endeavour to insure, by always affording that field under the corn, of which it is annually so thickly sown, a coat of manure soon after the corn is harvested. My acre of carrots, which in the same article I mentioned as being from last year's drought, together with my not affording them, though sown on a wheat stubble, (so the trial was sufficiently indelicate) but one ploughing,

ploughing, produced (including a small patch, which I tried advantageously with parsnips) two hundred and thirteen bushels; the greater part of both were taken up in March, and given to my horses. The turnips, which I harrowed in over the carrots, were for the year (a failing one) a sufficient plant for the wants of the dairy, after about two acres of cabbages and borecole had been consumed; which turning out, like the carrots, a very imperfect plant, the vacancies were filled up by *every species of refuse plants* of the cabbage kind that were useless in the kitchen-garden, and our œconomy was rewarded, by not only saving this various herbage for the cattle, but by having our own table unexpectedly treated, from this whimsical field mixture, with plenty of very forward and fine green brocoli,

Such slovenly farming did not, it may be said, merit such plenty; but it suggested to us, that, with more becoming neatness, a field of about three acres would, for the establishment of any country gentleman, be more advantageously cultivated in this than in any other mode of agriculture; since by this gardening at the cheapest expence, under the plough, all the common winter and spring herbage, potatoes, carrots, parsnips, turnips, cabbages, borecole, and brocoli, might be annually raised

raised in sufficient quantities for the house, and for all the cattle usually belonging to a little farm. By changing these different species, the one successively after the other, into different parts of this *kitchen-field*, and keeping it neatly hoed, it might, as any other garden, always be cropped under this very profitable as well as most comfortable culture.

In order to contrast my conduct of last spring, I had in the present (after coating it with a little manure) half an acre *dug*, and sown with six pounds of carrot-feed; the digging cost 1l. the seed 5s. and three hand-hoeings just completed 1l. The plant is one of the most exact and promising that can be seen.

A neighbour of mine (who on one ploughing of a grass ley raised last year from six to seven hundred bushels of carrots per acre, and very profitably fattened oxen with them) took up in October 1400 bushels, and after topping and drying them a little in the field, flung them promiscuously into an out-house with a slight covering of straw, where they remained for occasional use, if snow or frost prevented the gathering those in the field, or as the reserve till those were consumed; which was the case, not being used till March, when they were so firmly found as to appear probably more nutritive than

than any taken then fresh from the field. I never saw, as far as I could conjecture, a more advantageous piece of culture; nor where the land (as in the two preceding years, from the crop of barley after the carrots they had experience of) seemed from a vegetable crop in such a promising state as this. But I must observe on carrots and potatoes, it is not the crop produced from a fresh soil, but that, where like turnips they have been cultivated in a regular rotation after corn, and for a series of years, which must determine their fair value and use, both for consumption, and preparatory to whatever corn crop may succeed them.

Turnips have had a long, and cabbages some trial, and, with carrots and potatoes, seem to promise a vegetable crop after a corn one, suitable, either one or the other, to almost all the various arable soils in this kingdom.

In Article 19th, on Mr. ANDERDON'S drill-culture of beans and turnips, you justly observe the same soil cannot be suitable to two crops of such an opposite nature. But the farmer, in the rotation of his crops, under the common husbandry, and from the necessities of his stock of cattle, must frequently hazard vegetable ones on soils little congenial to them, and rest his chance of success on that of the seasons;

seasons; upon the whole, he probably, if cautious, gains an advantage. It is on this plea the greater part of turnips are cultivated here; where, from the soil, a crop of beans after wheat seems much more natural than a crop of turnips; and consequently these should be proportioned on such a soil only to the bare necessity, and that necessity not increased by too large a stock of winter cattle; which, by extending the culture of turnips, or any winter vegetable over a larger space of ground, than for which a sufficiency of manure, so absolutely essential to their produce, can be reasonably procured, is sure to disappoint the very purpose, (and that frequently at a very great expence) which on a little scale must very advantageously have been procured. Where it can be afforded, cabbages, especially in the drill culture, are certainly the properest for the intervals of beans; the same soil suitable to both. The cabbages planted at the very period when the beans begin to cease vegetating, and their own vegetation promoted at first by the shelter that the beans afford, and afterwards, as their leaf decays, by gradually admitting on the young cabbage plants, in proportion to their strength, the sun and air.

It is with great satisfaction I see in Article 50th, on the representation of Mr. ANSTIE, a premium offered

offered for the establishment of Friendly Societies. The advantages of these are so striking; the œconomy on which they are founded so reputable to the lowest class, from whom they remove the stigma—that, sure of a legal support from the parish, they never will provide against their own misfortunes; and so beneficial to their superiors, by whom this legal support must be raised, and who consequently share in every shilling, that the establishment of these clubs enables the members to be too independent to take; that I have been astonished at not finding gentlemen in general, and every part of their families, (making it even a conditional agreement at the hiring of servants, that they should be members of such societies) contributing by subscription to their support; but I have been more than astonished at not finding any parish contributing out of the rates a trifle quarterly to the support of the most obvious scheme, by which the maintenance of the poor, a burthen so justly every where complained of, can be restrained: even where many of those societies, so truly honourable, have been dissolved by the sudden and large calls of sick members exhausting that stock; and consequently throwing them again on the ungrateful and improvident parish, that had neither generosity enough to serve them, nor prudence enough to serve itself.

The

The very parish from which I write, in spite of my representation, is of this folly a case in point; though in one instance of such illness, it saved by such a club nearly twenty pounds. What an universal subscription, from every person at a certain age to those clubs, considering how very large a portion would from situation draw no benefit from the collection, would do, may be at least conjectured from a little pamphlet, published some time ago, by a Mr. PUGH, of *Wellingborough*, Northamptonshire; who declares, that from the data afforded him in that parish, such a general subscription would not only answer the present poor-rates, but even probably afford an overplus for the assistance of poor families burthened with children, too young to earn any maintenance, and requiring all the care and time of the mother who should contribute towards it. Instead therefore of statute upon statute, of perpetually devising new laws and new schemes,—a very melancholy sign,—surely it would be but fair to try first whether the inefficacy complained of does not chiefly originate, and is not certainly increased, by the old laws we possess (preventive of every degree of vice, by restraining every place encouraging it) being never firmly and generally executed; nor to the good habits and customs that might still be found openly and liberally supported

and

and promoted; and consequently, whether some security against these evils be not chiefly, if not entirely, within the hand that will not use it.

Yours, &c.

CHARLES ONLEY.

P. S. Erect Bridewells on the plan of that of *Wyndham*, Norfolk; unite the poor into hundred-houses of industry, like those in that county and Suffolk; strictly execute the laws against vagrancy, every sort of immorality, profaneness, licentiousness, and neglect of the Lord's-day; reduce the number of ale-houses to the bare necessities of every parish; support Sunday or similar schools on a cheap plan, towards forming the children of the poor by habit to some *little* knowledge, strict decorum, and *much* industry; contribute by general subscription to the support of the Friendly Societies, or poor men's clubs for mutual assistance, and the forming such in every town and village in the kingdom;—and *then* complain of a want of police, and of preventive justice—of security against a profligate commonalty, and an expensive poor, if you can!

It becometh none but children, when they possess all they want, out of weakness or wantonness, or both, to cry out for more.

C. O.

ARTICLE VI.

On the Culture and Management of Rhubarb in Tartary; Method of using the recent Plant; curing the Root; Nature of its selenitic Salt, &c.

[By A. F. M. D. F. R. S.]

GENTLEMEN,

THE attention, which you have deservedly bestowed on the subject of RHUBARB, induces me to believe that a few additional observations, which have occurred to me since my last,* may not be unacceptable, particularly to those who wish to improve the culture and management of the plant in this country.

Mr. J. R. FOSTER, in his history of "VOYAGES TO THE NORTH," very lately published, informs us, from the most authentick accounts, that at Suchur, a province subject to the Great Khan of Tartary, where the true plant flourishes in the greatest abundance, and from whence the merchants carry it all over the world, the country is rocky and mountainous, the soil red with a stratum of stone under it, sometimes boggy, being every where intersected with numerous rivulets.

* Inserted in the Society's Third Volume, Art. LVI.

At Kathay, and some of the more remote provinces, this root is held in no estimation, except for the diseases of horses, and for the purpose of common fuel. But at Suchur, where its value is better understood, its culture and management are duly attended to, and their method seems worthy of imitation in Great-Britain. The plant, in its native soil, flourishes luxuriantly, and the roots, when arrived at their full growth, are of an enormous size; the larger ones often measure three quarters of a yard in length, and are of the thickness of a man's body.

The roots are dug up in winter, before they put forth leaves, because they then contain the entire juice and virtus of the plant; those that are taken up in summer being of a light spongy texture, and unfit for use. The root being thoroughly cleaned, is cut transversely, and the pieces are placed on long tables, and turned carefully three or four times a day, that the yellow viscid juice may incorporate with the substance of the root. If the juice be suffered to run out, the roots become light and unserviceable; and if the roots are not cut within five or six days after they are dug up, they become soft, and decay very speedily.

Four or five days after they are cut, holes are made through them, and they are hung up on

strings exposed to the air and wind, but are sheltered from the sun-beams. Thus in about two months, the roots are completely dried, and arrive at their full perfection. The loss of weight in drying is very remarkable, seven loads of green roots yielding only one small horse-load of perfectly dry Rhubarb! Concerning the age at which the roots are dug up, our author is silent; nor does this point seem yet to be clearly ascertained. Some contend, that it arrives at its highest perfection in six or eight years; while others assure us, it ought to continue in the ground till the 10th, or even 12th year, before it acquires its full maturity. •

Since the *Rheum Palmatum* has been cultivated in England, we have not heard of any use having been made of the recent plant. The Tartars, however, hold it in high estimation. Mr. THOUIN, superintendant of the exotics at Versailles, informs us, that the recent stem is converted into a marmalade, and is considered as a mild and pleasant laxative, and highly salubrious. They prepare it by stripping off the bark, and boiling the pulp with an equal quantity of honey or sugar. The leaves are employed in their soups, to which they impart an agreeable acidity, like that of sorrel, which ranks in the same class with rhubarb. The seeds of the English plant contain the medicinal virtue of the root
in

in an eminent degree, as I have already hinted in my last,* and seem worthy of further inquiry. The selenitic salt, which I also there mentioned, has been but very lately discovered to be a constituent principle in rhubarb, and other astringent vegetables. The ingenious Mr. SHEELE pronounces it a combination of the acid of wood-sorrel with a calcareous earth. Should this be found to obtain universally throughout that class of vegetables, it may help to enlarge our views concerning the nature of their astringent principle.

I am, Gentlemen, your very humble servant,

A. FOTHERGILL.

* See the Society's Third Volume, as above.

ARTICLE VII.

On a more speedy Method of propagating Rhubarb.

By Mr. HAYES, Surgeon, at *Hampstead*.

[Communicated by Dr. FOTHERGILL.]

GENTLEMEN,

Feb. 15th, 1787.

Notwithstanding much has been written on the means of cultivating a very valuable root, the RHEUM PALMATUM; permit me to add my

mite to the general stock; as I think, by the following method, the plants may be raised in less time, and with greater certainty.

Having found myself disappointed for many years back, in raising the rhubarb plants from seed, in the open borders of my garden, I was induced to try what success I should have by separating some of the eyes or buds, which shoot out on the upper parts of the root, together with a small part of the root itself, with some of the fibres to it; many of these may be seen, both in the spring and autumn, on plants of three or four years old. My success was equal to my expectation; and all the rhubarb plants which I now grow, are raised after the above-mentioned method. I have just separated twenty eyes or buds from a plant of four years' growth, which plant was itself raised the same way. The old plant is not at all injured, by taking the eyes from it, but is suffered to grow till it be seven or eight years old, or sometimes longer, as the quality of the rhubarb, as well as the size of the root, will be much increased, if it lie in the ground till it be ten or twelve years old.

By the above method, I save a year in the growth of the plant; it is not in such danger of being eaten by vermin as seed, nor so uncertain of its growing;
it

it is not so tender, neither does it need transplanting, or any other care than keeping the ground clear of weeds. I have not found any difference in the size of the roots thus raised, from those which are raised from seed. I think my friend Sir Wm. Fordyce (whose views to enlarge science in general are unceasing) has remarked the uncertainty of the seeds of rhubarb coming up; and has pointed out, in the papers published by the Society of Arts, &c. in London, some means to render them more certain. Perhaps the above method may be thought preferable: if it should not, please to accept the will for the deed; and believe me, that to be useful is the only design of,

Gentlemen,

Your most obedient humble servant,

THOMAS HAYES.

ARTICLE VIII.

Account of a Plant of the Rheum-Palmatum, grown at Boreatton in the County of Salop.

[By a GENTLEMAN of that County.]

THIS plant, the sixth year after it was sowed, grew between the months of April (when the stalk first appeared out of the ground) and the middle

middle

middle of July (when it was at its greatest perfection) to the height of 11 feet 4 inches: when an observation was made on its growth, it grew in one day 3 inches, and in one night above 4: many of the leaves were above 5 feet long, the numerous branches all covered with blossom, and then with seed; in the latter state by much the most beautiful. In October the seed was quite ripe, and the plant died down to the ground; the root was then taken up, and weighed 36lb. when clean washed and deprived of its small and usefess fibres. The method I took to cure it was as follows:—I pared off the outer rind, divided it with a sharp knife into pieces of about an ounce weight, and then bored them through, strung them on packthread, and hung them in the windows of an hot-house to dry. Some few I dried quick in an oven moderately heated, and did not find much difference; those I attempted to dry in the shade became mouldy and usefess; I should guess the whole when dried, reckoning the supposed weight of those pieces I spoiled by the last method, would have amounted to about 10 or 11 lbs. Of the refuse pieces, such as small roots not thick enough to dry, I made a strong infusion in white wine, which I used with great success in the dysenteries of cattle; and some given occasionally to poor people, when I thought it proceeded from cold.

THE METHOD OF CULTURE.

Sow the seed in your early cucumber bed, when a little of the first heat is over. When the plants have got their third leaves, expose them to the air; and when the season advances, remove the frame, leaving them in the bed:— in October or November take up the plants, the roots of which will be about half an ounce weight, and bury them under the mould prepared for the next year's hot-beds; the February following, plant them in an artichoke bed, which ought to be of the deepest black garden mould, at least $2\frac{1}{2}$ feet deep; after which they are to be treated in all respects like artichokes, and about the sixth or seventh year taken up for use:—you may cultivate them from off-sets, when you take up a plant, but I think those raised from seed better. I have never been able to obtain any seed from my plants since that large one, the birds ever since having constantly destroyed it before it was ripe.

Nov. 29th, 1783.

J. S.

ARTICLE IX.

Observations on the Growth of some Rhubarb, sent to the Society by GEORGE POOLE, Esq.

GENTLEMEN,

Bicknoller, Somerset.

March 16, **T**HE Rhubarb seeds were sown in 1779. the natural ground, and the 20th of March following the plants were removed from the seed-bed, and planted in a piece of garden ground

ground 44 feet long, and 22 feet wide, divided into four beds of about 5 feet each bed; holes 20 inches deep were made for each plant, and two ranks of plants in each bed, 3 feet asunder, (which I think is too near by a foot.) The ground was kept very clean from weeds, and every year in the month of October was dunged, the same as for asparagus, and cleaned off again the spring following.

Nov. 15, 1782, one of the borders of rhubarb was taken up; and of the roots, after they were cut, cleaned, and dried, there was left 54lbs. of good rhubarb; 50lbs. of which were sold in May last to a druggist in London for £10.

In September 1783, the other three rhubarb borders were taken up, and produced 166lbs. of rhubarb of equal quality with the rhubarb herewith sent. The remainder of the rhubarb roots were produced from some plants that grew in an orchard of very poor land. The rhubarb roots lost in drying about two-thirds. I am of opinion that the rhubarb going to seed (which will be in four or five years from sowing) lessens the weight of the roots, and tends much to its putrefaction; therefore it would be adviseable to cut off the seed-stalks as soon as they appear. The crowns of the plant, when

when cut off and put into the ground again, will produce tolerable good rhubarb in four or five years, but not so large and plentiful as from seed plants.

The purging quality of this rhubarb is, I apprehend, not so strong as the foreign rhubarb; 30 grains of this rhubarb powdered being equal to about 20 grains of foreign rhubarb powdered. *Quere*;—If rhubarb seed mixed with clover seed, and sown with barley in deep rich lands, and permitted to remain four or five years, would not turn to much advantage, apprehending cattle of any sort would not hurt or eat the leaves? This is an experiment I purpose to make this spring. G. P.

ARTICLE X.

On the Danger of using of Lead, Copper, and Brass Vessels, in Dairies.

By Mr. THO. HAYES, Surgeon, at *Hampstead*.

[Communicated by Dr. FOTHERGILL.]

GENTLEMEN,

Feb. 18th, 1787.

MANY eminent physicians have asserted, that butter is very unwholesome; while others equally eminent have considered it as not only innocent, but as a good assistant to digestion; and each

each have been said to ground their opinions upon experience. Perhaps both may be right; and after all butter may be innocent or mischievous, according as it contains many or few adventitious materials collected from vessels, &c. used in the process of making it.

I am led to these conjectures by observing, that in almost all the great dairies, the milk is suffered to stand in lead, brass, or copper vessels, to throw up the cream. The closeness of the texture of these metals, and their coldness and solidity, contribute to separate a greater quantity of cream from the milk than would be done by wooden trundles, or earthen pans, both of which are also sometimes made use of.

As I wish to establish the possibility of the fact, that milk may corrode or dissolve particles of the vessels above-mentioned, and therefore be liable to communicate pernicious qualities to the butter, I beg leave to submit my reasons, from which I draw this conclusion; and if my opinion should appear satisfactory to you, I make no doubt but you will do all in your power to discountenance the farther use of them; especially as I shall point out others, which may be made, and will do as well for the dairyman's purpose.

Whoever

Whoever has been much in great dairies must have observed a peculiarly sour, frowsy smell in them, although they be ever so well attended to in respect to cleanliness, &c. In some, where the managers are not very cleanly, it is extremely disagreeable, owing mostly to the corrupted milk.* In some, too, from the utensils being scalded in the dairy; and in others, from a bad construction of the building itself, the want of a sufficient circulation of air, water, &c.; but in all, a great deal of the lighter or more volatile parts of the milk fly off from the surface of the pans, and furnish a great quantity of acid effluvia to the surrounding air and ceiling, and which is again deposited on every thing beneath it, and of course often on the vessels after they have been put by clean, in the intervals of their being out of use. This may be observed to give a dull sort of appearance to brass and copper, as if you had breathed upon them; for if you rub your finger lightly over the vessels, you will have both the taste and smell of the metal.

It also happens sometimes, that after the vessels are washed, they are not carefully rinsed, nor perfectly dried by the fire; so that some of the milk, &c. is left on the surface of them, which may

* See a very ingenious paper by Mr. HAZARD, in the Third Volume of the Bath Society's Papers, on making butter.

dissolve

dissolve the metals, either by its animal, oily, or acefccent qualities.

This is not the only way, nor the worst, by which the butter may become impregnated with mischief. The greater the quantity of cream that is thrown up from the milk, the larger profits accrue to the dairyman; therefore he keeps it in the vessels as long as he can, and it is frequently kept 'till it is very sour, and capable of acting upon them; if they are of lead, a calx or sugar of lead is produced; if of brass or copper, verdigrise.

It is true, the quantity cannot be very great; but this will depend upon the degree of sourness, and length of time which the milk stands:—but independent of the acid, the animal oil in the cream will dissolve brass and copper.

That an acid floats in the atmosphere of a dairy, may be proved by placing a basin of syrur of violets for a little time, and it will be found to turn red.

Then, gentlemen, if I am right in my conjectures, as I am persuaded I am, from the innumerable experiments and observations which I have made to satisfy myself of the fact, and which would be
trifling

trifling with your time and patience to relate here, —may not the reputation of the wholesomeness or unwholesomeness of butter, depend upon, or be owing to some of the above causes? And may not many a casual, nay, obstinate complaint originate from the same source, which the physician may have in vain laboured to account for? Butter is found very frequently to occasion much disorder to very weakly, delicate, and irritable stomachs; yet these stomachs will bear olive oil:—this cannot be therefore accounted for from the oleose parts, but may from the metallic impregnation.

I will not contend, that all the ill effects attributed to butter are caused by the mineral particles which it gains by the means above stated. I only insist that it is possible, and indeed very probable, and that it may in consequence do frequent mischief; and that when butter is free from these particles, it is not so unwholesome as some have asserted; though when it does contain them, it is found to disorder very tender persons.

To enlarge upon the subject, or attempt to explain the many ways and how a very small portion of the above metals may prove injurious to the human frame, in some particular constitutions, will be only to repeat what has already been said
by

by abler writers.* Some will perhaps say that my ideas are very far fetched, and others that my opinions are ill-founded; but I trust whoever has read the industrious researches of the very learned Sir GEORGE BAKER, on the effects of lead, and the melancholy case of a young lady having died from eating pickle samphire very lightly impregnated with copper, and which others ate without being diseased, as related by the ingenious Dr. PERCIVAL, will receive my opinions with less objection. If I have erred, I have done it in honourable company.

If you think with me, gentlemen, I hope you will have some influence over the dairymen, to induce them to change their utensils, as very commodious vessels may be made of cast-iron equally well fitted for their purposes, which will not prove expensive, and will be more innocent and cleanly. But if they continue in the habit of using those above-mentioned, after they are informed of the bad tendency of them, they must be guilty of a great breach of moral duty, and highly blameable, both in a religious and political point of view.

* See Sir GEORGE BAKER's papers on the effects of lead, in the Medical Transactions;—Dr. PERCIVAL's paper in the same;—and Dr. FALCONER also on copper vessels.

I beg pardon for thus trespassing upon your time and patience, but I trust you will excuse my errors, and also my prolixity, since it has for its object the preservation of the health and happiness of my fellow creatures.

I am, Gentlemen,

Your most obedient humble servant,

HAMPSTEAD,
Dec. 5th, 1786.

THO^S HAYES.

ARTICLE XI.

On the Culture of Rape or Cole Seed.

THE proper time to sow Rape, broad-cast, is the month of June; the land should, previous to the sowing, be twice ploughed and well pulverized; when about two pounds of clean seed will suffice for every acre, which should be equally cast upon the ground with the two fore-fingers and the thumb; for if it be cast with all the fingers, it will come up in patches, and be the means of wasting seed. When the plants appear, if they come up too thick, a pair of light harrows should be drawn, length-ways and cross-ways, over the land; this will equally thin them, and when the plants (that the harrows have pulled up) are withered, the

ground should be rolled, and a few days after the plants may be set out with a hoe; 16 or 18 inches is the distance proper for each plant to flourish in.

In the North of England, the farmers pare and burn pasture lands, and sow them with rape after one ploughing; which crop commonly stands for seed, and will fetch from 25l. to 30l. per last,* for the purpose of making oil. Poor clay, or stone-brash-land, will frequently produce from 12 to 16 or 18 bushels per acre, and almost any fresh or virgin earth will yield one plentiful crop. Many in the Northern Counties, by cultivating rape, have been raised from poverty to the greatest affluence. The seed of it is ripe in July or the beginning of August; and it is surprising to see with what avidity people flock to a rape threshing (as it is called in the North). It is an absolute feast; a violin is constantly played in the field, while the business is performing; the best of provisions are procured, and a rural dance concludes the evening's diversion: mirth and good-humour mark the happy countenances of all who assemble; and those who are or are not invited, equally partake of the provisions and pleasures of the day.

The rape is cut by men with hooks or sickles, and spread thinly on the ground to dry, and when

* A last is two loads—ten quarters—eighty bushels.

it is found in order for threshing, the neighbours are invited, who endeavour to render themselves useful. A number of cloths are in readiness, for the purpose of carrying the seed to the threshers; who perform their business on a large cloth in the middle of the field—and here the fidler displays his skill.

The seed is put into sacks and conveyed home; and a field of 20 acres or more is completely harvested and threshed in one day upon the spot; nor will rape admit of being carried from the ground in the pod, as it must be perfectly ripe, and would therefore shed or scatter; the straw the farmers burn, and dispose of the ashes, which are allowed to be as valuable as the best pot-ashes.

Rape that is suffered to stand for seed, will very much impoverish old arable land; but pasture lands, that are previously pared and burned, will bear two or three good crops of corn after, without manure.

The price for paring and burning, varies in different counties; in Yorkshire, and still further north, it is performed for from 10s. to 15s. per statute acre, and in the south and west parts of England, the price is from 16s. to one guinea.

Rape is an excellent food for sheep, and for this purpose it will answer well on arable land; but it should be hoed and set out as before directed, and it will be the stronger, and produce a much heavier crop, if it be looked over a second time, and the earth be drawn round the stems; and should there appear any places where the crop has failed, it will be right to draw plants where they are found too thick, and plant them in the bare places; by which means a more general and equal crop may be expected; and that which is transplanted, will be superior to any of that which has never been removed.

The writer has experienced the good effects of transplanting rape, and begs leave strongly to recommend it; he advises a plot of ground of about a rood, to be sown in the middle of June; this will produce plants enough for ten acres, which may be planted upon land that has previously borne a crop of wheat, provided the wheat is harvested by the middle of August: one ploughing will do for these plants; the best of which should first be selected from the seed plot, and be planted upon ridges at least two feet asunder, and sixteen inches apart in the rows; they may afterwards be horse or hand-hoed, and the earth should be drawn round their stems; and in the spring of the year this crop may be

be

be fed off with sheep, when very little other green fodder is to be found, or the leaves might be gathered and given to oxen or young beasts; from the same stems fresh leaves would sprout again, and these might be fed off by ewes and lambs, time enough to plough the land for a crop of barley or oats; but it must not be forgot that planting rape upon land the beginning or middle of July, would be the most advantageous as to the crop of rape, as the leaves might be then fed off in the autumn season, and they would still produce other leaves anew in the spring; and this method of early planting might be adopted where pease or beans had been gathered green, and sent to a market, or where any kind of pulse or green fodder had been fed off the preceding spring.

The expence of planting rape varies according to the price of labour in the different counties; but the most general price, where rape is planted on ridges two feet asunder and sixteen inches apart in the rows, is 2s. 6d. or 3s. per acre; but where every plant is to be equidistant, or 16 inches every way apart, on a flat surface, 3s. 6d. or 4s. per acre is about a fair price, provided in either case the grower finds a woman or boy to draw the plants from the seed plot, and to drop them before the planter. When they are thus planted, they may be hand-

hoed and earthed for 4s. 6d. per acre; but where rape is sown broadcast, few will be found to hoe and set the plants out at equal distances, and earth them for 7s. per acre, nor will the plants ever flourish equal to those which are planted; therefore it is obvious which method is to be preferred.

The practice of sowing rape and turnips (if they are afterwards suffered to stand together) is by no means commendable, as it is not possible to hoe or set out both sorts to advantage. If the rape flourishes best, the turnips should be destroyed, and *vice versa*; otherwise the crops would injure each other, as the lateral fibres of the rape would be prevented from expanding, if surrounded with turnips; and in frosty weather the water or dews would drop from the leaves of the rape on to the turnips, and totally rot and destroy them. It is a common practice with farmers to feed such crops with sheep, and afterwards to plough up the land for wheat; on which account it appears unnecessary to them to hoe or set out either crop; but let them consider, if it be right to sow turnips and rape, it is equally to their advantage to hoe them; as the hoed crop will produce a burden at least five times larger than the crop that is not hoed, this will amply defray the expence, and it should be a constant rule always to destroy the weakest crop.

Those

Those who look for an immediate profit, will undoubtedly cultivate rape for seed, but it may answer perhaps better in the end to feed it with sheep; the fat ones might cull it over first, and afterwards the lean or store sheep might follow them, and be folded thereon; if this be done in the autumn season, the land will be in good heart to carry a crop of wheat; or where the rape is fed off in the spring, a crop of barley might follow; in either case rape is valuable to the cultivator; and when it is planted and well earthed round the stems, it will endure the severest winter; but the same cannot be advanced in favour of that which is sown broadcast.

I flatter myself the foregoing observations will prove acceptable to the society, and useful to gentlemen farmers in general, who may wish to cultivate rape either for seed or fodder.

I am, Gentlemen,

Your very humble servant,

Stoney-Littleton.

J. HAZARD.



ARTICLE XII.

[*The following Letter was drawn up for the more immediate Use of the "ODIHAM AGRICULTURE SOCIETY," who had done the Writer the Honour of electing him an Honorary Member;—but being thought generally beneficial, its communication is extended.*]

ON THE MEANS OF PRESERVING APPLE BLOSSOM AND
ORCHARDS FROM INJURY.

SIR, *Beerferris, near Tavistock, Devon.*

I Do not recollect that yours is a noted cyder county, yet I take it for granted, some gentlemen have orchards, and the rarer the more valuable. This parish, which is my summer residence, abounds with orchards and cherry-gardens; the orchards, by their blossoming this spring, promised a much larger quantity of apples than they will actually produce; not occasioned, however, as the farmers here imagine, by the frosty nights of the first and second of last month, but by the ravages of an uncommon number of *insects*, which have been produced this season from a species of black flies in particular, which deposited their eggs in the apple-bud, or blossom, at its first opening; from which eggs were generated the maggot insects, which

which by feeding on the heart of the bud or blossom, soon occasioned it to drop, contract, and close itself into the form of a cup, of a brown red colour, resembling that of a dry dock-leaf, (unless this was originally caused by the bite of the fly, when she deposited her egg there) so as to afford a safe nidus for the young insect, and sufficient nourishment to support it, until full grown in that state, and needing no longer protection there; when it decamps, and the blossom being destroyed, at last falls off—whereby a plentiful blossoming is likely this year to produce (as is often the case) a scanty bearing.

I have within a few weeks past opened some scores of those shrivelled blossoms, and scarce ever failed of finding a maggot insect (some much larger than others) safely inclosed within its natural nest; though in some instances I found it had decamped, after having exhausted its nutriment, and the decayed blossom was ready to fall off with the slightest touch.

Having thus given you a plain concise account of the evil, permit me, Sir, to point out what I conceive will be an *effectual remedy*, or rather preventive; and will likewise contribute to the fertility of the soil, the prosperity of the trees, the future produce of apples, and the goodness of the pasture.

When

When the winged insect tribe first begin to appear, (which some conceive, and not improbably, to be by an east wind bringing some sorts at least of them over from the continent) I would recommend some heaps to be made of the sward or spind, in the nature of denfiring or burnbaiting, or heaps of long dung, wet straw, weeds, or any other like matters, at different intervals all around, *i. e.* on every side, and likewise some in different parts of the orchard. If an east wind blow, set fire to some of the heaps on the east side, and some within the body of the orchard; if a south wind, then on the south side; and so occasionally on different sides, as the wind may happen to vary; but always on that side from whence the wind happens to blow, so that the smoke from the smothering of the heaps may blow through and fumigate the orchard for some weeks. The expence attending which will comparatively be very trifling, but its consequences and beneficial effects very great, as it will effectually prevent the insect fly not only from depositing its eggs, but even from approaching, or at least continuing long in such a noxious situation, whereby the blossoms and fruit will be preserved from such ravages, and the heat and ashes of the smothering heaps will likewise contribute to the fertility of the soil, the sweetness of the pasture, and the growth and vigour of the trees

for

for future bearings; thus destroying *moss* probably better than by any other means, and counteracting the effects in some measure of cold and blighting winds, and such late frosty nights as those of the first and second of last month.

I am, Sir, your's, &c.

June 3, 1786.

C. GULLETT.

P. S. It seems superfluous to add, that the same process is applicable, and promises to be equally advantageous, to *all other fruit trees*, if suitably adapted in point of time and other circumstances.

ARTICLE XIII.

Success of an Experiment of fumigating an Orchard.

SIR,

Nov. 23, 1786.

THE foregoing letter was drawn up on the day it bears date, the 3d of June last, and was intended to have been communicated at that time, but a diffidence of publishing my theoretical ideas, unaccompanied by facts, prevented; and accordingly it hath lain by ever since, and so would have continued but for the following information.

Since

Since this idea first occurred to me some years ago, I have occasionally mentioned and recommended it in strong terms, to very many gentlemen farmers, cyder growers, and others, both in the east and west parts of Devonshire, and in Cornwall; but so little are recommendations of any innovation or improvement heeded, especially by the generality of farmers, that I have never heard, till very lately, of any one having put it in practice, and that one instance occasions my troubling you with it, as the success of this farmer may induce others to adopt it, until *the fumigation of orchards*, in blossoming season especially, becomes general; and a most precarious crop is thereby rendered as sure and certain as a crop of corn.

I have been well informed then (at first by a gentleman farmer, with great glee and satisfaction, to whom I had some years ago recommended it) of a farmer in the eastern part of Devonshire, who this spring determined to give a fair trial to the success of fumigating orchards; and in order thereto, made choice of one orchard to be fumigated, leaving another (similarly situated and circumstanced) unfumigated. The event of which was, that the *fumigated* orchard had a very large and plentiful bearing of apples, to his no small emolument; which he attributes, and I believe, very justly, to
this

this fumigation alone; while the *unfumigated* orchard and neighbourhood had scarce any apples at all.

Your most obedient servant,

CHRIST. GULLETT.

ARTICLE XIV.

Means of insuring full Crop of Turnips.

SIR,

Exeter, Nov. 24, 1786.

THE very great failure of Turnip crops, so generally and almost annually complained of, in different parts of the kingdom, have occasioned a variety of recipes to be published, but which on trial too frequently fail. The turnip seed itself seldom fails to vegetate, (especially if sown just before rain falls, and as some say, if left to itself, neither harrowed nor rolled, when sown dry and rain soon follows) but the damage is occasioned in its subsequent state of leafing, by the voracity of *insects*. To prevent this, seems the grand *desideratum* in turnip agriculture; and a most desirable one indeed it certainly is, as the loss in turnip crops this summer, in *Devonshire* alone, is calculated at upwards of 100,000*l.* The use of steeps, &c. for the seed, however, appears to me very little likely

to

to produce this effect. In lieu of all which, I beg leave to recommend the adoption of the following idea, which hath occurred to me, in the course of writing my preceding letter dated yesterday; of the certain and never-failing effects of which, in the most satisfactory manner, I will not hesitate to express an absolute confidence.

The damage in orchards is done by insects, so it is here, though of a different species; the former effected by the insect in its maggot state, the latter by the fly: but as the fly is the original cause in both, so the same means are applicable in both cases; and therefore let the farmer make himself master of the method I have recommended for the security of apple blossom, and very little more need be added here.

If the turnip ground be spaded and burnt, or the weeds, &c. burnt without spading, the fumigation thereby may suffice to chase such of the insect winged tribe from thence as are then there; but in all cases, when the field is ploughed and ready for sowing, let heaps be made at different places and intervals round by the hedges and boundaries of the turnip ground, and some few scattered through the field, in the same manner as directed for the orchards. Then, as soon as the seed is sown, let the
heaps

heaps on the *windward side*, and the scattered ones, be lighted and kept smothering during the continuance of the wind in that quarter; the less the fire and the more the smoke, the better. Should the wind happen to shift, those heaps on the quarter it shifts to must then be lighted, and kept smothering in like manner; so that during the growth of the tender turnip leaf, and until it becomes rough and out of danger, this fumigation and smoke over and across the field must be continued from one quarter to the other; which, I venture to assert, will effectually deter and prevent any winged insect tribe from approaching the turnip ground; nay more, if there already, it would most completely drive them from thence, as such delicately formed insects (which can only feed upon the most tender leaf) would be ill able to continue long in such a smother of fire and smoke. The consequence is obvious and certain, that if the fly be kept from approaching the field, *the turnip crop is safe*—and few, I believe, will disagree with me, that *prevention is better than remedy*.

I am induced to be the more sanguine of the success of this method, from the great success, which on many trials attended a similar idea of mine, for the preservation of cabbage plants from caterpillars by means of elder bushes, which was
 inserted

inserted in the Sixty-second Volume of PHILOSOPHICAL TRANSACTIONS," about the year 1773; from whence it was copied into the *Annual Register*, magazines, and periodical and other publications.

In order, however, to be sure not to fail of obtaining the full effect and utmost safety, (though it seems a work of supererogation) let me, in addition to the above fumigation, recommend it to the farmer, who harrows or brushes in his turnip seed, to add to his harrow or thorn-bush, a bush of stinking elder, [SAMBACUS] the dragging which over the field will leave such a disagreeable smell and effluvia behind it, as might, and would, I think, be sufficient alone, without fumigation, (as was the case with butterflies and of the caterpillars above alluded to) but when united with fumigation, no farmer who adopts this recommendation, I will venture to promise him, need be at all uneasy in future about the success of his turnip or *any other* vegetable crop; and such as know it, and refuse to adopt so cheap a remedy, deserve little pity, if their crop is devoured by the insects.

I could proceed to apply a similar remedy for *wheat crops* from being damaged by the yellows and other insects; of which I have discovered upwards of forty living ones, inclosed within the husk
of

of a single *grain* of wheat, as stated in the above caterpillar history, to which I refer; but *that* must be the subject of a future letter.

If it should be asked,—What would become of those most numerous tribes of prolific insects, if this method should become general? I most seriously answer, that I firmly believe not a thousandth part of them would trouble us in a few years hence. And in a *philosophical* light, I cannot but consider that such very general fires and fumigations throughout the kingdom, would tend very materially to the rarefaction, purifying, and improvement of the state of the atmosphere, and procuring healthy seasons.

As I consider this an object of consequence, I lose no time in conveying these my sentiments to you for the good of the publick, which is the object of your laudable institution, as well as of my amusement at leisure hours.

Your most obedient servant,

CHRIST. GULLETT.



ARTICLE XV.

On the Culture of Mustard;—Remarks on the Trifolium Alpestre;—on the Necessity of Change of Artificial Grass Crops, &c. &c.

SIR,

Stisted-Hall, Essex, Dec. 14, 1786.

IN order to answer, as satisfactorily as I could, your enquiry about the cultivation of mustard, I sent for one of the *seed-cultivators*, of which there are several in this neighbourhood; especially about *Coggeshall* and *Kelvedon*. These men hire, at very advanced rents, a few choice acres of the farmers; cultivate them, merely for the seeds of various species of pulse, roots, herbs, and even some flowers, with the utmost gardening neatness; and speculate upon the chance of produce, sale, and price, in which they have some little portion of the acuteness of an alley-broker,—like him fluctuate from very great profits to some losses: but if they can stand out contingencies, succeed upon the whole amply enough.

The white mustard requires rather an heavy soil, which must by tillage be brought into a nice mould; must be sown in March at one bushel an acre; be always twice, and frequently three times, hoed, and set

set out at about ten inches plant from plant. The crop is reaped in August, and leaves the land in sufficient tith for any crop of other grain or corn that may be chosen to follow it: the *medium* produce three quarters per acre, and the medium price 10s. per bushel. Mustard never follows mustard; but may be sown on the same land again in the third year. The first hoeing is worth 4s. the second and third 3s. per acre.

I never saw the marle-grafs you mention; but observe, you affix the same Latin name to it as you did in my letter [Article xxxiv.] inserted in your last volume—*trifolium alpestre*, to what I there called cow-grafs; and which is, *trifolium purpureum pratense*; and from the trial I there mentioned to you, appears to me a most valuable species. The *trifolium alpestre* is, I apprehend, the *real* cow-grafs; though the other is, at the feed-shops, sold under that name. Your society therefore, if they have acquired any quantity of the seed of the *real alpestre*, which has been thought to be *particularly rare*, will bring a very great acquisition to agriculture in one of its most essential points.

Here common clover frequently, through the accident of seasons, rather than quickness in cropping with it, will fail. In Norfolk, where it has

usually come over again at every fourth crop, this failure, from the land being surfeited with it, has been in many instances so great, that a very considerable farmer there lately informed me, that he and many of his neighbours had lately under their barley sown rye-grass and trefoil; and in only the *next* rotation of barley sown the common clover; and so on alternately: for not less in artificial grass than corn, change and variety, under the *common husbandry*, is essential to the produce.

The very barley in Norfolk, probably from the same cause, has of late years, it is said, degenerated in fineness, besides varying more in the rotation of crops.

Our farmers defend the mode of the *whole year's fallow*, on the principle of its guarding against such surfeit; and thus by the delicacy of the sowing tilth it necessarily produces, making the proper bed for minute grass-seeds, and giving them the best security against the failure of their clover. They frequently mow it for hay, and then feed it, or for the chance of the latter, (a very dubious, though sometimes a most profitable one) feed it off first early; but very seldom let it remain a second year. I *conjecture*, that where it must necessarily come in quick rotation, it should never stand but one year, and

and in that be *constantly fed*; it may then alone be regarded as a *meliorating* crop, but otherwise as a *wearing* one; and a distinction of it is thus made in some of our leases. In the one instance the land is *probably* forfeited, by pushing forth into full bloom such a strong crop, and continued too perhaps to a second year; in the other, it is cherished by its pasturage, and improved by its being early turned in. When intended for merely one year's feed, any of the other artificial grasses may, to secure a plant, be sown with it.

My present wheat is on the rye-grass ley, mentioned in your third volume, [Article xxxix.] and appears as perfect as on one of clover. My field for early feed of next spring is also rye-grass *thickly sown*, and, as a little trial, I have sown with it, in one portion, some trefoil; in another, the perennial white; and in the third, perennial red clover, commonly termed *cow-grass*.

However congenial to the soil of a farm any peculiar species of corn, pulse, or vegetable, may appear; the chance of a secure crop from them, in a large scale, under, as I said before, the *common husbandry*, will in general be in a proportion to their not being sown too often:—the variableness of our climate corrects so frequently, or brings to such a

fort of equality, the variety of one soil, that in proportion to the necessities of his usual stock, the conveniency of culture, and the benefits of rotation, as corn, pulse, or artificial winter herbage, and spring grass, may, though not in equal, yet in some proportion, be advantageously raised on soils, in appearance improper for one or the other of them, by every attentive farmer ; and his profit in a long lease, on this broad basis of rough agriculture, be at the end more secure, though occasionally it cannot be so great. I am, respectfully your's,

CHARLES ONLEY.

ARTICLE XVI.

Account of the Cultivation and Produce of a Crop of Buck-Wheat.

[By a GENTLEMAN FARMER, to the Secretary.]

SIR,

A GREEABLE to your request, I send you the following account of the cultivation of $11\frac{3}{4}$ acres of Buck-wheat.

The inclosure No. I, containing seven acres, was a deep, friable, sandy loam ; its aspect a gentle slope towards the south. In 1784, it produced a very
poor

poor crop of wheat, being smutty and very full of weeds. The wheat-stubble was ploughed up in November following, and a good coat of dung spread over it. In this state it remained till the middle of last May, by which time it became full of couch and other noxious weeds.

The soven of a tenant then giving up his lease, I had the furrows turned back, then cut across, well dragged and cleaned with a couch-harrow—an excellent implement for dispatch—a horse, man and boy, doing in a day as much work as a dozen people with rakes. Next I gave a deep ploughing lengthways, harrowed and couched again; which brought the land in fine tilth, and exceeding clean. I finished sowing about the 1st of June, and harrowed and rolled afterwards. The buck-wheat came up about two inches high, regular and even, when the long drought commencing checked its growth, and cast a sickly yellow hue over the whole, particularly under the hedges, where it lay as flat as if cut off, a considerable quantity being burnt almost to a coal. In this condition it continued languishing for about six weeks, when a fine shower produced an amazing alteration; it immediately reared its drooping head, and tillered out into branches six or eight in general on a stalk.

The

The appearance was now agreeably changed, the whole field being covered with a most beautiful white carpet; and an innumerable multitude of bees buzzing in every part, presented a scene truly romantick. From this time through the summer, it continued matting together, growing and blossoming till full a yard in height, promising a fine crop. To appearance the seed kernald remarkably well, several people who went to view it, concluding there would at least be a load upon an acre. The second week in September, began mowing, and turned about two acres; but perceiving, as the haulm was so long and stalky, that in turning a vast quantity would be shed out, I ordered a couple of men to go to two swarths, and take gently up a small quantity, and place each parcel against its fellow, between the swarths, the seed uppermost:—by this means the sun and air circulated freely through the haulm, drying it faster than turning would have done. Once setting up sufficed, besides the advantage of preserving the seed. Before it was dry enough to harvest, the wet weather commenced, which obliged us to keep it frequently moved to get it in order, as well as to prevent the seed growing; of consequence this occasioned the loss of a considerable quantity, and delayed housing it till the beginning of October.

The

The buckwheat left this piece in exceeding fine condition for wheat, not a weed or scarce even a blade of grass was to be seen throughout the whole. Observe:—An acre of this piece was sown with turnip-rooted cabbage, for an experiment; which failed, though the plants came up thick enough; yet after hoeing and weeding, they made such little progress, that the weeds got the ascendancy and choaked them. Deduct likewise about forty lug of grubbed hedge-rows, and a road running up the middle, which is included in the seven acres.

The fields No. II. and III. contained, the one four, the other two acres, somewhat stronger land than No. I.; the exposure a gentle descent towards the east, except about an acre lying hollow, which is subject to be overflowed after heavy rains. These pieces were oats in 1784. As soon as No. I. was sown, I gave them one earth; the weather being likely to continue dry, I harrowed and sowed directly. A little of the seed came up between the ridges, where the ground was somewhat moist; the rest remained as dry as when sowed till July, when the rain that occasioned No. I. to flourish so much, caused this to make its appearance; but it was very irregular, straggling and weak. It soon came into bloom, tillered but little, and grew slowly, scarce attaining above a foot or 18 inches in height, and fore-
boding

boding but a lamentable crop. However, it was some amends to have a fine season for harvesting, which was finished by the 8th of October. The land was in tolerable order for the ensuing wheat crop, though nothing to compare with No. I. it not ploughing so free and mellow; besides the couch was got up, particularly in No. III. which is the wettest of the two pieces.

The expences of cultivation have been very heavy, as you may judge from the neglect of the late occupier, and its being at a distance from home, on which account I have been obliged to hire for every thing. However, I have endeavoured to state accurately every expence which ought to be charged, as follows:—

INCLOSURE No. I.— <i>Debtor.</i>		<i>£.</i>	<i>s.</i>	<i>d.</i>
To ploughing 5½ acres in Nov. 1784, at 7s.		2	0	3
Four horses and 2 men, dunging 2 days, at 9s.		0	18	0
To ploughing 3 times in May 1785, at 6s.	-	5	3	6
Dragging, 4 horses and a man, 1 day	-	0	8	0
Couching and carting off with 2 horses and 2 men, 2 days	-	0	10	0
Nine bushels of buckwheat, at 5s.	-	2	5	0
Sowing and rolling	-	0	4	0
Rent	-	5	15	0
Tithe compounded for	-	1	1	0
Poor-rates	-	0	10	0
Two men 3 days mowing, at 2s.	-	0	12	0
		<hr/>		
		£.19	6	9

	£.	s.	d.
Brought up - -	19	6	9
Two men at intervals turning, carting, &c. a fortnight each, at 1s. 4d. - - -	1	12	0
Two children 5 days each, turning at 3d. - - -	0	2	6
Threshing 21 sacks, and 1 bush. buckwheat - - -	1	0	3

£.22 1 6

PER CONTRA.—*Creditor.*

By 21 sacks and 1 bushel buckwheat, at 16s. - - -	17	0	0
Value of haulm for litter, &c. - - -	3	0	0
Loss to balance - - -	2	1	6

£.22 1 6

INCLOSURES No. II. and III.

In June ploughing 6 acres, at 7s. - - -	2	2	0
Dragging and couching with 2 horses and 2 men one day - - - - -	0	9	0
Two days 1 man raking, at 1s. 2d. - - -	0	2	4
Nine bushels buckwheat, at 5s. - - -	2	5	0
Sowing and rolling - - - - -	0	4	0
Rent - - - - -	6	0	0
Tithe - - - - -	1	1	0
Poor-rates - - - - -	0	10	0
Mowing 6 acres, at 1s. 2d. - - -	0	7	0
Three children turning 6 days each, at 3d. - - -	0	4	6
Carting, with 2 horses and 2 men, 1 day - - -	0	6	0
Threshing 12 sacks, at 1s. - - -	0	12	0

£.14 2 10

PER CONTRA.—*Creditor.*

By 12 sacks buckwheat, at 16s. - - -	9	12	0
Value of haulm - - - - -	2	0	0
Loss to balance - - - - -	2	10	10

£.14 2 10

According to the above computation, I think the cultivation of buckwheat to be of great consequence to the community as a substitute for a fallow, as no fallow can exceed, or hardly equal, the piece No. I. for condition; though as a crop it has fallen greatly short of my expectation, yet as it stands, I think having a fallow of twelve acres of ground for about 5*l.* expence, very reasonable.

I finished sowing with wheat on one earth the 6th of November, the expence of putting in as under-mentioned:

	£.	s.	d.
To ploughing 12 acres, at 6s.	-	-	3 12 0
Five days at harrow, at 5s.	-	-	1 5 0
Nine bags feed-wheat, at 1 <i>l.</i> 15s. per load	-	10	12 6
Sowing - - - - -	-	-	0 4 0
Two days striking furrows	-	-	0 10 0
			<hr/>
	£.16	3	6

N.B. I have sold about two quarters of buckwheat for fattening pigs, at 4s. per bushel, for which reason I made that the average charge. An acquaintance of mine has sown one field alternately wheat and buckwheat for three or four years past; rolling down the buckwheat, and then ploughing it in. He informed me that his last crop of wheat yielded four quarters per acre after the buckwheat.

N.B. The

N. B. The above account of cultivating buckwheat appearing very extraordinary and unnecessarily expensive, we shall subjoin the remarks made on it by a very ingenious gentleman farmer from Suffolk, who has long cultivated this grain in a very different and much more profitable manner.

“ *To the* COMMITTEE.

“ GENTLEMEN,

“ THE letter on the cultivation of Buckwheat, on which you desire my sentiments, appears to have been written by a gentleman totally unacquainted with the management of that particular grain, and not sufficiently versed in the true principles of agriculture.

“ His soil was of the best quality, and advantageously situated;—but what rational, practical farmer would, after one earth in November, immediately spread a large coat of dung on a foul wheat-stubble, allowing it to remain until the middle of May following, that the sun might exhale the saline, oleaginous, and every other nutritive quality from it, which could enrich and fertilize the soil? It might well, as the writer observes, be full of couch-grass and other noxious weeds. He then, after using the couch-harrow, (which probably is an excellent instrument) gave this land a deep earth, and
sowed

sowed his buckwheat upon it; by which *deep ploughing*, he must have buried and treasured up thousands of feed-weeds, which could not have vegetated for want of sufficient tillage. Had he given the wheat-stubble three shallow ploughings, with good harrowings, allowing all the feed-weeds to vegetate between each stirring of the earth, he might *then* with propriety have given it a *deep ploughing*, spread his dung, and after turning it in, sown his seed with an almost certain prospect of securing a good and profitable crop.

“ The expences are doubtless charged as paid by your correspondent; and he accounts in some measure for their magnitude, by saying he was *obliged to hire for every thing*. But to one who resides in a county where agriculture is perfectly well understood and practised, and buckwheat usually cultivated, they appear too great to remain unnoticed. I shall therefore contrast his expences for Inclosure No. I. with what the same work would cost in Suffolk, supposing every thing put out by the day, viz.

	£. s. d.	Correspondent's Expences.
To ploughing 5½ acres, at 4s. per acre	1 3 0	£.2 0 3
Four horses and 2 men at dung cart, 2 days - - - - -	} 0 18 0	0 18 0
To ploughing 3 times in May, at 4s.	3 9 0	5 3 6
Dragging, a man and 4 horses a day	0 8 0	0 8 0
	£.5 18 0	£.8 9 9

	£.	s.	d.	£.	s.	d.
Brought up - -	5	18	0	8	9	9
Couching and carting off - -	0	10	0	0	10	0
Six bushels seed fully sufficient, 5s.	1	10	0	2	5	0
Sowing and rolling - -	0	4	0	0	4	0
Rent - - - -	5	15	0	5	15	0
Tithe - - - -	1	1	0	1	1	0
Poor-rates - - - -	0	10	0	0	10	0
Mowing at 1s. per acre - -	0	5	9	0	12	0
Turning, &c. by men and children, not only quite unnecessary, but detrimental - - - -	0	0	0	1	14	6
Threshing 21 sacks and 1 bushel, at 7d. per sack - - - -	0	12	4½	1	0	3
	<hr/>			<hr/>		
	£.16	6	1½	£.22	6	6

OBSERVATIONS.

Buckwheat is esteemed in Suffolk, Norfolk, and Essex, as adapted to lands of about 5s. value per acre; or from 3s. to 10s.; but can never answer on deep friable loam worth 1l. 1s. per acre; for on the *latter* there will always be too much straw, even without manure; and the *former* will yield on an average from three to four quarters per acre. It prevents the growth of weeds, but will not destroy couch-grass. It is usually sown in Suffolk with grass-seeds for laying down land, and for that purpose it is preferred to most other kinds of spring corn.

ARTICLE XVII.

Description of the Construction and Use of a new Implement in Husbandry, for Transplanting Turnips.

[In a Letter to the Secretary.]

SIR,

Isle of Wight, Nov. 18, 1784.

HAVING made a tour lately into Norfolk, among their many improvements in agriculture and its implements, shewn me, I was particularly pleased with their *Turnip Transplanter*. As a member of your society, and being willing to contribute what little assistance may be in my power towards general improvement in agriculture, I have taken the liberty of sending you one, made under my directions in this place.*

From the simplicity and cheapness of the instrument, and the very easy manner of using it, (two great recommendations in all implements in husbandry) I cannot but think it may become generally useful. As it frequently happens in turnip fields, that large spots fail, it is used for filling up those spots, from the adjoining parts of the same field. It may also be very useful in gardens, for transplanting plants of different kinds.

* A figure of it is given in the annexed Plate, No. I.

The

The method of using it is, to hold the long handle with the left hand, and the short handle with the right drawn up; put the instrument over the plant that is to be taken up, and with your foot force it into the ground; then give it a twist round, and by drawing it gently up, the earth will adhere to the roots of the plant in a solid body; then with another instrument of the same size, take the earth out where the plant is to be put, and bringing the instrument with the plant in it, put it into the hole which has been made by the other; then keep your right hand steady, and draw up your left, and the earth and plant will be left in the hole with the roots undisturbed.*

When turnips are to be transplanted in a field, there are two men employed with each an instrument, one man taking up a plant, while the other fills his instrument with earth only, thereby making room for depositing the plant; so that the hole which is made by taking up the plant, is filled with the earth taken out where the plant is to be put; which having deposited, he takes up a plant, and returns to the place he first set out from, the first

* This instrument, which may be had at the Society's rooms, is well adapted for garden uses, and particularly for gentlemen who would like the amusement of transplanting small roots of any kind, by an easy, clean, and expeditious method.

man at the same time returning with earth only, so that each man is alternately the planter, and each being employed both ways, the work goes on briskly.

This instrument was invented by Mr. CUBITT GRAY, of *Southrepps* in Norfolk, a person who has given a great deal of attention to husbandry, and particularly to the cultivation of turnips, for which crop he prepares his land in a different manner from most of his neighbours; they harrowing their land immediately after each ploughing, and then rolling it, in order (as they say) to keep in the moisture; on the contrary, he never rolls his land, nor harrows it till he is going to plough it again, but leaves it as open as possible, in order to warm it, as he thinks land can never be too warm or dry for turnips; and he has always had the best crops, even when the season has been dry when sown. This method he has followed 16 years, and never once failed of a crop of turnips—though his neighbours frequently have. He has sold turnips at five guineas and half per acre, to be fed off on his land: he always hand-hoes twice, as indeed do all the farmers in that country; his land is a sandy loam, a very free working soil.

I am, your's, &c.

JOSEPH KIRKPATRICK.

[N. B. The Society return their thanks to Mr. KIRKPATRICK, both for his letter, and for the instrument he so accurately describes the use of. If he would favour them with an account of the mode of husbandry practised by the best farmers in the Isle of Wight, it would be esteemed an additional obligation.]

ARTICLE XVIII.

On the Cultivation of Broad Clover.

SIR,

Colfield, near Leith, Dec. 9, 1786.

I AM duly favoured with your obliging letter of the 5th inst. and shall be glad if the little that I have been able as yet to do, respecting the culture of potatoes, should prove the means of stimulating others, who have better opportunities, and greater abilities than myself, to attend, in a more particular manner than has yet been done, to the culture of this truly valuable plant.

It would give me a particular pleasure, if I could communicate to your society any thing that should deserve attention, respecting the disease you take notice of, affecting Broad Clover. But as nothing *new* on the subject has occurred in this part of the world, I cannot pretend to offer any conjectures as to the cause, or hints for the remedy of that disorder.

order. I have cultivated broad clover as a crop for more than thirty years past, and cannot say that I have here had occasion to remark any thing of *late* that is in the least particular.

During all my practice I have ever found, that although broad clover sometimes affords as good a crop *the second year* as the first, (observe, I call the first year of clover, that in which it first yields a crop, not that in which it is sown) and on some occasions even a better; yet I have ever found that that was in some measure casual, and that no one could safely rely on it for a full crop the second year. This is the case at present, as it ever has been in this part of the world.

There is no doubt, however, that broad clover is much less apt to fail in some soils than others. It is a plant that thrives best on a firm *weighty* soil. It therefore does very well in clays of a certain kind; (you will observe I make a distinction between *thriving* well, and *long life*) but on all clayey soils, and more particularly on soft spongy soils that have lately been brought into culture from moor, it is extremely liable to be thrown out by the severities of the winter weather, and generally more so than on some others:—a firm hazel loam, or even a very *weighty*, or what we here call a *sharp*, rich friable mould,

mould, tending to a sandy nature, is that on which I have ever found it least liable to the accident of which you complain. I cannot tell if you have any of the soil of the kind I here describe, never having been in Gloucestershire; and I am yet more doubtful if the terms I make use of, will be intelligible to you;—but I have no other means of communicating my ideas on this subject.

The process by which broad clover is thus destroyed, is very easily observable on spongy moory soils, in which water is retained in a state more nearly approaching to fluidity than in others. In rich clayey loams, where the same process takes place in an inferior degree, the progress is far less perceptible. In such spongy soils I have often remarked the following phenomena:—

After a night of bare frost, in those places where the earth is not covered with a close sward of grass, the surface seems to be divided into a great number of broad kind of points, divided from each other by a great variety of fissures, something like what takes place in a clayey pool, when the water has been suddenly evaporated, and the mud hastily indurated. On taking up one of these detached pieces, and examining it, we discover that it consists almost entirely of frozen water, with a thin crust of

earth on its top. The ice in this case assumes a beautiful and singular form, consisting of a stack of needle-like columns, standing in a vertical position, all of one height; a rude sketch of which is given in the annexed plate A.* The vertical column consists of transparent spiculæ, sometimes with a little earth intermixed with them, but usually pretty free from it. They have always a little earth at top; and when they are taken up, a little earth also adheres to their bottom; and below that the frost has not penetrated. These columns are longer or shorter according to circumstances, from near two inches, as I have seen them, to less than a quarter of an inch. If the frost continues more than one night, these icy pillars admit of a greater elongation by an additional range of columns shooting up below them, and forcing the former to rise to a greater height. This second series of columns is always shorter than the first, and is divided from it by a thin stratum of earth, as at B.* Should the frost continue longer, another row of shorter columns still is formed beneath the former, divided from it also by its stratum of earth: and so it goes on, each night's frost producing a new set of columns, which become gradually shorter, till at last the different strata of earth which separate them become so near to each other, as that the watery columns cannot be

* See plate No. I.

distinguished;

distinguished; so that the base appears to be only a lump of frozen earth, to which these stacks of columns (C. D.) firmly adhere.

I should not have taken the trouble to describe so minutely as I have done this process of nature, had I ever observed it described elsewhere; and because it is very necessary to be adverted to, seeing it is usually in consequence of that process that our broad clover fields are so frequently cut off by the severities of our winter, which will be easily understood by attending to the following remarks,

When any vegetable is growing on the soil thus affected, the top of these columns of ice naturally lay hold of it as it were, and adhere to it so closely as to force it up along with them with a very strong power. If the root penetrates the ground perpendicularly, either the main root must be broken off by this force, applied as at E, or the lateral fibres must be all torn off from the principal root, so as to leave it entirely naked, and thus exposed to the injuries of the weather altogether defenceless. When a thaw comes, the columns of ice are melted away, and the earth subsides to its former bulk, so that the poor naked root stands up as at F, and must infallibly perish. Every attentive farmer must have remarked his broad clover drawn at times out of the ground in this manner; though he has not
perhaps

perhaps adverted to the process above described, by which it was effected. I have sometimes seen it thus forced out of the ground, on soils of the nature above described, full six inches; but in mellow cultivated fields, it seldom exceeds one or two inches.

Spungy soils, of the nature above described, are therefore unfit for producing broad clover; and the nearer they approach to the nature of these, the more precarious will that crop be upon them: but nothing of this sort happens, when the frost is accompanied by snow to a sufficient depth.

In soils of the nature here described, it is observable, that if the surface be covered with fibrous-rooted grasses, they are not thus thrown out; for as these roots are generally numerous, and closely interwoven with each other, they form such a close surface, that the tops of the icy columns do not appear divided; but the whole surface is lifted up with a considerable stratum of earth, so that when the thaw comes, the whole surface subsides together, and the roots quickly strike into the soil below; so that though the surface might be easily peeled off immediately after the thaw, in flakes, nearly as if it had been pared off by a spade, yet in a short time the roots strike into the loose earth below, and it becomes adhesive to the bottom as usual. This phenomenon,

phenomenon, however, is never observable on any other soils but those that are uncommonly spongy, particularly mossy soils; for the close surface of grafs prevents the frost from penetrating it in others: nor does the frost ever produce such devastation on any soil, when well covered with a coat of matt-rooted grasses, as otherwise.

This being obviously the case, if ever reliance be to be had on broad clover for a *second* year's crop, it is adviseable to sow with the clover a proportion of rye-grafs. This is a very profitable practice, as it much augments the weight of the first cutting, and makes it come some weeks earlier than otherwise it would have been. It also effectually prevents the white gowans from appearing, which so often render a crop of red clover sown alone worth very little. And as the clover afterward advances much more quickly than the rye-grafs, the succeeding cuttings are as good as if no rye-grafs had been sown.

To guard the clover too, if reliance be to be had upon it for *the second year*, it should never be cut very late in the season, for this makes the surface so bare as to leave the roots very much exposed to danger; but if it be cut pretty early in autumn, the rye-grafs advances again in the end of the season, after the clover has become stationary, so as to afford a close covering that defends the roots pretty well.

By

By these precautions, I have been seldom disappointed in my second year's crop of clover, though it will *sometimes* disappear almost entirely: nor do I think it possible in our climate ever to guard against this accident *with certainty*, where broad clover alone is sown; so that I should think it imprudent in any one, in almost any circumstances, to rely on that *second year's crop*; I have therefore ever held it as a maxim, that if a man is to depend on red clover alone, he never should think of taking above one year's crop of it; but if he does resolve to have two year's crops of grass, he may always easily insure that, and frequently have them of red clover, though not with certainty, if alone.

The rule I have ever followed to guard against every accident of this sort, is, to sow along with the red clover a considerable proportion of the white or Dutch clover, and some grass. If the broad clover flourishes, these do not retard its growth, and only tend to thicken it; and if it should fail, which it sometimes will do in spite of every precaution, these plants fill the ground, and produce an abundant crop of herbage, which affords a greater weight and finer hay, than broad clover alone: though they do not answer quite so well for cutting for green forage.

White

White clover spreads its fibrous roots upon the surface of the ground, and is not so apt to be thrown out as red clover; nor is it ever destroyed by any accident, if the earth is rich and *firm*; frequent rolling makes it flourish abundantly, even on light soils; but without that, on such soils it inevitably will perish; (by the term *light*, I do not mean *sandy*, as sometimes is so expressed, but ground that is not *weighty*; we here call it *deaf*.)

If these hasty observations can be of any use to the members of your society, they are much at their service.

Some years ago, I published two volumes of "ESSAYS ON AGRICULTURE;" in which I threw out several observations on grasses, but the above are not among them. There are few plants more valuable for *certain purposes* than broad clover. But there are many which *in some respects* exceed it. I must not however longer trespass on your patience, than to assure you that I shall be ever happy to contribute my mite to the advancement of science.

I am, your most humble servant,

JAMES ANDERSON.

N. B. The

N. B. The drawings [in Plate I.] are intended to give some idea of the progress of the *icy columns*. A. represents three stacks of one night old; B. ditto, of two nights' growth; C. ditto, of three; and D. a greater number, as they appear after the frost has continued many days. On all occasions there are numerous columns shooting up by the side of one another, so that the general surface of the ground is nearly as even as before the frost; though that surface is by means of these columns lifted a good deal higher than its natural level. D. represents a few fibrous-rooted grasses on the surface of the ground. At E. is represented a stalk of broad-clover, with its root forced up by the surrounding columns of ice, and broken off. F is the same root after a thaw, the columns of ice being melted, the earth subsided, and the plant falling down faded. A section of the earth is here supposed to be made to shew the portion of the roots.

ARTICLE XIX.

Bishop of Killaloe's Method of cultivating Potatoes.

[Given by him to Mr. WOODBINE.]

WHEN your land is left in such an exhausted condition, that it will not answer to plough it again for a crop, the method of bringing it again into heart by Potatoes is as follows;—

Spread your manure in lines (of about five or six feet broad) upon the ground, about twelve or fourteen
 teen

teen waggon-loads to an acre, leaving an interval of about two feet and a half between every row of manure. The intervals to be broader or narrower, according to the depth of soil on the land; where the vegetable mould is shallowest, the intervals to be broadest. Then cut your potatoes into pieces, leaving one eye (from whence a small fibre of the root seems to grow) upon every piece: every one of these eyes will produce a new plant. Then spread the pieces on the ground, at a foot or a foot and a half distance. Then send in your diggers, and let them dig out of the intervals as much earth as will cover the pieces of potatoes about two inches.

As soon as the new plants all appear above ground, send in the diggers again, and cover the plants completely. When they appear above ground a second time, cover them again with earth dug out of the intervals, taking care not to go much deeper than the remaining vegetable mould; though you may venture to go a little into the thill or clay, as it will tend rather to improve the land than otherwise; for lying at the top, it will not injure the vegetation; and being exposed to the sun and dews, it will be converted into fertile earth, in a season or two, as well as the rest.

When

When the weeds have appeared and are fit to pull, the crop must be carefully weeded, and in the course of the summer, must be weeded a second time.

If the potatoes are planted in the latter end of March or even the beginning of April, they will be come to their full growth before Michaelmas. They must then be dug out, and the land will be left in condition to bear a good crop of wheat to be sown at that season with a slight ploughing, at which time the brows of the ridges should be partly ploughed into the trenches, that the ground may be in order for future crops, and then the whole of the field properly covered with the crop. After this husbandry, the ground will be fit for a crop of barley to succeed the wheat, and then a crop of oats with clover, &c.

N. B. By this course of husbandry, the arable land of the farm will never be fallow for a year, as the potatoe crop succeeds the last crop of oats, and will be well worth 20l. per acre; and the land by the digging will be left in finer tilth than four ploughings will produce.

I twice tried an experiment, which answered beyond my expectations. Instead of first digging out my potatoes, I cut the haulm with a scythe, and threw it into the trenches. I then sent the sower to sow the land with wheat; then I had the potatoes dug

dug out, and let the wheat take its chance of being properly covered in the digging, and then gave it a slight harrowing; and by this method I had a crop of ten barrels to the acre; which I ascribed to the seed being better covered by being dug in, than it would have been by the harrow in the usual way. I do not, however, recommend this to be done the first time this husbandry is tried, though the experiment may be made in one ridge only, and according as that succeeds, it may be pursued or not hereafter.

July, 1786.

THO. KILLALUE.

ARTICLE XX.

Observations on the Disease called the Wind in Sheep.

[By Mr. J. WEBB, Apothecary.]

GENTLEMEN,

Doynon, Gloucestershire.

NUMEROUS as the diseases of the brute creation are, I believe they suffer but little less from them than from the absurd means that frequently are administered for their relief, arising from the generality of farmers being very ignorant both of the *seat* and *cause* of the complaint. This

I attri-

I attribute partly to the terms used for diseases not conveying any just and proper ideas of them.

I have seen several sheep, immediately after being shorn, appear to be in violent pain; their sides are somewhat extended, and their breathing very short; the head is hung drooping, and they have a great aversion to moving or walking, and generally lie down. These symptoms continue increasing till the sheep dies in a few hours, unless a violent purging come on, which generally gives immediate relief. On enquiring for the name given to this complaint, I found it was called *the Wind*; but where the seat of it lay, few could tell. Some thought it was in the head, others in the lungs or lights, &c.; and the remedies they applied were as various as their opinions of the disease; some giving gin, others black pepper, or both these mixed together. Daffy's elixir, and elder-berry syrup, are sometimes administered.

Not satisfied with these accounts, I endeavoured (by inspecting the carcases of sheep that died of the disease) to discover the cause and seat of the complaint. On opening four sheep that died of the disease, I found all the intestines rather distended with flatus,* but not in any great degree. Their

* From whence I suppose the term *wind* for this disorder originated.
blood-

blood-vessels were very turgid and of a deep red, particularly those of the large intestines, excepting the rectum, (or what is commonly called the *bum-gut*) which had a healthy appearance, as likewise had the stomach, milt, caul, liver, heart, lungs or lights, &c.; and in short all the viscera contained in the cavity of the trunk. From these appearances I will venture to say, that the disease in question is a violent inflammation of the intestines; perhaps in some measure arising from bruises in shearing, but more so from losing a warm clothing, and being suddenly exposed to cold air and cold feeding.

I beg leave therefore to recommend to farmers, that on the first appearance of the complaint, they put the sheep into a stable or other warm place, and immediately bleed it very freely. Bruise a quarter of an ounce of some carminative seed, such as carraway, anise, cummin, or fennel, and mix these with two ounces of Glauber's purging salts in a pint of water; place it on a fire, and make it boil for a few minutes, then strain it off: then add a quarter of an ounce of powdered jalap, and while lukewarm give the sheep a quarter of a pint of this liquor (first well shaken together) every half hour till it dungs. It should have no food or cold water till recovered, but a little warm water might be of service.

This remedy, I imagine, might be of service to oxen, when blasted from putting them into fresh clover; but they being much larger and stronger animals, will require a dose larger in proportion. With the same regulation I would recommend it for the fret in horses, as a better remedy than the drenches commonly given.

I am, Gentlemen, your's &c.

OCT. 10, 1786.

J. WEBB.

P. S. Perhaps it may appear strange to recommend glisters for horses; but I am well assured that one (composed of some tobacco boiled in a pint of water a few minutes, then strained off, and with the addition of a little sweet oil or hog's lard) given as such, would greatly assist the drench before recommended.

ARTICLE XXI.

On the Cultivation of Apple-Trees.

SIR,

I Have ever esteemed Apples as the most useful fruit cultivated in this kingdom. They are placed on the tables of the great, and are within the power of the cottager to enjoy; at whose homely board, when dressed in puddings or pyes, they may be considered as a luxury.

These

These considerations make me view with concern the present neglect of orchards, where the old trees are decaying without proper provision being made for the succeeding age: for if a farmer plants fresh trees, (which does not frequently happen) there is seldom any care taken to propagate the better sorts, as his grafts are usually taken promiscuously from any ordinary kind, most easily procured in his neighbourhood.* Hence arise the numberless apple-trees, which may almost be said to incumber the ground, and occupy the room which a valuable tree might possess.

I have heard it frequently remarked, that a good apple is hardly ever to be procured but near large towns; and in general I have found the observation just, owing, I conceive, principally to the inattention of the farmer, and sometimes to the difficulty he finds in obtaining the best sorts.

* We hope for the credit of common sense, this is not literally the case; few people would take the trouble of grafting without a view to some improvement; and in country places, the best apple-trees of the neighbourhood are sufficiently noted; but if the spirit of improvement prevailed as it ought in this article, the owners of orchards would not only propagate the best sorts *occasionally*, but constantly reduce their young apple-trees which were found to bear ordinary fruit, to grafting stocks for the most valuable sorts. By such a practice, great reformation would be made.

Could these difficulties be obviated, I conceive we should in a few years find good apples at every cottage, and greater choice at our country markets.

This being, in my opinion, an object of some utility, give me leave to suggest some hints, which you may possibly improve and render really useful.

After making a catalogue of the best apples for eating, baking, keeping, &c. suppose your society were to procure grafts of each kind from the countries most celebrated for the respective sorts: which, I imagine, may be done by a society at a moderate expence, as many gentlemen would be proud to furnish them; so that the carriage would be the only cost: some might be purchased and given away, without any great expence to the society.

I fear offering a premium for the cultivation of apple-trees, would be inadequate to the intent; as small rewards, which must necessarily be difficult and slow in their operation, would not raise a spirit in farmers in general to pursue the object.

I therefore think that the Bath Society (if they deem the subject worthy notice) might advertise that they were collecting a quantity of grafts from apple-trees of superior kinds, which they meant to distribute

distribute gratis to farmers and cottagers who applied and engaged to cultivate them; and that the application must be made either verbally or in writing by a certain day, specifying the number the party wishes to have. And when the grafts are ready, a second advertisement might give notice for each person who has applied to call or send for the proportion allotted to him.

If the society also recommended to their correspondents and other gentlemen, a similar disposal of good grafts, round their respective neighbourhoods, I should not doubt but in a very few years every county would be plentifully supplied with the best apples.

I am, Sir, your's, &c,

RICHARD SAMUEL.

[N. B. The substance of this letter is of great importance to the nation; for it must be universally acknowledged that the apple is the first of fruits, as an article of family consumption, if not as a luxury. In its different applications for cyder, for dressing as food, and for eating in its natural state, its flavour is of great consequence to our pleasure, and perhaps of some to our health. For it is not easily supposable, that a rough acrid cyder is equally wholesome with a soft and pleasant sort, to all constitutions;— and while the same space of ground, and the same expence, will suffice for a fine sort of apple-trees, as for one of the worst, it is well worth publick attention to promote the growth of the finest sorts, as at once cheap, wholesome,

and grateful. It is a *benevolent* object, likewise, when we consider how easily the palates of the middling and lower classes of our countrymen, who cannot afford the luxury of more expensive fruit, may be gratified by improving the quality of this common and excellent species.

From these considerations, it is hereby requested, as a first step towards general improvement, that those gentlemen, who have been particularly curious in the improvement of their orchards, or in remarking the distinctions and excellencies of different sorts of apples and pears, would be so obliging as to communicate their observations on the subject by letter to the secretary, as soon as they conveniently can after reading this article. They are earnestly requested also to mention particularly the flavour and properties of the sorts they approve best, for summer use and for long keeping; likewise with what number of scions they could conveniently furnish the secretary for distribution; first among the members of the society, and secondly to others who may wish to concur in the general plan of improvement.]

ARTICLE XXII.

On the Degeneracy of Apples.

[In a Letter to the SECRETARY.]

SIR,

Kensington, Dec. 16, 1786.

THE subject of the decay of the different sorts of Apples, I have maturely considered, and compared my ideas with those of men in long practice with myself, and find it is the general opinion, that

that it is not a real decline in the quality of the fruit, but in the tree, owing either to want of health, the season, the soil, the mode of planting, or to the stock which they are grafted on, being too often raised from the seed of apples in the same place or county: it appears from the ablest men in my profession, that they never found a real decline in any one kind of fruit, but from the above causes.

To make a fair experiment, I should be much obliged to any gentleman that will take the trouble to send me a few cuttings, from those very trees, the fruit of which is supposed to be degenerated from the original goodness. I would graft them on the real crab-stock, and some also on the stock raised from the apple-pips in this county; then send the trees to the place where the cuttings came from;—by which means (though the process is tedious) we shall be able to ascertain, whether the change of stock will not restore the fruit to its original goodness.

I have not a doubt in my own mind, but that the trees which are grafted on the stocks raised from the apple-pips, are more tender than those grafted on the real crab-stock; and the seasons in this country have for many years past been unfavourable for fruits, which add much to the supposed degeneracy of the apple. It is my opinion, that if planters of orchards

orchards would procure the trees grafted on real crab-stocks from a distant county, they would find their account in so doing much over-balance the extra expence of charge and carriage.

My reason for recommending the true crab-stock is, that I believe the crab to be a native of this country; but whether it is or not, we are sure it is much hardier than the stocks raised from apple-pips, and there cannot be a doubt but the apple was originally an exotic. The crab-stock will succeed in many different soils, particularly in stiff, cold, moist ground, where the apple-stock will canker and die. I recommend the crab-stock for this reason, as also that it is not so early in vegetating as the apple; by which a few days may preserve the flower from the cold blasts, and be the means of saving a fine crop of fruit.

Your most obedient servant,

DAN. GRIMWOOD.

ARTICLE XXIII.

On the Culture of Parsnips.

TO cultivate this root so as to make it prove advantageous to the farmer, it will be right to sow the seed in the autumn, immediately after it

is ripe, or come to perfection; by which means the plants will appear early the following spring, and will get strong before the weeds can grow to injure them. Frosts never affect the seed, nor do the young plants ever materially suffer through the severity of the seasons. Not only on this account, but for many other reasons, the autumn is preferable to the spring sowing, as the weeds at this time will keep pace with the parsnips; and often when they are hoed or cleaned, great part of the crop is pulled up, cut out, or otherwise destroyed, as they are (when sown in the spring) so small when they first appear, as not easily to be distinguished from the weeds; and if no rains fall at that season, some of the seed will not vegetate till late in the summer; and the few plants that do appear, will scarce pay the expence of cleaning them; besides, they will never grow to any size, but be sticky or cankered, and consequently will be destitute of nutrimental juice; while on the contrary, those that are sown in the autumn will be large, free from the defects of the others, and fully answer the expectation of the cultivator.

The best soil for parsnips is, a rich deep loam; next to this is sand, or they will thrive well in a black gritty soil; but will never pay for cultivating in stone-brash, gravel, or clay soils; and they always
are

are the largest where the earth is the deepest. Dry light land is pleasing to them, but wet, stiff, or hide-bound land is destructive. If the soil be proper, they do not require much manure. The writer hath obtained a very good crop for three successive years, from the same land, without using any; but when he laid at the rate of about forty cart-loads of sand per acre upon a very stiff loam, and ploughed it in, he found it answered very well, from which he concludes that a mixture of soils may be proper for this root.

It is most adviseable to sow the seed in drills at about 18 inches distant from each other, that the plants may be the more conveniently hand or horse-hoed; and they will be more luxuriant if they undergo a second hoeing, and are carefully earthed so as not to cover the leaves.

Those who have not ground to spare, or cannot get it in proper condition to receive the seed in the autumn, may at that time sow a plot in their garden, or the corner of some field, and may transplant from thence the latter end of the month of April, or early in the May following. The plants must be carefully drawn from the seed plot, and the land that is to receive them should be well pulverized by harrowing and rolling; and when it is thus ordered, a
furrow

furrow should be opened with the plough about six or eight inches deep, in which the plants should be regularly laid at about the distance of ten inches from each other, taking care not to let the root be bent, but for the plant to stand perpendicular after the earth is closed about it, which should be immediately done by means of persons who should for this purpose follow the planter with a hoe; and he must not forget that the plants will be injured if the leaves are covered. Another furrow must be opened about 18 inches from the last, in the same direction, and planted as before; and so in like manner till all the plants are deposited, or the field is completely cropped; and when the weeds appear, hoeing will be necessary, and it will be right afterwards to earth them.

There is no doubt but many may disapprove of the method of transplanting parsnips, yet some may be induced to try the experiment, when they consider that they may perform it at a time when there is little beside to be done in a farm, and that their crop will be more certain; for if they are planted after rain, they will not be checked by the removal, nor will they be injured by weeds, or the ground suffer so much by being thus planted, as otherwise it would do, if the seed were sown in the autumn.

It is wrong to plant parsnips by means of dibbling, as the ground thereby becomes so bound as seldom to admit the small lateral fibres (with which these plants abound) to fix or work in the earth, on which account they are prevented from expanding themselves, and never attain their proper size.

If people would in general be attentive to the soil, the season for sowing, the cleaning and earthing the plants, and raising their seed from the largest and best parsnips, (which should be selected and transplanted for this purpose) there is no doubt but such a crop would answer much better than a crop of carrots; they are equal if not superior for fattening pigs, as they make their flesh whiter, and they eat them with more satisfaction. When they are clean washed and sliced among bran, horses eat them greedily and thrive therewith; nor do they heat them, or like corn fill them with disorders.

It is reported, that cows and oxen are fond of parsnips; if so, they are certainly well worth a farmer's attention, especially in countries where there is a scarcity of fodder. The writer therefore flatters himself, the foregoing directions may prove serviceable to gentlemen or farmers, who are so circumstanced; and begs to assure the Society he shall

all times be happy to communicate to them the little knowledge he possesses or may acquire.

Littleton-House,

J. HAZARD.

June 1787.

ARTICLE XXIV.

Account of the Culture, Expences, and Produce of Potatoes, per acre, about Ilford, and the adjacent Parishes, six miles East of London.

THE soil on which the best crops are raised, is a strongish loam, not quite approaching to clay. The manure used is rotten dung, which is laid on just before planting, in the proportion of from 15 to 20 loads per acre.

Twenty-four bushels, cut into sets of one or two good eyes each, are planted per acre, at 15 inches distance, and kept clean by hoeing, in which the earth is drawn up round the plants as they advance in height. The produce on an average, ten tons per acre—126lbs. to the hundred weight.

They take them up with a broad three-tin'd fork, at three guineas per acre. The average expence
per

per acre, every charge included, is about ten pounds. Their value for feeding hogs, 25s. per ton; at which valuation they are worth only 12l. 10s. which leaves a profit of only 2l. 10s. But the growers generally make double that price at the London market, which brings the profit to 15l. per acre.— They seldom sow potatoes more than two years on the same land, without an intervening crop.

The *Aylesbury white* is mostly planted for the table; but the *Ox-noble* is most productive for cattle.

W. BRAINES.

ARTICLE XXV.

On the Depravation of Apple-Trees.

[From Mr. GILLINGWATER, of *Harleston*, addressed to Mr. JOHN WAGSTAFFE, *Norwich*.]

I Observed in the Ipswich Journal of Saturday last, that circular letters were sent from the Secretary of the Bath Agriculture Society, relative to a representation made to that Society, viz. “ That in most of the counties, and particularly in that of Worcester, the old and best kinds of apples are nearly lost; and that by persons conversant in fruit-trees

trees it is apprehended, they will in a few years be entirely gone." I must acknowledge, that I was struck with the representation; and it immediately occurred to me, the conversation which we lately had at Harleston, when I observed to you the danger which orchards of apple-trees, when planted too near each other, were exposed to, from the mixture of various farina: and this, I apprehend, is the cause of the degeneracy of all the old and best kind of apple-trees in the great cyder counties of this kingdom, which is here complained of; and which the Society so earnestly requests its members to extend their enquiries concerning.

This conjecture appears to me extremely reasonable; for if the great variety of apples, and also other fruits, be produced by the casual intermixture of different farina, the fruit also itself must be affected. The old and best kinds of apple-trees, I apprehend, are not lost at all, but are only corrupted from being planted too near bad neighbours:—remove them to a situation where they are not exposed to this inconvenience, and they will immediately recover their original excellency.

The Society informs us, that their trees of the best kind are *nearly* lost, but not *altogether* so. The reason I conceive for this distinction is, that some
few,

few, having the advantage of being situated where they are not injured by the farina of other trees of inferior kind, retain their primitive qualities; whilst others, which are planted indiscriminately in large quantities in orchards, are almost totally spoiled from the farina of other surrounding trees, which intermixes with them.

Your's, &c.

Harleston,
July 10, 1786.

EDM. GILLINGWATER.

An ADVERTENCE to the foregoing.

THE remarks of my friend respecting the probable alteration in the distinguishing quality and flavour of fruits, by an indiscriminate planting of various species of apple-trees together, are unquestionably well founded; but whether the entire depravity can be conquered, and a perfect regeneration of the original specifick quality of the fruit be recovered, is a matter of question. For we may consider the circulation of the sap in trees as somewhat analogous to that of the fluids in animated bodies; and that the latter imbibes salubrity and contagion from the approximation of different subjects; whereby a constitutional change is sometimes effected.

Now

Now the degeneracy of the best species of apples from the aforementioned cause being allowed; and as there is an acknowledged flow of the elementary fluid to the blossom, and to its fruit, and in refluxion from both; what these receive or imbibe may, by a repeated circulation, alter the habit of the tree. This speculation might have been too much refined, had not it been experienced, that a scion ingrafted hath not always produced that specifick fruit from whence it was presumed to be taken; and that the mere insertion of the bud in inoculation hath, without sensible vegetation, altered the habit of the plant in which it was inserted.

The first instance has been attested by some practical observers; the latter is founded on an experiment related by BRADLEY, under his "particular proofs of the sap's circulation in plants;" where he mentions the "inoculation of some of the *passion-tree*, whose leaves were spotted with yellow, into one of that sort of *passion-tree* which bears the long fruit. Now though the buds did not take, yet in a fortnight's time the yellow spots began to shew themselves above the inoculation, and in a short time after appeared on a shoot which came out of the ground from another part of the plant."

Nevertheless, the discriminate planting proposed by my friend will generally apply to the preservation of the original distinction of the fruit; for whether the farina be wafted by the breeze, or winnowed by the wings of insects, it must be in a contiguity of trees that the alteration must arise.

It is true, that bees, wild and domesticated, with many other insects, insert their bodies within the *nectarium* of the blossom, and that there is a frequent adhesion to their downy sides of the impregnating dust; which is not unfrequently conveyed to a various species of blossom, from that whence it was received.—Still, were it not for the contiguity of the various trees, no sensible change would be effected by the insect becoming an *auxiliary* to the *surer* impregnation of those trees of the genus wished to be preserved from depravity. This precaution will equally apply to a valuable species obtained from seed, or an undegenerated old species to be extended; as the planting *either*, somewhat remote from other apple-trees, will be certainly out of the flight of the farina, or the probable conveyance of it by insects; which rarely quit a vicinity that supplies their nutriment, but to deposit their extract in the common repository.

It is a piece of justice to advert to some subsequent remarks from my friend, that “no degeneracy

neracy is to be apprehended from the proximity of other fruit-trees; as the admirable disposition of the receptacle to its farina, denies every ungenerical impregnation."

Norwich,
Nov. 9, 1787.

JOHN WAGSTAFFE.

ARTICLE XXVI.

On the Cultivation of Flax and Hemp.

SIR,

Wisbech, July 11, 1784.

IN answer to your letter, I have applied to a friend of mine who has had many years' experience in cultivating both Flax and Hemp; and he informs me as follows, viz.

1st. The usual price of flax-seed is 2l. 2s. per coomb; the quantity sown is two bushels per acre.

2^{dly}. As to manure, there is none laid upon land where you intend to sow flax; but it must be clean or sward land.

3^{dly}. If the land be sward land, or what we call grafs land, it must be ploughed but once, and harrowed fine. As to my rich land, it will bring turnips, wheat, or clover, &c. after the flax is off.

4thly. The crop, managings and getting into the barn, costs somewhat about 3l. per acre. The produce is from 20 to 50 stone per acre, according to the land. As to the score, I have sold at 5l. 6l. and 7l. per score.

5thly. It does not impoverish the land, but rather improves it.

P. S. You should have an experienced man to sow it, as there are but few who understand that business. And likewise when it is fit to pull, one who knows when to put it into the dike, and when to take it out, as there is a great deal of difficulty in managing that point, without spoiling the flax.

I am, your humble servant,

JAMES ELLERKER.

ARTICLE XXVII.

Description of a Comb-Pot, to be used with Pit Coal.

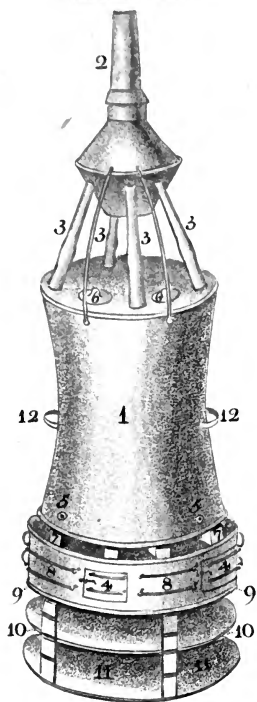
Invented by JOHN ASHMAN, of *Abbey-Milton, Dorset.*

SIR,

Sarum, Oct. 24, 1786.

THE sketch of a comb-pot I here send you, was invented by JOHN ASHMAN, who has been in our service about six months. He worked
it

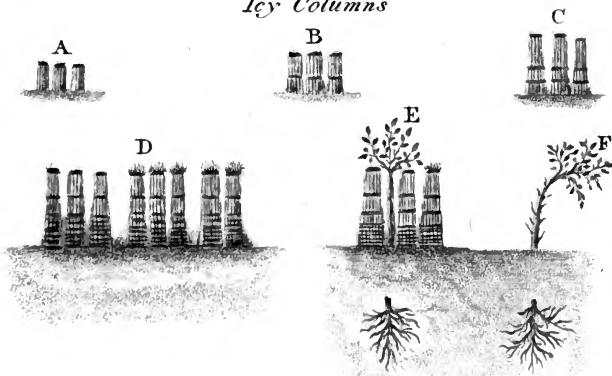
*Comb Pot for Burning
Common Coal*



The Transplanter



Icy Columns



it two years and a half at *Abbey-Milton*, and three years and a half at *Blandford*; and is very anxious to present it for the approbation of the Bath Society.

Your obedient servant,

DAN. & THO. DYKE.

PLATE I. *Fig. 1.* The furnace for water, which contains a smaller one, keeping the fuds of the second washing the wool, for to be used with the next quantity of wool the first way.

Fig. 2. A tin chimney for conveying the smoke, (and carried higher in any direction made of tin) the lower part of which is made almost globular, for the better conveniency of taking away the four smaller ones from the top of the furnace, [*fig. 3. 3. 3. 3.*] to clean the same tubes continued through the furnace, close to the side at equal distances, and directly over each fire-place.

Fig. 4. 4. (with two more on the other side) The fire-place doors.

Fig. 5. 5. Cocks for drawing off the water and fuds.

Fig. 6. 6. Covers to the furnaces.

Fig. 7. 7. (with two more on the other side) Spaces between each fire-place, for receiving the combs to heat on a cast-iron plate.

Fig. 8. 8. (and two more) Large wires on iron-plates, projecting a distance sufficient to prevent the wool from singeing in the combs while heating; each place heating one pair of combs.

Fig. 9. 9. An iron plate, for making the fire on, with holes to let the ashes through.

Fig. 10. A stone to receive the ashes on; and at four equal distances bricks to support the upper part.

Fig. 11. A place for the pit-coal, supporting in like manner the ashes. Plate, &c. as the last described.

Fig. 12. 12. Handles for taking off the furnace.

The above pot is made of a circular form, lessened in the middle for receiving the handles of the combs while heating.

ARTICLE XXVIII.

On the Disorder called the Blast in Sheep.

SIR,

Wiley, Wilts, May 7, 1787.

IN our county we breed many sheep, and manure the fallows, &c. with them. After having penn'd them all night, when they are driven into fresh grass, or young clover, they are frequently taken with what we call the BLAST; that is, they over-gorge themselves, foam at the mouth, swell exceedingly, breathe very quick and short, then jump up, and fall down dead instantly. This is so frequent a disorder, and so great a loss, that a neighbour of mine had 17 die in one morning—indeed within half an hour; for they are often taken with it many at a time. We have no remedy, ever known as yet, but

but driving them into a bare place like a road, and keeping them in motion;—but it is so sudden, there is not time for that in general. It is a disorder not unfrequent in cattle; and having a cow taken in this manner, I had heard that, by stabbing her in the maw, I stood a chance of saving her life—I did this; the matter flew out, gave instant relief to the cow, she did well, and has had two calves since. I therefore resolved to try the same with my sheep, and have succeeded to my wish. The way I perform it is as follows:—

The sheep will swell considerably on the left side (or what you would call the nigh side of a horse) near the kidneys, behind the ribs, which is near the flank; the swelling is very protuberant, and there is mark enough, (about three inches) where if you dart your knife in, you must *at this time* go instantly into the maw; the food or matter immediately flies out, gives relief, and with only common applications of a horse-doctor's mixture of bees-wax, rosin, greafe, &c. the sheep is sure to do well. All my neighbours were surpris'd at my success, as it was quite new to them and to all the shepherds around.

I am, Sir, your humble servant,

WM. POTTICARY.

ARTICLE XXIX.

A Continuation of Experiments in the Drill Husbandry.

[By Sir JOHN ANSTRUTHER, Bart.]

Experiment of Drilled Barley—Crop, 1786.

IN ——— 1785, 3 A. 2 R. 20 P. of English measure were drilled with some Lincolnshire barley. Part of this was one acre, upon which the experiment of transplanted wheat, and dibbled wheat and barley, was made last year. The remainder was after carrots and cabbages, and as it was not manured for these, it had a top-dressing of dung. Upon that were drilled $4\frac{1}{2}$ bushels of Winchester measure; these were drilled after the plough, by a man following the plough, and dropping the seed by hand; a second plough followed and covered this; and the third furrow was sown and covered in the same manner: by this plan the rows were at 18 inches distance; these were hand-hoed once at the expence of 10s. The produce was 147 bushels, which is nearly 32 for one, and is $40\frac{1}{2}$ bushels per English acre.

The rest of the field was sown broadcast at the same time, with the same grain; the same quantity of this was measured, viz. 3 A. 2 R. 20 P. and the
proportion

proportion of seed to this measure was $16\frac{1}{2}$ bushels, or about $4\frac{1}{2}$ per acre. This was after turnips, for which the land was previously manured. The produce was 114 bushels, which is nearly 7 after one, and $31\frac{1}{2}$ bushels per English acre.

Produce of the drilled	}	BUSHELS.	Broadcast produce	31 $\frac{1}{2}$	}	BUSHELS.	
per acre - - -			40 $\frac{1}{4}$	Deduct the seed -			4 $\frac{1}{4}$
Deduct the seed -			1 $\frac{1}{4}$	Clear produce			27 $\frac{1}{4}$
Clear produce			39 $\frac{1}{4}$				

Produce of the drilled superior $12\frac{1}{2}$ bushels.

In the account of the experiment of the drilled barley last year, it was omitted to mention the quantity of ground drilled, and of the broadcast. The quantity was 2 A. 20 P.; and the same quantity was measured of the field which was in broadcast:—it was drilled as above described, and sown under furrow.

EXPERIMENTS 1786.

Half an acre was drilled with wheat, and horse-hoed. This was once ploughed after a crop of barley, drilled at 18 inches. It was designed to have been ploughed in ridges 4 feet 8 $\frac{1}{2}$ inches, which should have made 21 ridges, as the breadth was 33 yards; but by the ploughman's want of experience in ploughing straight ridges, they were unequally broad, and there were only 17 ridges.

It

It was drilled the 21st of October 1785, with two rows of wheat upon each ridge, with partitions of 14 inches; two intervals three feet four inches. It was sowed with a peck and a half; was four times horse-hoed; twice from, and twice to, the rows; and three times hand-hoed in the partitions and rows.

October 21st, upon a ridge 74 yards long, and four broad, which is the 16th part of an acre, were transplanted ten rows of wheat plants, at nine inches distance every way, from seed sown in a garden the end of August, and two rows from seed sown in May.

Nov. 12th, another ridge of the same dimensions was planted with plants (from seed sown in August) at the same distance. At the same time one ridge was dibbled of the same dimensions with wheat, at nine inches, and the wheat dropped in the holes, and from one grain to 15 per hole, and two rows of each.

March 31st, two ridges of the same dimensions (viz. the eighth of an acre) were planted with plants, at the same distance, from seed sown in August.

In July and August, viewed the experiments, and found a high wind some days before had broken down a great deal of the drilled wheat; and that, in the horse-hoed, the earth had not been properly ploughed up to the rows, and as the earth was fine and loose, it had so fallen down from the roots that the plants had little support from the earth on one side, and the weight of ears with the high winds had made them fall over, by reason of that want of support. The earth was hoed up to the rows, which I found supported the stems from falling over. The very dry season, or the frost in winter, or some other cause, had destroyed a great deal of the drilled wheat, as well as the dibbled and transplanted. In many places there was from one to two feet destroyed: these had been filled up by transplanting the 21st of April, but many of them died; or were small plants and small ears, and not above three or four ears to a plant.

There appeared at this time no difference between what was transplanted in October and November, or between those from the seed in May and August. But the two ridges transplanted the 31st of March was the worst crop, and much greener than that transplanted before winter, having but nine or ten stems on the best plants; but
many

many of the other had 16. The ridges dibbled with grain in November, appeared at this time a better crop, and the ears larger than the transplanted. On counting the ears, it did not appear there were more from the holes where there were 12 and 15 grains, than where there were fewer grains planted.

The transplanted and dibbled were much less layed over by the wind than the drilled; which appeared to be from the stems supporting each other, and the earth about the roots being firmer than the drilled, which had less support on one side, from the earth not being properly layed to the stems. These were reaped the 22d of September. That transplanted in March was not quite so ripe as the other.

The drilled half acre produced five bushels and two pecks; which is at the rate of 11 bushels per acre:—had there been 21 ridges, it would have been in proportion 13 upon 21 ridges. The numerous gaps or blanks, and ears broke down and lost by the wind, made this a bad crop.

To see what the produce might have been if it had been equally good, the ears and grains of some yards were counted of the drilled rows, and, where
equally

equally good, some yards of a single row produced 124 ears, some 102; and the average of these counted, was 113 ears per yard of a single row. Some ears produced 80 grains per ear; the lowest was 50, and the average 61; and the number of grains per ounce was 880. The ears multiplied by the grains, and divided by 880, is $7\frac{7}{8}$ ounces per yard, of single rows; there being 14 ridges of the above breadth in an acre, this made 5992 yards of single rows, exclusive of head ridges; this would be at the rate of 49 bushels per acre, had it been all equally good, and 28 rows in the breadth of the acre.

The produce of the two ridges transplanted in	} <i>B. P.</i>	
October and November, being the eighth of		2 2
an acre		
That of the two transplanted the 31st of March		1 0
The one ridge dibbled with wheat in different	} 1 0	
quantities, being the 16th of an acre		

At this rate the proportions would be per acre,

That transplanted before winter	-	-	-	20 0
That planted with grain	-	-	-	16 0
That transplanted the 31st of March	-	-	-	8 0

The produce of these experiments is but small; but could they have been compared with the broadcast this year, they would have made a better appearance

appearance than by comparing them with good crops of other years, as the broad-cast crops of wheat in general were very thin and bad this year. One thing was to the disadvantage of these experiments:—they were made upon a part of that which was in drilled barley last crop; and some of the barley had been shaked out, which sprung up early, and made it necessary to hoe it early to destroy it. Of the transplanted, a great many of the plants had 16 ears; and if a crop were equally good, the produce would be very great, even allowing each to produce on an average eight ears, as each plant has a space of nine inches square, this is 77440 plants, and at the above average of the drilled at 61 grains per ear, and 880 grains per ounce, the produce would be 44 bushels; therefore it appears the ears were not above four per plant.

The small produce of the transplanted, it may be supposed, might have been occasioned by being badly planted; but the dibbled was worse, that was not liable to that accident. And we do not find the planted wheat, where practised, produced so great crops as might be expected.

Whether these methods are more liable to accidents than the broadcast, experience and more extensive practice may discover.

These

These small unsuccessful experiments by no means prove the method bad, but the bad execution or unfavourable season; and from these we see what great produce they may yield when properly executed in more favourable seasons; as in a former experiment the drilled was much more successful, although this is so bad. And it is to be hoped, as many of the intelligent correspondents of the Society have practised the drilled husbandry, that their experience will shew it to be as profitable as many former practisers of it have shewn.

J. ANSTRUTHER.

ARTICLE XXX.

An Account of a Series of Experiments made by Mr. Nehemiah Bartley, on his Farm near Bristol.

[In a Letter to the SECRETARY.]

SIR,

Bristol, Nov. 1, 1787.

I Take the liberty of communicating to the Society, such of my experiments in agriculture as I thought might merit notice, made within these ten years past—the term assigned by the Society in their Premium-book 1786.

Nothing

Nothing short of an institution, like that of the Bath Society, would be in any degree adequate to the due registry of experiments in agriculture, and to their transmission for the advantage of posterity. Since the establishment of that Society, the management of my farm hath been greatly directed to promote its general design: and yet I am almost ashamed to consider how barren I find myself of useful experiments.

The endeavours of an individual are very limited, frequently interrupted, and sometimes wholly defeated, from a variety of occurrences; besides that an experiment, conducted perhaps successfully for months, or even for years, is probably lost, in the loss of only a few hours.

The cultivation of the land, as it is an employment the most innocent in its nature, so is it the most necessary and useful. It is the foundation and support of all others. Trade could not subsist without it, and perhaps it is the only employment of which it may be said, that the whole community flourishes in proportion to the prosperity of the individual engaged in it.

No. I. *Experiment on deep Ploughing.*

From the experiments and reasoning of Mons^r CHATEAUVIEUX, DU HAMEL, and others, I was determined

determined to try the effects of deep ploughing; for this purpose I provided myself with a very stout plough, and began with a piece of land about 5 acres on Brislington Common, to which my experiments have been mostly confined. The soil a rich loamy sand, the colour that of a hazel-nut when fully ripe: the upper stratum of a pretty uniform quality, to the depth of from 2½ to 4 feet. In the first place, I had to contend with the prejudice of the ploughman, who, for what reason he knew not, very strongly objected to deep ploughing; however, I soon brought him to submission, and not without much labour he performed the business to my entire satisfaction:—the general depth was about nine inches.

During the operation, the ground was visited by most of the farmers in the neighbourhood, and the method universally exploded. By some it was said I should not plough for them, though I would do it for nothing; by others, that the land would not recover for seven years; and again, that it would be quite ruined. From all this I was not discouraged, and after giving the land two other ploughings, which were performed with ease and pleasure to the ploughman, it was cropped with Lammas wheat, and the produce was estimated, by some of these very farmers, at 40 bushels per acre. The next

year it was manured with about 20 putt-loads of a composition, consisting of half hog dung, and half virgin earth, part of the same field, and planted with potatoes. This crop was kept free from weeds, well hoed and earthed up, the produce not less than 140 sacks, or 560 Winchester bushels per acre. Next it was sown with flax-feed, and produced two packs per acre, the pack 240lb. After this two succeeding crops of hoar-wheat, both good, say about 30 bushels each crop per acre.

The last season it was sown with black oats, and layed down with clover and ray-grass seed. The oats I estimate at 64 bushels per acre, which will appear moderate in comparison of an experiment upon that grain, which I shall note in the sequel.

I attribute greatly to deep and frequent ploughing, the success of these crops, and I persist in the same method. It is probable, however, that some degree of caution may be necessary on particular soils.

No. II. *Experiment on Turnips*—1782.

Four acres of ground were divided into two equal parts; one half manured with four putt-loads of soapers waste ashes, and the other remained without any manure. Turnip seed was sown on both
at

at the same time. The manured part proved an excellent crop, the other quite destroyed by the fly.

No. III. *On the Culture of Flax.*

The soil a rich loamy sand, five acres, as per experiment No. I.

EXPENCES.	£.	s.	d.
Rent of 5 acres, at 40s.	10	0	0
Two ploughings, at 5s. each	2	10	0
Sowing and harrowing, at 1s.	0	5	0
Fifteen bushels seed, at 7s.	5	5	0
Pulling the flax, at 8s. per acre	2	0	0
Watering and preparing, about 10s. per ditto	2	10	0
Swingling or dressing, &c. 203 dozen, at 1s. 8d.			
per dozen	16	18	4
Ripling the seed, at 8s. per acre	2	0	0
Contingencies, at 5s. per acre	1	5	0
	£.42	13	4

N.B. It is to be observed, that I have not charged any of these experiments with tithe; the common being as yet exempt from tithe.

PRODUCE.	£.	s.	d.
Ten packs of flax, at 5l. 5s.	52	10	0
Thirty-five bushels of seed, at 5s.	8	15	0
	61	5	0
Deduct expences	42	13	4
Profit	18	11	8

or 3l. 14s. 4d. per acre.

The management of flax is tedious and difficult in these parts, by reason of the scarcity of proper workmen. Those we have are emigrants from the West, and take every opportunity of imposing on the inexperience of young farmers. Besides it appears to me that flax-growers ought to make it their staple article, and to consider the other parts of their farm as in subserviency to it. For the present, therefore, I have discontinued this culture. If I mistake not, there is a parliamentary bounty of 13s. 4d. per pack to the growers.

No. IV. *On Jerusalem Artichokes.*

At a considerable expence and trouble, I procured of these roots sufficient to plant half an acre of ground, but I have them now in great plenty. I find the produce to be about 480 Winchester bushels per acre; and I think they are about equal in value to potatoes for feeding store-pigs, such as are not less than five or six months old. For fattening hogs, I do not find they are near so valuable as potatoes. But their chief recommendations are, the certainty of the crop, that they flourish in almost any soil, and do not require any manure, at least for such a produce as I have stated. They are proof against the severest frost, and may be taken out of the ground as occasion may serve. Whereas potatoes are soon affected with frost, and must therefore

fore be secured before the winter season sets in. I generally plant three or four acres in a season.

Expences per acre—drills $3\frac{1}{2}$ feet asunder, sets nine inches—time, beginning of March.

	£.	s.	d.
Rent - - - - -	1	10	0
Two ploughings, at 5s. - - - - -	0	10	0
Four sacks of sets, at 2s. - - - - -	0	8	0
Flat hoeing - - - - -	0	2	6
Earthing up twice, at 2s. 6d. - - - - -	0	5	0
Digging 120 sacks, at 3d. - - - - -	1	10	0
	<hr/>		
	£.4	5	6

PRODUCE.

One hundred and twenty sacks, at 2s. - - - - -	12	0	0
Deduct expences - - - - -	4	5	6
	<hr/>		
Profit - - - - -	£.7	14	6

No. V. *On Woad.*

Having been in conversation with some growers of woad, who reside at Keynsham, a place famous for the manufacture of this valuable dye-stuff, it was asserted by them, that the growth of woad was peculiar to their soil and situation, and that the soil of Brington would by no means suit it; and indeed there is a very considerable difference in these; that of Keynsham, where the woad is raised, being

a blackish heavy mould, with a good proportion of clay, but works freely; whereas the soil of Brifflington is mostly such as I have described it. I know of none similar to that of Keynsham; yet I resolved to prove how far their assertion was well founded; and obtaining some seed from one of the needy sort, I sowed half an acre on the common, an exceeding fine tilth, and a better crop I never saw in Keynsham. I could not prevail on any of the Keynsham growers to purchase it, although but about two miles distant; and not having either apparatus or judgment to manufacture, I suffered it to run to seed, gaining only from the experiment, that it is of a very easy culture, and might be made general, and that the only difficulty is in the preparing it for market.

No. VI. *On Coriander Seed.*

March 22d, 1783, sowed ten perch with coriander-seed, the soil a good sandy loam,

	EXPENCES.	£.	s.	d.
Three ploughings	- - - -	0	1	6
Sowing and harrowing	- - - -	0	0	1
Four pounds of seed, at 3d.	- - - -	0	1	0
Harvesting	- - - -	0	0	3
Ripling	- - - -	0	1	0
Rent	- - - -	0	2	0
		<hr/>		
		£.0	5	10
		PRODUCE,		

PRODUCE.		£.	s.	d.
87 pounds of coriander seed, at 3d.	-	1	1	9
Deduct expences	-	0	5	10
		<hr/>		
	Profit	£.0	15	11

or 15l. 18s. 4d. per acre.

I have since made several larger experiments in this article, but none has proved so good a crop as the preceding; yet all of them such as to afford a good profit. There is a ready sale for it with the distillers, druggists, and confectioners. The former purchase very large quantities—the price varies from 16s. to 42s.

No. VII. *On Brining Seed-Wheat.*

At my outset in farming, I had frequently smutty wheat, until, about seven years ago, I adopted the brining method, which, excepting in one instance, I have invariably pursued, and saving that instance my crops have been invariably free from smut. The method is this:—

Mix salt with common water till it is capable of bearing an egg floating on its surface; introduce the feed wheat, well stirring it about, so that the light imperfect grains and other refuse matter may swim at the top; this must be carefully skim'd off

off from time to time till none arise; let it remain the space of 12 to 16 hours; after which drawing off the brine at a spigot or cock below, placed there for that purpose, take away the seed grain, and after suffering the remaining moisture to drain off a little, sprinkle it with fine powdered lime, or wood-ashes, it will then immediately be in a proper condition for sowing. Although I remember that some years past, a sudden and severe frost interrupting our sowing, some seed thus prepared remained so a full month, was afterwards sown, and vegetated as perfectly as if it had been sown immediately. The same brine will answer equally for any operations, and even for years, only supplying the loss absorbed by the grain.

No. VIII. *On Spring Wheat.*

April 9th, 1784, sowed $1\frac{1}{2}$ acre of spring wheat, the produce was $10\frac{1}{2}$ sacks or $45\frac{1}{2}$ Winchester bushels. It being an unusual season for sowing wheat, brining was forgotten, and the crop proved remarkably smutty.

As to the practice of sowing wheat in the spring, I am no advocate for it, only in cases wherein the land cannot be got in order at the proper season.

No. IX. *A*

No. IX. *A Comparison between Brining and not Brining.*

Of the smutty wheat in the last experiment, I caused a bushel to be sown unbrined, on half an acre of ground, and a bushel brined on another half acre; the crop of the brined was free from smut, the unbrined very smutty.

No. X. *On recovering Smutty Wheat.*

I took a sample of the smutty wheat [Experiment No. VIII.] to my baker, which he was very unwilling to purchase at any rate; at length, however, he offered me 16s. per sack, 36 gallons: this was so much under the current price of sound wheat, that I could not think of accepting his offer.

Some days afterwards it came into my mind to wash and dry it; accordingly I provided myself with a tub conveniently shallow, that would well cleanse about two bushels at each operation, reserving a suitable space above the grain for the water, placing this under a pump; whilst one man was pumping, another kept continually stirring it about with a broom, the smutty water, together with the light grain, overflowing the sides of the vessel, till the bulk of grain was thoroughly clean and bright. Thus in a few hours we completed that part of the business. Next it was committed

to

to a malt-kiln for drying; and as I thought a much greater degree of heat ought not to be communicated to it than that of a hot summer, I never suffered it to exceed the 85th degree on Farenheit's thermometer, which I was well enabled to regulate by the application of that instrument. In the space of about 18 hours the drying was finished, and the whole performed greatly to my satisfaction;—not the least vestige of smut in smell or appearance. I then took a sample from the kiln to the same baker, acquainting him with all the circumstances; he was surpris'd at the metamorphosis, and, after examining the bulk on the kiln, purchased it at 27s. per bag, confessing it was nothing inferior to any wheat of equal weight, the top of the market being then 28s. per bag; the loss in measure attending the experiment was something less than half a bushel.

STATE of the EXPERIMENT, viz.

Ten bags of wheat, as per baker's first offer,	£. s. d.
at 16s. - - - - -	8 0 0
Ten bags sold after the wheat was cleaned,	
at 27s. - - - - -	13 10 0
Deduct 2 men's wages, 2 days	£. 0 6 0
Loss in measure half a bushel	- 0 1 8 $\frac{1}{4}$
Fuel and rent, suppose	- 0 5 0
	— 0 12 8 $\frac{1}{4}$
	12 17 3 $\frac{1}{4}$
	8 0 0
	— 4 17 2 $\frac{1}{4}$
Saved by the experiment	- £. 4 17 2 $\frac{1}{4}$

No. XI. *On Canary Seed.*

March 1783, sowed one peck of canary seed on half an acre of land, the soil a mixture of loam and clay—produce 8½ bushels,

EXPENCES.	£.	s.	d.
Three ploughings, at 2s. 6d.	0	7	6
Sowing and harrowing	0	1	6
Weeding	0	4	0
A peck of seed	0	2	0
Cutting and harvesting	0	2	0
Threshing, 9d. per bushel	0	6	4½
Rent	1	0	0

£.2 3 10½

PRODUCE,	£.	s.	d.
8½ bushels canary seed, at 10s.	£.4	5	0
Deduct expences	2	3	10½
Profit	£.2	1	1½

or 4l. 2s. 3d. per acre.

I have made several other experiments in this culture, but never exceeded the above in produce; although it is said that in the Isle of Thanet, where this crop is not unfrequent, they usually obtain upwards of 20 bushels per acre.

No. XII. *On Anise.*

I have tried several experiments in the culture of anise, but was never fortunate enough to get a crop,

crop, it appearing that this climate is not in general sufficiently warm to mature and perfect the seed; the distilled plant however, using it when in blossom, affords a more sweet and grateful tincture than either the ripe seed or essential oil.

No. XIII. *On Potatoes.*

The quantity of land $6\frac{1}{4}$ acres, a mellow, deep, sandy loam, on Brislington Common—distance, drills three feet asunder, sets eight inches.

	£.	s.	d.
Three ploughings, at 5s.	-	-	4 17 6
Thirty-five sacks of seed potatoes, at 5s.	8	15	0
Planting, at 3s. 6d. per acre	-	-	1 2 9
104 putt loads of manure; composition, 2-thirds natural mould, and 1-third hog-dung, at 2s.	-	-	10 8 0
Taking out of the ground	-	-	13 0 0
Bringing to market	-	-	13 0 0
Three hoeings, at 12s. per acre	-	-	3 18 0
Rent	-	-	13 0 0
			£.68 1 3

PRODUCE.

Potatoes sold	-	-	£138 5 0
Ten sacks used in the family, at 5s.	-	-	2 10 0
Sixty sacks reserved for planting, at 5s.	-	-	15 0 0
			155 15 0
Deduct expences	-	-	68 1 3
			Profit - £.87 13 9

or 13l. 10s. per acre nearly.

Besides, the whole expence of manuring ought not to be charged to this experiment, the succeeding crops clearly evincing the great advantage they received from it; for it is worthy remark, that this piece of land never received but the single dressing mentioned above to this time, and yet has produced stout crops of wheat, and potatoes alternately, until last spring it was laid down with grass seeds, and sown with oats.

No. XIV. *On Black Oats*—1787.

The same land as in the last experiment. The preceding year it had carried potatoes, and received one ploughing for a winter fallow.

In February last, another ploughing was given, and on the 27th and 28th of the same month four Winchester bushels per acre of black oats were sown; this was earlier by about a month than oats are generally sown in our parish, and I did it with a view to ascertain the effects of early sowing. When the oats were ripe, I caused exactly half an acre to be cut with the sickle, and sheaved; these were threshed out, the produce was 49½ Winchester bushels—a quantity most amazing in these parts. The success of the crop I impute partly to early sowing, and partly to good deep tillage; and I believe the half acre was a fair average of the whole piece.

EXPENCES of an ACRE.		£.	s.	d.
Rent	- - - -	2	0	0
Two ploughings, at 5s.	- - - -	0	10	0
Cutting	- - - -	0	3	0
Harvesting	- - - -	0	5	0
Four bushels of feed, at 2s. 6d.	- - - -	0	10	0
Sowing and harrowing	- - - -	0	3	0
		<hr/>		
		£.3	11	0
PRODUCE.				
98½ bushels of oats, at 2s.	- - - -	£.9	16	6
Deduct expences	- - - -	3	11	0
		<hr/>		
Profit	- - - -	£.6	5	6

The straw may be valued in lieu of threshing, conveying to market, &c. but is worth abundantly more than what would defray those expences.

I am, Sir, your obedient fervant,

NEHEMIAH BARTLEY.

ARTICLE XXXI.

On the Black-Rust in Wheat.

[In a Letter to the Secretary.]

SIR,

Bradley-House, July 27, 1785.

THE bearer hereof, RICH. WINSOR, of *Berry-Pomeroy*, near Totnes in the county of Devon, yeoman, has found out a method of curing the Black-

Black-Rust in wheat, which he has tried several seasons, and found it to be of great utility; and others, who have taken his advice in trying the experiment, have likewise reaped a considerable advantage by it.

The method he has found out for curing it, is to let such rusty wheat stand uncut, three weeks or more after the usual time at which people in general cut such wheat.

He attributes the infection to small insects, falling upon the stalk in foggy or misty weather; insects of a poisonous nature, that cause the stalk to swell, and the knots of the stalk to close; by which means the sap, which should go to nourish the grain, is prevented; and that by letting it stand as aforesaid, the sun and air will destroy these insects; the knots will then open, and as they open, the sap passes up and feeds the grain; which, by letting it stand a proper time, will recover and become much more full, and will be near as good in quality, as though no rust had happened to it.

Mr. WINSOR acquainted the Society in London of this matter sometime ago, not knowing of a Society at Bath, till I informed him of it; and I have recommended him to apply to you as their
Secretary,

Secretary, desiring you to lay it before the Society, who, he doubts not, will reward merit according to its desert. I am, Sir, with all due respect,
 your humble servant,

RICHARD BAKER.

*** The foregoing short account, stated as a matter of fact founded on experiment, we give to our readers for their consideration; and as further experiments cannot be attended with any probable disadvantage, we conclude the method will have a fair trial among those farmers and gentlemen to whom the hint may be new.

ARTICLE XXXI.

Recipe for making Rennet for Cheese.

[In a Letter to the SECRETARY.]

SIR,

Frome, Oct. 5, 1787.

AMONG the various subjects which engage the attention of the members and correspondents of the Bath Agriculture Society, it appears somewhat strange, that the two grand articles within the province of the Dairy-woman (Cheese and Butter) have not been more attended to.

The Agriculturist has been repeatedly informed of the proper management, the best manures, and the

the likeliest crops, which may be applied to each respective soil: but the good housewife, the sedulous dairy-woman, who daily furnishes us with two of the chief supports and luxuries of life, has been left to grope out her way, through this age of improvement, with the little stock of knowledge which, in early life, she imbibed from her mother. I wish, therefore, that the members of your Society would now and then bestow a little of their attention on these good women, who so much want and so highly deserve it.

It is not within the compass of a letter, that instructions can be fully given for making cheese and butter; yet, as detached observations on those subjects may sometimes have their use, I send you a recipe for making rennet for curdling cheese.

Take the *abomasæ*, commonly called the veils or pokes of calves, killed before they have fed on vegetables, and wash them in clean water, salt them well, and lay them in salt for two months; then, with the salt about them, hang them up in a coarse bag in the chimney (not too near the fire) for ten months. In the spring following, when the cowslip is in full bloom, gather a quantity thereof, and pick the petals from the calixes, and boil them in a sufficient quantity of water for a quarter of an hour,

with the proportion of a pound of salt, and an ounce of allum to every twelve pints of water. Let this brine stand to cool until the next day, when it may be strained off from the cowslips. To every gallon of this brine, put in two pokes, and let them remain four days, at which time you may bottle it off, putting two or three cloves and as many grains of allspice into each bottle. Let the bottles be corked tight, and the rennet will keep good a year or more. Two large spoonfuls of rennet, thus prepared, will coagulate a hoghead of milk.

After the pokes have been thus used, let them drain dry, and salt them afresh for a fortnight, and they will serve again, nearly as well as before.

Should this paper be found worthy of admission, in the fourth volume of the Society's select papers, I may be induced, at a future opportunity, to give you some further thoughts on cheese-making.

I am, with respect, yours, &c.

A. CROCKER.



ARTICLE XXXIII.

On the Benefit of Cultivating Parsnips and Burnet.

GENTLEMEN,

I Have with much pleasure and much instruction perused your selection of papers communicated to the public; and am of opinion, that there is a plant, I mean the Parsnip, which has not been yet tried by any of your correspondents; but which is in France, and in our adjoining islands, held in high esteem as a food, particularly for cattle and swine. In Brittany, especially, they mention it as little inferior in value to wheat. Milch cows fed with it in winter, say they, give as good milk, which yields as well-flavoured butter, as milk in May or June, and in as great abundance. It is much commended for swine, which rear young pigs. It also proves very useful in fattening swine.

For a complete account of its uses, consult a volume of Memoirs published by a Society at Rennes, instituted for similar purposes as your's. I think there is a translation of the Memoirs in MILLS's husbandry.

Some judgment may be formed of the comparative value of plants as food, from the proportion

of mucilage they contain, or yield in decoction; for this purpose, suppose a pound weight, for instance, of parsnips, carrots, potatoes, &c. were boiled separately in a quart of water, the decoction strained, and, when cold, compared. The decoctions of the parsnips will, I believe, be found the most mucilaginous, or the most thickened. Be this as it may, the culture and trial of the plant seems an object worthy the attention of your Society.

Farmers are apt to judge of the merits of plants by the weight of their productions, without attending properly to their different qualities. Thus *Burnet* is, I find, by your correspondents made little account of. Upon trial it will be found that it goes much farther in feeding sheep, for instance, than any other plant. Thus, suppose that some sheep are fed on an acre of it, and an equal number on an acre of any other plant; I have some authority to say, that sheep will be longer well fed on burnet, than on any other plant I know. The mutton of sheep fed on it will be better coloured, more juicy, and better flavoured, than the mutton fed on any other food. It stands the winter better, and shoots as early in spring as any plant. It has been found to be a perfect cure of the *rot* in sheep; and cows, sheep, or goats, fed on it, give more milk, and more nourishing milk, than on any other
pasture;

pasture; and the butter obtained from their milk is not inferior to any.

I have mentioned sheep particularly, because burnet seems to be more peculiarly beneficial to them than to cattle.

The great excellence of the Turnip-rooted Cabbage is, its being a certain and early food in spring, when it is generally most wanted.

Wishing your Society the success they so well deserve,

I am, with much respect, Sir,

Your obedient servant.

A Lover of Georgical Pursuits.

N. B. We agree perfectly with our correspondent, in a high opinion of the value of parsnips, as a food for cattle; and have been induced to insert his letter as a fresh call of the public attention to the subject, though by no means as to a new, or wholly neglected matter. His encomium on burnet may be considered also as much anticipated by former writers. But if it shall be proved, that this well-known plant is either generally, or under particular circumstances, a perfect cure for the *rot in sheep*, much benefit will be found to result from the fact.

ARTICLE XXXIV.

On the Use and Value of Turnip-rooted Cabbage.

[In a Letter to the SECRETARY.]

SIR,

Hethel, June 21, 1787.

I Have been for a long time so much occupied by other matters, that little leisure has been afforded me for experiment or observation on agricultural affairs. The following one, whereby the use and value of the Turnip-rooted Cabbage may be in some degree ascertained, I transmit for the inspection of the Gentlemen of the Society, and submit to their consideration, how far, from this account, the cultivation of that root appears to merit their future encouragement.

The following is an account of the cattle or beasts fed from five acres of turnip-rooted cabbages; four acres of which were eaten upon the land as they were growing, (but parted off by fold-hurdles into portions of about an acre each) and one acre pulled up and carried to the stables and ox-houses. These turnips were sown and cultivated as other turnips; the beasts were put to them on the 13th of April, and continued feeding upon them till the 12th of May following.

Twelve

	<i>£.</i>	<i>s.</i>	<i>d.</i>
Twelve Scotch bullocks, weight 40st. each			
4 weeks, at 2s. per head per week - -	4	16	0
Eight homebreds, 2 years old, at 1s. ditto - -	1	12	0
Fifteen cows full-sized, at 2s. per week - -	6	0	0
Forty sheep, at 3d. ditto - - - -	2	0	0
Eighteen horses, fed in the stables with an allowance of hay, at 1s. ditto - - - -	3	12	0
	£.18 0 0		

Besides 40 store hogs and pigs, which lived upon the broken pieces and offal, without any other allowance for the whole 4 weeks.

When it is considered, how very nourishing a food the turnip-rooted cabbage is, the price I have fixed to the keeping each beast per week will not, I conceive, be deemed too high. I am sure the farmers here will always, at that particular season of the year, be willing to give it, and more; because it enables them to spare the young shooting grass (which is so frequently and greatly injured by the tread of the cattle in the frosty nights) until it gets to such a length and thickness as to be afterwards but little affected by the drought of the summer. They have besides other great advantages to recommend them to a more common use; they are never affected by the most intense frosts; if bitten by sheep, hares, rabbits, or the wood-pigeons, (which in this place abound to the great destruction

tion of turnips near any woods) they hardly ever rot. The tops or leaves are in the spring much more abundant, and much better food than those of the common turnip, and they continue in full perfection after all other turnips are rotten or worthless.

With these circumstances to recommend them, it must however be owned, that they have inconveniences attending them. They require a great deal of time and pains to get them out of the ground, if pulled up to be carried elsewhere:—and if fed as they grow, they are so deeply rooted in the ground, that it requires the same labour to get the pieces out of the ground, and they rise with abundance of earth entangled in the fangs of the roots. They are likewise so firm and solid, that the whole ones, when pulled up, require to be cut in halves, that the cattle may be enabled to eat them.

To obviate some of these objections, it will be proper to sow them on rich and very light land; and as they are longer after being sown in coming to the hoe, than the common turnips, I have found it necessary to sow them earlier, so early as the beginning of June.

I have grown them a great number of years; from the experience I have had of their utility I
 continu

continue to cultivate them; and I think no gentleman, who keeps them to consume for the last fortnight or three weeks before he turns his cattle to grafs, will have reason to grudge the expence or trouble attending them.

If in any enquiry or other business here I can be of the least use, you may freely command me, and I shall be proud on every occasion to shew that

I am, Sir,

your most obedient servant,

THOMAS BEEVOR.

ARTICLE XXXV.

On the Mangel-Wurzel, or Scarcity Root.

[By the SAME.]

SIR,

Hethel, Oct. 12, 1787.

I Feel myself highly flattered by the favourable opinion the Gentlemen of the Society are disposed to entertain of those accounts in husbandry, which it has been in my power to send them; and give me leave to say, that I have particular reason to be pleased with the polite and friendly manner in which you have expressed their and your approbation of them.

I wish

I wish I could by any fresh communication convince them, that I was deserving of their commendation; but from the many and various avocations I have lately had, I have been rendered less able than I could wish, to attend to any experiments worth relating.

I this summer received from a friend who came from Paris, some seeds of the plant called in Germany *Mangel-Wurzel*; by M. DE COMMERELL, *Racine de Disette*; and in English, *the Scarcity-Root*. The account of the plant, and its time and method of propagation, are so fully given by M. L'ABBE DE COMMERELL above-mentioned, in the Memoire published by him, and which I suppose you have seen, that I shall wholly omit the mention of them, and only relate what little I have yet observed of it.

My seeds were sent me very late, two months nearly after the most proper time of sowing them; however I ventured to commit them to the ground on the 12th day of June last; and in a few days had the satisfaction to find them all rise well, and in a vigorous state of growth. I have since gathered their leaves twice, and find their roots of such size as to promise a considerable and profitable production. The measure of some of them is now 15 inches round; the length (of a few I pulled up on
this

this occasion) is 13 inches, and the weight of them on an average 4lbs. The seed and plants are not, I think, to be distinguished, at their first growth, from some beets; but in order to ascertain the difference, (if such there was) I sowed on the same bed of mould, on the same day and hour, some seeds of the real beets; and find that, under the same management, the roots of the scarcity plant are four times as big, and the leaves of it much larger than those of the real beets. I have offered a few of the leaves of the scarcity plant to the cows whilst going in exceeding good pasture in my park, which they readily ate; I did the same to some horses which were standing in a waggon in the harvest field, who as readily ate the broad tender part of the leaves, but rejected the thick parts of the stalks. I have also had dressed the leaves of each of the above-mentioned plants, and brought boiled to my table; and think, as did some other gentlemen who ate of them, that there is a manifest difference in their taste; those of the scarcity plant being so like spinage, as hardly to be distinguished from it; whilst those of the beet were both harder and drier.

What further observations I shall be able to make upon the growth and application of this plant, in the course of the winter, I will transmit to you,

you, as it certainly promises to be of the first importance in the article of food for cattle. In the mean while let me not omit to inform you, that I saw a few weeks ago at Lord ORFORD's place at *Eriswell*, near Barton-Mills in Suffolk, some of the plants, which were nearly twice as big as mine:— and I have been told, that at Mr. DASHWOOD's, of *Cley*, in Norfolk, there are some which measure two feet in circumference; but the two last-mentioned parcels were, I am informed, sown at least six weeks sooner than mine were.

I have had sent me this week an account of a most wonderful production of vetches: upon two plants sown in the garden of JOHN BERNEY PETRE, esq; of *Westwick*, in Norfolk, there were found (after several had been accidentally plucked off) no less than 994 pods, containing on an average six seeds in each pod; in all 5964 seeds.

Mr. PETRE, who sent me the account, did not know the name of the plants; but from a branch of it which he sent me, with the account, I have great reason to believe it to be the broad-leaved many-flowered vetch of Crete; for it had upon it some deep purple flowers, and is a perennial plant, as he assured me; however, not having any botanical

nical book by me at present, I cannot be at all certain of the truth of my conjecture.

P. S. In riding yesterday about seven miles from this place, I saw at least two-thirds of the wheat for next year's crop was dibbled, and set by hand. I am inclined to believe it will soon be generally so here.

ARTICLE XXXVI.

Experiments on various Sorts of Potatoes.

[By the SAME.]

SIR,

Hethel, Dec. 1, 1787.

I Venture to send you an account of a trial made by me, of a few sorts of Potatoes planted last spring; and as there is not, perhaps, in the wide field of agriculture, any plant which more deserves attention and general cultivation than the potatoe; so I hope every information which leads to the discovery of the best and most productive kinds, will be received in good part, and neither deemed trifling nor useles by any of those who are real well-wishers to the interest of society.

I shall content myself with this apology for the contents of my letter; and after premising that all the underwritten potatoes were planted on the 2d day of April, in a garden, the soil of which is a rich hazelly

hazelly coloured loam, neither too wet nor too dry ; that they were all well dunged, for that the four first forts stood on a border where a row of apple-trees had grown, which were taken up about a month only before the sets were planted ; that the three last forts were planted on ground which had been cropped as gardens usually are, and that the pieces planted were cut from large potatoes, with two or three eyes on each piece ; I will proceed to shew the result of the experiment.

No.	Names.	Weight of feed.		Quantity of Ground.	Weight of produce.		Bush. per acre.
		lb.	oz.		ft.	oz.	
1.	Incomparable, a } feeding,	4	9	6-10ths of a rod	13	0	692
2.	Denne's Hill, dit.	3	1	8-10ths	16	10	668
3.	Bayley's feeding,	3	1	5-10ths	8	6	539
4.	Manley White	4	12	3-10ths	6	4	670
5.	Kentish feeding,	2	10	4-10ths	16	11	1342
6.	Champion,	3	6	5-10ths	11	1	708
7.	Ox-Noble,	3	11	4-10ths	14	0	1140

The above roots were all taken up on the 29th day of October last, and the stems of each, except those of the Manley and Champion, which were entirely dead, were green and fresh at the time of taking them up.

No. 1, large white, meally, ill-tasted.

No. 2, very large, white, meally, and good.

No. 3, middle-sized, white, meally, and exceeding well flavoured.

No. 4, large, white, meally, and good-tasted.

No. 5, very large, white, not yet tried upon the table.

No. 6,

No. 6, middle-sized, white, mealy, and exceeding good to eat.

No. 7, large, white, and ill-flavoured.

The bushels above-mentioned are heaped bushels, weighing on an average 70lb. per bushel.

ARTICLE XXXVII.

On Planting of Waste Lands.

GENTLEMEN,

Norwich, Feb. 29, 1788.

THOUGH planting waste land be not immediately within the province of agriculture, yet the publick advantage, of which you are the promoters, may be more effectually served by the study of certain modes of planting it, than from annual crops; and especially as planting becomes eventually a useful auxiliary to cultivation. I therefore wish to present to your notice, as a possible example to other parts of the nation, the practice and success of a neighbouring gentleman (Sir Wm. JERNINGHAM) on the most unpromising ground, perhaps, that any successful planter has hitherto attempted; notwithstanding there is a certainty from experience to believe, that the stubborn soil may be meliorated, and the apparent sterile be made productive; and by properly timing the period for
specifick

specifick productions, what would in the natural state of the land have been impossible, by an adaption of fit circumstances, a production may be excited, foreign and uncongenial to the soil; while, without these circumstances, no more success would have followed than to him who sows without culture, or plants without trenching the ground.

These reflections arose from a frequent and late observation, made on the extensive and thriving plantations of the abovementioned gentleman; who has, without hyperbole, changed the barren heath to a fruitful field, the dreary waste to a delightful forest, by an adaption of circumstances to situation and soil; and, by an application of what would cherish and defend, has extended a plantation of beech-trees uncommon to this district; nor I believe do they spontaneously grow in any county through the eastern division of the kingdom.

The mode Sir WILLIAM pursued, was the planting of the beech-trees from the nursery, while small, amongst Scotch firs. Many heaths beside his have been broken up and planted with firs, to much publick and private benefit. But I have not observed, unless recently, the regular intermixture of the beech at due distance. These trees, in a soil perhaps without clay or loam, with the heathy sod,
trenched

trenched into its broken strata of sand or gravel, under the protection of the firs, have laid hold, though slowly, of the soil, and, accelerated by the superior growth of the firs, have proportionally risen, until they wanted an enlargement of space for growth, when the firs were cut down.

It is scarcely necessary to observe, that when this resinous tree is felled, the roots decay in the ground, and furnish by that decay a new support to the soil on which the beeches grow; by which contingency, they receive an added vigour, as well as the favourable concomitants of an enlarged space in earth and air; and by being now disincumbered from their former supporters, their growth becomes more and more obvious; they are ornamental to the country, promise in time to be useful timber, and probably may disseminate their species where they would not have been expected to flourish, but under the shade and encouragement of the firs. And these firs having met with no obstacle from the infant timbers they encouraged, their boles are now converted to posts, rails, and various other uses, and their branches have been bound into thousands of bavons, that have heated the ovens, or have been burnt on the hearths of the farmers and cottagers around.

JOHN WAGSTAFFE.

ARTICLE XXXVIII.

Description of a Model of a Machine for communicating Motion at a Distance.

[In a Letter to the Secretary.]

SIR,

Bristol, Nov. 21, 1786.

A Commodious method of communicating motion at a distance, has long stood among the desiderata of mechanics, and no method that I know of has been attempted, that at the same time will free the machine from weight and incumbrance. Hollow shafts of cast-iron bid fairest to answer this end, but they are expensive; and though I suppose it may be cheapest, all things considered, it will be difficult to make them general.

The method introduced to you by the model accompanying this letter, was tried and approved of at a mill in the neighbourhood of this city, on two shafts, one 15 feet long and 15 inches thick, and the other 12 feet long and 12 inches thick; the latter of which was so weak as to twist near a tenth of its circumference; which, when the resistance became in any wise unequal, subjected the whole machine to the greatest danger and disorder.

It was proposed and intended to take it out and substitute a larger, which would have been attended with

with great expence and inconvenience, as the whole manufacture must have been interrupted for some time, and part of the mill-house must have been taken down. Being apprized of this intention, I advised the method here recommended. Accordingly two flat bars were procured from a scrap forge, of $2\frac{3}{4}$ inches by full $\frac{3}{8}$ ths of an inch, and their ends furnished with screw-pins of $1\frac{1}{4}$ inch, with square threads: the bars were then hollowed on the under side with a large swage, in order to make the edges lie close to the shaft. This done, they were annealed and put to a large vice, and twisted with a hand-hook, such as the anvil-smiths use; so that one end had made a little more than a revolution, after which a few blows of the hammer (and which requires not so much skill as may be imagined) formed them into a spiral, fitted to a cylinder of 12 inches diameter. They were then carried to the mill at the distance of five miles, and after the blocks were fitted to receive their ends, were put on with the greatest facility.

It may be necessary to observe, that the distant gearing of the mill was trigged, while the water-wheel was turned back in order to twist the shaft the reverse way of its going; by which means the spirals bound closer than could possibly be by screwing only. I should add, also, that some blows of a

hammer, of about 12lb. were laid on in order to close them to the sides of the shaft; which being an octagon, and not a cylinder, could not be effected by any other means.

This was the method practised in strengthening those shafts already in gearing; but if it should be thought expedient to use them in construction, they may be applied to more advantage; for instead of one revolution of the spiral, it may have two; in which case the advantage will be double: add, that in both cases there may be as many spirals as there are arms in the wheel.

I am, Sir, your obedient servant,

J. C. HORNBLOWER.

N. B. It has not been thought adviseable to attempt any representation on a plate, of the model accompanying this letter; but our mechanical readers, who have any curiosity to see it, may be gratified, by applying at the Rooms of the Society.

ARTICLE XXXIX.

SIR,

West-Monckton, March 6, 1788.

BEING struck very forcibly with the importance of the subject, I sometime ago committed the inclosed thoughts to writing, not at that time with any

any design that they should appear in publick ; but I happened to shew them lately to a gentleman of the neighbourhood, who desired I would send them to your Society. I have, therefore, taken the liberty to follow his advice ; and if you find any thing worthy the notice of the Society, or yourself, it will afford pleasure to, Sir,

Your obedient humble servant,

T. PAVIER.

“ Were the forest of Dean duly improved, it were
 “ an imperial design: and I do pronounce it
 “ more worthy of a prince, who truly consults
 “ his glory in the highest interest of his sub-
 “ jects, than that of gaining battles, or subdu-
 “ ing a province : for he not only secures the
 “ strength and glory of the nation, in prefer-
 “ ving an abundant supply of timber for ship-
 “ ping ; but also adds greatly to the number
 “ of people, by the many new farms for corn
 “ and grafs, erected where the land turns at
 “ present to little account for timber, which is
 “ universally neglected ; and less for men, be-
 “ ing uninhabited.”

The above is a quotation from Mr. EVELYN'S
 SYLVA, which a late survey of the land therein
 X 3 mentioned,

mentioned, and the small quantity of timber reported to be now growing thereon, have brought afresh to my memory. Such an improvement as is above recommended, would undoubtedly be of the greatest importance to this kingdom, in future generations; and would redound highly to the honour and glory of a British government that should carry it into execution, at the same time that it would be attended with but an inconsiderable expence.

To illustrate this assertion, let us suppose that instead of disposing of all the waste lands belonging to the crown, some particular places, where the soil and situation seem adapted for producing good oak timber, were reserved to be improved for that purpose; the expence of inclosing is then the first thing that comes under consideration; and this expence will always vary in proportion to the form and magnitude of the land to be inclosed; as a field of a hundred acres may sometimes be fenced in for the trifling sum of about 10s. per acre, whilst another of but ten acres shall cost by the acre three times as much.

It may happen that the ground for such intended improvement may adjoin to lands already inclosed, which will greatly lessen the expence; but in order to make some kind of calculation, I will suppose

suppose it to be fenced quite round on every side, and to cost on an average 20s. per acre.

The next step will be to prepare the ground for the reception of the acorns, which will undoubtedly be best effected by frequent ploughings; I would therefore propose to keep it in constant tillage for two or three years, till the earth is brought to a fine, mellow state of tilth, and then to sow or plant the acorns in the autumn: the profit of the crops taken from off the premises will (no doubt) abundantly overpay all the expence of inclosing, as well as the collecting and sowing the acorns.

These crops could not impoverish the ground so as to occasion any injury to the intended plantation, because the young trees will derive their nourishment and support from that part of the soil which lies beneath the action of the plough, or the extension of the roots of any kind of corn.

From hence it appears, that an improvement of this nature would be attended with very little, or perhaps no expence, but what would be amply repaid by the profits arising from the same; and I am persuaded, that no further trouble or expence would be necessary for several years, but to take care that no kind of cattle whatever be admitted into the inclosure.

When

When the plants are about eight or ten years old, it may be necessary to cut down the greater part, leaving a sufficient number of the most promising ones, the superfluous branches of which should then be taken off, which ought to be the only time they should ever be pruned; as it would be better for the young trees, that such branches should be stripped off by hand every time the underwood may be cut, as long as they can be easily bent down for that purpose, or if convenient, every year.

At every time of cutting the underwood, the young trees should be thinned with great discretion; the thicker they stand in reason whilst young, the better lengths will they arrive at: but I apprehend that each tree should at the last be allowed a hundred square yards for the expansion of its limbs.

Allowing this to be a proper distance, an inclosure of fifty acres would produce 2420 trees, which I suppose would come to perfection in about 100 years, and that they would be worth (on an average) five pounds each; the value of the timber on the fifty acres would then be 12,100 pounds.

Mr. EVELYN computes the profit of a thousand acres, in a hundred and fifty years, to amount to upwards of 670,000l. How he made such a calculation,

lation, I cannot guess, but think the profit is charged much too high.

Oak timber, let up in the manner above described, would arrive to great lengths; and having never been pruned or transplanted, there could be no danger of their falling unsound; consequently the charge I have made of 5l. a tree for their value on an average, will, I suppose, be thought very reasonable, especially as the bark and wood are both included.

The quotation from Mr. EVELYN, with respect to the forest of Dean, is most undoubtedly applicable to many others of the waste lands belonging to the crown, and in particular to the New-Forest in Hampshire, which would produce an immense quantity of fine timber without any expence, if a method could be devised to prevent the deer and other cattle from cropping the young trees in their infancy: the truth of this appears from an observation I made some years ago, that there was scarce a young oak to be seen but what had found its way up through a thick bush of thorns or brambles, and consequently owed its preservation thereto: from this observation also, I am of opinion, that there can be no necessity for any considerable expence in weeding a young plantation of oak.

Complaints of the scarcity of oak-timber fit for ship-building, are at present very frequent; and from the small quantities that are coming up in most parts of the kingdom, it seems to me very apparent, that such scarcity will be severely felt in another century; consequently the present opportunity for making some such improvements for the benefit of futurity, is highly deserving the notice and consideration of those in power.

If the foregoing considerations are just and reasonable, what vast advantages might future generations derive from judicious and provident improvements of this kind! And I am persuaded, that such undertakings would be recorded in history in terms that would oblige posterity to look back with gratitude and applause to the period that produced them.

The foregoing reflections, however brief on a copious and national subject, are equally seasonable, and fraught with importance. The improvement of any country in those articles of produce, which are of greatest consequence to its safety and accommodation, is among the first objects of its provident care. In determining what those articles of produce are, regard must be had to natural circumstances of soil, climate, and situation, with respect to surrounding countries.

According

According to the state of Europe, and the insular situation of this country, much of its safety and importance have been politically determined to arise from a plentiful growth of oak timber, fit for building ships of defence, and for merchandize. Nor is the cultivation of a tree so congenial to our soil, and so ornamental to our forests and fields, an object unconnected with domestick uses, in the construction of various kinds of machinery, and the most firm and comfortable habitations.

We agree with Mr. PAVIER, that the cultivation of Oak-timber, with a view to the benefit of posterity, seems to have been of late years too much neglected in these kingdoms. And while every friend of human felicity must condemn the misguided ambition of a tyrannical prince, who could destroy whole villages to plant a forest, he will feel due solicitude for those general advantages which must result from better maxims of cultivation.

It may not be deemed so fully within the province of this Society, to call on Government for its attention to the management of Royal Forests and Waste Lands, as to point out the benefits of a general improvement on the estates of individuals. Such a species of improvement will at least be listened to, as a worthy and proper object of rural œconomy; and every exertion that may be excited by such means, will have some favourable influence in a nation emulous of greatness and of fame.

From this motive, we shall not hesitate to suggest the easy and manifold advantages that would result from increasing plantations of oak-trees, on particular parts of numerous estates, from the lordly park, down to the small cultivated farm. On the former, the growth of the oak
is

is truly deemed essential, both to the elegance and grandeur of the inclosure. But while this idea prevails in theory, and neither grandeur nor elegance can be realized without it, there is too much reason to fear that planting has not kept due pace with the consumption of this valuable species of timber. On the latter, it is much to be questioned, whether a view to *immediate profits* from the soil, has not too generally obtained to the exclusion of timber plantations.

Why this error should obtain, it may be difficult to determine in a way favourable to the wisdom and foresight of a multitude of land-owners. For on many inclosed farms, and especially on farms which have a bleak northern exposure, it would frequently be found that a judicious plantation of young timber trees would gradually increase the value of the lands, by the shelter they would afford to cattle, the strength they would give to fences in which they might be planted, and the breaking of unfriendly North and North-east winds.

But admitting the situation of inclosures to be such, as sometimes not to stand in any great need of the shelter of trees, it frequently happens, that on farms of considerable size, and variety of soil and exposure, small parts, of no great value for pasture or cultivation, might be appropriated, without any material lessening of the annual income of the farm, for entire plantations, even of oak. But if it should be thought that an entire oak plantation would be too great a sacrifice of the ground, a plantation of various other species of trees of a quicker growth, to be periodically cut as underwood, might be made, and the produce come in aid of the supposed disadvantage; while the principal object above contended for, would be secured.

To these considerations may be added, the source of *fencing*, *hurdling*, *draining*, and *firing*, (that would be created on many farms where those conveniences are much limited, to the no small inconvenience of the farmer) and the picturesque beauty, that such plantations, generally adopted, would give to the face of a country.

ARTICLE XL.

On the Healthiness of managing Silk-Worms.

[In a Letter to the Secretary.]

SIR, *Bridge-North, Cann-Hall, Dec. 15, 1787.*

THE life and changes of a Silk-Worm may justly be classed among the most wonderful phenomena of nature: and never have my ideas of the great Creator of all been raised to a higher pitch of enthusiastic adoration, than whilst contemplating this industrious little animal, excluded from light, from air, and sustenance—and yet weaving, with mathematical exactness, the web which shall clothe the highest order of the world's inhabitants.

The incongruity of believing that Almighty Goodness could make that creature pernicious to man, for whose service and delight he is evidently created, will be sufficiently obvious to you;—but vulgar prejudices must be combated with other proofs.

If

If the fact were really so, what would become of the inhabitants of Italy, of China, and more especially of the islands in the Archipelago; where, from the immense numbers which are reared, the whole atmosphere must be impregnated with their deleterious effects? I have been assured, by an intelligent friend, who spent some time in Italy, that whenever they had epidemick complaints, the children who had the care of the silk-manufactories invariably escaped the contagion; and this I have reconciled on the principles of Dr. PRIESTLEY, who asserts, that the air in rooms is rendered doubly salubrious, by the introduction of opening vegetables, or fresh-gathered leaves.

The silk-worm in itself is totally inoffensive; but if dead ones are suffered to remain among them, they certainly become putrescent, as other animal substances, and of course unwholsome.

In the summer in which I fed upwards of 30,000 in one room, nobody was the worse for attending them; and yet I frequently spent whole days with them, as did many of those friends who were kindly attentive to assist me in the care of them.

I know a lady who had a good many silk-worms; she cleaned and fed them herself, and was seized with

with a bad fever: All this might be:—but without allowing for the coincidence of events, she boldly asserts her fever to have been occasioned by the silk-worms, and as loudly proclaims them unwholesome. It is, I suppose, from such circumstances as these, that the belief has gained ground; but I am decidedly of opinion that it is without other foundation.

The experiments you wish me to make, I certainly will attempt:—but I must confess the ascertaining how much food will support a given number of worms, has difficulties, since they eat much more voraciously at one time than another, and the lettuces vary materially in size.

There is a matter which appears to me of much greater magnitude, than the offering premiums for the planting of mulberry-trees; and that is, the holding forth a reward to those who shall discover the best method to propagate them. All the gardeners with whom I have conversed on the subject are ignorant of the practice of any other way, than by transplanting the suckers which spring from the roots of the old tree; and these are so few in number, that the expence of the purchase must effectually deter any one from making a large plantation, whilst the use and profits of it are so precarious.

Let

Let it once be known how they can be raised with ease, and in abundance, and the plan will become practicable, which it is not at present.

I am, Sir, your obliged friend,

HENRIETTA RHODES.

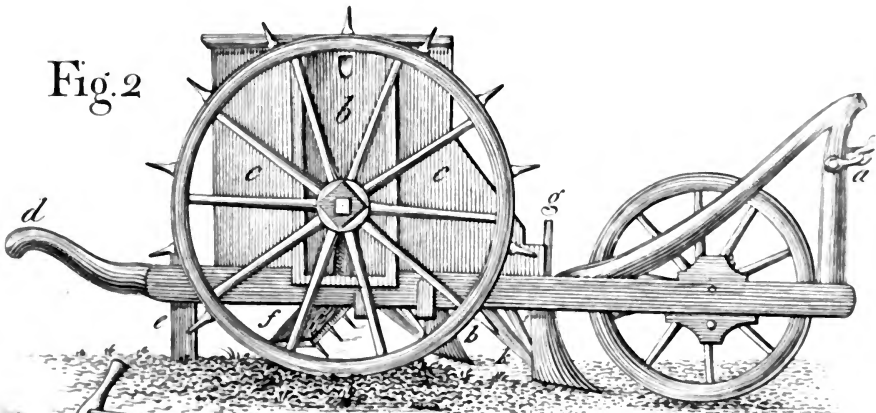
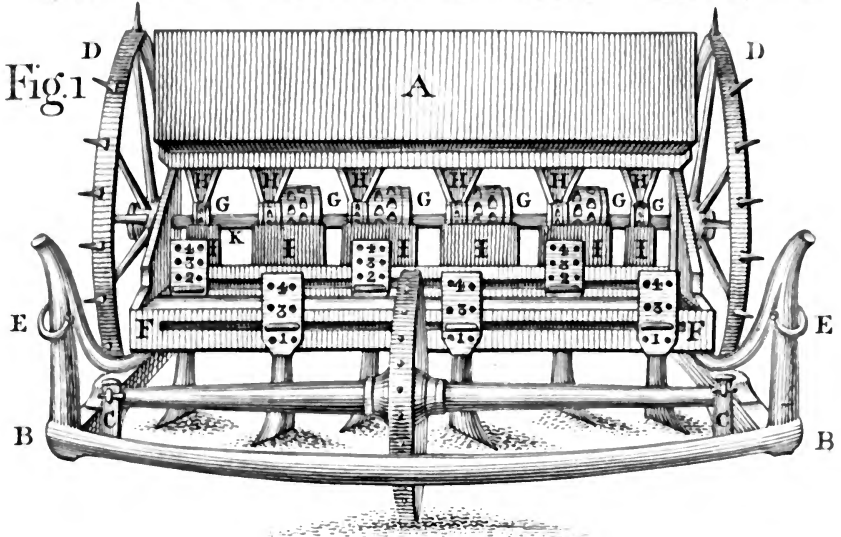
ARTICLE XLI.

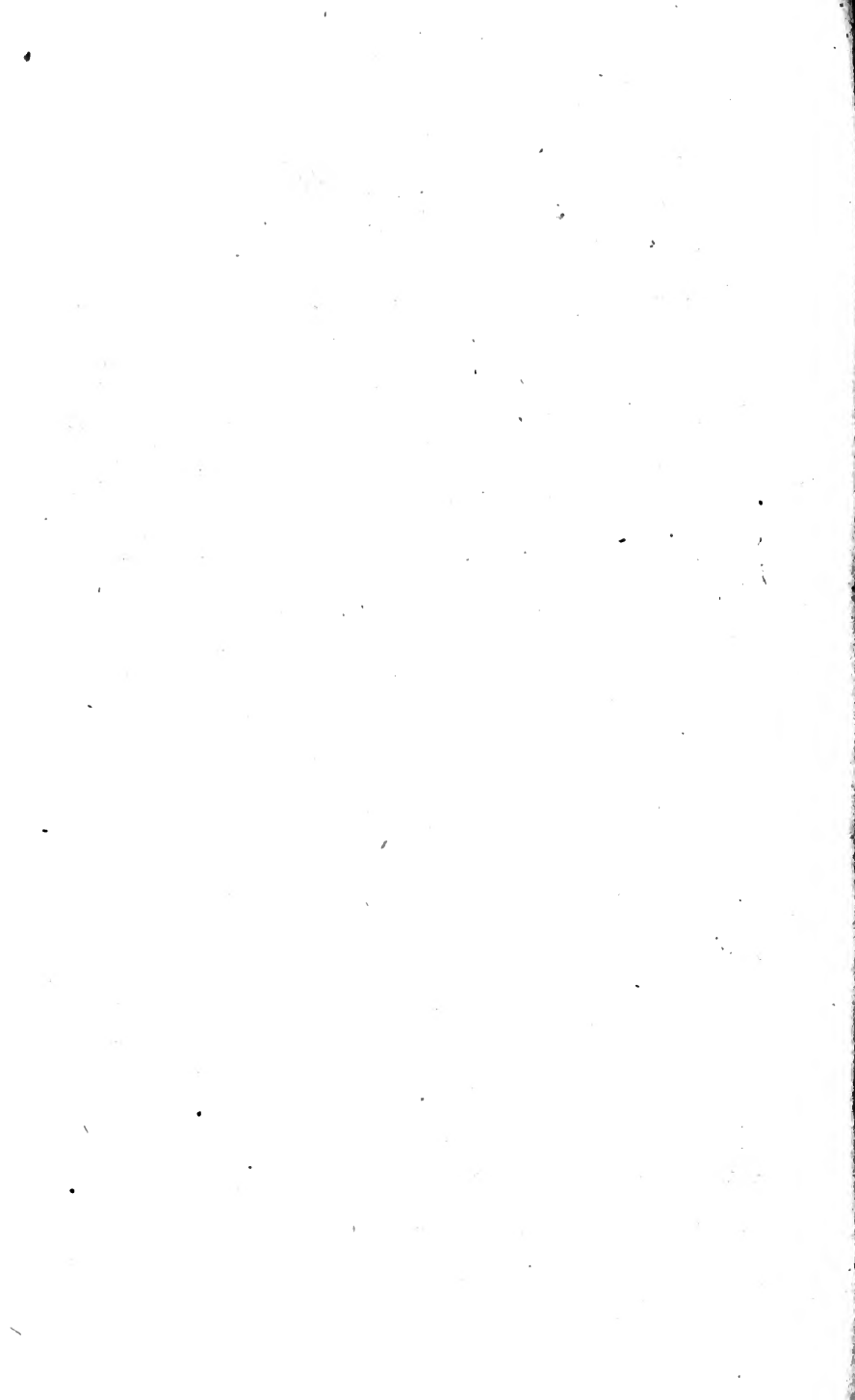
The Description and Use of Mr. Winter's New-invented Patent Drill Machine.

THIS Machine (says Mr. W.) is universally acknowledged to be superior to any hitherto invented; it is so strong that nothing but the greatest violence can injure it; and is constructed on such plain mathematical principles, as to be worked by any person of the lowest capacity. It deposits Grain, Pulse, Turnip, Carrot, or any other Seed, with the greatest accuracy, at any required depth in the earth, from the surface to six inches, at any required distance from 6, 7, 8, 9, to 40 inches between the rows, and may be instantaneously regulated so as to increase or decrease the quantity sown, which is immediately covered. One man, a boy, and two horses, can drill ten acres of light, and eight acres of stiff land in one day; and from one bushel of seed wheat, and one bushel and a half of barley, will produce a crop of from 6 to 20 bushels per acre, (according to the richness of the soil) more than when sowed by the common mode of husbandry.

The

Winter's Patent Drill-Machine.





The machine may be seen at the Exchange, or at Mr. HANCOCK'S, wheelwright, Old-market, Bristol. Orders to be directed to Mr. G. WINTER, Bristol.—The price *Sixteen Guineas.**

FIGURE I.

Represents a front view of the machine when at work, with six coulters fastened on, depositing grain at the depth of two inches, in drills at seven inches distance.

A. The fore flap turned up, and the back board taken off, for the purpose only of representing the inside work, which when drilling in the field is all inclosed:—It then appears as a box between two wheels, and all the inside work is perfectly secured from the effects of the most tempestuous weather.

B. The frame.

C. Iron plates, in which the gudgeons of the fore wheels are placed, and may be removed to any required depth.

D. D. The two hind wheels with spikes, which are for the purpose of preventing the wheels from sliding over rough ground or clods, and by the spikes penetrating into the earth, the wheels are forced round, by which the grain is delivered; for when the wheels stop, or slide, no grain is discharged.

E. E. Iron rings fastened to the fore-standards, to which the chains are fixed, for drawing the machine.

F. Coulters-bars with grooves, through which the coulters are placed at any required distance, from 6, 7, 8, 9, 10, to 36 inches or more.

* The saving of the seed and extra produce (more than can be obtained by the common mode of sowing) off ten acres of good land, drilled at the distance of seven inches, with wheat at 5s. per bushel, will in one season pay for the machine.

1, 2, 3, 4. Six Coulters numbered between the bolt-holes, with figures for setting the coulters so as to deposit the grain at any required depth; for instance, when the bolts are placed over No. 2, the grain is deposited at two inches deep; when over No. 3, at three inches deep; and so on.

G. Six cylinders, which occasionally slide off and on the axis, so that the whole, or any number of them, may be fixed at any required distance.

H. Boxes which contain the feed.

I. Conductors, into which the feed is delivered out of the cylinders, and conveyed into the grooves, in the back part of the coulters.

K. The axis, which passes through the cylinders and large wheels.

FIGURE II.

Represents a side view of the machine when at work.

a. Iron ring with a hook and chain fixed to it.

b. A sliding-board that covers an opening in the box, through which the axis and cylinders are taken out.

c. The case or box inclosing the works.

d. Handles for lifting up, and turning the machine at the headlands.

e. A marker for discovering the track of the machine, on land not ridged.

f. A harrow, for more effectually covering the seed and leveling the ground.

g. One of the three coulters on the fore coulters-bar.

h. One of the three coulters on the hind coulters-bar.

i. The guard which protects the conductors from being injured by stones, dirt, or weeds.

k. The

k. The pipe of the conductor, which enters into the cavity in the back part of the coulter.

There are two strong iron wheels which are placed in the back part of the frame, letter e, for the purpose of travelling from one place to another; which wheels elevate the coulters about six inches above the surface of the ground, and are immediately removed when set to work. There are also regulators for increasing and decreasing the quantity of grain to be sown, which with the wheels cannot be discovered in either of the views.

FIGURE III.†

Represents a running hoe for cutting the weeds between the drills, and adding earth to the rows of vegetables; the two points collect the weeds, which are in a manner inclosed, and more effectually destroyed than when the blade is square, or angular.

G. W.

* Is not the invention of, but altered by Mr. Winter.

ARTICLE XLII.

No. 73, Oxford-street, London,

March 20, 1778.

SIR,

AS it is but too common for individuals to speak roundly on subjects in which they are particularly interested; and as such assertions are generally viewed with a jealous eye by the public, I am induced to content myself with referring the public to individuals who have made experiments in

Y 2

drilling,

drilling, thereby putting myself out of the question, and only observe, That from the rapid progress, which the drill system has lately made, there is reason to apprehend that it will soon become general.

Your obedient humble servant,

JAMES COOKE.

Ascertainments of Crops of Corn, reaped in the Year 1786; the Seed of which was sown by the Rev. JAMES COOKE'S Patent Drill-Machine.

Lord Viscount Bateman, Shobdon, Herefordshire. Wheat by the machine, 40 bushels per acre. Barley, self-evidently superior to that sown by hand, but omitted to be particularly ascertained.

Marquis of Stafford, Trentham, Staffordshire. Wheat by the machine, 33 bushels per acre. Barley 24s. 6d. per acre more than broadcast.

Rev. H. J. Clofe, Hill-House, Ipswich. Barley by the machine from 9 bushels of seed, 400 bushels of excellent grain. Also a particular experiment upon one quarter of an acre of poor land, and out of condition: by the machine 33 bushels per acre; broadcast 19 bushels. Oats, the produce in the same proportion.

Mr. Yeld, Milton, near Leominster. Wheat by the machine 30 bushels per acre; broadcast 25.

Mr. Boote, Atherstone-upon-Stower, near Stratford-upon-Avon, the seven following accurate experiments, including in the whole 368 acres drilled, viz.—Wheat on loamy land, 47 bushels per acre. On cold clay, 44 bushels 5 gallons 2 quarts per acre. Wheat on cold

cold clay, 25 bushels 1 gallon 3 quarts. Broadcast on adjoining land, 9 bushels 4 gallons 2 quarts. Pease on light sandy land, 50 bushels 2 gallons per acre. Barley on light land 72 bushels 4 gallons per acre. Beans on light land, 36 bushels 2 gallons 2 quarts per acre.

Mr. Morley, Wood-hall, near Downham, Norfolk. Wheat by the machine, 44 bushels per acre.

Mr. John Lees, near Cirencester, Gloucestershire. Wheat by the machine, 53 bushels 4 gallons per acre. Broadcast, 39 bushels.

Moses Harper, esq; Astley, near Stourport. Barley by the machine, 56 bushels per acre. Broadcast 54 bushels.

N. B. The land of the hand sown crop allowed to be in better condition, than that upon which the machine was used.

Mr. Dunmore, Stanton-Wyvil, near Market-Harborough, Leicestershire. Wheat by the machine, 45 bushels per acre. Barley 72 bushels 4 gallons.

Mr. Glover, Burlaughton, near Shiffnal, Salop. Barley by the machine, from very light sandy land, 44 bushels per acre. Broadcast 37 bushels 4 gallons.

Mr. Hett, Bawtry, Yorkshire. Barley by the machine, 64 bushels per acre. Ditto broadcast, 48 bushels.

H. Cecil, esq; M. P. Hanbury-Hall, Worcestershire. Wheat by the machine, 5 bushels per acre more than broadcast, from two years' experiment.

Mr. R. Crabb, Moulton-park, near Northampton. Barley by the machine, 6 bushels per acre more than broadcast.

Colonel Wilton, Dedlington, near Stoke, Norfolk. Wheat by the machine, exactly half as much more as broadcast.

N. B. The drilled stubble, very clean by hoeing, the broadcast stubble a bed of poppies.

Sampson Barber, esq; Peterborough. Wheat by the machine, 27 quarters 6 bushels, from 5 acres 3 perches.

Mr. Wm. Wright, Warboys, near Huntingdon, an extraordinary crop of barley by the machine from fen land, allowed to be much superior to broadcast.

Mr. Holland, near Louth, Lincolnshire. Barley by the machine, 8 bushels per acre more than broadcast.

Ascertainments of Crops in 1787.

Sir Wm. Jones, bart. Ramsbury-Manor, Wilts. Wheat by the machine on a flinty loam, clover lay, one earth, 25 bushels 1 gallon per acre. Ditto broadcast 20 bushels 3 gallons. Wheat by the machine on a two-year clover lay, 27 bushels 2 gallons per acre. Broadcast 25 bushels. Barley by the machine after wheat, 27 bushels per acre. Broadcast 22 bushels.

Francis Skyrme, esq; Lauhaden, near Haverfordwest. Wheat by the machine, 57 bushels 1 gallon per acre. Broadcast 48 bushels 2 gallons. Barley by the machine, 67 bushels 2 gallons per acre. Broadcast 48 bushels 2 gallons. Oats by the machine 70 bushels per acre: broadcast 49 bushels.

Mr. John Boote, Atherstone upon-Stower, near Stratford-upon-Avon. The eleven following ascertainments, in all 450 acres, viz. —Beans drilled upon loamy sand after oats, 50 bushels per acre. Wheat drilled upon marl and mixed soil after beans, 36 bushels per acre. Wheat drilled upon loamy sand after beans, 50 bushels 6 gallons. Barley drilled upon loamy sand after turnips, 75 bushels 5 gallons. Barley drilled upon sandy land after turnips, 58 bushels 4 gallons. Pease drilled upon loamy land after clover, 51 bushels 4 gallons. Wheat drilled upon loamy land after beans, 45 bushels 5 gallons. Oats drilled upon sandy land after barley, 57 bushels 3 gallons. Oats drilled upon loamy land after barley, 76 bushels 6 gallons. Wheat drilled upon poor cold clay after clover, 25 bushels 4 gallons. Wheat sown broadcast upon poor cold clay after clover, on adjoining ground, 13 bushels 7 gallons.

Mr. Boote has announced a clear profit of 700*l.* over and above his usual profits, by drilling 450 acres in the year 1787. Also a clear profit of 500*l.* by drilling 368 acres in 1786.

Rev. H. J. Clofe, Dorking, Surry, fo perfectly fatished with his fucces in drilling, as to decline fowing any more broadcast. His eftate in Surry, confifting of 700 acres, being now under the drill fyftem.

Mr. Greenway Afcot, near Stratford-upon-Avon, Warwickshire. Barley by the machine, 16s. per acre more than broadcast.

Thomas Knight, efq; Godmersham-Park, Kent. Wheat by the machine, 4 bufhels per acre more than broadcast.

Colonel Wilfon, Didlington, Norfolk. Barley and oats by the drill, fuperior to any he ever had before.

Rev. J. S. Lufhington, Bottifham, near Cambridge. Barley by the drill, 10 fhocks per acre upon the field, more than broadcast.

M. Harper, jun. efq; Aftley, near Stourport, Worcefterfhire. So perfectly fatished with his fucces in drilling, as to decline fowing any more broadcast.

W. B. Earle, efq; Clofe, Salifbury. Eight acres of wheat by the drill, adjoining to 8 acres broadcast; the former fuperior to the latter, in the proportion of 8 to 7.—N. B. The 8 acres drilled with fomething more than 8 bufhels of feed; the 8 acres fown broadcast, with 28 bufhels.

Mr. John Aulten, Old-Park, near Canterbury. Wheat and rye by the machine, infinitely fuperior to the broadcast upon adjoining land.

Mr. Taylor, Treafey-Farm, near Enftone, Oxfordfhire. So far fatished with his experiments by the machine, as to perfevere in the practice.

Mr. Glover, Burlaughton, near Shifnal, Salop. The fineft crop of peafe by the drill he ever faw.

Mr. Quihampton, Repton, near Afhford, Kent. Wheat 4 bufhels 7 gallons per acre more than broadcast.

Mr. John Stuart, and Mr. Jamett, Afhford, Kent. Wheat 20s. per acre in favour of the machine, compared with broadcast.

Nine other gentlemen, near Ashford, express themselves perfectly satisfied with a superiority in favour of the machine, without ascertaining their crops.

Mr. Hall, Elmstone, near Ash, Kent. A comparative experiment in wheat, between Mr. Cooke's drill machine, and Mr. Duckett's system of opening furrows in the land, and sowing the seed broadcast. The result of the experiment was in favour of the drill-machine, which determined a wager of ten guineas in favour of Mr. Quihampton, of Repton.

To the above profits by drilling, may be added the average profit of 7s. or 8s. per acre of seed sowed.

ARTICLE XLIII.

Description of a new Harrow and Drag.

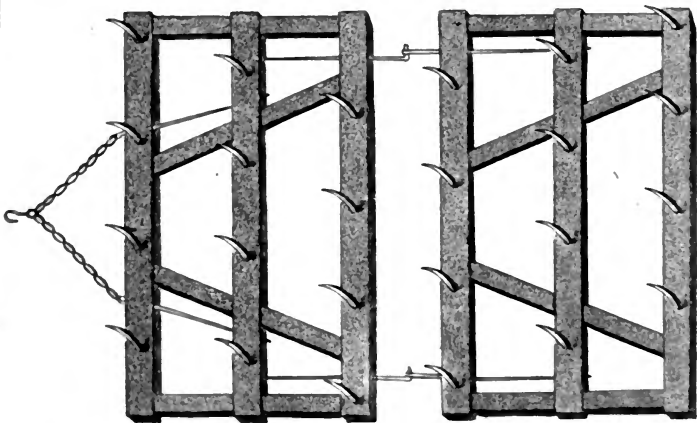
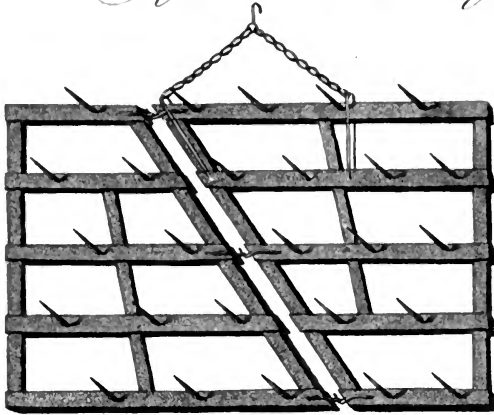
[Illustrated with an Engraving.]

GENTLEMEN,

I Take the liberty of sending you a rough draft of a Harrow I lately invented, together with the motives which induced me to construct one different from those commonly in use; which when you have examined, compared, and proved, I doubt not but you will be induced to recommend to the publick.

At the time of sowing barley last season, I considered that our common harrows did not answer the end designed so well as could be wished, and
having

M^r Triffry's, Harrow & Drag



A Scale of Feet



having seen various kinds in different counties and places, I did not recollect to have seen any that answered better than my own. The faults I espied in all those I had seen were, the tines or spikes were placed too near together in the middle of the harrows, which prevented them from sinking down into the ploughed land so deep as necessary; and when the ground on the top became fine, that they were apt to draw the couch, &c. together in heaps, and at the same time little or no service was done for a foot or more within each side corner; in consequence whereof we were obliged to double over that ground again, by which means I thought we lost at least one day's work in a week, which is no trifling matter.

After reflecting a little further on these things, I applied pencil to paper, and produced a plan, from which I had a harrow constructed, which in several respects far exceeded my expectations; the sides, or ends, do not only operate as well as the middle, so as not to need doubling over again, but the tines or spikes sink down so much deeper than the common harrows, (on account of their being regularly placed at 15 inches distance in each bar, whereby also the clods, &c. have a free passage, and are not drawn together in heaps) but that no part is left untouched more than three inches, when the har-

row

row is drawn only once over the land; from all which conveniences, I find more execution is done by drawing this harrow once over the land, than any other I ever saw will do by being twice drawn over the same spot.

It equally excels as a drag, or first harrow, for rough land commonly ploughed; and also for such as is turned one half on the other, which we call skirting or thwarting, as well as for finishing and smoothing the surface.

I imagined at first more strength would be required to draw it, but find two of our little country horses from 14 to 14½ hands high, draw it with ease.

My harrow is seven feet one inch long, and the posts twelve inches from center to center. The bolts should be forelock'd *on top*, and have a small *flat head under*. The posts are 3 by 2½ inches, the ledges or bars are three inches by 3-qrs. of an inch, which was intended for a finishing or last harrow, *not a drag*.

THE DRAG.

As to the drag, I observed the common one to scratch over the surface of the land without entering so deep as it ought, partly from the cause I before remarked

remarked in the common harrows, and partly from the tines being fixed straight downward; but these being bent, and pointing forward, and also fixed at 18 inches distance, draw into the earth as deep as the ploughing, rending the ground in an extraordinary manner, and leave the *hard* clods to pass freely through; yet no ground remains untouched more than three inches from the point of one tine to the point of another. The hinder post or rail is twice as heavy as either of the others, to keep down that part as deep as is necessary, which otherwise would not be the case. My land is in general tolerably free, so that four large, or six common oxen draw it well; but I prefer four of our little horses to either.

I do not expect, that either the harrow or drag are so perfect as to admit of no improvement; but if they are inducements, only for some abler persons to exercise their genius for the benefit of the public, I shall be amply rewarded for the thought, trouble, and expence, I have been at.

I am, with much respect, &c.

R. TREFFRY.

Beer-Barton, near Plymouth,
July 1787.

ARTICLE

ARTICLE XLIV.

On the Advantage of River Weeds as a Manure.

[In a Letter to the Secretary.]

SIR,

Norwich, Feb. 29, 1788.

IN your Third Volume, is an insertion communicated by me, respecting River Weeds as a manure, when cut in their vegetating state, laid in the furrow, and ploughed in.

Permit me now to relate a mode of more experienced advantage, which is, by extracting them with their roots, and the surface of the soil on which they grow; leaving them awhile to the action of the sun and air, for a requisite fermentation; more particularly a certain species hereafter to be mentioned.

About the middle of June, in a broad part of a stream, where from a lessened current a muddy sediment rested, and on which, in spaces, various weeds grew, but whose surface was generally covered by the river *Conferva*,* whose extended deep green filaments scarce left any of the other species perceptible. To draw these out, I employed two men, accustomed to the cutting of weeds in rivers,

* *Conferva rivularis* of Linnæus.

who,

who, with paring and dragging instruments, drew out many loads in the course of the day. These, laid on a ridge, about fifty yards on the bank of the stream, were continued there about three weeks; when I had two cart-loads of this aquatic substance laid on two different parts of an inclosed piece of land preparing for turnips, in an equal proportion with stye and stable manure, spread at the same time over the remainder of the field: with another load I filled up a hollow that had been lately excavated, on which I planted turnip-rooted and favoy cabbages; and at the same time planted some of both in a common garden soil, and likewise in some unmixed mud, where no weeds grew, drawn from the river for that purpose.

The virtue of the weed-compost is obvious in each experiment; in the last-mentioned, the favoys exceeded in cabbage, and the turnip-rooted in leaf and bulb, others of the same species set in garden mould; while those set on the mere mud have scarcely made a progress; decisively evincing, I conceive, that the principle of increase, and progress of vegetation, are more peculiarly derived from the weeds, than from the matrice on which they grew.

In respect to the turnips, though no partiality was shewn in spreading more in quantity, in equal spaces,

spaces, than of the other manures, nor were those spaces in any estimated preference as to native soil; yet are those spots distinguished by a more vigorous vegetation, and a deeper green; nor can there be found on the rest of the field (7-8ths of the whole) any roots so large as many in these small tracks.

I have carried this experiment farther, but from thence no decision can be formed, being on land newly dibbled with wheat; the probable success of which, and the more assured probability* of an improvement on a barley crop, intended in succession to the turnips, I purpose, if in health, to communicate when time shall give the result; and am, in the interim,

Your very respectful friend,

JOHN WAGSTAFFE.

* To explain the apparent presumption of more *assured probability*, it may be noticed, that of the river *Conferva*, many unbroken parts remained after the second hoeing of the turnips, owing to the interwoven state of its fibres, which are more immense than its extended leaves or filaments; and which, in the compound, before it was spread on the land, emitted a scent almost as strong as *stye* manure.



ARTICLE XLV.

*An Account of a new Drill-Machine, invented by a
Somersetshire Farmer, and of a Crop sown by it.*

[In a Letter to the Secretary.]

SIR, *Near Mells, Somerset, March 31, 1788.*

IT is with pleasure I comply with your request, in giving you some account of the success of my endeavours to complete a Drilling-Machine, which may unite the several objects of simplicity, general usefulness, and cheapness. After considerable pains, I am of opinion, that I have succeeded so far as to insure general satisfaction. And my own success in the use of it, among my neighbours as well as on my own farm, confirms me very fully in the preference of the drill husbandry before the broadcast, in all crops where the hoe is usually introduced.

In the construction of this machine, the peculiarities of which are entirely of my own invention, I have had regard to equal convenience for sowing all sorts of grain, and on soils and surfaces heretofore considered as the most unfavourable to drilling. I am about to procure a patent for the exclusive right of making this machine for sale; for which reason, as well as that I have not procured an engraving of it,

it,

it, I omit attempting a particular description for the present. Whenever it shall be fully before the public, I flatter myself it will be found to possess, at the price of Ten Guineas, at least more than all the valuable properties contained in other machines of a much higher price.

As I have now completed a new machine, including all the improvements suggested by considerable practice with my first; and as my wish is to extend public utility, I shall be happy to shew it to any gentleman desirous of inspecting it. Moreover, as soon as I can get sufficient leisure, I intend making a model, and sending it to the Society's Rooms at Bath.

It may not be unimportant to say, that this machine is constructed to be drawn easily by one horse, save on very rough and hilly ground. Having maturely considered and proved the usefulness of the different parts, I think myself warranted on the foundation of experience, and not of theory, in offering to supply any person with this machine; having brought my workmen to such neatness of execution, as to bear a comparison with most others.

I intended sending you for the Fourth Volume of the Society's papers, an account of the quantity of acres sown last year with the machine, for myself and

and neighbours, together with a statement of the seed and crops; but find I shall not have time to do it correctly. I will, however, annex an account of a crop of pease sown with my machine in its less perfect state, and hoed with a large breast-hoe of my own invention.

In the beginning of April 1787, I drilled a field of 17 acres, of poor sandy ground, on one earth, after barley, with eight sacks and one bushel of pease.* The rows were twice hoed, and earthed up with my breast-hoe before-mentioned, at the expence of less than 2s. 6d. per acre. My crop from the harvest field was 63 or 64 full-sized waggon loads; and though (not having completed my threshing) I cannot exactly ascertain the whole quantity of pease, I can do it sufficiently near to assert, that I have above ten sacks per acre, after deducting the seed, besides the advantage of very clean straw, and having my land in excellent order for my wheat crop.

With my breast-hoe, I found that one man could with ease hoe an acre per day, the first time of hoeing. And to shew the difference between this and the common hoe, I introduced three men with the

* This quantity, though but half what is usually sown broadcast, is greater than was necessary, and greater than I sow this year.

latter to work in a field against two with the former. At night it appeared that the three had not more than finished an acre, while the two with the breast-hoe had completed, in a much better manner, two acres. A stronger proof need not be brought to evince the superiority of any instrument.

Brief Statement of the Advantage arising from my Management of the Pea Field above-mentioned.

	DRILLED.	£.	s.	d.
Produce 170 facks, suppose at 16s. per fack	- - - - -	136	0	0
Seed $8\frac{1}{4}$ facks, at 18s.	- £.7	8	6	
Hoeing, twice, say at 2s. 6d. per acre	- - - - -	2	2	6
Extra expence on account of the superior quantity to be brought to market,	-	5	0	0
		<hr/>		
Gross profit	-	£.121	9	0

*BROADCAST.

Suppose the same 17 acres had been sown broadcast, the produce on the soil in question would have been deemed good at 5 facks per acre, which at 16s. as above, would be	- - - - -	£.68	0	0
Seed, 17 facks, at 18s. per fack	- -	15	6	0
		<hr/>		
Gross profit on the broadcast		52	14	0
		<hr/>		
Difference of gross profit on the 17 acres in favour of drilling	- - - - -	68	15	0
or 4l. 0s. 10d. per acre.				

It will be allowed, that my statement of £.5 for extra expences of bringing the drilled crop to market is fully sufficient, if not an unnecessary abatement, when the quantity and cleanness of my straw, and the superior condition of my land, from twice hoeing, for a wheat crop, are taken into the general account.

I hope to give you some further account of my success in similar attempts; and though I employ the hand of a friend to methodize my communications, I desire you and the public to consider my veracity as pledged for matters of fact, and to be assured that I shall at any time have pleasure in giving my opinion, and advancing the interests of husbandry.

Your's very respectfully,

GEORGE BARNES.

ARTICLE XLVI.

An Account of a Crop of Cabbages, for which a Premium of the Bath Society was awarded to the Writer.

[In a Letter to the Secretary.]

SIR,

Chilcompton, Dec. 3, 1787.

A GREEABLE to your request, I send you some account of my cabbage crop, of 12 acres, which the Committee has thought deserving the premium offered by our Society. As you desired,

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I have

I have weighed the produce of one perch, on each side of the road; there being, as you remember, some considerable difference in the appearance of the two pieces. The perch on that part which appeared lightest, weighed five hundred and one quarter; and sixty times that weight, I believe, makes forty-two tons per acre,—The perch on the other side weighed eight hundred and a half, which is sixty-eight tons per acre.—The former, as you justly observed, when they shall have attained their full growth, may be nearly equal to the latter. This difference I account for from the first having been sown in the beginning of March, and therefore had not so good a chance for growth as the others, which were sown in the autumn, and planted out in May. The spring-sown ones were not planted out till near Midsummer, and then in so dry a time that they were almost scorched up. Therefore I shall in future join in opinion with my neighbour Mr. BILLINGSLEY, and always sow for autumn plants. For which purpose, the best time to sow the seed is about the middle of August, and transplant them off into some warm garden, or other place in which they may be sheltered from very severe frost.

In the next place I shall reply to your enquiry about the quality and general value of the arable land in this parish. It is of a light, shelly, stone-brash

brash nature,—a foil in some people's opinion unfavourable to cabbage. They will tell you it ought to be a stiff clay, or heavy loam; my success, however, in the growth of cabbages, proves that more is to be expected from manure and management than the disputers about foils seem aware of. This remark, indeed, will apply to most crops, but you will pardon my making it.

The value of our arable land per acre, is about 30s. on the average; which is in my opinion too high a price to allow giving a direct summer fallow. But if the land were as low as half that price, I should endeavour to raise turnips, cabbages, &c. as a fallow crop: such a crop is worth more or less according to the price of hay, sometimes 5l. 6l. 7l. or more, per acre, which is certainly at any rate an object, both to the farmer and the community at large; and far more eligible in most situations than letting the land lie for a bare fallow. For after the cabbage is fed off, (which I always endeavour to do, and sow the land to wheat by Old Candlemas) I find, by more than ten years' experience, an additional advantage in the goodness of the following crop. Such wheat with me is ever superior to that which I sow at or before Michaelmas. The sort of wheat I generally sow after such green crops, is

the *white-eared*, so called at Warminster and Devizes; in the West, *brasil*.

I think you further wished to know the manure I made use of for my cabbage. It was a compost of lime, weeds, and earth, that lay under the hedges round the field, and a layer of dung, all mixed and turned together. I spread about 25 cart-loads on an acre, with the usual ploughing given to a common summer fallow. This is not to be reckoned with expences attending a cabbage crop; for admitting such crop to exhaust the manure in some degree by its growth, an ample restoration will be made by its refuse ploughed in, and by the stirring and cleaning the ground.—I will give you, as nearly as I can, a full account of the expences of the crop of cabbages per acre.

	£.	s.	d.
The seed sufficient for an acre, is $\frac{1}{4}$ lb. at 3s.	0	0	9
Sowing and transplanting - - -	0	5	0
Ridging up two furrows, and leaving two, with the Norfolk plough - - -	0	2	6
Two men and two boys, for drawing and setting plants - - - -	0	3	4
Earthing up on the two furrows left, done when the plants are well rooted -	0	2	6
Hoeing and earthing up the said plants*	0	2	6
	<hr/>		
	£.0	16	7

* The plants ought to stand a yard apart every way.

£. s. d.
 0 16 7

The carrying of the cabbages of the land to the cattle, as they are wanted, I will suppose, on such a scale of feeding as mine, to require a man, 2 horses, and a cart, half the day, which per week for one acre, is about

- - - - - 0 17 6
 Total expence, per acre - £. 1 14 1

The aforesaid man in my farm carries the cabbage to 45 oxen, and upwards of 60 sheep; and throws them out of the cart over the fields without cutting them. My 12 acres of cabbage will feed the above number of stock for three months, and I am very well assured that they prove as fast as they do in the prime months of the season, May, June, and July. I am, and would wish to be, the practical farmer; at the same time I am open to information, or the candid opinion of any man; remaining, dear Sir,

Your much obliged friend and servant,

HENRY VAGG.

[The communication of experiments conducted with care, and on so respectable a scale as Mr. VAGG's, above related, must be ever acceptable to this Society, as well as interesting to the publick. We would, however, beg leave to recommend to Mr. VAGG some future attention to the possible advantage of cutting the cabbages before they are eaten;

eaten; on which plan it may become prudent to contrive some mode of giving them to the cattle different from that of strewing them on the ground. We are of opinion, that method and cleanliness in the fattening of every sort of cattle, will ever be found of *some* importance, both in promoting their growth, and in the saving of their food.

Mr. VAGG has omitted to mention, and the press cannot now wait for the enquiry, what quantity of hay was eaten by his cattle, while feeding on the cabbage; but such information, though a proper part of an experimental account, is not very important, as the quantity necessary to others may vary according to accidental circumstances.]



ON THE
PRESERVATION OF THE HEALTH
OF
Persons employed in Agriculture,
AND ON THE
CURE OF THE DISEASES
INCIDENT TO THAT WAY OF LIFE.

BY

WILLIAM FALCONER, M. D. F. R. S.

And Physician to the Bath Hospital.

THE
PRESIDENT OF THE
UNITED STATES OF AMERICA
BY
SECRETARY OF THE ARMY
GENERAL
OF THE ARMY
OF THE ARMY



INTRODUCTION.

THE Preservation of the Health of persons employed in Agriculture, is, abstracted from moral and religious considerations, of greater national importance than any improvement either in the theory or practice of the art can lay claim to.

Without Artificers, it is obvious, that there can be no manufacture of any kind; and if the workmen are inferior in number to the proportion required, the business must languish, or be contracted in its extent. An attempt, therefore, to correct the errors, or to restrain the imprudence, with respect to such matters as concern Health, of those employed in this branch, can need no apology.

I wish I could say, that the execution of the work were equal to the importance of the subject; but however inferior it may be, it contains, I trust, some useful cautions, and, I hope, some hints that may lead to farther improvement.

I have judged it eligible, to address the present work to those who employ the persons for whose immediate use the cautions are principally intended, rather than to attempt to instruct the people themselves. Few of the latter have much time for reading, and little capacity for instruction in matters of reasoning. I have, therefore, ventured

tured to direct myself to those from whom information of this kind would be likely to come with greatest authority, on account of their immediate connection and influence.

The Reverend Clergy will, I trust, excuse my offering a hint to them on this occasion. They are almost universally persons of liberal education, and more general knowledge, than falls to the lot of most of their neighbours. Would it not be an agreeable as well as an useful method of employing these advantages, to turn their thoughts towards the practical part of Medicine? The Natural History of the Human Body affords a more useful subject of investigation, than is done by stones, spiders, or shells; and though medicine, taken at large, is an arduous and deep study, yet it is practicable enough to gain sufficient knowledge of it to be of great service in many cases, especially such as occur most frequently among persons of the description here alluded to. The disorders incident to such are in general simple in their nature, and seldom exhibit at the same time such apparently contrary, and of course perplexing indications, as those which are the offspring of luxury and refinement.

All the disorders indeed that occur among such persons are not equally simple, but good sense and moderate information will suggest the propriety of asking, in such cases, the advice of persons whose professional education and attention has led them to a deeper knowledge of the subject.



ON THE
PRESERVATION OF THE HEALTH OF PERSONS
EMPLOYED IN AGRICULTURE.

ADVANTAGES WHICH PERSONS EMPLOYED IN AGRICULTURE POSSESS IN POINT OF HEALTH.

THE way of life of persons engaged in agricultural business, exempts them from many of the disorders to which other occupations are liable. Many of the employments by which great numbers of people are supported, are injurious to health, by being either too sedentary, or too laborious; by which the powers of nature are either suffered to languish for want of exertion, or worn out prematurely by over-fatigue. But the business of husbandry is not necessarily connected with either of these extremes. The labour is indeed constant, but not in general so violent as either to exhaust the strength by over-straining, or to excite any weakening degree of discharge by perspiration. The variety likewise of the necessary business is a favourable circumstance for those who are employed in
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it, as thereby the different muscles of the body are exercised, and various postures used, which contribute to strengthen the body more generally, and also relieve the mind by a diversity of attentions.

A farther advantage attending the nature of labour in husbandry is, that it is performed in the open air, which in general must be pure and wholesome, as being free from smoke and other vapours arising from inflamed bodies, and also from putrid exhalations both of the animal and vegetable kind, which are well known to taint the air in large cities, and in manufactories of every kind, where great numbers of people are assembled in a small compass.

The surface or staple of the soil, which is the subject of these operations, does not give out any noxious odours, like many of the mineral or metalline substances employed in several manufactories, but is at least perfectly innocent, and has even been thought to produce effluvia rather favourable than injurious to health. The number of vegetables, likewise, with which persons concerned in such employments are generally surrounded, contribute to render the air which is respired pure and salubrious, by absorbing the putrid and phlogistic substances that float in the atmosphere.

The diet of persons who live in the country is, I think, in general more wholesome than that of those who inhabit towns. A large portion of it consists of fresh vegetables and milk, which, though not excluded from the food of those who live in towns, are enjoyed in much greater plenty and higher perfection in rural situations. These correct the putrefactive disposition of animal food, and tend to keep up the proper secretions and evacuations, and to maintain that balance in the animal system, upon which health so much depends.

The regular hours necessary to be observed by those who follow country business, are perhaps of more consequence than any of the other articles, however important those may be.

It is an old and a common opinion, that the external air is much less salubrious during the night than the day; and this opinion, which probably was at first drawn from observation, seems to be confirmed by chemical experiments, which tend to shew that the air exhaled by vegetables, whilst the sun is above the horizon, is much more pure and fit for respiration than that which issues from them in the absence of the sun. The ill effects of the latter are probably best avoided, by the human body being in a state of repose and insensibility,
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which render it less liable to be affected by such impressions. The morning air, on the contrary, so celebrated both by poets and philosophers for its benign and cheering effects upon the mind and body, is enjoyed in high perfection by persons in this way of life: and the advantages they derive from thence in point of health are probably very great.

I have been informed from the best authority, that a person in high station some years ago, who was very desirous to protract his existence in this world as long as he was able, made every possible enquiry concerning the regimen and manner of life of those persons who had arrived at a great age, but found no circumstance common to them all, save that they all had observed great regularity in point of hours; both rising early, and going early to rest.

Freedom from care and anxiety of mind is a blessing, which I apprehend such people enjoy in higher perfection than most others, and is of the utmost consequence. Mental agitations and eating cares are more injurious to health, and destructive of life, than is commonly imagined; and could their effects be collected, would make no inconsiderable figure in the bills of mortality.

The simplicity and uniformity of rural occupations, and their incessant practice, preclude many anxieties

anxieties and agitations of hope and fear, to which employments of a more precarious and casual nature are subject. Nor is it the least advantage to health, accruing from such a way of life, that it exposes those who follow it to fewer temptations to vice than persons who live in crowded society. The accumulation of numbers always augments in some measure moral corruption, and the consequences to health of the various vices incident thereto, are well known.

Disorders to which Agricultural Persons are subject from the Nature of their Employment.

THE life of husbandmen and farmers, though in general healthy, has, like other situations, some circumstances attending it which produce disorders. These may be considered in several points of view, according to their causes.

First, then, the nature of their employment often exposes such persons to the vicissitudes of weather. These, perhaps, may be of many very different kinds, when considered with regard to the changes in the nature of the atmosphere; but this is an enquiry too deep and obscure for a popular treatise, like the present, and I shall only take notice of such as are obvious and certain. These are three

in number, *cold*, *heat*, and *moisture*; to which may be added, a combination of the last of these with either of the former.

Exposure to a great degree of cold may produce inflammatory disorders of different sorts, but principally, though not altogether, of the topical kind. Thus the inflammatory sore throat, rheumatic pains in the teeth and face, inflammations of the eyes, and coughs, with pain of the breast, attended with fever, are all complaints liable to be produced by cold air, either externally applied, or drawn in by the breath. To these may be added, the rheumatism, both of the acute and chronic kind, which, though sometimes a local disorder, is often general, and may be frequently traced to this cause.

Cold, likewise, when great, and long continued, is apt to produce disorders of an opposite nature to those just mentioned. Paralytic affections are frequently caused by it, especially in the lower extremities, which are generally the most exposed to its influence.

Heat is another source of disease to the husbandman, who often experiences its bad effects in time of harvest. Inflammatory fevers are often the consequence of heat and labour, and sometimes such

as are attended with local inflammation, as pleurifies, peripneumonies, inflammations of the bowels, &c. Sometimes the brain is primarily affected, probably from the immediate effect of the sun's rays upon the head. The eyes are also liable to be inflamed from exposure to strong light. Moisture, especially when combined with either of the above extremes of temperature, is productive of several disorders.

People who work in the open air, and oftentimes at a distance from shelter, must necessarily be exposed to casual showers at every season of the year. If these happen in cold weather, they aggravate the bad effects of cold, by conveying it to a closer contact with the skin, and also by the generation of cold by evaporation. If rain fall suddenly at a warm season of the year, its effects are, I apprehend, less dangerous than in cold weather to those who are wet with it; nevertheless it is not void of hazard, especially if the persons exposed to it have been previously much heated, either by the weather, or exercise.

The evaporation of the moisture generates a degree of cold, which is greater as the evaporation is quicker. This then is one reason, why the danger of wet clothes is greater, as the body is more heated.

Whether moisture, simply considered, has any other effect than as increasing the influence of cold, is not clearly determined. But whatever doubts we may entertain, concerning the moisture of the atmosphere, there is no question that some kinds of moisture, to which persons who labour in this way are sometimes exposed, has specifically noxious qualities.

The draining of marshy grounds, however it may in its consequences benefit the health of those who live in the neighbourhood, has been long observed to be but an unwholsome employment for those who work at it. Yet this is frequently a necessary piece of business for the farmer, as well as the cleansing of ditches, which is in some measure of the same kind, though in general less apt to do mischief. The moisture to which people thus employed are exposed, must not be considered as mere humidity; but as humidity, combined with putrefying substances, and capable of diffusing the effects of such over those who are within a certain distance of it.

Marshes are well known to produce disorders, even over a considerable extent of country, and must of course be particularly liable to affect those who break up any part of them. Putrid complaints of various kinds may be produced by these exhalations;

exhalations; but I apprehend, the intermittent fever is the usual consequence; the frequent appearance of which, in moist and fenny countries, has been universally observed.

Such are the diseases to which people employed in husbandry are occasionally liable from the nature of their occupation. But they are subject to a much greater number from their own imprudence, of which I shall next speak.



Disorders to which Persons employed in Agriculture are liable from their own imprudence.

AND first, *Of their wanton exposure of themselves to the vicissitudes of Heat and Cold.* It is no uncommon thing for people who work in harvest, when violently heated by the weather and by labour, to drink large draughts of some cold thin liquor, as water, milk, whey, butter-milk, and such like. This, if taken in great quantity, has been sometimes known to suppress the powers of life altogether, and to produce an almost instant death.

This however, I believe, seldom happens; but the bad effects of this practice appear in other ways

sufficiently ferious to discourage such hazardous experiments. It is not uncommon for a violent fever to be the consequence, which is frequently attended with inflammation of the stomach or bowels; both which are disorders of the most dangerous nature. But should they escape incurring any acute complaint, it is common for them to be affected with a sense of weight and sickness at the stomach, which continues several weeks, and is at last relieved by vomiting; this, however, does not put a period to the complaint, as it is generally followed by an itching eruption on the skin in blotches, in various parts of the body, which proves to be the leprosy—a loathsome and filthy disease, and very difficult of cure!

I have had an opportunity of seeing at the Bath Hospital, a great number of people thus afflicted, and am satisfied that they all, without exception, owed their disease to the application of cold, in some form or other, to the body when in a heated state.

Labouring persons are very apt, when they leave off any work in which they have been much heated, to remain some time at rest in the open air before they put on their clothes. This is a very imprudent practice, and frequently produces bad effects, especially in bringing on coughs, and other disorders
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of the breast, which oftener owe their rise among the common people to this than any other cause.

Neglect of changing their clothes when wet, is also a great source of disorder among husbandmen. To remain in wet clothes when the body is at rest, subjects the person who is so imprudent as to suffer it, to the united bad effects of cold and moisture. Much worse consequences may however be expected, when they who are heated by labour lie down to sleep, as they often do, in their wet clothes. The diminution of the force of the circulation and other powers of life, which always takes place during sleep, causes the bad effects of cold to operate with much greater danger to health and life. This hazard is much aggravated, if they add to this imprudence by sleeping on the wet ground. This not only communicates an additional moisture and cold, but is perhaps still more prejudicial from the nature of the exhalation. It is the opinion of a physician of the greatest eminence, that the vapour which arises from moist earth is the cause of the most dangerous fevers. Those, therefore, who put themselves wantonly in the way of such danger, are guilty of little less than suicide.

Excess, or Irregularity in Diet, is another source of disorder to people in this way of life. This is
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common indeed in some measure to all ranks, but in several respects it is particularly applicable to those who are employed in husbandry. Air and exercise are well known to sharpen the appetite; and as these advantages are incident to this way of life, it may be expected that some excess should now and then take place. The diet of such persons is indeed in general too spare and plain to offer any great incentive to indulgence in point of quantity, but opportunities sometimes offer for a more plentiful allowance of food, and more inviting to the palate. On such occasions the lower ranks of people exert little consideration or prudence. They have scarcely any view beyond the gratification of the present moment; and if a full indulgence of appetite is not exercised, they deem it a loss of an opportunity for the enjoyment of so much happiness.

It is needless to enumerate in this place all the complaints that excess in quantity of food may bring on; it is sufficient to say, that it has often produced sudden death, and where its violent effects have not been so immediate, has laid a foundation for bad health during the remainder of life.—To this head may be referred the brutal practice of eating enormous quantities for a wager, or out of bravado. It is needless to descant upon so odious a subject, farther than to say, that such things sink
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men below the level of beasts in grossness and folly, not to mention the scandalous immorality of such actions.

The diet of people employed in husbandry, does not admit of much luxury respecting its quality; there are however some things which come within the reach of these people, and which they regard as gratifications, and of course are apt to take in too great quantity. Of this kind are some of the autumnal fruits, which in some years are produced so largely, as to be of scarcely any pecuniary value. Of these, plumbs, especially such as are of the coarser and more austere sorts, are the principal. It is a common observation, that in years wherein there is an abundance of such fruits, purgings, colicks, and most other complaints of the stomach and bowels, are very common. It is proper here to observe, that the incautious manner in which these fruits are devoured, especially at their first coming in, causes many of the stones to be swallowed;—a practice extremely hazardous. The history of physick affords many examples of the worst consequences arising from such bodies lodging in the stomach and bowels. Sometimes, when the accumulation of them has been considerable, they have obstructed the alimentary canal altogether, and produced a miserable death in a short time; at others,

others, they have made their way through different parts of the body, and caused either a long and painful illness, or death, by the hectic fever attending internal suppurations.

Pears, if eaten too freely, are apt, as well as the stone-fruits, to disorder the stomach and bowels; but they are less dangerous, and not so often swallowed in such quantities as to be materially prejudicial to life or health.

Nuts are perhaps, upon the whole, the most dangerous of any of the fruits that are likely to fall into the way of this rank of people. When eaten in large quantity, they have been often known to lodge in the stomach, and to be incapable of being removed from thence by any medicine, and of consequence have put a speedy end to life. When taken in less quantity, they are found to oppress the breathing, and to produce vomiting and bowel complaints.—HOFFMAN observes, that dysenteric complaints are always most common in those years in which the harvest of nuts is plentiful. Excess in diet, however, is more frequently committed in liquids than in solids.

It is observed of mankind in general, that they have a natural fondness for fermented or spirituous liquors,

liquors, and a certain proportion appears to be allowable and even necessary for persons who undergo hard labour. But the healthy quantity is apt to be exceeded when opportunity offers, and excess of this kind is more hurtful than a defect of such gratifications. I need not here enlarge on the consequence of *drunkenness* to health. Fevers, dropies, consumptions, apoplexies, and many other miserable disorders, are well known to follow such a course. The want of money among labouring people, indeed often prevents the bad effects of a habit of this kind, but occasional opportunities occur which are laid hold on with great avidity; and it is far from uncommon to find death the immediate follower of such licentious indulgence.

Diet, however, is not the only article which such persons are liable to carry to excess. It is common to see exertions of a more liberal kind pursued to too great length. The caprice of emulation will often produce instances of labour, which duty, and the urgency of circumstances, might in vain solicit. The bursting of some of the blood-vessels, particularly those of the head, lungs, or stomach, nephritic complaints, and intestinal ruptures, have all of them followed such ill-judged and ostentatious display of strength and corporeal abilities.

Directions

Directions relative to the Prevention and Cure of Disorders incident to Persons employed in Agriculture.

AFTER the above enumeration of complaints to which persons thus employed are liable, it is proper I should offer something on the subject of their cure or relief. This I shall consider in two views; the first as to what regards the prevention of disorders, and the second as to what regards their cure.

Persons that work in husbandry are necessarily exposed to the weather in both its extremes of temperature. The ill effects therefore of both, it behoves us to counteract. Cold in this climate is most necessary to be attended to, as its operation is of longer duration; several months in the year often requiring us to be on our guard against cold, whilst excessive heat scarcely lasts more than a few days. Warmth of clothing is the only method, exercise excepted, by which those who spend their life in the open air can guard against cold, and nothing is more necessary for such persons as are the subjects of the present consideration, than a proper regard to this article.

The woollen cloths of our own country are perfectly well adapted for these purposes, being warm without being too heavy, resisting moisture in a good measure,

measure, and even when wetted being less cold to the touch than any other substance. It appears to me that some of the coarser and looser woven fabrics are preferable, both in point of warmth and lightness, to those of a more even surface, and also give more resistance to the penetration of moisture.

Every person who employs men under him in business of this nature, ought to be careful, in point of interest as well as humanity, that his servants have clothing sufficient for the season of the year; otherwise he may expect a proportionable diminution in the labour he expects to be performed, and the loss of many valuable opportunities, especially in precarious weather and seasons.

The same arguments are applicable to those who have the care of the parish poor, whom it would be far more oeconomic as well as humane to preserve in a good state of health, than to suffer them to become victims of diseases which might be prevented. This caution refers particularly to the youth, who, by being neglected at that time of life, often continue burdens on those persons, whose expences (had the children's health been duly attended to) they might have contributed to diminish.

Friction, properly applied, might prove an excellent preservative against, and even a remedy for
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many of the bad effects of cold. Would persons chilled with the severity of the weather, rub their bare limbs with woollen cloths for a considerable time after they return home, it would produce a more equable and genial warmth, and contribute more to support the powers of life, than any artificial heat whatsoever. The same operation would probably prevent many of those painful and refractory sores called chilblains, which are so apt to affect the extremities, especially in young people. Should any persons in extreme frost have their limbs or any part of the body actually frozen, the utmost caution must be had not to bring them near to any fire. The safest method is said to be, to rub the part frozen first with snow, and to continue the friction till some degree of warmth begins to appear, but not to suffer the access of any heat from fire, till the warmth from friction takes place. Even then, the part frozen should not be suddenly exposed to the heat of a fire, but rather be continued to be rubbed till the natural sensation and heat are perfectly restored. If the part frozen be exposed to the heat of a fire whilst in a frozen state, it will undoubtedly mortify.

It seldom happens, that the cold is so intense in this country, as to destroy those exposed to its influence by its direct and immediate operation; yet

as great degrees of it now and then take place, it may be proper to caution those who may be in a situation that exposes them for any considerable time together to violent cold, to be cautious how they suffer any propensity to sleep, or drowsiness, to steal upon them. A tendency to sleep in a person who is in such a state, is a certain sign that the cold begins to gain ground on the powers of life, and should therefore excite the strongest efforts to resist it. This may be a difficult task, but is necessary, as life entirely depends upon it.

Heat, though less frequently an object of our care in this respect than cold, nevertheless demands our attention. Though seldom of long duration, the heat is sometimes excessive. I have seen it in the shade, and in a situation exposed to no reflected heat, raise the thermometer to 87 degrees. Such heats, and even considerably less, are too great for laborious work even in the shade, and must be still more injurious to those who are exposed to the sun's rays, which is of necessity the case with those who work in the harvest.

In such extremities of temperature, it should not be expected, or even permitted, that the unthinking labourer, who has scarcely any views beyond the present moment, should expose himself to such hazard.

zard. Economy, as well as humanity, pleads loudly in behalf of such indulgence.

Inferior, yet still considerable degrees of heat, although they need not preclude work in the open air, still have need of some cautions respecting them. It is not uncommon to observe a degree of impatient anxiety which accompanies some people in every action of life. This prevails among the lower as well as higher ranks of mankind, and often proves a source of fatigue and toil, without expediting labour. Calmness and composure are necessary to the corporeal as well as the mental operations, and tend greatly to prevent the bad effects of excess of stimulus of any kind.

As the head is the part principally exposed to the action of the solar rays, it is particularly necessary to use some defence for that part. Hats are used for this purpose, but the black colour of which they are generally made, causes them to absorb the heat, and of consequence to accumulate it in the very part on which we should least desire it to fall. Hats for working people in hot weather should be made of straw, or some light substance of a white or pale colour, and with brims sufficiently wide to shelter both the head and shoulders from the scorching beams of the sun. Even a piece of white paper covering

covering a hat, is no contemptible defence against solar heat.—The eyes should likewise be considered, which exposure to strong light is so apt to injure. This should be guarded against by the brim of the hat being made of a sufficient breadth to shade the eyes, and the inside should also be tinged of either a green or blue colour, but by no means either black or a very light hue.

I have before mentioned the bad effects of cold applied in any way to the body when violently heated. This should serve as a sufficient caution against such imprudencies. It may be useful to add, that as it may be necessary to drink frequently, it prevents much of the bad effects of cold liquor, to eat something solid immediately before any liquid be taken. A few morsels may be sufficient, and the efficacy of the precaution is well known.

The mischievous consequences of cold liquors, drunk in such cases, are much aggravated when they are, as is too common, swilled down in enormous draughts. Would thirsty people but have a little patience, and drink small quantities at a time, with proper intervals, as of a few minutes, the uneasy sensation would be more effectually removed, and that without any danger to health.

Another caution highly necessary for such persons is, to put on their clothes immediately on their leaving off work, and to do this without any regard to the warmth of the weather. Nothing can be more hazardous than for a person who is heated with labour, and in a strong perspiration, to remain exposed to the wind. The exhalation both from the body and the wet linen, produces a sudden and considerable degree of cold, which is not merely transient, but continues as long as the moisture is suffered to exhale freely into the open air.

I have before remarked the hazard of labouring persons sleeping on the ground during the intervals of their work. This is improper at all times, but particularly dangerous if the ground be any wise moist. Indeed I am of opinion that sleep had better be avoided altogether at such times; as such slumbers produce but little refreshment, and expose the health to unnecessary risque. The body would be sufficiently rested by the cessation of labour, and early hours in the evening would afford a sufficient portion of time to be spent in sleep.

Moisture is equally necessary to be considered in this place, with respect to its effects on the health, as *heat* and *cold*. This, I have before observed, cannot be always avoided, but the bad effects it sometimes

sometimes produces may generally be obviated. If those who are wet with showers, would be careful to continue their motion and labour whilst they remain in the open air, and to change their clothes on their return home, many of the bad consequences of wet clothes would be prevented. Friction on such occasions might be an excellent preservative against the bad effects of cold and moisture : were the body and extremities that have been so exposed, rubbed strongly for a quarter of an hour with a coarse woollen or linen cloth, immediately on the wet clothes being stripped off, it is probable few bad consequences would follow from the accident.

It is indeed extraordinary this should not be oftener practised in such circumstances than it is. Every labouring man knows the necessity of rubbing horses that have been wet and dirty, and this not only for the purpose of cleansing away the filth, but also for that of preserving a due perspiration and regular warmth on the surface of the body. Bathing the feet in warm weather would also be an useful precaution on such occasions, especially to those who are subject to purging and other disorders of the bowels.

Labouring men are sometimes exposed to moisture of a less innocent kind than such as falls from

the clouds. Draining marshy ground is a necessary business, and, as I have before said, exposes the workmen to hazard from the nature of the moisture, as well as from simple humidity. The intermittent fever is the principal, though not the only complaint, work of this kind is liable to bring on, and must be particularly guarded against. It therefore seems proper that such kind of work should, if possible, be performed in the spring, or early in the summer, in which seasons these disorders are not so likely to happen as when the autumn is advanced. And those who work in this way should be sufficiently clothed, and be very cautious to avoid sudden transitions from heat to cold.

Intemperance is particularly dangerous under such circumstances. It is highly proper, and even necessary, that those who perform such kind of labour should have a sufficient, and even liberal allowance, in point of diet; but excess of any kind, in spirituous liquors especially, tends to weaken the stomach, and in consequence thereof, the whole vital system, and to render the body more liable to receive contagion of every kind. This is not a caution founded merely on theory or general principles, but a fact in medicine established beyond all doubt.—Another caution very necessary to be attended to is, that none should go to such kind of labour in the morning

ing before they have taken some kind of food. Somewhat warm is most proper, and if it can be had, I should prefer animal food. It is difficult to account for, but true as a fact, that warm victuals are greatly more cordial and strengthening to the body, and of course more fit for the support of those who perform laborious work, than the same food if taken when cold.

Cleanliness is an essential article in such circumstances. Would those who work at such employments be careful to wash their hands and feet at their return from work, and to change their linen and stockings as often as their circumstances would admit, it is probable that the hazard would be greatly lessened.

It is necessary to remark, that the above cautions apply at least equally strong to those who superintend such operations, as to those who actually perform them. It is probable that the labour of body and attention of mind, which occupy those who are at work, is no small preservative against the access of contagion of every kind.

As there is reason to believe, that intermittent fevers may in some cases be so far infectious as to be communicated from one person to another, it

would be proper that when any person should be attacked therewith, such person should be provided with a separate bed during the continuance of his disorder. Cautions of this kind would be the best œconomy, as disorders might then be checked at their first appearance, and prevented from spreading.

Excess, or Irregularity in Diet, is the next subject of these cautions. I have before mentioned some of the disorders likely to be produced hereby, but shall now be more particular. Food may be considered with respect to its *quantity* and its *quality*. The first of these can only be measured by a reasonable attention to the appetite. What may no more than suffice for one man, may be great excess in another; and in general what the appetite leads to, may be considered as the proper standard. But some ignorant rustics are foolish enough to imagine, that there is a degree of credit annexed to the being able to consume a larger quantity of victuals than is in the power of other men; and this beastly prejudice, which often produces fatal consequences, should be as much as possible discouraged, even by those who practise hospitality among the lower ranks of people. It is certainly mean to offer to entertain any persons, of whatsoever degree they may be, without producing a sufficient quantity of wholesome provisions;

vifions; but it is ftill more inhospitable to encourage any to make fuch an ufe of what is provided for them as to endanger health or life, not to mention the fcandalous wafte which muft be caufed by it. Still more blameable is the practice of encouraging gluttony by wagers, or offers of reward. They who do this are in fact highly criminal, and in no fmall degree guilty of the fatal confequences which fo often follow fuch brutal difplays of appetite. Moderation is not only neceffary in what regards the quantity of food, but alfo as it regards the time in which it is confumed. It is neceffary to the proper digeftion of our food, and of courfe to the nourifhment of the body, that it be taken in gradually, and its texture broken down by chewing. It would fcarcely be credited, were it not known as a fact, that the folly of gluttony has prompted wagers not only on the quantity of food, but alfo on the time in which it fhould be fwallowed; by accelerating which, all the bad effects of an enormous quantity of victuals muft be greatly aggravated. Meat, thus fwallowed, muft be of courfe in large pieces, fcarcely acted on by the teeth, and of difficult digeftion. The fudden diftention of the ftomach, by the introduction of a large quantity of meat fo nearly at the fame time, muft weaken its tone, by overftretching its fibres; and this has fometimes

times gone to such a length as to deprive the stomach of all that power of expelling its contents, which soon terminated in death.—To these dangers should be added, that of the meat sticking in the passage of the gullet, and remaining there without a possibility of removal, a thing which is not uncommon amidst such excesses. Even the proper temperature of food is worthy attention. Rustick folly has produced wagers and premiums on the eating food nearly boiling hot. It is difficult to preserve any temper in the censure of such outrageous stupidity.

The quality of food is necessary to be considered, as well as its quantity. The stomachs of labouring men are undoubtedly strong, and able to digest coarse meat; but ill-judged œconomy should not prompt farmers to set before their servants decayed or indigestible food. Putrid meat is not merely unwholesome in its remote consequences, but immediately dangerous to life, as has been often experienced, and should be avoided as carefully as we would any other poisonous substances.

I have before pointed out the bad consequences that are apt to result from the free use of some indigestible fruits, particularly plumbs and nuts. I think it would be a proper caution for farmers not to plant any of the former that are of the coarse and austere
kind;

kind; for though they generally bear plentifully, their fruit is of little value, and likely on that account to fall to the share of such people.—Hazel plantations are more necessary; but still it would be of service to place them as far from farm-houses as might be convenient, that they might afford less temptation for the gathering of their fruit. It is proper to notice here the danger thoughtless people who spend much time in the fields are exposed to, from eating plants and berries with which they are unacquainted. Many plants, commonly met with, are well known to be extremely poisonous, such as the Henbane, Deadly-nightshade, Water-hemlock, some species of Drop-wort, several kind of Mushrooms, and many others.—It should be a strict injunction to all who spend their time in the fields, never to taste any plant, fruit, or berry, which they do not know to be safe, and indeed it would be more prudent to discourage altogether such useless curiosity. It is obvious that this caution is particularly necessary for children.

The danger of excess in liquids is greater than in solid food. Fermented liquors, taken in moderate quantity, are both proper and necessary for those who perform laborious work; but this healthy proportion is apt, when opportunity offers, to be exceeded by people whose gratifications are few in
 number,

number, and of rare occurrence. As it is impracticable to prevent such excesses altogether, I would wish to suggest, that, if they must take place, malt liquor is found by experience to be much less injurious to the health and constitution than distilled spirits, however diluted with water. I have been informed that a principle of œconomy has induced many farmers to treat their servants, and those with whom they are connected, with spirits and water, instead of malt liquor ; but such a practice is by all means to be discouraged, as spirits are much more inflammatory than malt drinks, and produce more readily obstructions and inflammatory disorders, especially of the liver and mesentery. The temporary delirium of intoxication that they produce, is said to be much more violent and outrageous, and of course more dangerous, than what follows from taking too large a quantity of malt liquor. The destructive effects of spirituous liquors were so observable some years ago, as to produce the most serious apprehensions in a national view, and to attract the notice of the legislature.—The baptisms of London alone are said to have been reduced from twenty thousand annually to fourteen thousand, which was with reason ascribed to the use of this pernicious beverage:—This fact is equivalent to a thousand arguments!—On this subject I would

would wish to say a few words on the debauchery that usually attends county elections, especially such as are contested.

Much has been said of late years on the subject of instructing Members of Parliament. No condition would be more justifiable than to demand of all the candidates a promise that they would not, by encouraging debauchery, ruin the health, destroy the industry, and corrupt the morals, of those people for whose interest they profess such an anxious concern, and to whose service they are so profoundly devoted. I believe it will not be thought going too far to affirm, that very few indeed have it in their power to repair, by any political conduct of their own, the mischief done by a contested election. No combination among the electors could be more truly patriotic, than one which tended to refuse support to every candidate that attempted to promote his interest by such means.

In the former part of this essay, I have mentioned some of the ill effects that follow violent exertions of labour or exercise, which I trust are sufficient to shew the imprudence of such strained efforts. I shall only add here, that such trials should not be encouraged by premiums or other means, either by private persons or public societies. It would be far preferable to encourage constant and persevering
industry

industry and good execution of work, than excessive labour and fatiguing exertions of strength.—I shall conclude this chapter with some pieces of general advice.

Those who employ servants in agriculture should encourage them to be careful of their health, and to make it a point of consideration. A proper prudence in this respect is perfectly consistent with industry, and is indeed the most necessary circumstance towards the execution of a great quantity of work.—It is common with agricultural societies to give premiums for the greatest number of children; but this should always be conjoined with another condition, that the children should be healthy, and this last circumstance should preponderate against the other.

The situation of *farm-houses* is a matter of great consequence as it regards health. The greatest care should be taken to place them in dry situations with a descent from them every way, and upon a gravelly spot, or at least such a one as is free from springs that rise to, or near to, the surface of the earth. Care also should be taken to place the repositories for dung and other manure at some distance from the house, and this caution should also be extended to the hog-styes and poultry-yards. The necessary attention to the feeding these animals does not allow the

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the distance to be considerable, but still does not require their being so near as we generally see them placed. It is needless to expatiate on such a subject, or to attempt to prove that air impregnated with such filthy exhalations must be injurious to health.

Even good plans for farm-houses of different sizes, according to the number of inhabitants, would contribute in no small degree to general welfare. The bed-chambers in farm-houses are in general too low and confined, and the whole building too small; this occasions too many people to be crowded together, a circumstance always very unfavourable to health, and the most common source of contagious disorders. Good water is also a circumstance of great moment. If this can be had from any spring that rises to the surface of the earth, it is commonly preferable to such as is drawn from a considerable depth; but such a choice is not always in our power. If pond-water be used through necessity, it should be previously put into cisterns or reservoirs, covered at the top, and there suffered to settle. Care should be had that the water be taken from a large pond, with a stony or gravelly bottom, and not subject to become putrid. Those who drink water of this kind should beware of swallowing the eggs or spawn of animals, leeches particularly, which sometimes have produced, it is said, disagreeable symptoms.

Cleanliness

Cleanliness of the person is of greater importance to health than is generally imagined, and ought to be particularly encouraged among the lower ranks of people, especially those employed in this way. Nothing seems more likely to contribute to this salutary purpose than a due observation of Sunday; this precept is not only conducive to religion, morals, and civilization, but also to health.—It is well observed by Mr. ADDISON, that Sunday clears away the rust of the whole week:—an expression which may be understood to extend to cleanliness as well as other considerations, and indeed appears to have been so intended by the amiable author in the passage referred to.

On the CURE of the DISEASES incident to an
AGRICULTURAL LIFE.

I now come to the last part of this essay, which is to speak—*Of the Cure of the Diseases to which Agricultural Persons are subject from their way of Life:* and here I must remind the reader, that the present treatise is not meant to be a discussion of the subject at large in a medical way, but only to contain some plain hints and directions of the practical kind, which I believe to be justified by reason and experience.

Persons

Persons employed in daily labour of a healthy kind, and living on coarse food, naturally become robust and athletic, of a firm fibre and dense blood. Hence inflammatory complaints are in such habits more common than those of the putrid kind; and such as are attended with low spirits and other hypochondriacal symptoms, are rarely met with. Evacuations may of course be used with more safety among such people than among the effeminate inhabitants of populous towns.

Bleeding in the fevers that occur among country people, is for the most part necessary, especially in such as are attended with local inflammation, as pleurisy, peripneumony, or inflammation of any of the viscera. In such cases, twelve, fourteen, sixteen, or even twenty ounces of blood, may, and often ought, to be drawn at one time. The quantity, however, cannot be determined by any general rule, but must be regulated by the age, strength, sex, and constitution of the patient, but principally by the urgency of the symptoms. If the internal pain be very acute, the skin hot and dry, and the pulse exceed 110 beats in a minute, a large bleeding is generally necessary, especially if any other symptom of a fatiguing or dangerous kind, as a violent cough, or shortness of breath, be present.

It is proper here to remark, that as soon as the nature of the complaint is so far ascertained as to prove bleeding to be indicated, it is of consequence that such operation be performed as soon as possible, and that a sufficient quantity be drawn at one time. One plentiful bleeding will sometimes subdue a disease at its first appearance, when if half the quantity only had been taken, it would have required perhaps to be repeated several times.—It often, however, and indeed generally happens, in fevers attended with local inflammation, that one bleeding, however judiciously managed in respect of quantity, is not sufficient. In such cases we must be governed nearly altogether by the urgency of the symptoms, and when these indicate a farther evacuation to be necessary, we must proceed, not indeed without regard to other circumstances, but nevertheless as considering them as subservient only to the principal object. An attention to this circumstance is especially proper, when the parts that are the seat of the complaint are immediately necessary to life, as in inflammations of the brain, lungs, bowels, or any of the viscera; in such cases there is no time to be lost, and what many would think bold practice, is indeed the only means of escape.—It is proper indeed to be careful, that the complaint originally be of such a nature as to require bleeding
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at all; and in this, it must be confessed, even the most acute persons of the profession have been deceived.—The intermittent fever sometimes comes on with such violent symptoms as to resemble very strongly an inflammatory fever. But a little time generally resolves the difficulty, and the successive and clear marked stages of *cold*, *heat*, and *sweat*, are for the most part sufficient to determine the nature of the disorder, even before any intermission takes place, and any necessity of beginning to treat it as a fever of a different kind. Even if it should be mistaken, and some blood drawn, this evacuation has been often found serviceable in the beginning of intermittents, when the symptoms are violent, and is recommended on such occasions by the most judicious practitioners. A careful examination of circumstances will, for the most part, enable us to distinguish this disorder at its first appearance.—Moist weather, and a season of the year about either the vernal or autumnal equinoxes, the latter especially, and the frequency of the disorder in the neighbourhood, afford strong presumptions in favour of a fever being of the intermittent kind;—to which we may add, such observations as may be drawn from the nature of the soil and situation, and the business or work in which those attacked with the complaint had been employed, previous to its first coming on.

It is an opinion generally received, that if bleeding be omitted at the beginning of fevers, it is improper in their advanced state, and this is in some measure true. Fevers that commenced with inflammatory symptoms often become putrid as they proceed, and bleeding is certainly improper in such circumstances. But I would observe, that this caution holds more strongly with regard to the enfeebled inhabitants of towns, than for robust country men. I apprehend that bleeding, though certainly more likely to be of service if tried at the beginning of the disease, is nevertheless proper at every period when inflammatory symptoms are present. This holds more strongly in cases of fever attended with local inflammation, as in pleurisy, inflammations of the viscera, &c. in which the propriety of bleeding at every stage, provided the symptoms are urgent, is universally acknowledged. It sometimes happens in robust people, that the common inflammatory fever preserves its original appearance nearly as long as life continues, and its change of type is not to be regarded so much as an indication that points out the propriety of a different method of treatment, as a sign that all our attempts are likely to be in vain.

Topical bleeding is often of great service in many disorders as well as general bleeding, especially in the removal of some troublesome and distressing symptoms.

symptoms. The head-ache is frequently an attendant on fevers, and often continues when the heat, quickness of pulse, thirst, and other symptoms, are much abated; and may be often thus relieved.— One of the easiest and safest methods of partial or topical bleeding is by the application of leeches. If 3, 4, 5, or 6 of these, be applied to the temples, in the cases mentioned above, they will often procure almost immediate ease, and are perfectly safe in their application, as the quantity of blood each of them draws is very small. Leeches may often be applied with great success in many inflammatory complaints that shew themselves externally, as rheumatic swellings, particularly those of the face and cheeks, inflammations of the eyes, inner parts of the ear, &c. In every instance they should be applied as near as possible to the part affected. Bleeding, however, though a powerful remedy, requires some judgment and caution in the application of it.— The fevers that appear among country people, though often inflammatory, are not always so. Putrid fevers, though scarcely natural (if such an expression may be admitted) to a country life, are nevertheless capable of being communicated by contagion, and in such cases bleeding is generally hurtful. In some instances the putrid and inflammatory symptoms are so combined, as to make it

doubtful to which class of symptoms we ought principally to attend, and in such cases some experienced person should be consulted; but in general the sudden debility of body, and dejection of mind, that usually come on at the access of the fever, the red watery eye, and the tendency to perspiration or other evacuations, sufficiently distinguish this complaint from those of the inflammatory kind. The nervous fever seems to be only an inferior degree of the putrid or malignant. It is principally distinguished by the weakness and dejection of mind that attend it.

The ulcerated fore-throat is another complaint that may be found in every situation, as it is capable of being propagated by contagion. The difference of this from the inflammatory fore-throat is now well understood and generally known; but there is another complaint that resembles it very much, which requires a very different mode of treatment, of which I shall speak hereafter. In both, however, bleeding is improper.—No case requires the use of the lancet more than the common cold, if attended with cough and pain of the breast or side. These symptoms, if neglected, frequently terminate in consumptions, which might easily have been prevented by some evacuation of this kind, joined to common care, whilst the complaint was recent.

An absurd custom prevails among the common people, of letting blood about the spring and fall of the year, whether they have any complaint that requires such evacuation or no; this practice, however, so far from tending to prevent disorders, contributes greatly to produce them. It causes an habitual plethora, impoverishes the blood and juices, and when done at the latter end of the year, is apt to dispose the body to intermittent fevers, and, if often repeated, to dropical complaints. Many other bad effects of this absurd practice might be enumerated, but they are, I think, unnecessary to mention.

Purging is a mode of evacuation, whose consequences in inflammatory complaints are often important, though less so than bleeding, and I think less hazardous, if misapplied. Almost every inflammatory complaint requires some operation of this kind; it is however in general proper to be preceded by bleeding, which is thought to make it more safe and effectual: but this rule admits of many exceptions, and is not necessary to be adhered to, except the tendency to inflammation prevail pretty strongly.

It was formerly thought, that purgative medicines differ considerably in the nature of the discharge they produced; some being calculated to discharge water, others bile, others phlegm, &c.

but modern practice does not admit of much difference in this respect. All purgatives evacuate the bowels, and, if powerful and stimulating, produce a watery discharge by the absorption they occasion from the lymphatic system. Notwithstanding this similarity in the effects of purgative remedies, they differ considerably with respect to the circumstances that attend their operation. Some purgatives are observed to stimulate the body and accelerate the pulse during their operation more than others, and this is an important circumstance to direct our choice of them, according to the purposes for which they are intended. Those that operate with least irritation to the system, especially to the circulation, are preferable in acute complaints; and nothing in such cases is better than a simple solution of the bitter purging salt in water. It is seldom rejected by the stomach, however unpleasant it may be to the taste, and its operation is effectual and takes place quickly;—a circumstance of great importance in such cases. From one to two ounces may be safely taken, dissolved in a pint of warm water, in all inflammatory complaints where purging is proper. If it should be necessary to repeat it in the advanced stages, when the feverish heat begins to subside, it may be taken dissolved in the same quantity of infusion of flowers of chamomile, which will

will conduce to support the tone of the stomach without obstructing the evacuation.—The same remedy is proper in such fevers as are attended with local inflammation. If given early in such complaints, it will generally procure a passage, being quick and effectual in its operation, and found by experience to be less liable to be thrown up than things much more pleasing to the taste. The use of this medicine is not only adviseable in continued fevers, but also in the beginning of intermittents, when the patient is strong enough to bear purging. But of this I shall say more when I come to speak of the use of the Peruvian bark in that disorder.

In the advanced state of all fevers, when the inflammatory disposition begins to abate, and a tendency to putrefaction to prevail, the saline purgatives in general are less proper than such as are of a more warm and stimulating nature. Rhubarb in such cases is more proper, as being warm and aromatic, at the same time that it is purgative. If it be required to be made warmer, one half or one third part of nutmeg, or any other spice, may be added; from 20 grains to 60 may be given for a dose, but this must vary according to circumstances.

It is a perplexing circumstance attending the giving purgative medicines internally, that we cannot
determine

determine the degree of their operation by the proportion or quantity that is taken. It generally happens that one half or two thirds of the usual dose will have little or no effect; whereas had the full quantity been taken, it would have produced a larger discharge than might be desired. In cases, therefore, where some evacuation of the bowels is necessary, and at the same time we might be apprehensive of any unpleasant effects from a large discharge, it is proper to employ clysters, which have an additional advantage, that their effect takes place in a much shorter time than could be produced by any purgative medicine internally taken. When clysters are administered with this intent, there is no great necessity to be very particular in their composition. A pint of warm gruel or broth, with two spoonfuls of fallad oil, or melted butter, a table-spoonful of common salt, and the same quantity of brown sugar, forms as efficacious and proper a clyster as the most laboured composition.

It is proper, while upon this subject, to caution against the practice of giving purgative medicines internally, especially such as are of the heating or stimulating kind, commonly called warm purgatives, to people who complain of pain in their stomach or bowels; particularly if this pain be attended with
heat,

heat, thirst, or other symptoms of fever. It is much the safer practice to inject a clyster of the kind beforementioned, and to repeat it if necessary, and to use external fomentations, than to enter precipitately on the use of purgative medicines, which, if they do not take effect, often aggravate the mischief, by producing or increasing a disposition to vomit, and sometimes totally inverting the peristaltic motion of the intestines. If sufficient stools can be procured by clysters, the danger is generally over; but if that means of relief do not succeed, it is safer to apply to some of the profession, who may best determine what method may be pursued.

It is of the utmost consequence to mention, that when any complaint of violent pain in the stomach or bowels is made, especially if such pain be not accompanied by stools, we should enquire first about the place in which it is chiefly felt, if that can be pointed out; and next, if it came on rather suddenly, or soon after performing some laborious work, especially the lifting any great weight, or indeed any considerable exertion of strength. If this be found to be the case, we should carefully examine the belly, especially that part nearest to the seat of the pain; and if any swelling, or lump, however small, be found, even of the size of a hazel-nut, we may be almost certain, that the cause of the complaint originates

ginates from thence, and that if it be *immediately* attended to, it may *probably* be relieved, at least the present danger obviated; but that if it be neglected, the patient will almost infallibly die. The only remedy on such occasion is, to restore the portion of the intestine, which is thus protruded and compressed between the muscles of the abdomen, again into the cavity of the belly; and if this be done *soon* after the accident, it produces no farther injury. But this must be understood of such cases only as have a quick attention paid to them, since if any delay is made, the danger increases very rapidly: even a few hours may determine the interval between safety and death.—If the patient be in the vigour of age and strength, the consequences of neglect are more to be apprehended, than if he were advanced in years, as the probability of inflammation and stricture upon the intestine is greater,

The apparent facility and celerity with which this operation is often performed, and its great simplicity, may induce some people to attempt the performance of it, who have had no instruction or experience relative thereto; but it is proper to caution against such attempts, as much nicety of touch, and address of management, are often requisite; and if the part be rudely or injudiciously handled, the hazard of the disorder is much increased. The
parts

parts where such an accident is most liable to happen, are the navel and the groin, but this rule is by no means universal.

It is farther necessary to remark, that women, who in country business are often employed in lifting considerable weights, as of pails of milk, buckets of water, and such like, are more liable to ruptures than men; and on that account it is highly necessary that whoever attends women labouring under any acute pains of the abdomen, should make a strict enquiry into the circumstances under which such pains originated, and particularly if there be any tumour in the groin, belly, or pudenda; and if there be such, to be informed of what nature it is, before he goes any farther, or loses any more of that time, which in such cases is so very precious.

To return now from this rather long, but I hope not useless, digression.

Emetics are another class of medicines of the evaculatory kind, that are often of the greatest importance, and whose use requires the particular attention of those who give advice to sick persons. It is not meant here to give a general account of the causes or circumstances in which emetics may be administered with propriety, but only to give a few hints

hints relative to the cases that are most likely to occur in such situations, in which those remedies may be useful.

First, then, emetics are indicated in cases where from imprudence or negligence any thing has been swallowed, that we have reason to believe would be specifically injurious by its continuance in the stomach. Thus if any poisonous plant, root, or berry, as of henbane, dropwort, nightshade, or such like, has been incautiously or ignorantly taken, our principal security depends on such poisonous substance being evacuated as soon as possible, and this can only be done with safety by means of emetics. A scruple or half a drachm of powder of ipecacuanha, together with a grain of emetic tartar, may be safely given on such occasions to an adult person, and worked off with a strong infusion of chamomile flowers, or of root of horse-radish. This accident is most likely to happen to children, with whom the same remedy may be tried; some diminution in the dose may be proper; but in such dangerous cases it is better to give a full dose, and the rather as by the quicker and more effectual operation of a larger quantity, the emetic substance itself is sooner and more completely discharged, and in general with greater ease to the patient, than if a small dose had been employed. The same remedy may be
taken

taken when the stomach is overloaded by excess of food, or by any victuals that disagree.

With the same intention emetics may be given when by some violent debauch the stomach is deluged with strong liquors, and the insensibility may be so great, that it may be apprehended life is endangered. A quick and effectual evacuation of the stomach is sometimes of great consequence in such cases, and serves to rescue such unwary persons from impending destruction. When the stupor prevails so far as to prevent swallowing, a few grains of emetic tartar conveyed to the back part of the tongue will find its way into the stomach, and in most cases, where that organ retains any sensibility, produce vomiting. A few grains (three or four for instance) of blue vitriol may be used for the same purpose, and in desperate cases is preferable, as possessing a stronger emetic quality.

It must however be observed, that it is not always either adviseable or safe to give vomits to remove substances that have got into the stomach, that we apprehend may do mischief by means of their mechanical stimulus, as pieces of bone, pins, or other sharp or pointed bodies, that may have been swallowed. The contraction of the stomach that necessarily attends vomiting may, if the substances
be

be not discharged, aggravate their bad effects, and cause mischief by pressing on such substances; which might not have happened, had they been left undisturbed.

But the use of emetics is not confined merely to cases where we desire to empty the stomach, on account of any foulness supposed to be lodged there. They are often of the greatest service when given at the coming on of feverish complaints, whether these be intermittent or continual fevers. In both of these, it is usual for some degree of nausea, or sickness of the stomach, to accompany the cold fit, which it is proper to encourage, should it not come to an actual vomiting. An infusion of chamomile is often sufficient for this purpose; but if that fail to excite a complete discharge, a scruple of ipecacuanha in powder will assist the discharge sufficiently, effectually, and safely.

Emetics are often of service in the common catarrhus cold, when the glands of the throat and fauces are deluged with mucous phlegm, which is often very difficult to be spit up. In these cases, an emetic often acts in the most powerful manner in unloading the glands, and promoting general expectoration.

About

About ten years ago, a disease appeared in the Midland counties, much resembling the ulcerated fore-throat, but differing from it in reality, and requiring very different remedies. This was called the fore-throat, attended with scarlet fever, and raged principally in the summer and autumn, in hot and dry weather, and attacked principally robust and vigorous people. Vomiting in this disorder proved a very effectual remedy, and required to be frequently repeated, during the heat of the disease, even, in bad cases, as far as twice in twenty-four hours. Should the same complaint again become epidemic, the early administration of emetics will probably be of the utmost consequence, and ought to be carefully attended to. It was found necessary to use such as were of a powerful kind, otherwise little benefit was received.

The above are far from being the only cases wherein emetics are useful, but such only as occur to me wherein they may be administered without hazard of being injurious, and have a probability of being of service. It will be proper here to offer some *Cautions relative to the Dose and Management of Emetics.*

First, then, I apprehend, that it is a mistaken notion that gentle emetics, as they are called, are milder

milder in their operation than the more powerful. A small quantity of ipecacuanha often causes a most troublesome nausea and retching, for a long time together, owing to its not possessing a stimulus sufficiently strong to cause a complete evacuation of the stomach. A strong emetic, on the other hand, by clearing the stomach in a few efforts, is itself discharged, and of course gives no farther trouble. A scruple of ipecacuanha in general, operates with much less pain and fatigue than five or ten grains, and the operation is sooner over. It is proper to add a portion of some antimonial preparation to the ipecacuanha: a grain or two of emetic tartar, or a drachm or two drachms of antimonial wine, serve the purpose equally well. They are of service in clearing the stomach more completely than ipecacuanha would do if given alone; and on the other hand, the ipecacuanha causes the antimonial medicines to operate with greater certainty as emetics, which would otherwise often go off by stool.

Another caution I would recommend is, to wait patiently for the operation of the emetic, and not to attempt by any mechanical means, as tickling the throat with a feather, or with the finger, to cause retching before the sickness is sufficiently strong to excite vomiting freely. It is better even to repress
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the first motions to vomit, and wait till they become sufficiently strong to be effectual.

It is somewhat remarkable, that the addition of antimony to ipecacuanha, though it certainly causes a more full evacuation of the stomach, seems to retard the operation in some measure. Ipecacuanha given alone generally causes sickness in the space of fifteen or twenty minutes; whereas, if antimony be added, that effect seldom takes place under half an hour or forty minutes, and often longer.

Another caution is, for those who take emetics not to load their stomach with large quantities of warm insipid liquor, under the notion of working off the vomit; warm chamomile or horse-radish tea, or a mixture of both, is preferable to gruel or warm water, as not relaxing the stomach so much as those weak tasteless liquors.

Lastly, it should be considered by all, that the habit of taking emetics is of itself very weakening to the stomach and powers of digestion: occasionally used, they are in most cases a safe and powerful remedy, but frequent repetition causes them to be less beneficial, and in time hurtful.

Medicines that cause sweat, called in medicine *Diaphoretics*, are next to be considered. The use of

these, though not so general as was formerly thought, still forms an important indication. The common catarrhus cold is more effectually relieved by promoting this evacuation than by any other means, and the same was observed of the influenza, when that complaint was epidemic some years ago. Rheumatic complaints are also benefited by it, and many other slight febrile complaints. Nothing, however, has been more mistaken, than the most effectual means of producing this discharge. External heat is generally thought necessary; but it has been discovered of late years, that the body may easily be made too hot to sweat, and that there is often no method more powerful than by diminishing the heat of the body when too great, and that it is often necessary, in order to promote perspiration, to take off part of the bed-clothes, diminish the heat of the room by removing the fire and opening the windows, and to give cool liquors to the patient.— Nothing succeeds better with this view in the common catarrhus cold, which requires some discharge by perspiration as much as any complaint whatever, than to bathe the feet at night for a quarter of an hour in water made about blood-warm, and to take a moderate dose of spirits of hartshorn in a pint of warm whey, gruel, or infusion of some garden herbs, as balm, mint, &c. This is perhaps the safest

safest method of any; as whatever the nature of the disease may turn out afterwards, no injury can arise from what has been done.

In rheumatic cases, it may be necessary to employ diaphoretics of a more powerful kind, and for this purpose *Dover's Powder* is frequently given, and often with good effect. It is given from five to fifteen grains, and may be continued every night or every other night for ten days or a fortnight, if the discharge by the skin be not too great, and the painful symptoms continue.

It is proper here to speak a few words on the subject of that popular remedy, *Dr. James's Fever Powder*. This is well known to be an antimonial composition, less stimulating to the stomach and bowels than emetic tartar, and on that account preferable where any permanent effect is desired. It often acts as an emetic or a purgative, as well as a diaphoretic; but the last effect is, I think, more common. In fevers of the inflammatory kind, and such as are commonly found in country places, it is, if given with any tolerable caution, an excellent remedy, taking off the feverish spasm, unloading the stomach and bowels, and as it were giving an opportunity for the exertions of nature. It is best given at the beginning of feverish complaints, be-

fore they alter their tendency from an inflammatory to one that is putrid. If the inflammatory symptoms are violent, it is safer to use some previous evacuations by bleeding, and a clyster; after which from five to twenty grains may be given, according to the strength of the patient and urgency of the symptoms. It is given with most advantage in cases wherein the patient is able to bear considerable discharge by stool; but it is remarkable that these seemingly distressing operations are soon recovered, and the patient appears in many cases the stronger on their account. The sickness also caused by this medicine, however uneasy to bear whilst it lasts, generally leaves the stomach in a state fit for the receiving of nourishment; an inclination for which is, in many instances, one of the first marks of benefit received from the use of this remedy.

It sometimes happens, that this medicine, though given to its full quantity, produces no sensible effect of any kind. Whether this be owing to any defect in the preparation, or to any insensibility in the nerves of the stomach at such times, I cannot determine. It is however in such circumstances necessary to forward its effects, since if it remain inactive in respect of producing some evacuation or other,

other, it seldom is of any service. If the stomach appears to be loaded, a scruple of ipecacuanha may be given, joined to a grain of emetic tartar, which generally takes effect, and sometimes seems to excite the action of the powder. If we wish to determine its action downward, an ounce or six drachms of the bitter purging salt may be taken, and a clyster of broth and common salt thrown up.

As to the mode of exhibiting this medicine, I have before observed, that it may be taken from five to twenty grains at a dose, and is most conveniently given in something of a viscid consistence, as pulp of roasted apple, currant-jelly, or the like. If put into any thin fluid, as tea, it is apt to sink to the bottom, being of considerable specifick gravity, and indissoluble in any watery fluid. It has been a great injury to medicine, that this preparation should have been kept so long as an empirical secret. It has been by that means extolled in complaints in which it had no salutary efficacy, and was even liable to prove injurious. It is impossible that any medicine can be suited to every kind of fever. Some require immediate and large evacuations; in others, such a treatment tends infallibly to destroy the patient; and there is no doubt that the indiscriminate recommendation of this remedy, which

generally acts as a powerful evacuant, must have been the cause of many lives being sacrificed to pecuniary interest. Such a remedy, however suited to disorders where a quick and powerful evacuation is required, is utterly improper in cases where the powers of life are much reduced, and where the utmost attention to support the strength of the patient is necessary. This is always the indication in fevers of the low, nervous, and contagious kind, and is frequently the case in the advanced state of fevers in general, whatever might be their tendency at their first appearance. Even in the rheumatism, which is of an inflammatory nature, though often chronic in point of its duration, this medicine, though often serviceable at the beginning, must not be continued very long, as it is found, like the other antimonial preparations, to injure by long use the tone of the stomach and powers of digestion.

The high, and as it might justly be called extravagant price of this remedy, which bore scarcely any assignable proportion to its intrinsic value, has caused its use to be less general among the poor than humanity would desire. That objection is now, however, superseded; the powder being now sold at Apothecaries-hall, for less than one twentieth part of its former price; and this powder is found, on the most impartial examination, to be fully equal
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in every respect to that sold under the denomination of *James's Powder*.

Diuretic Medicines form a class of remedies, whose effects would be very desirable, were they not so precarious. No diuretics that we know are much to be depended upon for certainty of operation, especially in such cases as we most desire to have it. Those that are safest, and least offensive to the stomach, are the sweet spirit of nitre, and the sweet spirit of vitriol, which may be taken in the dose of a tea spoonful in a glass of water, or other cold liquor, once or twice a day, and continued for two or three weeks. Some of the vegetable infusions, as of horse-radish and mustard-seed, will sometimes produce the same effect, and may be continued, if successful, a long time without injury to the constitution or health in other respects. The infusion may be made by pouring hot water on the mustard-seed bruised, and horse-radish fresh scraped, and letting them stand together a few minutes. An ounce of each of the ingredients is enough for a quart of water; and about a quarter of a pint of this infusion may be taken twice a day.—The above infusion, or one similar to it, is often used with success in the swelling of the belly and legs, which often succeeds obstinate intermittent fevers, and is generally attended with thick turbid urine, which

is secreted in small quantity. This preparation, though apparently simple, is as likely to succeed as many others that are more compounded, and may be safely tried in all cases where the urinary secretion is defective.—It is proper, however, to caution against the giving diuretic medicines of any kind, when any pain, or heat of urine, accompanies the diminution of its quantity. In such cases, opiate and emollient remedies are proper, joined with such as abate inflammation.

Having thus spoken of medicines that produce evacuation, I shall now speak of those which stimulate, and call the powers of life into action.

Stimulant Medicines may be considered in practice as of two kinds; one of which tends to give a permanent support to the vital powers, the other tends to excite their action in a more temporary manner. Of the former of these, wine, when good, is perhaps the most generally useful in cases of emergency. It is now found that, in low and putrid fevers, wine may be given with great advantage in larger quantity than was formerly thought practicable with safety, even to two or three bottles in 24 hours. Nay, larger quantities have been administered, but it has been found that even a proper remedy may be over-dosed, and that such quantities

as I have above specified, should be cautiously ventured on, and not without attentively observing the effects of each dose that is taken. The best way of giving it is, I think, in small quantities and frequently, and as fresh from the cellar as possible, perfectly cool, and without any admixture.

In fevers, where the skin is moist, with a scalding heat to the touch, the pulse quick and low, the eyes moist or watery, the stools loose and foetid, thirst great, tongue foul, respiration difficult, and spirits depressed, there the use of wine is adviseable, and is indeed the principal remedy on which we must depend. The indication for wine is stronger, if any spots of a blue or purple cast appear on the body, or if a low muttering delirium come on, attended with faintness. Life then depends on active and quick exertions. Most fevers that are contagious are of this kind, particularly that called the *Jail Fever*; and the same method of treatment is necessary in some measure in most acute fevers that last beyond eight or ten days, without some evident signs of abatement. The marks whereby we may judge wine when administered to be of service are, a cessation or diminution of the pain in the head, or delirium, diminution of the heat and clammy sweat, and by the patient being in better spirits, and entertaining hopes of his recovery. It often happens, that fevers
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of this kind, when they begin to abate, assume somewhat of an inflammatory appearance, the skin becoming hot and dry, and the pulse full and quick. These symptoms are not unfavourable, and generally abate of their own accord. They indicate, however, that wine should be more sparingly given, if not totally laid aside, during their continuance.

If wine cannot be had, or not in perfection, or is not relished by the palate, good malt-liquor may be substituted in its room; and I have seen porter tried with the best effect in a case of this kind. The patient drank about three quarts a day for several days, and it seemed to agree better than wine or any other medicine, and was, after the second day, the only remedy administered. I have some reason to think, ale, or strong beer, might be used with similar effect; but have never had any personal experience of their efficacy. The Peruvian bark is used with the same intention in the same disorder, and with good effect. But it is now thought that wine is full as powerful, and much more easily administered, as being more grateful to the palate:—a thing of great importance where the frequent repetition of a medicine is necessary. The use of the bark is, therefore, in a good measure superseded in putrid fevers, except where the throat is ulcerated; in
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which complaint it has been found by experience to be particularly useful.

The principal use of the *Peruvian Bark* is in the intermittent fever, the returns of which it is well known to be very efficacious in preventing. It is best given in substance, and most conveniently in form of an electuary made up with any syrup, and with the addition of some spice, as a little nutmeg, or cinnamon, in powder, to each dose. If the patient be strong, and the body costive, a small quantity (a drachm for instance) of Glauber's salts, or the bitter purging salt, may be added to the three or four first doses of the bark, which generally opens the body and promotes urine; but if the disorder be advanced, or the patient weak or in years, such addition is less proper. If the bark purges, such tendency must be moderated, which a few drops (two or three for instance) of liquid laudanum in each dose generally does very effectually; and when that disposition is conquered, the laudanum must be omitted. The bark must be given in considerable quantity when employed to cure an intermittent. It is to little purpose to give to a grown-up person less than an ounce in twenty-four hours, and often double that quantity. It may be given in doses of two scruples or a drachm each, or about the bulk of a large nutmeg of the electuary every two hours

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on the day of intermission, and repeated every day for several days, if the fever does not return. After the intermission of three or four periods of the paroxysms, we may diminish the quantity, and give it only every four hours, taking care to give a dose a little before the time of day that the return of the complaint may be most probably expected. If the complaint does not return, the quantity may be in the space of a week or ten days still farther diminished, but it must not be left off entirely for the space of at least six weeks. If the disorder has had several returns, if it be an autumnal season, and the weather rainy, if the fits return every day, or with an interval of two days, or if the patient be weak and emaciated, more caution and attention to the regular administration of the bark will be necessary.

It would be a desirable circumstance, if that kind of the Peruvian Bark, called the *Red Bark*, were to be had genuine; but at present there is reason to think, that it can scarcely be procured. In an obstinate case of an intermittent, that fell lately under my care, I had an opportunity of trying the effects of the *calamus aromaticus*, which given in combination with the Peruvian bark, in the proportion of one part to two of the bark, stopt the progress of an intermittent that had resisted the bark
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taken alone. It is proper during a course of the bark to use a moderately liberal diet; but all excess, either in meat or drinks, is carefully to be avoided.

It is an old prejudice that subsists even to the present time, and among some of the medical profession, that intermittent fevers should not be too soon stopt, but suffered to go on through several paroxysms, before the bark should be given. It was thought that several disorders, particularly indurations of the liver, jaundice, mesenteric obstructions, and even rheumatic complaints, were produced in consequence of the bark being, as it was thought, prematurely given. But it now appears, that these complaints were the consequences of the disorder, being suffered to continue too long, not of its being too soon stopt, and that the best method of preventing them is to interrupt the course of the fits as early as possible by a steady and resolute use of the proper remedy. This caution ought to be carefully attended to, and enforced by those who give advice to people in country places, as the prejudices in favour of the fits being suffered to continue, are often very strong.

Bitter Medicines, such as the flowers of chamomile, roots of gentian, and centaury, are, in a good measure, similar in their effects to the Peruvian bark.

bark. They are, however, less effectual in the cure of intermittents and disorders of a putrid tendency, but better suited to a weak state of the stomach and organs of digestion. A strong infusion of any of the above-mentioned articles, with a little rind of the Seville orange, makes a bitter preparation as efficacious as any, and as pleasant as such a medicine can well be expected to be. A quarter of a pint of this taken twice a day for a week, fortnight, or three weeks, will often be of great service in disorders of the stomach unattended with fever. Infusions of this kind are also convenient vehicles for the administration of some other medicines. I have before mentioned, that saline purgatives may be given to advantage dissolved in an infusion of flowers of chamomile, and the same is true of such diuretic medicines as are of small bulk. The dulcified spirits of vitriol, and of nitre, may be given in this way, as may salt of tartar when used as a diuretic.

There is likewise another class of stimulant remedies, which seem to act more generally on the system, though they sometimes excite particular secretions. The infusion of *mustard seed* and *horseradish*, before recommended as a diuretic, is of this kind, and is often given with advantage in cases where the secretions in general are languid and slow.

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It may be taken with considerable advantage in rheumatic cases of long duration, where the pain is rather tedious and troublesome than acute, and attended with little or no fever. This medicine may be continued a considerable time, several months for instance, with less injury to the health and constitution in general, than might be expected from the long use of substances, whose sensible qualities are so powerful.

Stimulant applications of the external kind are next to be considered. The principal of these are *Blisters*. The proper use of these in many instances is attended with much nicety, and of course not a subject of my present treatise, which is only to give cautions, and to recommend the use of such remedies as may be applied with safety in such circumstances as are obvious to common understandings, independant of medical knowledge.—Nevertheless, there are, I think, many opportunities of their being employed with safety and probability of advantage, in circumstances that require no great medical knowledge to discover. Thus the use of blisters is adviseable in all internal pains, whether of the breast, side, or belly, attended with fever. In such cases, after bleeding, a blister, applied as near to the seat of the pain as possible, is a safe, and in general, if put on early after the commencement of the disease,

an efficacious remedy; which may, if necessary, be repeated with perfect safety.—In cases, likewise, where cough and pain of the breast, though unattended with much fever, are symptoms, I have seen the best effect from small blisters repeatedly applied to the part where the pain was felt; and believe, if they were oftener tried when these symptoms are but recent, might prevent many complaints of the lungs, which a short neglect renders fatal. I have found it the most easy, as well as effectual method of using this remedy, to apply it at going to bed, and, if it has risen, to remove it in the morning, and suffer it to heal up, and if necessary to repeat it. This is less troublesome, and I think more effectual, than a perpetual blister.

Blisters are useful in pains of the head accompanying fever, or where any tendency to vertigo or delirium appears. If applied at the first appearance of these symptoms, which are always alarming, they are often of the greatest service, and safe in their application. They are most serviceable in such cases, if applied to the head when fresh shaved; but as that cannot always be done, especially with women, they must be put on between the shoulders. The same remedy is often used in some local inflammations, partly of the external kind. Thus in the inflammation of the eye, or inner part of the ear,

ear, blisters behind the ears frequently bring, after other evacuations have been used, great relief; which is likewise the case in violent pains in the cheek and face.

The strangury sometimes follows the application of a blister. This however, though troublesome, is seldom of any serious consideration, as it is mostly relieved by drinking plentifully of any mild warm diluting liquor, as milk and water, infusion of linseed, solution of gum arabic in an infusion of the root of marsh-mallows, and such like. It is thought to conduce to the prevention of the strangury, in those subject to it, to cover the blistering plaister, as far as the flies extend, with a piece of gauze or muslin, and to spread the margin with the gum plaister, to secure its adhesion. By this management, the whole of the flies are taken off when the blister is dressed, which contributes to prevent the absorption of their acrimonious particles, which are thought to be taken into the circulation by being suffered to remain on the raw part. This precaution is of service, but not always quite effectual, and should not be used when a quick operation is required, as it abates the activity of the cantharides. It is customary with some to suffer the blistering plaister to remain on the part twenty-four hours, but I think the time should be measured by the

effect; and if a blister be raised in a third part of the time, as is often the case if the plaister be good, there is no occasion to trouble the patient with it for a longer time, which often gives unnecessary pain, and is much more likely to cause strangury, than if it were removed earlier.

The dressing of blisters is worthy attention.—The best of any is a simple plaister of white wax and olive oil, melted together by a very gentle heat, and spread thin on a rather fine linen cloth. This keeps the part from the air, and does not stick to it, or cause any irritation. It is proper, previous to the application of a blister, to examine the surface of the plaister, that it may be sufficiently moist; since, if it be too dry, it will often produce no effect whatsoever. If it seem dry and unpliant, it should be gently warmed before the fire, and moistened, first with a little spirits of wine or brandy, and then with a little olive oil or fresh butter. We must be cautious in practice of applying blisters at all in cases of the putrid kind attended with fever, and where inflammations of the urinary passages are present.

Blisters, however, are not the only forms in which external stimulants may be employed with advantage. It sometimes happens, that it may be convenient to employ a remedy of quicker operation,

as in violent pains of the head, delirium of fevers, apoplectic or paralytic seizures, and the like. In such distressing circumstances, it has been frequently found that stimulant applications to the lower extremities have been of great service, and proved a safe as well as an effectual remedy. Mustard seed bruised, or in fine powder, as the flour of mustard, is the best application. If this be mixed with an equal quantity of stale bread grated down, and made into a rather moist paste with vinegar, it will form a cataplasm of a proper consistence for the purpose here intended. If this be spread about a quarter of an inch thick on a piece of leather or linen cloth, and applied to the soles of the feet, or in extremities to the whole of the feet, it almost immediately produces a violent burning sensation, and sometimes, though not always, an inflammation of the part; and now and then it raises a blister. The time it should be suffered to remain upon the part, must be measured principally by the effects it produces. It should not be removed immediately on the first abatement of the symptoms, nor need it be kept on till they have entirely ceased, as the sensation continues a considerable time after the cataplasm is removed.

In less arduous cases, as in fixed rheumatic pains of the hip, shoulder, or other parts, a plaister of

brine has been applied with advantage, as being less painful than mustard, and less apt to blister than cantharides. In the tooth-ache, and pains of the face, a convenient temporary application may be made by mixing a little black pepper ground into powder, with as much brandy or other spirits as will make it into a soft paste, which is to be spread on leather, and applied to the face. This produces a considerable sensation of heat, but without any great uneasiness, and seldom blisters, tho' it is often very efficacious in removing the pain of the part.

The foregoing application is very useful at the first coming on of a fore-throat, if laid upon the outside under the chin, and moistened again with spirits as it becomes dry. I never knew it blister, though it is frequently of great service. A mixture of spirits of hartshorn, with olive oil put upon flannel, and laid to the throat, is often advised; but I think it not so effectual as the former.

Medicines that ease pain, and procure rest, are the next to be considered; these are of several kinds, but Opium, by its greater efficacy, and more convenient exhibition, has superseded in a great measure all the others.—Did opiates produce no other effects than those above ascribed to them, it would be unnecessary to give any directions relative to their
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their use, farther than to determine the proper dose; but the operation of this remedy is not so simple, but requires attention to regulate, and, in some instances, to counteract some of its effects. Opium may be safely and properly administered in most cases of violent pain, attended with none, or but little fever or inflammation. Thus it is the principal, and indeed almost the only remedy to be depended on, in those dreadful fits of pain which often attend the passage of a stone or gravel thro' the urinary passages. In such circumstances, opiates may be given with considerable freedom, in proportion to the excess of pain which is necessary to be alleviated, not only for the purpose of procuring ease to the patient, but also to allow the stone to pass, which seldom happens unless the pain and consequent spasm can be abated. Twenty, forty, or sixty drops, or any intermediate quantity of the tincture of opium, or of liquid laudanum, may be taken in twenty-four hours, according to the urgency of the symptoms. Larger doses have been given, but they are not without hazard, since as the pain is from the nature of the complaint liable, and indeed often does cease suddenly, from the passage of the irritating substance, the opium then is left to exert its full effect, unchecked by the stimulus of the pain, and aided by the disposition to

sleep, which naturally comes on after the cessation of great torment. This is said, in some instances, to have produced fatal effects, the sleep proving mortal. On this account it will be prudent, after giving as large a dose of an opiate as can safely be done, to endeavour to allay the pain by other means, as fomentations, warm baths, &c. until the effect of the opiate be gone off a little, and a second dose may be given with safety. If the complaint be attended with vomiting, as those of the nephritic kind frequently are, a larger dose may be ventured on, if we find that what has been before given has been thrown up; but we must not conclude, that the effect of opiates is *quite* lost, even though they should be rejected from the stomach. Their stay is generally sufficient for them to shew some signs of their specific qualities. In cases where opiates are proper, and where there is any great nausea or tendency to vomit, it is more convenient to exhibit this medicine in a solid form; and it is found by experience, that the smaller the bulk of the remedy, the greater is the probability of its being retained upon the stomach. A small pill, therefore, made of a grain of unstrained opium, without any other admixture, may be used in place of thirty drops of tincture of opium, to which it is fully equivalent; and this may, if necessary, be repeated once in
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twenty-four hours. If the vomiting be so violent as to suffer nothing, however small, to be retained upon the stomach, opium may be conveniently administered in a clyster. Forty drops, or a moderate tea-spoonful, which is generally regarded as equal to a drachm in measure, may be mixed with about half a pint or less, of broth, gruel, or warm milk, and injected as a clyster, and retained, if possible, several hours.

It is always proper, that the body be kept, if possible, in a rather lax state during the use of opiates. If, therefore, any costiveness be present, it is advisable to inject a clyster of a moderately opening kind, previous to the giving of the opiate, which makes the operation of the latter safe, and less liable to affect the nervous system. If the use of opiates be necessary to be continued, it is proper to administer occasionally some internal medicines of a mildly purgative kind, as opiates generally render the body costive. The precautions just mentioned are equally applicable to such bilious disorders as are attended with great and often exquisite pain about the pit of the stomach, without fever, and generally without any increase of pulse, and are produced by the gall-stones sticking in the ducts which convey the bile from the liver and the gall-bladder into the intestines. It should, however, be considered,

dered, that opium, in both the above-mentioned cases, is only a temporary relief; and though it often assists the passage of the obstructing body, yet is of no service to prevent the return of the disorder, and therefore should be taken only when great pain, and other urgent and distressing symptoms, render its use necessary.

The use of opium is in no instance more strongly manifested, than in the violent purging and vomiting that often comes on towards the latter part of the summer, or during the autumn, and is called the Cholera Morbus. It may not be proper to give opiates immediately on the access of the disorder, but after we may reasonably suppose the stomach and bowels to be cleared of their proper and natural contents, and little but bile, water, or mucus, passes, it is time to administer opiates, especially if the retching to vomit, distention of the stomach, and griping pains, be violent. In such cases there is no time to be lost, and opiates are often the only resource. They may be given either in a liquid or solid form. The liquid opiate takes effect sooner, but is more liable to be thrown up, on which account we should endeavour to make it as acceptable to the stomach as possible. About a spoonful of warm simple mint-water, or of peppermint, is as likely to make it stay on the stomach as any thing
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I know, and the smaller the quantity of fluid swallowed with it, provided it be sufficient to disguise the taste, the more proper.

Opium is likewise proper in the simple diarrhœa or purging, that often comes on towards the close of summer. This, though sometimes salutary when moderate, often continues so long as to exhaust the strength and weaken the tone of the stomach and bowels. In such cases it is often necessary to combine the opiate with some cordial astringent, among which I think cinnamon the best. If an ounce of cinnamon in powder be made into an electuary with any syrup, and the bulk of a small nutmeg taken three times a day with four, five, or six drops of tincture of opium added to each dose, it forms a powerful and safe remedy in autumnal fluxes.

Opiates, judiciously administered, might often prevent many of the bad consequences that follow violent colics, the iliac passion, and inflammation of the bowels. If a sufficient dose of tincture of opium, 20 or 30 drops for example, or, what might perhaps be more proper, a grain of unstrained opium in a pill, were to be given as soon as the pain becomes violent, and before any vomiting has come on, it might allay the pain, and make way for the operation of clysters; and would be preferable, in
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my opinion, to the exhibition of strong purgatives taken by the mouth, which, if they fail of producing an evacuation downwards, as they often do, cause vomiting, and aggravate all the other bad symptoms. If, however, the pain be violent, and accompanied with heat or thirst, it will be necessary to let blood, which is perfectly compatible with the operation of opium. This medicine is not only useful on account of its own specific qualities, but also as a corrector of those of other medicines.

It is not uncommon for the Peruvian bark to act as a purgative, which, in some of the most arduous circumstances in which it is given, as in intermittents, and fevers of a putrid tendency, is apt to disappoint its good effects. In such cases a few drops of tincture of opium, added to each dose, generally prevents the bark proving purgative, and of course suffers it to continue in the body long enough to be serviceable. This need not in general be continued long, as after a few doses the bark will usually lose its purgative quality, and may be taken alone.

I shall conclude this head with a caution relative to the use of such remedies; which is, that the taking of them is very apt to insinuate itself, and to become habitual, especially in those who are occasionally subject to painful disorders. If often used,
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they become almost necessary, as sleep cannot be procured without them. Those, therefore, who are obliged to take opiates occasionally, should make it a point of consequence not to use them except when they are obviously necessary, and to leave them off as soon as that necessity no longer exists. It may be troublesome at first, but sleep will return in time spontaneously, if the party have but resolution to persevere. The long continuance of opiates requires an increase of the dose, which produces costiveness, indigestion, general weakness, and a tribe of nervous symptoms, very similar to those which are the consequences of dram-drinking, which the taking of opiates in large quantities very much resembles.

I have thus finished what I have to say on the use of the medicines, which are calculated to answer the principal indications of cure. The reader will perceive easily that this extends only to diseases of a certain description, and respects in them only those remedies, the propriety of whose use is obvious to any person of sense and tolerable education, without assistance from professional study or information. I hope I have advanced nothing that is liable to mislead, and I trust that what is advised, will tend to make what future medical operations may be necessary more successful. Physicians often justly
lament,

lament, and often when it is too late, the imprudent measures that have been taken previous to their being employed. To obviate this in some measure, is the principal intention of the present essay, which I have put into the present form, as being comprised in smaller compass than if I had treated of the diseases separately, and as I think more easy to be understood.

Some general directions relative to the *treatment of Sick Persons*, which could not so properly be introduced under the several indications, are here added.

Cleanliness is a matter of the greatest consequence to the cure both of acute and chronical disorders. Every person who is indisposed ought to wash the face and hands, and feet occasionally, with at least equal regularity as in health. The ease and comfort this affords to sick persons, those especially who labour under acute disorders, can scarcely be imagined, except by those who have experienced it.—Change of linen is a highly necessary article. Every person ill of a fever ought to have clean linen for the head and body every day, and clean sheets every three days, or oftener, if the perspiration be large. Many
causeless

causeless fears formerly prevailed, and still subsist, concerning the airing of linen. It is necessary undoubtedly that this should be dry, but this is best insured by its being exposed when perfectly clean to a fire, and dried by that means only. Linen that has been worn, or sheets that have been lain in, with a view to airing them, are unfit for sick persons, as they are in reality fouled and damped by such absurd care. The room itself should be swept daily, and every offensive thing removed as soon as possible, and nothing suffered to remain in the room that is not immediately necessary to the patient. Whatever food or drink he does not consume should be removed immediately after as much as is necessary be taken, and no person suffered to take food in the room except the sick person.—It is necessary that the utmost care be taken that the victuals, and whatever besides be prepared for the sick, be dressed with the greatest regard to cleanliness. The stomach in such cases is always delicate, and it is of the greatest consequence to indulge it in this respect.

Change of Air and Coolness are nearly connected with Cleanliness, and equally necessary to be attended to. Every person confined to their bed with any feverish complaint, should have the door and window of the room opened for a quarter of an hour

hour twice at least in twenty-four hours. If the weather be very severe, the curtains may be drawn so as to prevent the current of air from blowing on the sick person; but if the weather be mild or warm, the door and windows should be open thro' the day and even the night. There cannot be the least necessity why the air should be warmer for a person ill of a fever than for a person in health, but many reasons why we should wish it cooler. To keep a sick person's chamber well aired, (I mean here not by fires, but by opening the doors and windows) contributes not only to the benefit of the sick person, but to the safety of the attendants.— Many fevers, which were at first simply inflammatory, have become by heat, confinement of air, and other improper treatment, putrid and contagious. It is obvious that if the complaint originally be of a putrid tendency, these cautions become doubly necessary.

The proportion of bed-clothes is a circumstance of great moment. These must be measured partly by the age of the patient and nature of the complaint, but principally by the feelings of the sick person. I have often observed, that much of the restlessness attending fevers, which is so troublesome and fatiguing a symptom, and so exhausting of the strength of the patient, is owing to the quantity

tity of bed-clothes. Too much heat naturally produces a desire to change the heated place for one that is cooler; but if the body were not uneasily hot, no such impatience would take place.

Quiet is another important article. Officious curiosity is apt to make many persons intrude upon sick people, who have very little real concern on their account. This should by all means be discouraged, and no more persons admitted to the chamber of the sick than are necessary to attend him. The admission of others tends only to foul the air, increase the heat, and prevent the rest of the sick.

The proper administration of food is a matter of the utmost concern. At the beginning of inflammatory complaints, provided the patient be young and robust, some abstinence may be proper; but in the advanced state of all disorders both acute and chronic, it is necessary to pay great attention to the article of food. As long as any considerable degree of fever remains, it is proper to use a vegetable diet. Milk boiled with bread, bread and rice puddings, roasted apples, and the like, are all proper; and for drink, toast and water, whey, or (if it be good) small beer; but no stronger liquor, and least of all distilled spirits. A most absurd and unhappy
notion

notion still prevails among many of the lower people, that sick persons are in want of something cordial to support their strength, and keep up their spirits; in consequence of which they often, in spite of any directions to the contrary from those who are better qualified to judge, give them some strong fermented liquor, as ale or strong beer, and sometimes rum, brandy, gin, and the like. It is a melancholy reflection, that numbers fall victims to this odious opinion, which, as well as many other instances of impertinent interference with the sick, ought to be discouraged as much as possible.

The mode of giving food to a sick person is worthy regard. It should always be in small quantity, and no more should be brought into the patient's sight than it may be expected he will be able to take at a time. This should be done often in the day, and even during the night, and without waiting for its being asked for by the sick person, who is often able to take food when he has not spirits to ask for it. It must not however be pressed with any importunity, which is more likely to excite disgust than appetite.

The support of the spirits of a person labouring under disease, is as necessary towards his cure as
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altogether. I am inclined to think, that the almanacks, in which such advice has been for many ages preposterously inserted, have been the principal causes of such absurd notions being carried into practice for so long a course of years. I see it has been of late omitted in some, and hope the others will follow the example.

A prejudice subsists among many people of the lower ranks, against every remedy that does not operate upon them in some sensible manner as an evacuant. They do not measure its good effects by the change it produces upon the health, but by its increasing their natural discharges. This is an unfortunate prepossession, as several of the most effectual remedies act for the most part without any sensible alteration in the animal system, save the cessation of the disorder. This is the case in general with the Peruvian bark, when given as a cure for the intermittent fever, in which, if medicines of the evaculatory kind were to be joined with the bark, they would, unless very gentle in their operation, frustrate the good effects of the principal remedy. It is proper on this account, whenever medicines of this kind are given, to forewarn those to whom they are administered, that they are not to expect from them any other effect than an abatement

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ment of the disorder which they were intended to remedy: a condition surely sufficient to satisfy any reasonable person.

The common people are too apt to estimate the efficacy of medicines, as they do that of other things, by their pecuniary value and their scarcity. They have no idea that Providence has made the most useful things in medicine, as well as food, cheap and common, and that expence in such articles is oftener necessary to flatter and comply with effeminate delicacy, than to add to the real efficacy of a remedy. The poor who are in hospitals do not receive, in proportion to their numbers, less relief than the rich in their splendid apartments; though in the former case nothing be conceded to prejudice, fancy, and caprice; and in the latter, it makes the most important consideration. It is incumbent, therefore, on all who take the charge of the lower people when sick, to combat this mistaken opinion, and to endeavour, if possible, to convince them, that the best remedies are in many instances the cheapest.

Those who take the charge of sick persons should be cautious that the same course of medicines be not continued too long a time together. It should be understood, that medicines (at least the greatest

part of them) are more calculated to *restore* health than to *preserve* it. We should therefore be careful to recommend, to persons in health, to be contented with the happiness they enjoy in that respect, and not to attempt to improve what cannot be amended, but may easily be impaired. Some ignorant people are prepossessed with a notion that it is *wholsome*, as it is termed, to drink several infusions of herbs, as of flowers of chamomile, of centaury, and several others. But such trials are not only unnecessary, but likely to be injurious. The taking of bitters in large quantities, for a long time together, hurts the tone of the stomach, instead of mending it, as was found by fatal experience of those who took the Portland Gout Powder, which destroyed nearly all who tried it. This powder was nothing else than such bitter herbs as are commonly drank in tea, or brewed with malt liquor in the form of purl. What is here said, is not meant to insinuate that bitters *properly* and *moderately* used, are not very useful remedies. It is the excess only that is censured.

Another reason why we should be upon our guard against continuing the use of the same medicines for a long time is, that it is apt to introduce that most destructive of all habits, *Dram-drinking*. Many
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of the tinctures recommended in this way are little else than drams concealed under a medicinal disguise, and as such should be with equal caution avoided, as far as respects their becoming habitual. I have more than once seen a habit of this odious kind introduced among women, particularly by these means. It is not so likely to happen to the lower ranks, as to those who employ them, for whom this caution is principally meant.

The last piece of advice I shall offer respects
QUACKERIEY.

Perhaps there is nothing disgraces the police of this country, more than the numerous impositions of this kind that are daily advertised. Scarcely any one of them has not only a greater certainty of success ascribed to it, but is alledged to be infallible in a greater variety of disorders than are curable by all the articles of the *Materia Medica* taken collectively. Some of these boasted remedies are merely frivolous and inert, but others are violent and dangerous in their operation, and highly improper to be trusted to such persons as those who are thus rashly encouraged to take them in an indiscriminate manner. A solution of arsenic is said to have been the basis of a late specific for fevers,

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and I am well informed has in several instances destroyed the patient. These instances however, are carefully concealed, whilst every escape is carefully recited as a cure, owing to the remedy so given.

No piece of humanity would be greater than to preserve the ignorant and uneducated of the lower ranks from sacrificing their health and money to unfeeling fraud and interested knavery.



P O S T S C R I P T.

REPORT RESPECTING THE TRIALS OF PLOUGHS IN
MARCH 1788.

IN consequence of the premiums offered for ascertaining the cheapest and best plough, for the common practice of husbandry in these parts of the kingdom, a field of strong old ley ground, part of Barracks Farm, near Bath, was selected as proper for the test of experiments.—The persons who declared themselves candidates for this trial, were,

1. JOHN BILLINGSLEY, esq; of *Ashwick-Grove*, with a double coulter-plough, to be drawn by six oxen, in yokes and bows.

2. Mr. HENRY VAGG, of *Chilcompton*, with the Norfolk plough, having two wheels, and one handle, to be drawn by two horses abreast, and guided by the ploughman without a driver.

3. Mr. JOHN THOMAS, of *Keynsham*, with a light swing plough of his own improvement, to be drawn by four small Welch oxen, in yokes and bows.

4. Farmer SULLY, of *Midford*, with a single plough of this county, somewhat lightened and improved, having a small wheel under the beam, in a line with the coulter, and to be drawn by three horses lengthwise.

5. Mr. GEORGE FLOWER, of *Midford*, with a single plough, commonly used in this county, and to be drawn by three horses lengthwise.

6. Lord

6. Lord WEYMOUTH, with the common single Wiltshire plough, to be drawn by three horses, two abreast, and a single leader.

For these candidates, six parallel pieces of ground were marked out, near one acre each, and all the ploughs were to begin at the same time, and to plough their respective lots at pleasure; but as nearly as possible four inches deep, and eight inches wide.—On a previous trial of the soil, the Norfolk plough, from having only one handle, and the man not being used to plough stiff ley-land, was found unequal to the contest, and Mr. VAGG declined it. Mr. GEORGE FLOWER also on account of inferior workmanship, occasioned by the ill-construction of his plough, declined. Thus the contest began with only the other four. Before a judgment could be formed of the probable issue, Lord WEYMOUTH'S plough was broken against a point of a rock just beneath the surface, and consequently thrown out:—the trial then was confined to three.

At the end of three hours and four minutes Mr. BILLINGSLEY'S plough had finished its lot. At the end of five hours and five minutes Mr. SULLY'S had finished: and Mr. THOMAS'S at the end of five hours and a half. The latter ploughed about half his lot with the four small oxen, and the remainder with the addition of a single horse, the soil being found too stiff for the strength of the oxen.—The committee of judges was composed of five practical farmers, three from Wilts, one out of Somerset, and one from the county of Gloucester.

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On a full examination and comparison of the goodness of work, it was the opinion of the majority of the committee, that the double-coulter plough had the preference, for general purposes of husbandry, laying the furrow more flat than the others, and consequently exposing more new surface to the influence of the elements, and preventing more completely the growth of grass and weeds between the furrows. The want of a wheel to the swing-plough occasioned an unevenness of furrow and depth, which rendered the ploughing rather inferior, on that soil, to the work of the horse-plough; though it appeared much inferior to what it might probably have been, had the regularity of a wheel aided the excellent turning up of the mould-board; for which reason the owner was requested to pursue his improvement of a plough, which in several respects promised considerable utility as an ox-plough on level soils; more especially as it was asserted by Mr. THOMAS, that on such a soil, in summer fallow, his man had ploughed, with the same plough and oxen, an acre in three hours and forty minutes.

Finally, the premiums were awarded thus:—

1. The first premium of six guineas to JOHN BILLINGSLEY, esq; with a gratuity of one guinea to his servant.
2. The second premium of four guineas to Farmer SULLY, with a gratuity of half-a-guinea to his servant.
3. The third premium of two guineas to Mr. JOHN THOMAS, with a gratuity of a smock-frock to his servant.

And such was the evident comparative superiority of Mr. BILLINGSLEY's double coultter-plough, drawn by six oxen, that several gentlemen and farmers from different parts have in consequence determined to work oxen instead of horses; and have given orders for the making of double ploughs to the amount of six or seven in number. One gentleman, who was an umpire on the occasion, and who occupies several large farms, having been accustomed to keep on one of them six horses and two ploughs, being convinced that a double-coulttered plough and six oxen would completely do the work of the farm, determined to make such a regulation immediately. Thus the Society may have the satisfaction of hoping, that from a continuation of similar public trials, improvements will be made in the lessening of expence in husbandry; from which, among numerous other causes, the proposed good consequences of their zealous endeavours will result.

To the foregoing Statement of Facts relative to this Trial of Ploughs, we subjoin the following Extract of a Letter written by a practical Farmer, who was present on the occasion.

—Let us here pause, and take a comparative view of the expence of ploughing an acre of land drawn from the preceding trials.

The average price of keeping oxen, (including winter and summer food) I take to be 3s. per week;
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the calculation then in respect to Mr. BILLINGSLEY'S plough will stand thus:

	£.	s.	d.
Six oxen, at 6d. each per day	-	0	3 0
Ploughman and driver	-	0	1 8
Wear and tear of plough, yokes, &c.	-	0	0 4
Total	£.0	5	0

Let us suppose that $1\frac{1}{2}$ acre of ley, or $2\frac{1}{2}$ acres of stubble, or fallow land, be ploughed each day, the expence of the former will not then exceed 3s. 4d. per acre, and of the latter 2s. per acre.—Is not this improvement worthy the attention of all farmers?—And are not the thanks of the public due to the person who has been instrumental in bringing forward to view a reduction of expences in ploughing, which cannot be estimated at less than 2s. 6d. per acre?

Farmer SULLY'S account may be thus stated:

	£.	s.	d.
Three horses, at 9d. per day each	-	0	2 3
Ploughman and man-driver*	-	0	2 4
Wear and tear of plough, harness, shoeing, &c. say only	-	0	0 5
	£.0	5	0

But as a boy might have guided the horses, I will consider the expence at 4s. 6d. per day; and herein

* This is properly remarked, as from an ill-judged policy in the farmer, a man-driver was employed, instead of a boy, that the horses might be constantly kept to their greatest speed.

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I think no partiality is shewn to the ox-plough.— If one acre of ley, or $1\frac{1}{2}$ acre of stubble, or fallow, be ploughed in a day, the expence will then be 4s. 6d. the former, and 3s. per acre the latter.—Superiority of Mr. BILLINGSLEY's plan in both instances 1s. per acre.—And this superiority would be still greater in a comparison with Mr. THOMAS's, were it not that the unskilfulness of his ploughman, and the smallness of the oxen, rather preclude a strict comparison.

Now farmers are in general quick-sighted enough in many cases wherein their interest is concerned; surely, therefore, they cannot shut their eyes in this instance, but must adopt the use of a plough so vastly superior to those in common use.

END OF VOL. IV.





